THE WORLD'S SAILPLANES VOLUME II ERRATUM SLIP

The following text is to be substituted for that on pages :–

Page 11 – Left-hand column: Kupper instead of Küpper
Page 14 – Left-hand column: Kupper instead of Küpper
Page 17 – Sources for Fig. 25 instead of Fig. 24
Page 17 – Sources for Fig. 25 L. Prandtl instead of Prandel
Page 17 – Sources for Fig. 25 W. Spilger instead of Spigler
Page 36 –

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions . . | 250 km/h |
| Placard airspeed gusty conditions . . . . | 140 km/h |
| Aero-towing speed . . . . . | 140 km/h |
| Winch launching speed . . . . . | 95 km/h |
| Cloud flying permitted? . . . . . | Yes |
| Permitted aerobatic manoeuvres. . . . . | No |
| Spinning permitted? . . . . . | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. . | 26–36 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) . . . . . | 250 km/h |

**Straight flight performance** Measured

at flying weight of . . . . . 300 kg

**No flap or brake**

| | V km/h | V sink m/s |
|---|---|---|
| min. sink condition . . . . . | 70 | 0,70 |
| max. L/D condition . . . . . | 105 | 0,86 |
| | 100 | 0,83 |
| | 140 | 1,40 |
| Stalling speed . . . . . | 55 km/h | |
| Max. L/D . . . . . | 34 | |


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# The World's Sailplanes

*Die Segelflugzeuge der Welt | Les planeurs du monde*

# The World's Sailplanes
# Die Segelflugzeuge der Welt
# Les planeurs du monde

Volume II

Published by

Organisation Scientifique et Technique
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(Chief Editor Schweizer Aero-Revue)

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# Contents

# Foreword by the President of OSTIV

It was a sunny summer afternoon, June 19th, 1958, when the OSTIV opened the secretariat of the VIIth Congress near the entrance of Leszno airfield in Poland. The world gliding championships had been going on for three days and there was a constant stream of glider pilots, ground crews and visitors past the open window over the "OSTIV SECRETARIAT" sign, well-remembered by many participants in former world championships and OSTIV Congresses. In the cosy office behind the window, the OSTIV Secretary and his assistant were busy giving out all kinds of information and, as always, selling OSTIV Publications—a familiar picture to the caravan of people who would not miss the world gliding championships and the OSTIV Congresses for anything.

Then Miss Betsy Woodward came into the office, the *first* copy of *"The World's Sailplanes"* in her hand. She gave it to me unceremoniously and said briefly and businesslike: "Let's open an order list and advertise this new OSTIV publication like anything. We've got a lot of gliding people here from all over the world, and we'd better use the opportunity..."

There was a rush of orders for the new book and all 2000 copies were sold out completely in 18 months. Even today we are still getting orders for "The World's Sailplanes" every week.

The first edition of "The World's Sailplanes" was compiled under the auspices and with co-operation of the OSTIV, but the personal initiative was Miss Betsy Woodward's, who also had it published at her own expense.

When the edition was sold out, the OSTIV board decided to publish the *second* volume themselves.

Mr. B. S. Shenstone, editor of the OSTIV Section in AERO REVUE—the official OSTIV organ—was willing to head the editorial staff and Mr. K. G. Wilkinson agreed to edit the technical data and drawings which had been received. Mr. A. Stirnemann, AERO REVUE chief editor, again consented to see to the printing and the layout of the book.

Now that this new book, *"The World's Sailplanes II"*, is lying before me, I must say that these three people have done an excellent job, for which all the world's gliding enthusiasts owe them a great debt of gratitude.

As decided by the OSTIV board, the present volume does not contain types of sailplanes which were included in the first edition. Moreover, the second volume is more liberal in arrangement and design.

I hope that "The World's Sailplanes II" will find the same or even better reception than its predecessor, so that our organisation will feel encouraged to continue this work in the future, i.e. to collect data on the newest types of sailplanes, print them in AERO REVUE, and publish them in new volumes of "The World's Sailplanes".

Bearing in mind the saying of the great founder of commercial aviation, my compatriot the late Dr. Albert Plesman, that "whatever you put your heart into, succeeds", I am sure this OSTIV publication will be another big success. The loving care Messrs. Shenstone, Wilkinson and Stirnemann have given to its creation, is a sure guarantee of this.

L. A. DE LANGE
President of OSTIV

# Technical Introduction

This volume is a continuation of the book published in 1958. It does not repeat data on sailplanes published in the first book, although some later marks of formerly published types are described when the changes made are important.

This volume also contains data from several countries not represented in the 1958 book. These additional countries are: Australia, Bulgaria, Canada, China, Czechoslovakia, India, Japan, Rumania, Russia, South Africa.

The data presented are those sent in by the designers or representative organizations. They were not blindly accepted by the editors and in many cases were returned for revision. Sometimes the revisions never came back to us, which explains some of the gaps in the data. However all the data published are designers' data and therefore only as accurate as the designers. Most of the performance data are calculated, and there is no lack of optimism in this book.

Readers may wonder why some particular sailplanes are missing. We should also like to know. Maybe some designers are lazy and cannot bring themselves to the point of sending in data even when begged to do so. Others apparently feel that the only types worth describing are those that are for export sale. Both categories lost something by thus hiding their lights under bushels.

Even so, we have been able to collect data for more sailplanes than could be printed before the deadline, which indicates that a third volume will probably be published some day.

The format of this second volume is larger, in an effort to answer criticisms that the 3-view drawings in the 1958 volume were too small to be of use. The result is that this volume should be of greater use to designers, but can no longer be carried in a pocket.

We are grateful for the help given us by a number of people, particularly Bruce Carmichael, Hans Zacher and Elemer Racz. But without the loving care with which our data were handled, laid out and translated into print by Alex Stirnemann, this book would never have appeared.

THE EDITORS

# The Shape of High Performance Sailplane Technical Development

by HANS ZACHER, Dipl.-Ing., Munich

At least six hundred, and perhaps even as many as eight hundred, different sailplane types have been built since 1920, even if one ignores variants of a type. Of these, almost seventy types have appeared in World's Records Lists. But the following discussion is not concerned with the successful contest winners and record-breaking aircraft, but only with those of outstanding technical interest and those which were leaders of development trends. Sometimes consideration is given to rather unusual types if they provided new information of use for the future.

The above-mentioned large number of sailplanes, developed in various countries, and often paralleling each other in technical advances, combined with lack of suitable technical data, make it difficult to pick out and describe the fifty or one hundred best designs.

For this reason, we shall use as guidance the well-known German development, and build other developments around them. Since we do not wish to write a whole book, but only an historical review for a book, we must suggest to the reader who requires more information that he reads such books as those by Cijan, Hirth, Nessler and others. On the period since 1945, "The World's Sailplanes", Vol. I and Vol. II, provide the best data.

## Efforts up to 1920

Efforts to realise human soaring flight go back to Leonardo da Vinci who, in 1506, had already made drawings of a machine for climbing without wing flapping and sketches of a bat-like wing (Fig. 1). Around the middle of the 19th Century, among many technical-scientific contributions, those of J. M. Le Bris and L. P. Mouillard were so far ahead of their times that they described streamlines, proposed wings with high aspect ratios and flight without flapping

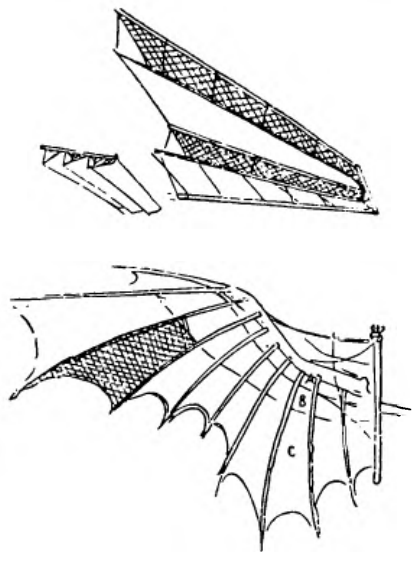

Fig. 1 Leonardo da Vinci: Wing Sketch (about 1500)

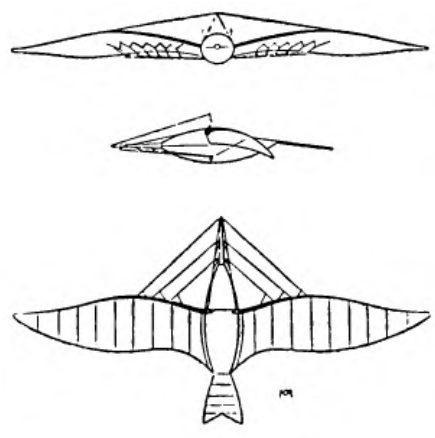

Fig. 2 J. M. LeBris: Glider No. 2 (1865)

(Fig. 2). Cayley has recently been confirmed as building the first successful man-carrying glider in 1853. He persuaded his coachman to fly it, but after the flight, he said: "Please, Sir George, I wish to give notice. I was hired to drive, not to fly". J. Montgomery, after detailed study of birds in the second half of the 19th Century, began to build gliders and by 1911 had tested five aircraft (Fig. 3). The most outstanding and generally recognised meritorious work on realising human flight was accomplished by Otto Lilienthal (1848–1896) (Fig. 4). He was the first who sought to solve the

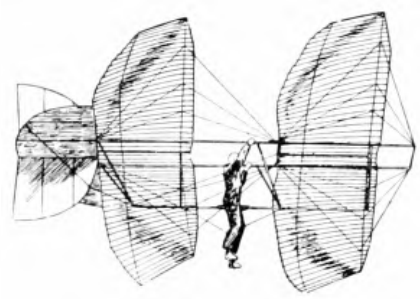

Fig. 3 J. Montgomery: Glider No. 4 (1905)

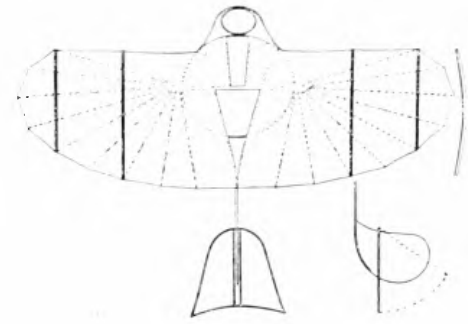

Fig. 4 O. Lilienthal: Glider (1895)

problems of bird flight by using engineering techniques, using a whirling arm to measure forces on a wide series of wing and wing section shapes. He recognised that the cambered wing produced higher lift coefficients than one without camber. This knowledge he applied to the construction of folding wing gliders with which he was able to fly up to 350 m distance with a gliding angle of about 6, after taking off from

Fig. 5 O. Chanute: Glider (1898)

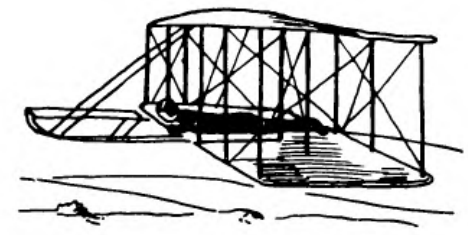

Fig. 6 O. and W. Wright: Prone Pilot Glider (1900)

a hillock. The control of his monoplanes and biplanes was achieved by shifting his body, there being no moving control surfaces. After Lilienthal's fatal crash in 1896, Percy Pilcher in England and Octave Chanute in USA took the matter further and developed many forms of glider, even one with five superimposed wings (Fig. 5). Chanute also tried movable control surfaces, but it was not until the work of Wilbur and Orville Wright that a further decisive step forward was taken when they began their flight tests in 1899 (Fig. 6). They laid great emphasis on the problems of balance and controllability. They built the first lateral control by means of warping the left and right wings in opposite directions. Their biplanes had forward elevators and aft rudders. During the early flights the pilot lay on the lower wing. The "undercarriage" consisted of two skids with a very narrow track. At about the same time as the Wright brothers were at work, José Weiss was busy with a series of gliders, mostly tailless. Etrich and Wels flew an all-wing glider modelled on the Zanonia Seed in 1906.

In the early years of the 20th century there was a parting of the ways for the pioneers, after thousands of gliding flights had taken place. Most of them saw that the goal of

their work involved the engine, because in the meantime the development of the light dependable internal combustion engine promised greater rewards. Only a few still believed that they ought to develop gliding further, and in addition to the scientific interest, there was also a sporting aspect. Thus, from 1908 to 1912 E.Offerman in Aachen carried out gliding tests using a catapult, and the members of the Darmstadt Sport Flying Union under H.Gutermuth took a series of monoplanes and biplanes developed by them to the newly-discovered Wasserkuppe from 1910 to 1914 (Fig.7). At the

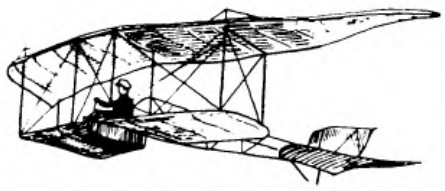

Fig. 7 Darmstädter Flugsportvereinigung: FSV 8 (1912)

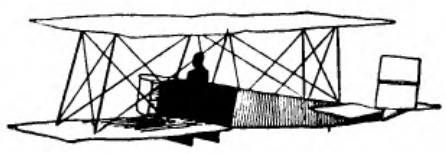

Fig. 8 E. von Lössl: E. v. L. 1 (1920)

same time, Harth and Messerschmitt were also flying gliders. They were already using wing sections with thickened leading edges and later built wing-controlled aircraft. Their work extended into the 1920's.

## Development 1920 to 1930

After World War I the first soaring contest was held in 1920 on the Wasserkuppe. The aircraft taking part showed that tentative experiments were being made in all directions. There were military derivatives, biplanes with open cockpits (Fig.8), sometimes with wheeled undercarriages, hang gliders, tailless designs and for the first time a cantilever low wing monoplane by Klemperer, the "Schwarze Teufel" (Black

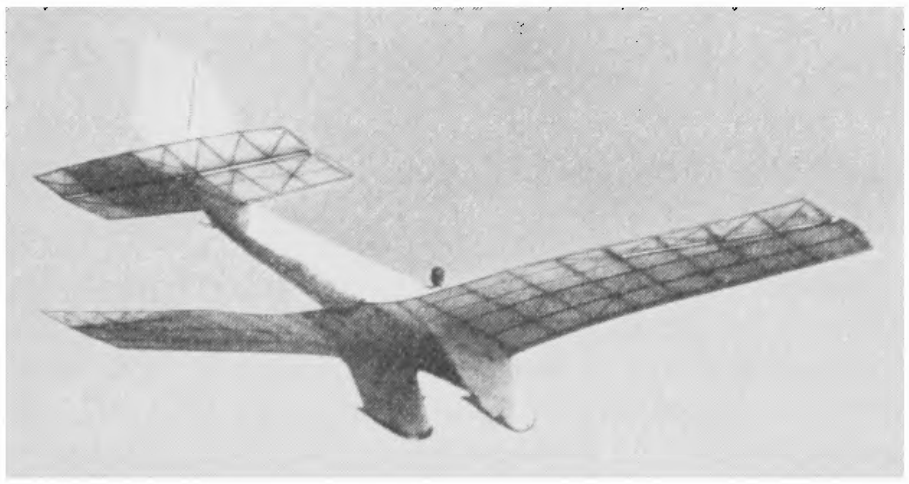

Fig. 9 W. Klemperer, Aachen: "Blaue Maus" (1921)

Devil). Next year he produced an improvement, the "Blaue Maus" (Blue Mouse) (Fig. 9) in which the pilot did not protrude so far out of the fuselage. A decisive step forward was however taken by the "Vampyr" (Fig.10) of the Academic Flying Group (Akaflieg) in Hanover which was characterised by a cantilever single spar wing with torsion resisting nose, set in the shoulder position on an angular plywood fuselage. Only the pilot's head protruded. The undercarriage consisted of three footballs. Apart from its outstanding performance in the contests the influence of its design and construction on sailplane development showed it to be a turning-point in sailplane design.

It was soon recognised that a low sinking speed was not the only requirement for a sailplane, but a good flat gliding

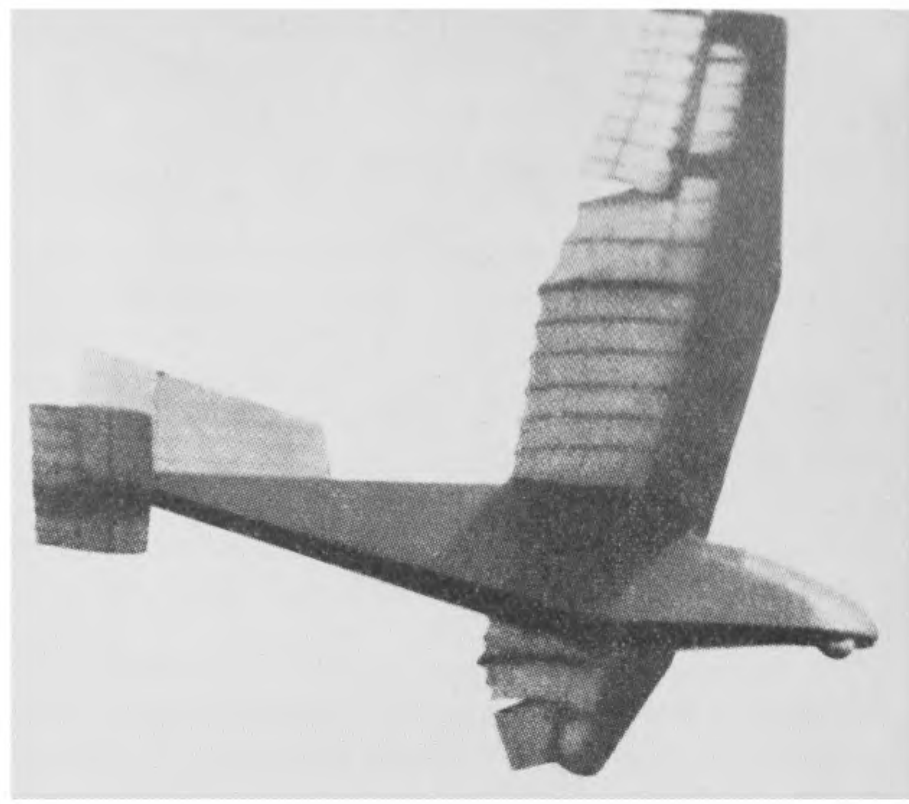

Fig. 10 Hannover: "Vampyr I" (1922)

angle was also necessary, if distance flying were to be undertaken as well as duration and altitude. After a bold experiment by Espenlaub, who was the first to build a 17 m span cantilever wing, the "Konsul" (Fig.11), built by the Darm-

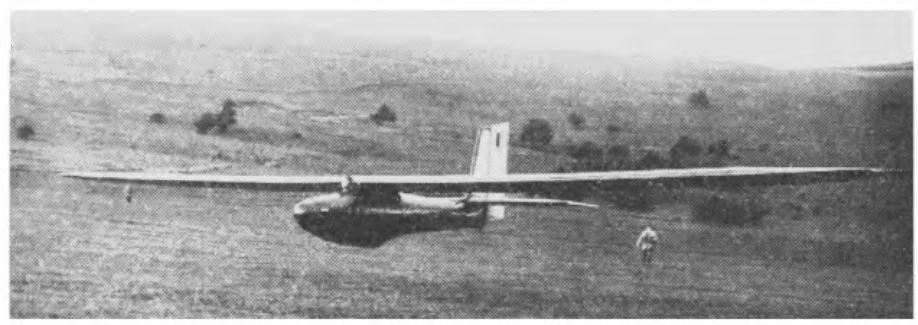

Fig. 11 Darmstadt: "Konsul" (1923)

stadt Akaflieg, was an aircraft which defined more clearly the appearance of future sailplanes. It had a span of 18.7 m and an aspect ratio of 18, using Göttingen 535 as wing section. It had a long elliptical section fuselage, a large rudder and differential ailerons. The "Konsul" was the prototype for the so-called Darmstadt School whose members during the years following designed, among others the "Roemryke Berge", Darmstadt II (Fig.12), "Starkenburg", "Westpreus-

Fig. 12 Darmstadt: "Darmstadt II" (1927/29)

sen", "Württemberg", "Lore", "Musterle". The elliptical planform wing was either directly set on the fuselage or on top of a short tower on the fuselage. By 1928 this line of development reached a certain exhaustion. In this year the "Kakadu" by the Akaflieg Munich appeared with its highly tapered wing and an aspect ratio greater than 20. Also the Rhön-Rossitten-Gesellschaft (RRG) later reorganised as the DFS produced the "Professor" designed by Lippisch for series or home manufacture. This was a braced high wing monoplane, and its larger and greatly refined development, the "Wien", followed it in 1929 (Fig. 13).

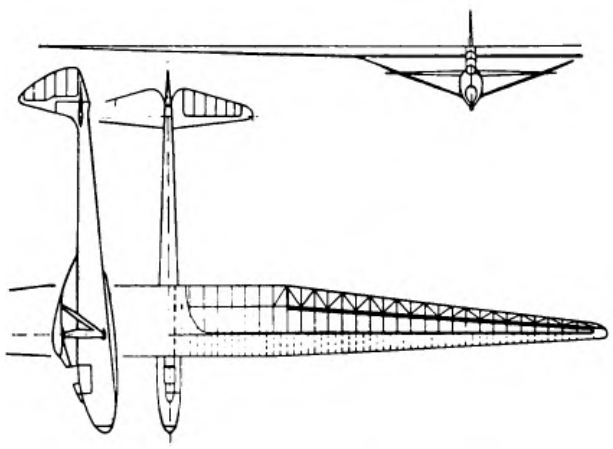

Fig. 13 RRG: "Wien" (1929)

Outside Germany there was also a lively activity in sailplane construction, particularly in France, England, in Switzerland and in Russia. The same trends were to be seen. One advanced gradually from the braced biplane to the cantilever monoplane, from open to faired fuselage, from wheeled undercarriage to skid and so on. It is notable, that in contrast to Germany where in most cases the Akaflieg and individuals were active in design, in France and England, important aircraft manufacturers undertook the development of sailplanes (Dewoitine, Farman, Hanriot and Potez, Handasyde, de Havilland). In Switzerland Spalinger came forward with his own designs and in Russia we find such names as Ilushin, Artamanoff, Gribowski etc. If we wish to name particular aircraft of this era, we should certainly mention Abrial's "Vautour" and Peyret's "Tandem" and also Tscheranowski's "Parabola".

## Development 1930 to 1940

During the 1920's the span increased from about 10 m to about 20 m, and the aspect ratio had about the same values. One had recognised that by span increase the performance would be improved and in 1931 Küpper with his "Austria" (Fig. 14) made the experiment of increasing it to 30 m. Stiffness and controllability problems were difficult to solve.

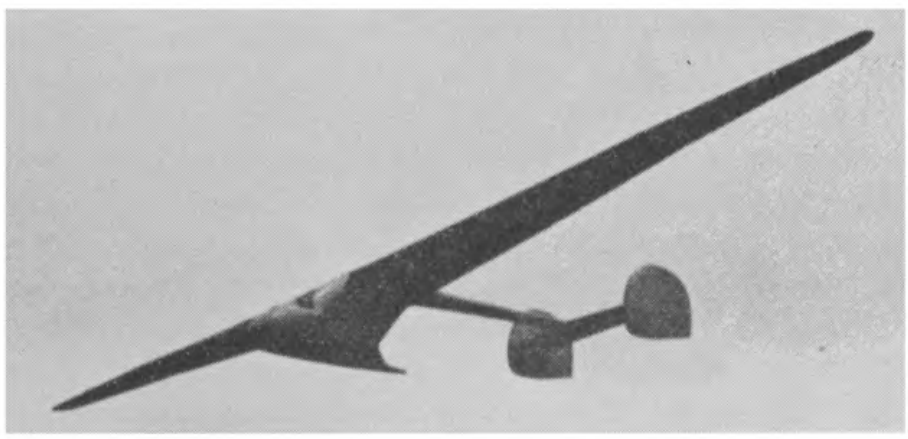

Fig. 14 A. Küpper: "Austria" (1930)

As a result thereafter, apart from a very few exceptions, sailplane spans ranged between 15 m and 20 m. In the meantime the RRG had produced Lippisch's "Fafnir I" (Fig. 15).

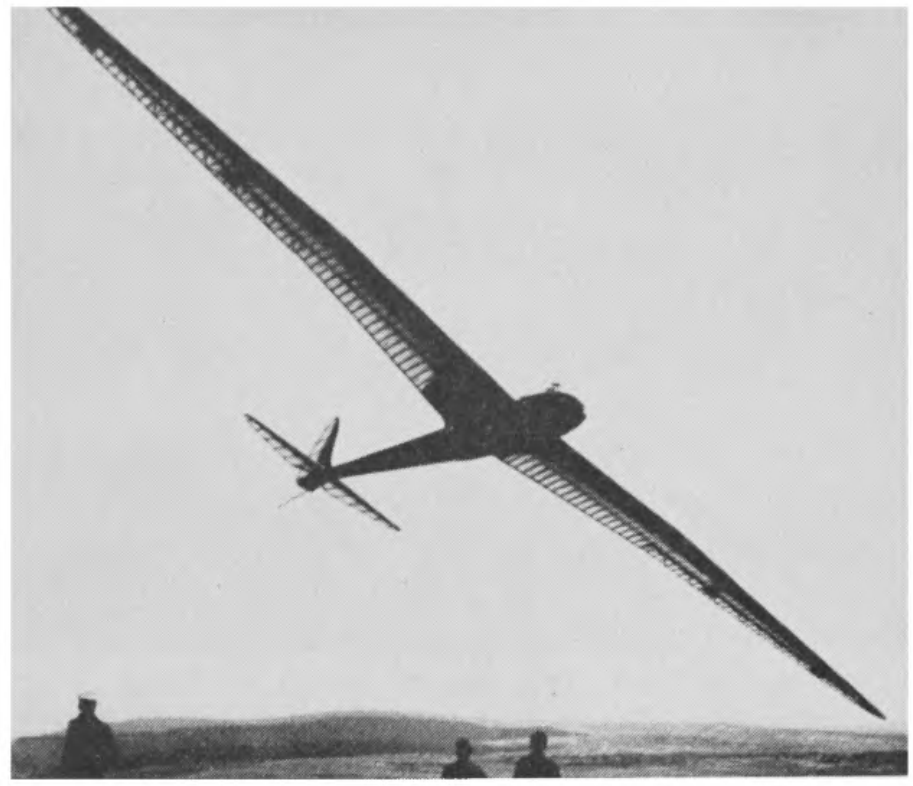

Fig. 15 RRG: "Fafnir I" (1930)

Fig. 16 Buxton: "Hjordis" (1935)

Its general features (cranked wing and fuselage-wing fairing) were typical of the Wasserkuppe School. It was followed by the "Fafnir II", Jacob's various "Sperber" variants, the "Habicht" and his "Reiher" (Fig. 17). Many designers

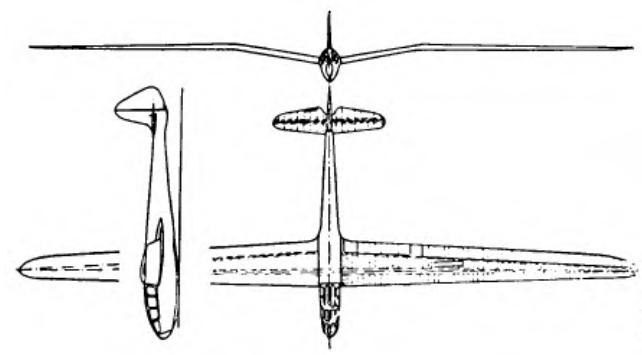

Fig. 17 DFS: "Reiher" (1937)

copied the cranked wing. Not until the end of the 1930's did the DFS return to the classical form of sailplane, which up to the present is followed in many designs. The DFS "Weihe" and "Meise" by Jacobs were normal high wing monoplanes with uncranked, straight-tapered wings and long elliptical section fuselages. Apart from the Wasserkuppe School, Wolf Hirth with his "Moazagotl" and "Minimoa" was also of considerable developmental influence in the 1930's. Both these machines had heavily cranked wings and a characteristic plan form. In addition the Flugtechnische Fachgruppen (FFG), into which the Akaflieg had been turned

at the various technical universities, brought out a large number of original designs which featured such things as camber flaps, cranked winghs, special fuselage-wing fairings, prone pilot and many other things. From this broad field the "Windspiel" and "D-30 Cirrus" (Fig. 18) were outstanding.

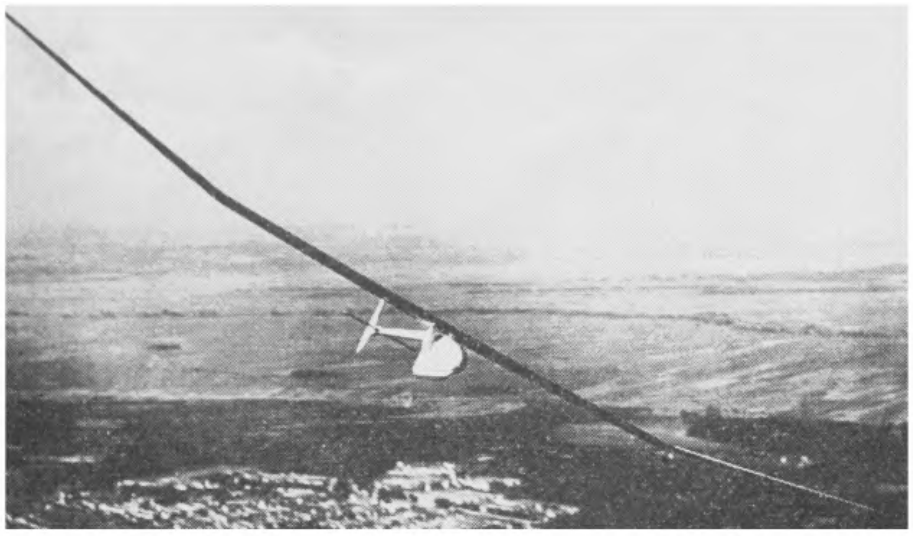

Fig. 18 Darmstadt: D 30 "Cirrus" (1938)

The "Windspiel" of 1933 with only 12 m span and designed for minimum weight (empty weight originally 54 kg) was the dwarf among high performance machines of its day, but because of its low weight and manoeuvrability was able to achieve a place on the World Record List. The opposite of the "Windspiel" and in many respects akin to the "Austria" was the "D-30 Cirrus" of 1938 which had a span of 20 m and an aspect ratio of 33 and whose primary structure was of dural and magnesium. It had camber flaps and spoilers, dihedral adjustable in flight and a tubular rear fuselage supporting the tail. It was close to the edge of the structurally possible and achieved performances which were not improved until 1954.

Apart from sailplanes of conventional shape reference should certainly be made to the tailless or all-wing sailplanes designed by the Horten brothers and particularly the "Horten IV".

In the meantime, soaring had become indigenous in many countries and particularly in Poland, Czechoslovakia and Hungary important technical advances were achieved. But there was also considerable design activity in Italy, Yugoslavia and USA. From the long list of important designers and successful sailplanes we may take the following as good examples: Grzeszczyk's "SG.21", Czerwinski's "CW-5", "PWS-101", "PWS-103", Zlin's "Z-25 Šohaj", the "M-22"

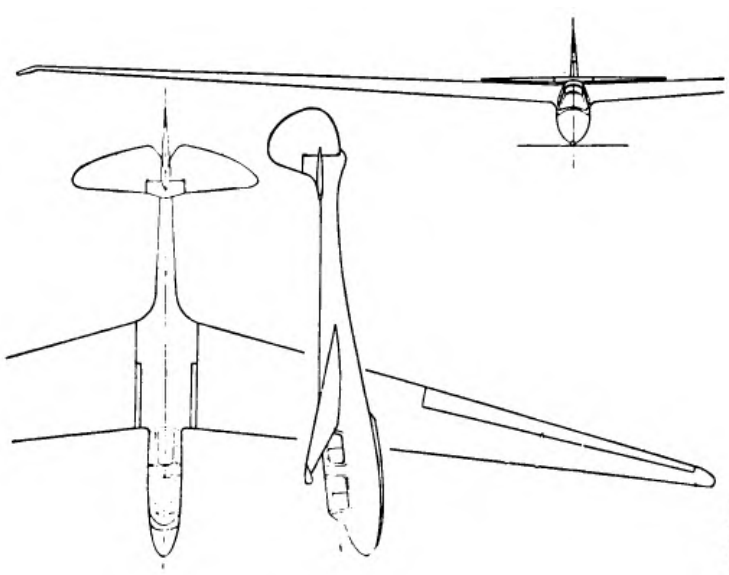

Fig. 19 KIM 3: "Stakanovitch" (1935)

by Akaflieg Budapest, Rotter's "Nemere", Musger's "MG-9", Bowlus' "Albatross" and Stanley's "Nomad" which was first to use a butterfly tail. The American Schweizer brothers were the first to put light alloy sailplanes in series production. With the addition of the French "Avia 41P", the British "Hjordis" and "King Kite", the Swiss Spalinger types and the "Moswey" and "Spyr", and the Russian "GN-7" and "Stakanovitch" (Fig. 19), the first sailplane with marked forward wing sweep, we complete the highlights of this decade.

At the end of this prewar section one more fact must be mentioned which, had it not been for the war, would certainly have given soaring a tremendous boost. This was the specification for an Olympic Sailplane, limited to a span of 15 m and to be built to standard requirements. It was not far different from to-day's Standard Class Sailplane. The Polish "Orlik" by Kocjan (Fig. 20), the Italian "Al-3" and

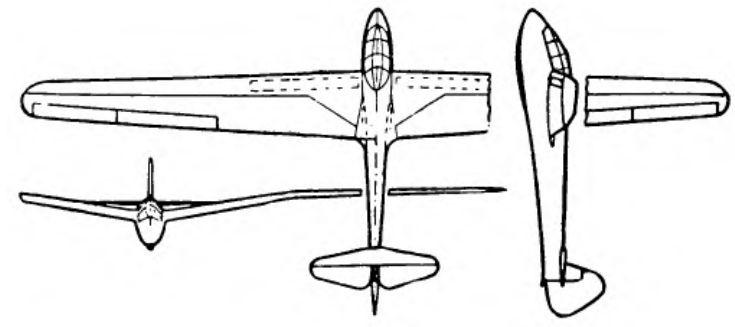

Fig. 20
H. Kocjan:
"Orlik" (1939)

"Pellicano", the German "DFS Meise" by Jacobs and "Mü 17" by the Akaflieg Munich were built to this Olympic specification and completed in flying and other tests in Italy in 1939. The result was that the "Meise" was chosen and re-named "Olympia-Meise".

In this connection, it should not be forgotten that, by means of the Internationale Studienkommission für den Segelflug (ISTUS) which was founded in 1930, all interested nations were given the opportunity to exchange knowledge and ideas.

This resulted in a number of decisive, although apparently small, contributions to sailplane development. It is not possible to give details here of individual authors' work, but the ISTUS reports show eloquent examples of scientific and technical effort and of friendly co-operation in those days before World War II.

## Development since 1945

During World War II practically no sailplane development took place anywhere. Up to 1950 there were mostly prewar types produced or variants of such designs. Then a great forward impulse toward improved performance was given by the late Dr. August Raspet. By his investigation on the "Tiny Mite" and "RJ-5" he showed that by improving the quality of the wing and fuselage surfaces both as regards smoothness and waviness, by improving fairings and removing gaps and leaks, a remarkable improvement in performance could be achieved. This work influenced sailplane designers in a most marked manner and one may safely say that such sailplanes as "Elfe" (Pfenninger), "HKS" (Kensche), "Spartak" (Dlouhy), "Meteor" (Cijan, Obad, Mazovec), "Phoenix" (Eppler and Nägele), "Zefir" (Szuba), "Skylark 4" (Slingsby), and many others, and certainly including many Standard Class sailplanes, have profited

from Dr. Raspet's work. Since the war OSTIV, successor of ISTUS, has had considerable success in collecting and disseminating technical and scientific information from various countries. OSTIV has also in co-operation with FAI-CVSM resurrected the idea of standard sailplanes and brought it to everyone's attention. It is generally recognised that the development of high performance sailplanes without cost limitations is hardly in the interest of club operations. Clubs require a simple and cheap sailplane, but also one with a good performance. In 1960 and 1962 OSTIV Prizes were given for two sailplanes which were considered to have fulfilled the requirements in the best sense. These were R. Kaiser's "KA-6" and R. Kunz's "Standard Austria".

That the Standard Class fills a need and is competitive is clearly shown by the increasing proportion of Standard Class Sailplanes in World Championships.

**Structural development of sailplanes**

In the earlier part of this review a general picture of the development was sketched in terms of persons and sailplane types. We shall now examine how some of the structural groups changed with time, and we recognise the fact that some elements developed from a primitive through a complex form to a final simple solution (undercarriages for example). In other cases the shape often changes as in the case of wing sections, and here many difficult problems have been attacked without finding satisfactory solutions, as in the search for methods of continuously varying camber. Finally we find characteristics that gradually disappear, such as the tendency to copy the cranked type of bird's wing. One can clearly see how the rush of development in the twenties, the refinement of shape and the tentative approaches to the achievable limits in the thirties took place. Since 1950, great attention has been paid to improvement of surface finish and to new constructional methods with new materials. Thus, we now gradually approach the sort of sailplane which perhaps has already taken on some kind of standard form.

The wing is of fundamental importance for the performance and flying characteristics of sailplanes. Originally it may have been folding, extensively braced or strutted, or approximating to bird or bat shape. In 1910 it was often of rectangular plan. In the twenties, apart from a few straight tapered wings, the elliptical plan form was favoured until it was recognised that a carefully designed straight taper could be practically as good aerodynamically and had considerable manufacturing advantages. Since "Vampyr" and "Konsul" the cantilever wing has been almost taken for granted, even though up to 1930 struts were used from time to time.

Experience in World War I showed that biplanes were very manoeuvrable. For this reason up to 1924 biplanes were still appearing in gliding contests. From then onwards the monoplane (initially high-wing) took over. "Fafnir I" (1930) whose cranked wing was in the shoulder position was widely copied as late as 1950. But even the DFS school with the "Weihe" and "Meise" returned to the tapered uncranked wing. The very heavily tapered wings disappeared and taper settled down to a maximum of 1 : 3 which has proved to be safe in stalling and in addition does not result in too low values of Reynold's Number at the wing tips.

Although at the first Rhön competitions a few sailplanes with wings of bamboo and cardboard appeared, after 1922 they were mainly of pine or spruce and plywood. Before World War II, there were already a few all-metal sailplanes and recently glass-fibre reinforced plastics, foam plastics, etc. have been used. The common two spar wing, popular in World War I disappeared quite quickly as soon as the "Vampyr" with only one spar and a torsion-resistant nose showed the way to go. In addition it happened to be largely a statically determinate type of structure. In recent times the shell type of wing with laminar wing sections has rapidly increased in importance. Wings are most often 2-piece. Although up to about 1928 3-piece wings were used for ease of transport, they are sometimes still used for other reasons.

Whereas the first gliders used uncambered wings, camber was used since Lilienthal, and in about 1910, exaggerated wing sections were designed, some even with thickened leading edges. After World War I, the Joukowsky sections were quickly adopted, followed by those tested in Göttingen and from 1933 including those from the NACA. Since 1950 the NACA laminar sections and those originated by Eppler and Wortmann became widely used. Since in choosing a wing section, not only its aerodynamic characteristics but also its structural application must be considered, the maximum thickness, its chord location and the area enclosed forward of this point can sometimes be decisive. Fig. 21

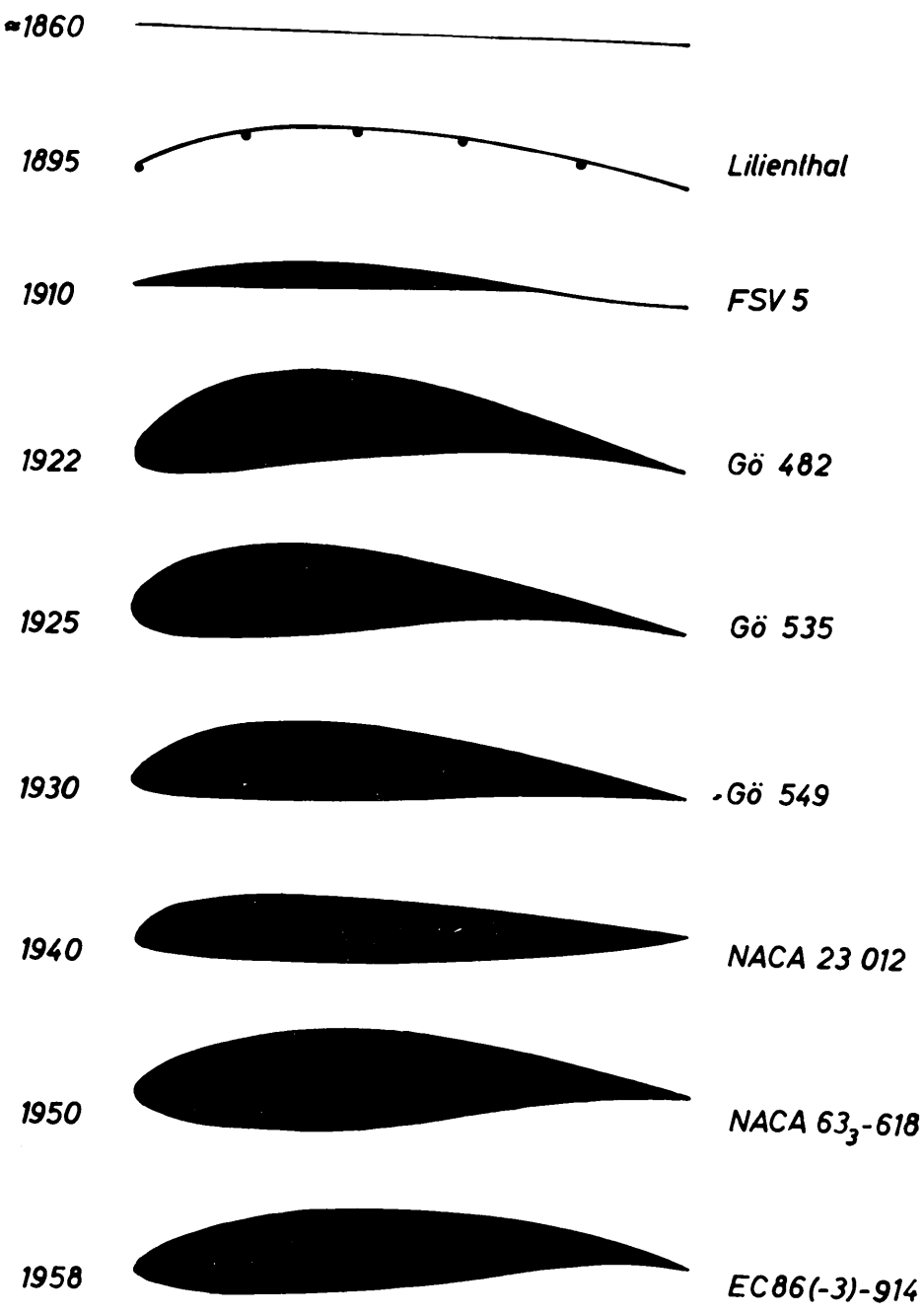


Fig. 21 Characteristic Sailplane Wing Sections

shows a series of wing sections characteristic of their times and which have been used by sailplanes. By changing the camber or by controlling the trailing edge position, one had hopes of attaining high maximum lift coefficients and thereby

lower landing speeds. Just as many attempts to produce adjustable wing sections were made in the fifties as in the twenties. Because of the complexity of the mechanisms, the often rather high control forces required and other things they have never been quite satisfactory. Camber changing flaps used often since about 1935 can be better. They cause, however, complex structure, weight and greater cost. For this reason such flaps are not considered desirable for the Standard Class.

Wing loadings have risen from about 6 kp/m² to about 30 kp/m² and sometimes even higher. Fig.22 shows the increase of wing loading over the years. The early spans were of the order of 7 m, grew to 10 m to 12 m at the first Rhön Contest, were taken to 18 m by "Konsul" but have seldom been greater than 20 m. The present day tendency is more

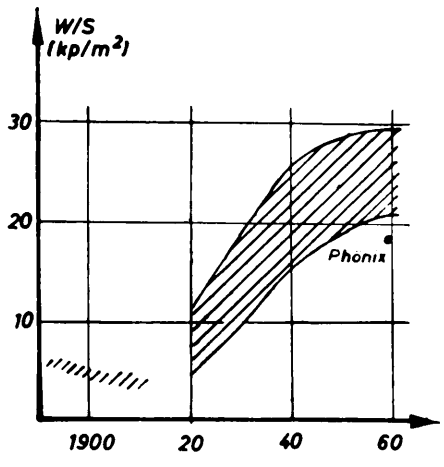


Fig. 22 Variation of Normal Wing Loadings

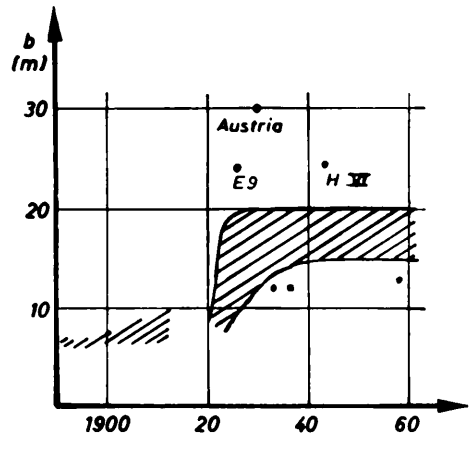


Fig. 23 Variation of Normal Spans

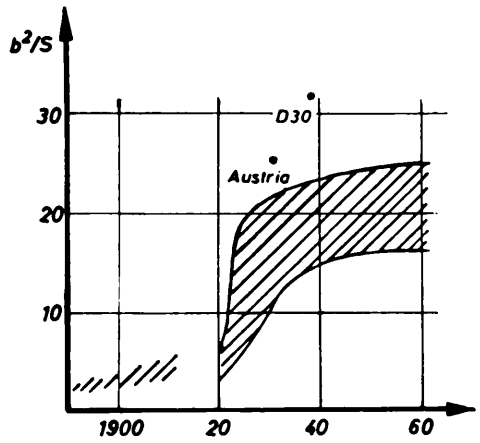


Fig. 24
Variation of Normal Aspect Ratios

in the direction of 15 to 17 m rather than to 19 to 20 m because ground handling and manoeuvrability in the air suffer with large spans. Stiffness and flutter requirements also tend to limit the span. Attempts have been made to approach limiting conditions either by large span as in "E. 9", "Austria" by Küpper, and "Horten VI" or by increasing aspect ratio, the figure of 33 having been reached. Fig.23 and 24 show the trend over the years. The wing load factor used to be very low, as neither heavy gusts nor sharp pull-ups were taken into account. Not until the thirties did one get away from ultimate load factors of the order of 6 to 7.5 or 9. This order of factor is likely to remain unless unusual loads are to be encountered, as in wave soaring, which may demand higher values. The OSTIV Standard Class Airworthiness Requirements use a factor of 8.

With the increase in sailplane performance, achieved by reducing drag and increasing wing loading, it became necessary to be able to increase drag at the pilot's wish, to prevent overspeeding and also during approach and landing. In the case of "Fledermaus" with vertical wing endplates and in Küpper's "Austria" with twin rudders, the gliding angle could be controlled by operating these surfaces in opposite directions. The effect was rather small. Similarly unsatisfactory were retractable fuselage mounted airbrakes and hinged wing leading edges (tried first on "ObsUrubu"). In 1934 the DFS developed spoilers which were installed only on the wing top surface and finally the airbrakes which were located on both top and bottom surfaces. By these means a valuable contribution was made toward improving safety. These brakes have been developed into many forms and today are used on almost all sailplanes. Unfortunately they disturb the wing surface just in the area where it is particularly important to retain laminar boundary layer conditions. For these reasons the best high performance sailplanes are equipped with braking parachutes in the tail which are used mainly for shortening the landing run and not for adjusting the glide, as they are seldom adjustable or retractable.

There has always been interest in the development of tailless or all-wing sailplanes. Even the 1906 Etrich and Wels glider shaped like a Zanonia seed was tailless. Up to 1922 there was Wenk's "Weltensegler" and "Charlotte", in 1925 the "Parabola" and later the all-wing types by Küpper and the Horten brothers. In the DFS Lippisch also was active in developing a series of similar types under the family name of "Storch" and later his first Delta wing (1930). In recent times Fauvel's unswept all-wing types have been successful. Whether the performance and flying qualities of all-wing aircraft are generally satisfactory compared to normal aircraft types, is not yet clear.

Naturally, the first hang gliders had open fuselages. The Wright brothers biplanes had nothing that could be called a fuselage. The pilot just lay on the lower wing. Gradually and in parallel with the hang glider, gliders with a seated pilot came into use, but the fuselages were still open. The control surface supports were mostly of girder construction. At the first Rhön competition fuselages of boat or nacelle form appeared and shortly thereafter the angular plywood fuselage, which covered more and more of the pilot until at last only his head protruded. The slender fuselage of elliptical cross-section first appeared in 1923 and has remained in favour up to the present. Only the fairing-in of the pilot has developed from no windscreen to a simple windscreen and then to plywood head fairing with side windows, thence to more or less angular transparent fairings and finally to blown plastic canopies which nowadays usually are integral with the fuselage shape. At the same time many attempts were made to integrate wing and fuselage with special fairings and shapes to reduce drag and to avoid irregularities in the spanwise lift distribution. The lengthening fuselages were a good thing for flying qualities, as both damping, general stability and controllability were improved. Materials used were initially wood and plywood, but from 1935 onwards, the welded steel tube fuselage came into use. In addition to these two continuing types of structure, metal-skinned and plastic fuselage have more recently come to the fore.

Even in the early days, two-seaters were built. Their suitabilitiy for pilot training is beyond argument. Fokker flew his 2-seat biplane in 1921. 1923 saw "Margarete" and later the "Cöthen" and several other one-off types appeared. In 1932 the "Milan" appeared; a high performance 2-seater with steel tube fuselage. But up to 1935, only single seat training was used. At this moment Jacobs of the DFS designed

the tandem "Kranich" which with Hirth's side-by-side "Goevier" were used for many years for dual training and thereby revolutionized training methods. They also broke a number of world records. The Russian "Stakanovitch" did the same. By 1950 a large number of 2-seaters were designed including the American wartime TG series of which several hundred were built. At present this activity has waned, possibly due to market saturation, but maybe because they are no longer included in World Championships.

The first hang gliders had fixed empennages, control being by shifting the pilot's body. Chanute was the first to use a moving empennage and the first lateral control was the Wright brothers' wing warping. The aspect ratio of the first bird-like tails became gradually greater as time went by and today is between 4 and 5 with a maximum of 8. The moving control surfaces are usually mass-balanced and equipped with trimmers. Ailerons were originally rather ineffective and suffered from adverse aileron drag yawing movements, the attempted cure being aileron differential. In addition to differential, an aileron-rudder coupling was tried which increased differential with rudder angle. Nowadays a moderate differential is used without complex mechanisms since the ailerons are relatively smaller, more carefully designed, and the wings are torsionally stiffer thus avoiding aileron reversal at lower speeds. In addition to normal controls with fixed and movable surfaces, all-moving surfaces and half-moving surfaces are used. These latter consisted of a normal moving surface aft of a tailplane or fin which also moved, but only about half the angle of the main moving surface. With this arrangement one hoped to reduce the drag due to operating the controls. During the time when one still hoped to be able to soar dynamically (1920 to 1923) many wings were pivoted so that they could move in pitch and thus could achieve a rapid change of incidence. The ordinary form of empennage is the cruciform one. The butterfly or vee tail was first used in 1938 and since 1950 has been quite widely adopted, because one hoped for some performance advantage and greater ground clearance. It now appears that the T tail may also become more widely used.

It is fair to say that some of the aircraft forms which have fallen by the wayside have fallen because of control problems. Instances are the above mentioned tailless types, tail-first and tandem-wing arrangements. Only a few have achieved true success and been generally satisfactory. There has been no lack of attempts to find optimum solutions during the whole period under consideration. Only the Wright tail-first and the Peyret tandem were successful, but as far form is concerned had no influence on the general direction of development.

There is little to say about control mechanisms. The stick-pedal controls are usual, but now and again we still come across a form of wheel control in very narrow fuselages. The control surfaces were formerly usually operated by cables, but in recent times we see more of them push-pull rod operated, which has advantages from the stiffness and temperature sensitivity points of view.

The undercarriage on hang gliders consisted naturally of the pilot's legs, until the Wright brothers introduced two side-by-side skids. Even though skids were known to be suitable, gliders even after World War I tended to use aeroplane type wheeled undercarriages with high pressure tires. Even Klemperer's twin skids on the "Blaue Maus" and "Vampyr's" tricycle football chassis which were both successful were not enough to kill the wheeled undercarriage. However since 1925, the central skid became general and not until about 1935 was a droppable wheeled chassis used in aerotow to reduce the take-off run. This development brought with it however, certain difficulties and as a result the fixed central (usually braked) wheel took its place. Parallel developments of the single wheel took place in USA where towing off hard runways made a wheel essential. Unfortunately neither landing or landing run characteristics are perfectly satisfactory because of insufficient shock absorption and damping. The retractable undercarriage has been successful in several installations, but it has disadvantages with respect to weight, space requirement and cost.

The undercarriage is closely associated with the method of take-off. The hang glider pilot ran along on his own legs, although later he was assisted by being pulled up by a hempen rope. The Rhön contests produced the shock cord or bungy catapult take-off, and in 1930 the auto-tow and winch launching came from the USA. Shortly thereafter the aerotow became generally used, and great attention was paid to the arrangement and attachment points of the cable. Winch launching and aerotow made gliding possible over flat country, whereas it had heretofore been dependent on hills and dunes. These developments had a great influence on the use of thermals and hence on the average sailplane performance. Other take-off methods such as rockets, auxiliary engines etc. will not be discussed here because they make the sailplane into a powered glider and that is another subject.

Although the primary concerns of this article are only those sailplanes which showed the way to the future, two quite different subjects must be discussed because of their influence on development: sailplane series production and the development of primary trainers and advanced trainers.

Until the end of the twenties almost all sailplanes were one-off jobs. Duplicates were hardly ever built, the next machine being always an improvement on the original even though externally very similar, as in the case of Klemperer's "Schwarzer Teufel" and "Blaue Maus". The successes and the classical shape of the "Darmstadt" caused (as already mentioned) many similar machines to be built in the Darmstadt School, one of which the "Westpreussen" was probably the first to be built in series to drawings. It then occurred to the RRG (later DFS) under Lippisch that it would be most advantageous to produce well worked-out and cheap drawings of a high performance sailplane in addition to drawings for trainers such as Zögling. It was intended thereby to widen the interest in advanced soaring. The result was the "Professor" and it was followed in the thirties by Jacob's "Rhönadler", "Rhönbussard", and "Rhönsperber" and Hirth's "Minimoa" and many others whose numbers in all countries grew considerably just before World War II. In many cases they were slight modifications of successful contest sailplanes. The sailplanes produced in those times were still to be found competing after the war in National and International contests up to 1960. But that year they were overtaken numerically by the Standard Class sailplanes as these with their improving performance came into wide use.

Training and practice sailplanes had long before been built in series. The first sailplane pilots were old wartime pilots, but very soon it was necessary to teach the younger generation. As they improved in performance the sail-

planes became more costly. Thus the necessity for something between the trainer and the high performance sailplane became obvious to reduce the risk of damaging the latter. The experience gathered with hang gliders and early seated gliders, mostly biplanes, was gradually applied and augmented through the "Hol's der Teufel", "Pegasus", "Zögling", "Grunau 9" to the "SG-38". In many lands such examples were followed and open primaries designed, usually with girder fuselage and braced wing. But they have disappeared because instruction is nowadays almost always done in two-seaters.

It is not quite the same for practice sailplanes. The original prototype was probably Akaflieg Darmstadt's "Edith". It was a braced high wing type with an angular fuselage. Through the RRG developments "Bremen", "Prüfling" and "Falke" came Hirth's "Grunau Baby" which sometimes in modified form, spread all over the world. By now they have been replaced by better sailplanes with gliding angles better than 1 : 20 because most of the instruction is done on two-seaters with better gliding angles, and the use of air brakes enables even high performance sailplanes to be easily handled.

The improvement in performance over the past 50 years and particularly from 1920 to 1935 is so well known that it is hardly worth special mention. But there are one or two points worth discussion. The performance figures given in the literature are mostly calculated and often only guessed. Only a few flight measurements, which are difficult and expensive to produce, have been published to enable a true picture of actual achievements to be seen. Data given in brochures and type descriptions are, sad to relate, fixed more with possible sales in mind than a desire for truth. They tend to be about 20% optimistic. If we now examine the true development of performance we must fall back on the scant published test data. In Fig.25 several polars of

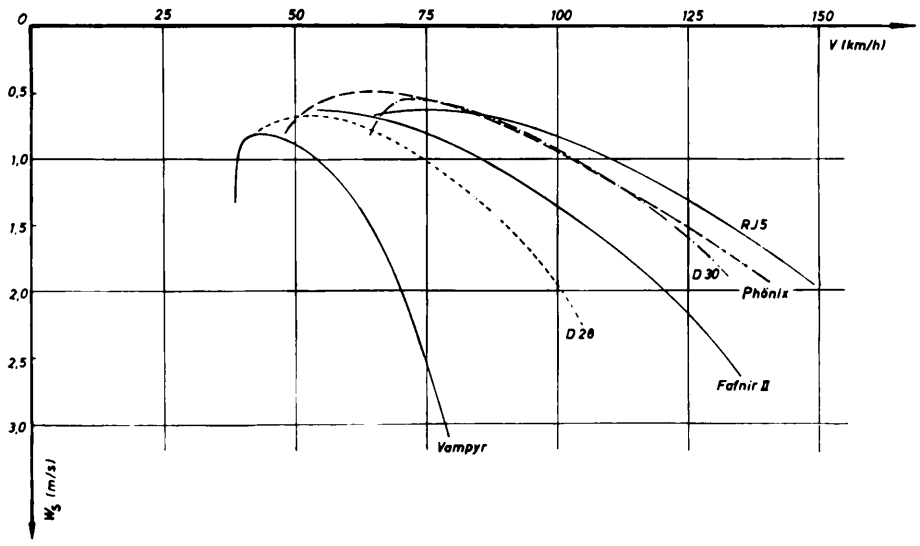


Fig. 25 Measured Polars for a Few Sailplanes (see Bibliography)

characteristic sailplanes of various vintages are drawn. One can see how the speed polar of "Vampyr" (calculated from wind tunnel model tests) was greatly improved upon at the high end of the speed range, 11 years later by the "Windspiel" of about the same span. The increase of span from 12 to 19 meters with its influence on the speed polars is shown clearly for "Fafnir II", a contemporary of "Windspiel" and which had a remarkably high speed performance for its time. Five years later performance was improved even more as the polar of the Darmstadt "D-30" indicates. After the war further major improvements were made as a result of Dr. Raspet's research. The "RJ-5" had a better high speed performance, but was not able to fly very slowly because of its high wing loading. The "Phoenix", with a lower wing loading, achieved a wider speed range which extended particularly to the lower speeds. This was achieved by careful wing section choice and a very refined general form.

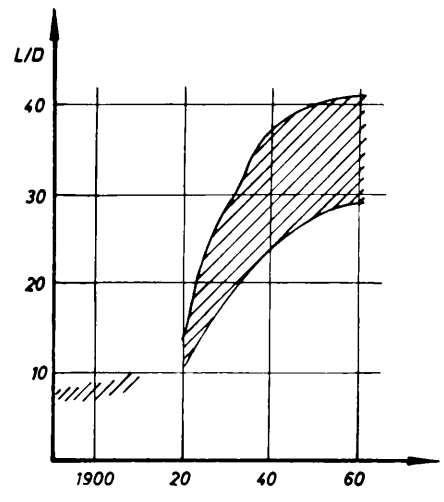


Fig. 26 Improvement in Gliding Angles

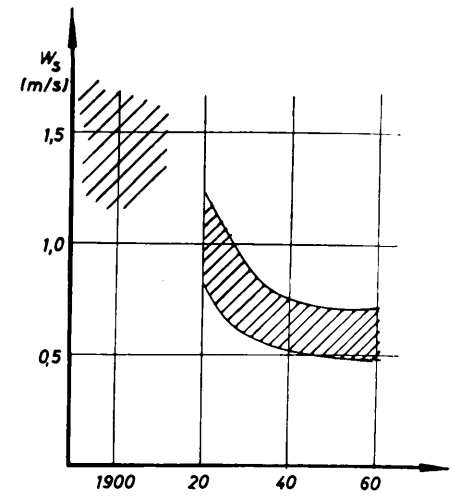


Fig. 27 Reduction of Sinking Speeds

As Fig.26 and 27 show, the best gliding angle increased from about 10 to about 40 while the minimum sinking speed decreased from about 1 m/sec to 0.5 m/sec. However the present day averages are L/D of 32 and a sink of 0.65 m/sec. Further improvements are hardly likely to come quickly as a 10% improvement would require great effort and cost. After all, the pilot has an irreducible size, and his accomodation and weight cannot be changed. As far as size of sailplane is concerned (Fig.28) (Span and weight) there are limits as already mentioned. Changes and improvements can only be made on wing sections, surface quality, leaks, gaps, and fairings, all of which mean endless detail labour.

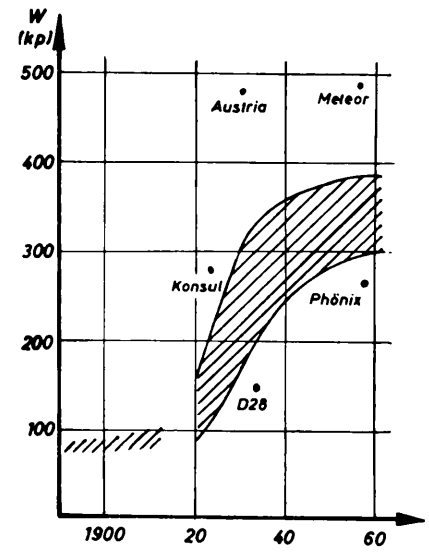


Fig. 28 Increase in All-Up-Weight

Flying qualities improvement has more scope than performance improvement and is more important for the wider extension of soaring. Controls and control surfaces have been discussed above. Manoeuvrability dependent on rudder and ailerons left much to be desired in the early days. One reason was the short tail arm especially for the rudder which is often too small and of low aspect ratio. Ailerons were bad because of oversize and adverse yawing movements and caused reversal effects because of inadequate wing torsional stiffness. Recently these difficulties have been mostly overcome because fuselages have become longer and the wing stiffness increased almost automatically because of the urge toward laminar flow conditions requiring a stiff wing covering. Stalling characteristics are relatively harmless because of more conservative taper combined with better rudders and ailerons. One always knew that good all-round stability would make handling easier. Slight spiral instability and neutral stick-fixed stability are no burden.

Not unconnected with flying qualities are the cockpit design and the equipment. Here a certain degree of standardisation has developed, but one should not conceal the fact that the accommodation of persons in sailplanes has always been assumed to be a job having nothing to do with sailplane design or performance improvement. The shape of the seat is often considered a minor detail and little attention has been paid to minimising the effects of accidents. Here there is still a broad field for the sailplane designer who should provide the pilot with comforts through a well shaped and adjustable seat in addition to protection in case of heavy landings.

Ideal flying qualities and the highest performance are hardly achievable simultaneously, because the various requirements are to some extent inconsistent. The art is to find a good compromise. That this is possible has been proved now and again, that it is very difficult to attain is indicated by inadequate flying qualities in many a high performance sailplane. Sad but true.

## Concluding remarks

Only a few of the hundreds of sailplanes developed over the years have been mentioned above. All those mentioned made some important contribution to the development of sailplanes and soaring. Many of them achieved world records, but many more had the duty of building up and strengthening the development of training and intermediate sailplanes.

Unfortunately, it has not been possible to give due credit to all countries where sailplanes have been built, because in view of the limited time available for the writing of this review, the requisite data and photographs could not be obtained in spite of making special efforts to do so. The examples given on the basis of German sailplanes will have to do for many other, sometimes better, sailplanes from other countries. For the period after 1945, we have now in the two volumes of "The World's Sailplanes" a source of data as objective as it is possible to produce.

The technical section of OSTIV and the writer would be gratified if these first attempts at collecting data were to produce a lively response so that responsible technical experts would send in photographs, drawings, descriptions and data on the technically most important sailplanes of every country. In the third volume of "The World's Sailplanes" we could then be sure of getting together the most important and interesting sailplanes from the entire world.

I should not like to end this review without thanking B.S.Shenstone for his encouragement and good advice and particularly for his efforts resulting in this translation.

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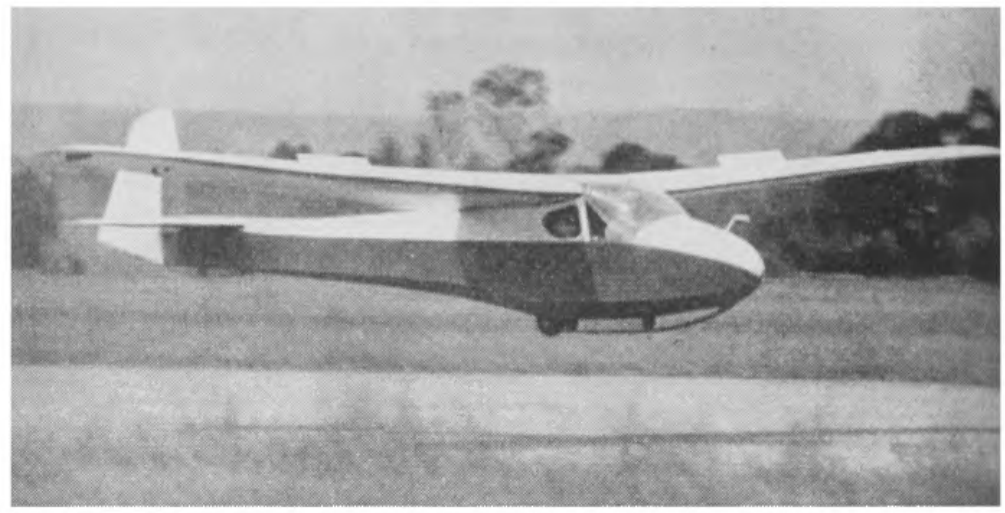
# AUSTRALIA

# ES 52 KOOKABURRA



The ES 52 is a two-seat training machine used by the majority of gliding clubs in Australia. It is of conventional wooden construction. Early versions of the ES 52 were fitted with a side-opening canopy and spoilers as standard. Dive brakes were sometimes fitted when required.

The latest version is designated ES 52 Mk IV and is fitted with dive brakes as standard. The all-up-weight has been increased from 362 kg to 393 kg and the cockpit has been enlarged and fitted with a revised front-opening canopy. Control circuits have been re-designed for improved maintenance.

More than thirty ES 52's have been built, of which four were Mk IV. The ES 52 Mk IV is the version described herewith.

Zweisitziges Schulungsflugzeug, das von der Mehrzahl der australischen Segelflugclubs verwendet wird. Es ist in üblicher Holzbauweise gehalten. Frühere Exemplare des ES 52 waren durch eine nach der Seite zu öffnende Haube des Pilotenraumes und Störklappen als Standardausführung gekennzeichnet. Sturzflugbremsen wurden in einzelnen Fällen angebracht.

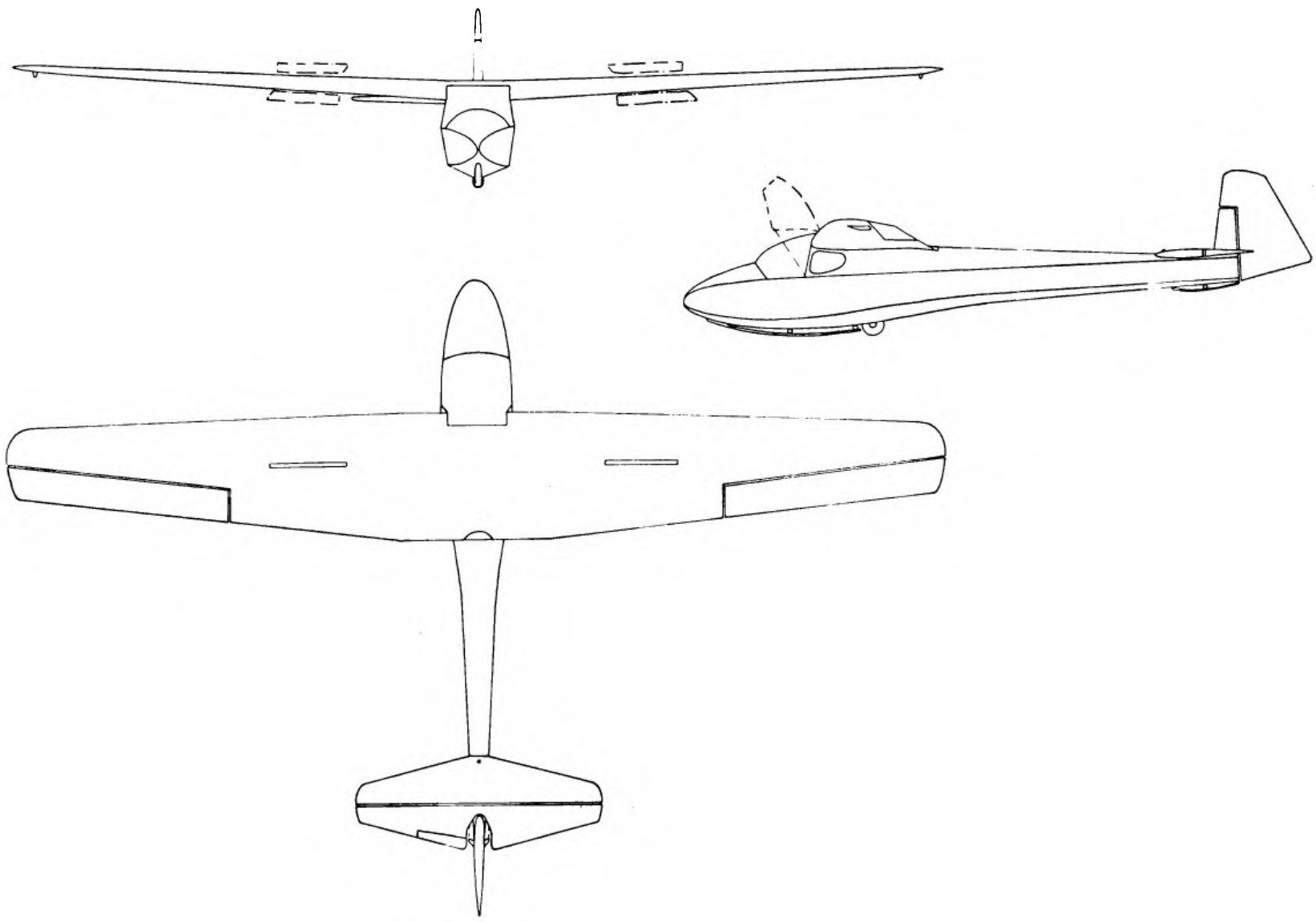
Die letzte Ausführung wird als ES 52 Mk IV bezeichnet und ist einheitlich mit Sturzflugbremsen ausgerüstet. Das Gesamtgewicht wurde von 362 kg auf 393 kg erhöht; der Pilotenraum wurde erweitert und eine von vorn zu öffnende Haube des Pilotenraumes angebracht. Die Steuerführung wurde neu konstruiert, um den Unterhalt zu erleichtern.

Es wurden mehr als 30 ES 52 gebaut, worunter vier vom Typ Mk IV. Die nachstehend beschriebene Ausführung betrifft den Mk IV.

Planeur d'entraînement biplace, employé par la majorité des clubs de vol à voile autraliens. L'ES 52 est une construction normale en bois. Les premiers exemplaires avaient un poste de pilotage dont le couvercle s'ouvrait de côté, ainsi que des volets de freinage comme équipement standard. Dans certains cas, des volets de piqué furent ajoutés.

La dernière version est appelée ES 52 Mk IV et comprend des volets de piqué comme équipement standard. Le poids total a été augmenté de 362 kg à 393 kg; le poste de pilotage a été élargi et muni d'un couvercle s'ouvrant depuis l'avant. Les gouvernes furent reconstruites afin d'améliorer le maintien.

On a construit plus de 30 exemplaires du ES 52 dont quatre du type Mk IV. La description suivante se réfère au Mk IV.



| | |
|---|---|
| Type designation | ES 52 Mk IV Kookaburra |
| Country of design | Australia |
| Designer | Edmund Schneider |
| Date of first flight of prototype | 1952 |
| Number produced | Approx. 30 (incl. 4 ES 52 Mk IV) |

**Wings**

| | |
|---|---|
| Span (b) | 11,7 m |
| Area (s) | 15 m² |
| Aspect ratio ($b^2/s$) | 9,13 |
| Wing root chord ($C_r$) | 1,6 m |
| Wing tip chord ($C_t$) | 0,9 m |
| Mean chord ($C = s/b$) | 1,28 m |
| Wing section, root | Gö 549 |
| Wing section, mid | Gö 549 |
| Wing section, tip | M 12 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 3,25° |
| Taper ratio ($C_t/C_r$) | 0,56 |
| Construction | Single spar wooden cantilever structure. Leading edge ply torsion box. 75% fabric covering, Spruce ribs spaced 0,305 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 2,75 m |
| Area (total) | 1,87 m² |
| Mean chord | 0,34 m |
| Max. deflection up | 32° |
| Max. deflection down | 16° |
| Mass balance degree | Nil |
| Construction | Wooden framework, fabric covered. Ribs spaced 0,305 m |

**Horizontal tail**

| | |
|---|---|
| Span | 3,10 m |
| Area of elevator and fixed tail (S') | 2,24 m |
| Area of elevator | 1,03 m² |
| Max. deflection up | 22½° |
| Max. deflection down | 22½° |
| Aerofoil section | Symmetrical |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,2 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S'1'/SC) | 0,49 |
| Construction | Wood. Ply covered tailplane. Fabric covered elevator. Ribs spaced 0,305 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,920 m² |
| Area of rudder | 0,782 m² |
| Aspect ratio | 2,06 |
| Tail arm | 4,9 m |
| Max. deflection | ± 23° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Unshielded horn |
| Construction | Wood. Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,895 m |
| Max. height (at cockpit) | 1,384 m |
| Overall length | 7,9 m |
| Max. cross section | 0,898 m² |
| Number of seats/arrangement | 2 staggered tandem |
| Undercarriage type | Fixed sprung wheel. No brakes. Fixed rubber mounted skid |
| Construction | Wood frame and stringer. Ply covered. Blown perspex canopy, front opening |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap (Mk IV) |
| Span (total) | 1,9 m |
| Area | 0,496 m² |
| Location, % of chord | 40 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.? | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 105 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 104 kg |
| Tailplane and elevator | 9 kg |
| Empty weight (including any fixed ballast) | 218 kg |
| Instruments | 2 kg |
| Equipped weight | 220 kg |
| Flying weight | 393 kg |
| Wing loading | 26,2 kg/m² |

**Straight flight performance**

| | |
|---|---|
| Calculated at flying weight of | 393 kg |

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 72 | 1,05 |
| Max. L/D condition | 81 | 1,12 |
| Stalling speed | 61 km/h | |
| Max. L/D | 20 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR, Sect. E |
| Date of issue of these requirements | 1948 |
| Certificate of airworthiness | Normal certificate, semi aerobatic category |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 150 | 5 |
| Point B | 300 | 4 |
| Point C | 300 | 0 |
| Point D | 142 | —2,5 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 150 | +20 |
| Point D | 150 | —20 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 220 km/h |
| Placard airspeed gusty conditions | 151 km/h |
| Aero-towing speed | 113 km/h |
| Winch launching speed | 113 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Loop, stall turn, roll off top |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 29 to 37 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 208 km/h |

# ES 52 B *Long-wing* KOOKABURRA

The ES 52 B has been developed from the ES 52 Kookaburra. The span has been increased to 14,86 m and the cockpit has been enlarged. An innovation is the tandem dual wheel undercarriage fitted with a wheel brake in place of the conventional wheel and skid to ease ground handling. The rear wheel coincides with centre of gravity of the empty glider.

The wing is of conventional wooden construction and is in three pieces. Bending moments are carried by the front spar and the rear drag spar is pin jointed at the outer panels. The thick ply skin extends to the rear spar.

The ES 52 B can be used for all phases of instruction from the first circuits up to Silver C level, including aerobatics and cloud flying.

Production versions will be of slightly revised design. Major change will be in the type of dive brake fitted. The pre-production versions are described here.

| | |
|---|---|
| Type designation | ES 52 B Long-wing Kookaburra |
| Country of design | Australia |
| Designer | Edmund Schneider |
| Date of first flight of prototype | 1959 |
| Number produced | 4 |

**Wings**

| | |
|---|---|
| Span (b) | 14,86 m |
| Area (s) | 19,30 m² |
| Aspect ratio ($b^2/s$) | 11,4 |
| Wing root chord ($C_r$) | 1,6 m |
| Wing tip chord ($C_t$) | 0,6 m |
| Mean chord ($C = s/b$) | 1,30 m |
| Wing section, root | Gö 549 |
| Wing section, mid | Gö 549 |
| Wing section, tip | M 12 |
| Dihedral | 2,5° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 1,5° |
| Taper ratio ($C_t/C_r$) | 0,375 |
| Construction | Two spar wooden cantilever structure. 32% fabric covering. Ribs spaced 0,275 m |

**Ailerons**

| | |
|---|---|
| Type | Plain. Upper surface hinge |
| Span (total) | 2 × 3,38 m |
| Area (total) | 2,22 m |
| Mean chord | 0,33 m |
| Max. deflection up | 27,5° |
| Max. deflection down | 7° |
| Mass balance degree | Nil |
| Construction | Wooden framework. Fabric covered. Ribs spaced 0,275 m |

**Horizontal tail**

| | |
|---|---|
| Span | 3,1 m |
| Area of elevator and fixed tail (S') | 2,24 m² |
| Area of elevator | 1,03 m² |
| Max. deflection up | 23° |
| Max. deflection down | 23° |
| Aerofoil section | Symmetrical |
| Mass balance degree | Nil |

Der ES 52 B ist eine Weiterentwicklung aus dem ES 52 Kookaburra. Die Spannweite wurde auf 14,86 m erhöht und der Pilotenraum erweitert. Neu ist das Tandem-Doppelrad-Fahrgestell mit Radbremse anstelle der früheren Kombination Rad–Kufe, zur Vereinfachung der Arbeiten am Boden. Das hintere Rad befindet sich am Schwerpunkt des leeren Flugzeugs.

Der Flügel ist in dreiteiliger, normaler Holzkonstruktion gehalten. Die Biegemomente werden vom Vorderholm getragen, und der Hinterholm ist mit Stiften an der äußeren Verkleidung befestigt. Die dicke Sperrholzbeplankung erstreckt sich bis zum Hinterholm.

Der ES 52 B kann für alle Stufen der Ausbildung von den ersten Flügen bis zum Silber-C einschließlich Kunstflug und Wolkenflug eingesetzt werden.

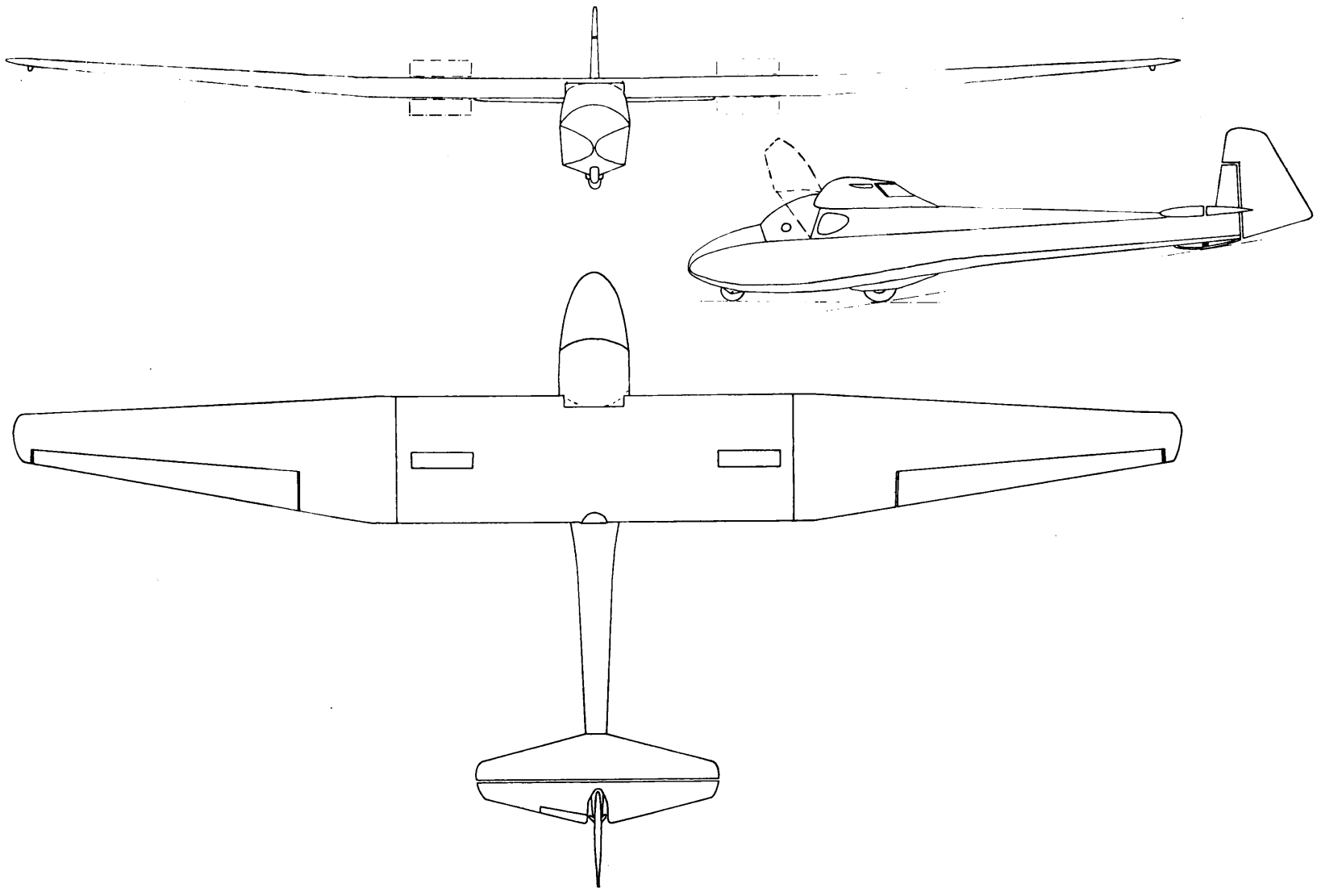
Die Serienausführung wird eine leicht abgeänderte Konstruktion aufweisen. Die wichtigste Änderung bezieht sich auf den Typ der Sturzflugbremse. Die nachstehende Beschreibung bezieht sich auf die Vorserie.

L'ES 52 B a été développé du ES 52 Kookaburra. L'envergure est agrandie jusqu'à 14,86 m, et le poste de pilotage a été élargi. Une nouveauté consiste en un train d'atterrissage avec deux roues en tandem, muni d'un frein de roue, au lieu de la combinaison conventionnelle roue-patin. La roue arrière se trouve au centre de gravité du planeur vide.

L'aile, en trois pièces, est une construction en bois conventionelle. Les moments de torsion sont portés par le longeron avant, et le longeron arrière est fixé au revêtement extérieur par des ferrets. Le revêtement épais en contreplaqué finit à la hauteur du longeron arrière.

L'ES 52 B peut être employé pour l'instruction depuis le premier vol jusqu'au brevet D, avec possibilité d'acrobatie et de vol sans visibilité.

La version de la série sera modifiée en certains détails. Le changement le plus important concerne le type du volet de piqué. La description suivante se réfère aux versions de la pré-série.



| | |
|---|---|
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,3 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S'1'/SC) | 0,387 |
| Construction | Wood. Ply covered tailplane. Fabric covered elevator. Ribs spaced 0,305 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,920 m² |
| Area of rudder | 0,782 m² |
| Aspect ratio | 2,06 |
| Tail arm | 5,0 m |
| Max. deflection | ± 20° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Unshielded horn |
| Construction | Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,95 m |
| Max. height (at cockpit) | 1,45 m |
| Overall length | 7,9 m |
| Max. cross section | 0,948 m² |
| Number of seats/arrangement | 2 staggered |
| Undercarriage type | Dual fixed unsprung wheels in tandem |
| Construction | Wood frame and stringer, ply covered. Blown perspex canopy, forward opening |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |

| | |
|---|---|
| Span (total) | 1,68 m |
| Area | 0,344 m² |
| Location, % of chord | 50 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 163 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 115 kg |
| Tailplane and elevator | 9 kg |
| Empty weight (including any fixed ballast) | 287 kg |
| Instruments | 3 kg |
| Equipped weight | 290 kg |
| Flying weight | 500 kg |
| Wing loading | 25,9 kg/m² |

**Straight flight performance**

Calculated at flying weight of 480 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 68 | 0,83 |
| Max. L/D condition | 84 | 1,03 |
| Stalling speed | 59 km/h | |
| Max. L/D | 24 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR, Sect. E |
| Date of issue of these requirements | 1948 |

| | |
|---|---|
| Certificate of airworthiness | Normal certificate, semi aerobatic category |

**Design flight envelope**

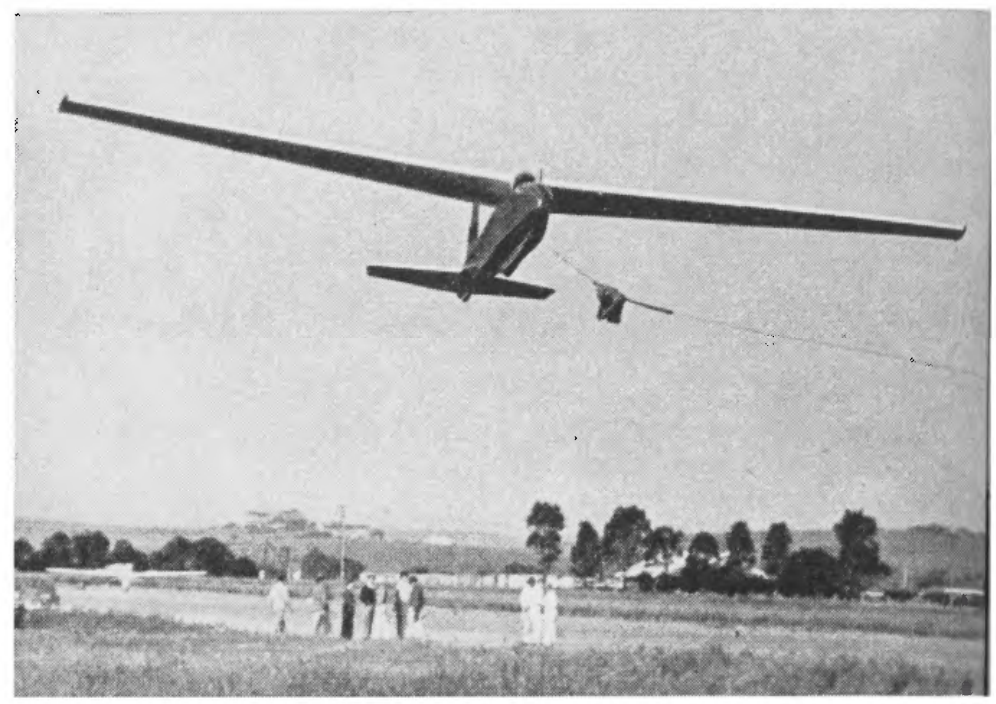
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 145 | 5 |
| Point B | 293 | 4 |
| Point C | 293 | 0 |
| Point D | 137 | —2,5 |
| Factor of safety | 1,5 | |

| *Gust Loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 145 | +20 |
| Point D | 145 | —20 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 194 km/h |
| Placard airspeed gusty conditions | 145 km/h |
| Aero-towing speed | 113 km/h |
| Winch launching speed | 105 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Loop, stall turn, roll off top |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 25,4 to 37,3 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 194 km/h |

# ES 56 NYMPH



This is a small-span single-seater with a one-piece laminar wing.

Einsitzer mit kleiner Spannweite und Laminarflügel in einem Stück.

Monoplace de petite envergure avec aile laminaire en une seule pièce.

| | |
|---|---|
| Type designation | ES 56 Nymph |
| Country of design | Australia |
| Designer | Edmund Schneider |
| Date of first flight of prototype | December 1955 |
| Number produced | 4 |

**Wings**

| | |
|---|---|
| Span (b) | 11,9 m |
| Area (s) | 10,12 m² |
| Aspect ratio ($b^2/s$) | 14 |
| Wing root chord ($C_r$) | 1,2 m |
| Wing tip chord ($C_t$) | 0,5 m |
| Mean chord ($C = {}^{s}/_{b}$) | 0,85 m |
| Wing section, root | Laminar |
| Wing section, mid | Laminar |
| Wing section, tip | Laminar |
| Dihedral | 2° |
| ¼ chord sweep | + 1° |
| Aero. twist root/tip | 1,5° |
| Taper ratio ($C_t/C_r$) | 0,416 |
| Construction | Single spar wooden cantilever one-piece structure. Leading edge ply torsion box. 60% fabric covering. Ribs spaced 0,210 m |

**Ailerons**

| | |
|---|---|
| Type | Plain. Upper surface hinge |
| Span (total) | 2 × 2,54 m |
| Area (total) | 1,036 m² |
| Mean chord | 0,204 m |
| Max. deflection up | 22,5° |
| Max. deflection down | 14° |
| Mass balance degree | Nil |
| Construction | Ply covered, wooden framework. Ribs spaced 0,210 m |

**Horizontal tail**

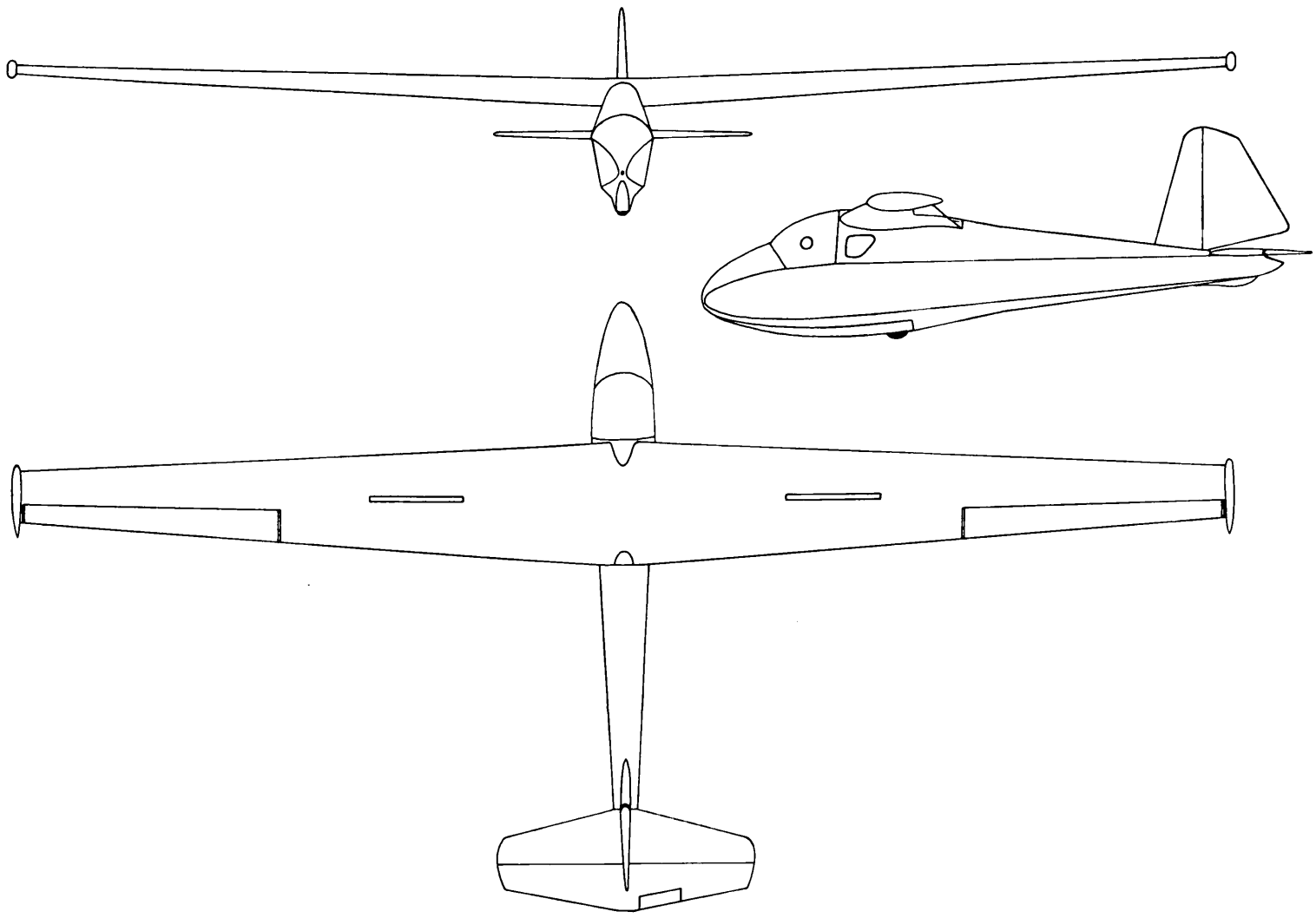
| | |
|---|---|
| Span | 2,54 m |
| Area of elevator and fixed tail (S') | 1,84 m² |
| Area of elevator | 0,84 m² |
| Max. deflection up | 25° |
| Max. deflection down | 16,5° |
| Aerofoil section | Symmetrical |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,5 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S'1'/SC) | 0,75 m |
| Construction | Wood. Ply covered tailplane. Fabric covered elevator. Diagonal ribs |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,0 m² |
| Area of rudder | 0,6 m² |
| Aspect ratio | 1,56 |
| Tail arm | 3,2 m |
| Max. deflection | ± 24° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Construction | Ply covered fin. Fabric covered rudder; diagonal ribs |

**Fuselage**

| | |
|---|---|
| Max. width | 0,61 m |
| Max. height (at cockpit) | 1,27 m |
| Overall length | 5,92 m |
| Max. cross section | 0,439 m² |
| Wetted surface area | 8,65 m² |
| Number of seats/arrangement | 1 |



| | |
|---|---|
| Undercarriage type | Fixed unsprung wheel. Rubber mounted skid. No brakes |
| Construction | Wood frame and stringer. Ply covered. Blown perspex canopy, side opening |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 1,84 m |
| Area | 0,368 m² |
| Location, % of chord | 42 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 79 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 66 kg |
| Tailplane and elevator | 4 kg |
| Empty weight (including any fixed ballast) | 149 kg |
| Instruments | 2 kg |
| Equipped weight | 151 kg |
| Flying weight | 241 kg |
| Wing loading | 23,8 kg/m² |

**Straight flight performance**

Calculated

| | |
|---|---|
| at flying weight of | 232 kg |

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 69 | 0,81 |
| Max. L/D condition | 84 | 0,93 |
| Stalling speed | 58 km/h | |
| Max. L/D | 25 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR, Sect. E |
| Date of issue of these requirements | 1948 |
| Certificate of airworthiness | Normal certificate, semi aerobatic category |

**Design flight envelope**

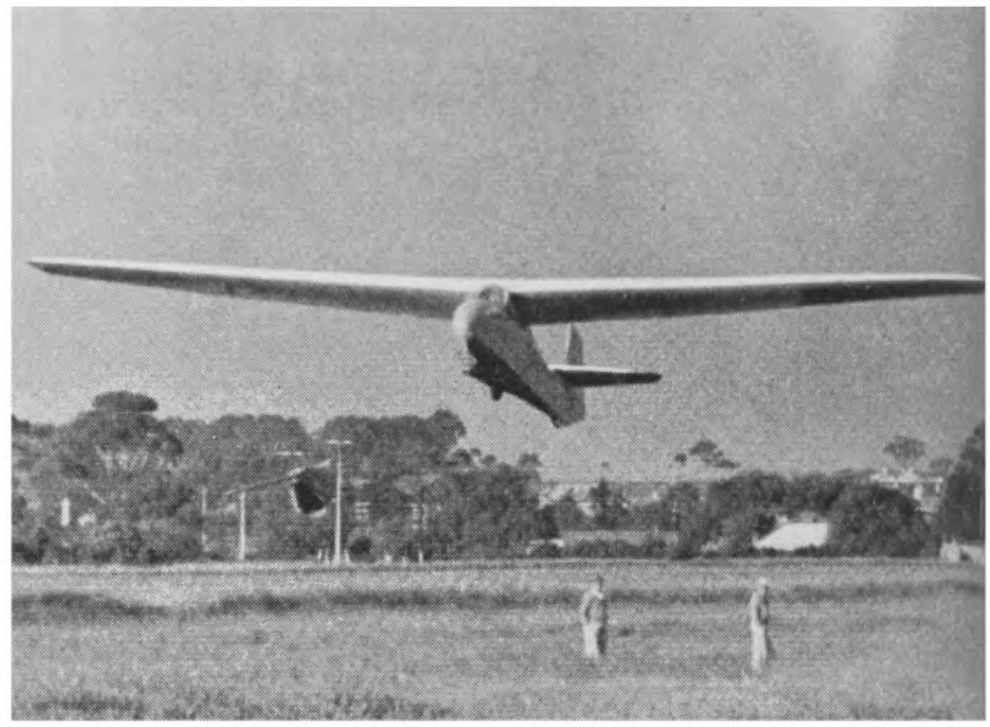
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 134 | 5 |
| Point B | 270 | 4 |
| Point C | 270 | 0 |
| Point D | 124 | —2,5 |
| Factor of safety | | 1,5 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 134 | +20 |
| Point D | 134 | —20 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 210 km/h |
| Placard airspeed gusty conditions | 130 km/h |
| Aero-towing speed | 115 km/h |
| Winch launching speed | 105 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Loop, stall turn, roll off top |
| Spinning permitted? | Yes |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 210 km/h |

# ES 57 KINGFISHER



The ES 57 has been designed as a cheap solo machine for the use of small syndicates or clubs. It can be trailered and launched with a car of 1000 c. c. capacity. Despite its small size the cockpit is sufficiently roomy for most pilots. The wing is of normal wooden construction with a single spar and plywood nose, built in one piece and fabric covered.

Many good flights have been made with this glider including a goal flight of 201 miles (324 km).

Der ES 57 wurde als billiger Einsitzer für den Bedarf von Gruppen und Clubs konstruiert. Er kann mit einem Automobil von 1000 cm³ Stärke auf der Straße transportiert und hochgeschleppt werden. Trotz der Kleinheit ist der Pilotenraum für die meisten Piloten geräumig genug. Der Flügel in normaler Holzkonstruktion weist einen Holm und eine Flügeleintrittskante aus Sperrholz auf; er ist in einem Stück gebaut und stoffbespannt.

Mit diesem Flugzeug wurden viele gute Flüge durchgeführt, darunter ein Zielflug von 324 km.

Construit comme monoplace peu cher pour les besoins des groupes et clubs. Le ES 57 peut être remorqué et lancé par une automobile de 1000 cm³. Malgré la grandeur restreinte, le cockpit est suffisamment grand pour la majorité des pilotes. L'aile en construction de bois normale avec un longeron, et un bord d'attaque en contreplaqué, est construite en une seule pièce et couverte de toile. Un grand nombre de bonnes performances ont été atteintes avec ce planeur, parmi lesquelles un vol à but fixé de 324 km.

| | |
|---|---|
| Type designation | ES 57 Kingfisher |
| Country of design | Australia |
| Designer | Edmund Schneider |
| Date of first flight of prototype | 1957 |
| Number produced | 7 |

**Wings**

| | |
|---|---|
| Span (b) | 10,5 m |
| Area (s) | 9,4 m² |
| Aspect ratio ($b^2/s$) | 11,75 |
| Wing root chord ($C_r$) | 1,2 m |
| Wing tip chord ($C_t$) | 0,6 m |
| Mean chord ($C = s/b$) | 0,895 m |
| Wing section, root | Gött. 549 |
| Wing section, mid | Gött. 549 |
| Wing section, tip | M 12 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 3° |
| Taper ratio ($C_t/C_r$) | 0,5 |
| Construction | Single spar wooden cantilever with ply leading edge torsion box. 68% fabric covering. Ribs spaced 0,29 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2×2,14 m |
| Area (total) | 2×0,577 m² |
| Mean chord | 0,28 m |
| Max. deflection up | 20° |
| Max. deflection down | 13° |
| Mass balance degree | Nil |
| Construction | Fabric covered wood structure |

**Horizontal tail**

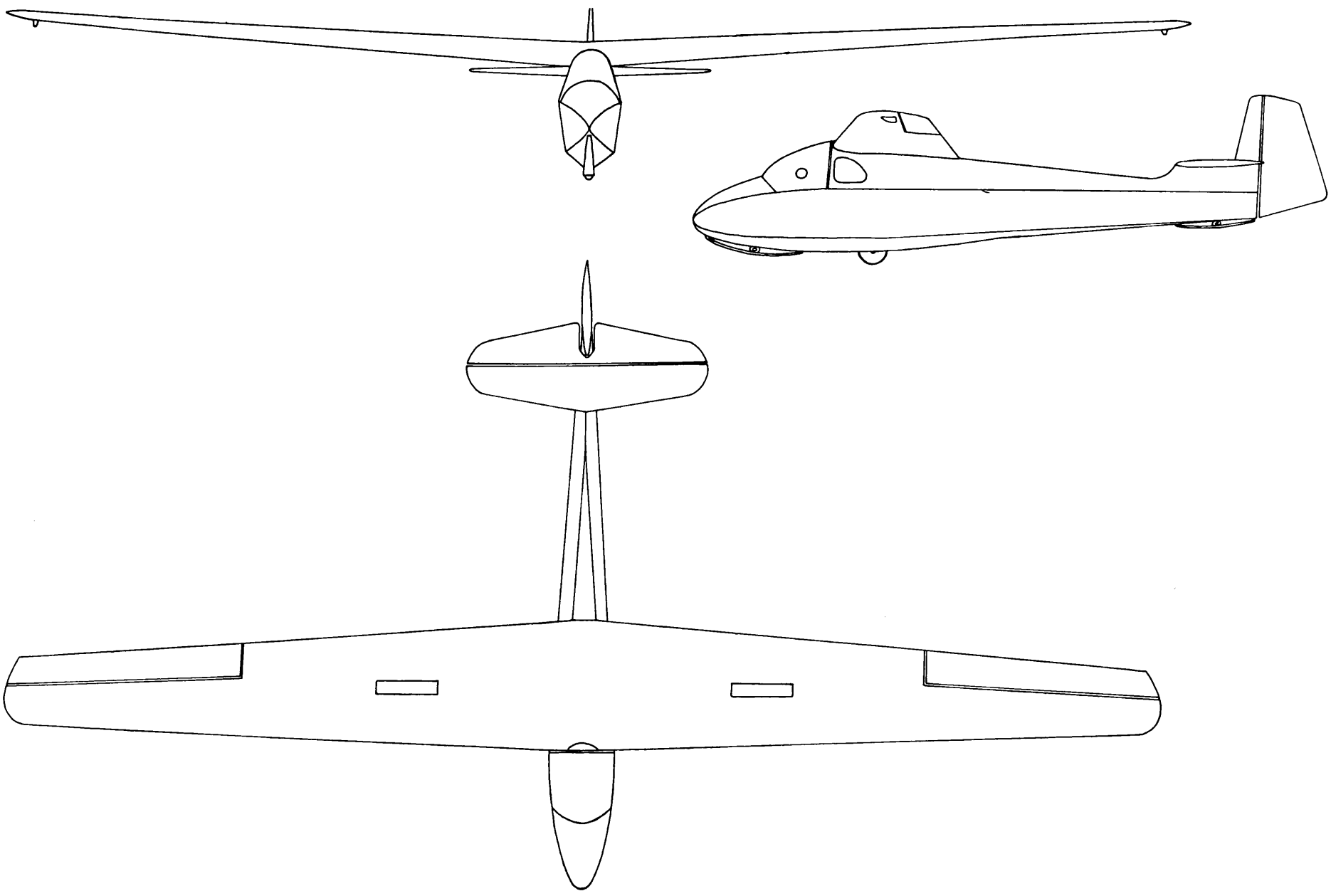
| | |
|---|---|
| Span | 2,2 m |
| Area of elevator and fixed tail (S') | 1,3 m² |
| Area of elevator | 0,6 m² |
| Max. deflection up | 20° |
| Max. deflection down | 18° |
| Aerofoil section | Symmetrical |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,0 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S'1'/SC) | 0,464 |
| Construction | Wood. Fabric covered. Ribs spaced 0,21 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,59 m² |
| Area of rudder | 0,096 m² |
| Aspect ratio | 2,13 |
| Tail arm | 3,54 m |
| Max. deflection | 28° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Construction | Wood. Fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 1,1 m |
| Overall length | 5,75 m |
| Max. cross section | 0,396 m² |
| Number of seats/arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel and rubber mounted skid |
| Construction | Frame and stringer. Ply covered. Canopy of blown perspex, side opening |



**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper surface spoilers. No gap |
| Span (total) | 2×0,56 m |
| Area | 2×0,056 m² |
| Location, % of chord | 44 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Empty weight (including any fixed ballast) | 107 kg |
| Instruments | 2 kg |
| Equipped weight | 109 kg |
| Flying weight | 195 kg |
| Wing loading | 20,7 kg/m² |

**Straight flight performance**

Calculated
at flying weight of . . . . . 195 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 67 | 0,99 |
| Max. L/D condition | 83 | 1,10 |
| Stalling speed | | 54 km/h |
| Max. L/D | | 21 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR, Sect. E |
| Date of issue of these requirements | 1948 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 144 | 5 |
| Point B | 288 | 4 |
| Point C | 288 | 0 |
| Point D | 136 | –2,5 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 144 | +20 |
| Point D | 144 | –20 |

**Limiting flight conditions**

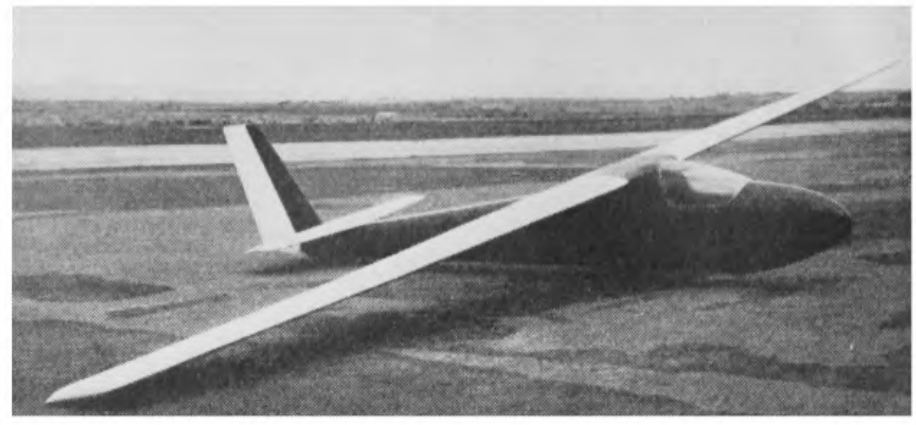
| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 144 km/h |
| Aero-towing speed | 113 km/h |
| Winch launching speed | 104 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | Loop, stall turn |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | Not available |

# ES 59 ARROW

The Arrow is a general purpose, cross country sailplane designed by Harry Schneider for the Gliding Federation of Australia. The development costs have been covered by the Federation.

Mehrzweck-Segelflugzeug für Überlandflüge, konstruiert von Harry Schneider für die Gliding Federation of Australia. Die Entwicklungskosten wurden von der Federation getragen.

Planeur à buts multiples pour des vols sur campagne, construit par Harry Schneider pour la Gliding Federation of Australia. Les frais de développement ont été couverts par la Federation.



| | |
|---|---|
| Type designation | ES 59 Arrow |
| Country of design | Australia |
| Designer | Harry Schneider |
| Date of first flight of prototype | 14 April, 1962 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 13,24 m |
| Area (s) | 11,0 m² |
| Aspect ratio ($b^2/s$) | 16 |
| Wing root chord ($C_r$) | 1,1 m |
| Wing tip chord ($C_t$) | 0,56 m |
| Mean chord ($C = s/b$) | 0,83 m |
| Wing section, root | 63.618 |
| Wing section, mid | 63.614 |
| Wing section, tip | Joukowsky 12% (mod.) |
| Dihedral | ¾° mid, 2½° outer |
| ¼ chord sweep | —2° |
| Aero. twist root/tip | 3½° |
| Taper ratio ($C_t/C_r$) | 0,52 |
| Construction | Single spar wooden cantilever with leading edge torsion box. 50% fabric covered. Ribs spaced 0,2 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 2,0 m |
| Area (total) | 2 × 0,43 m² |
| Mean chord | 0,215 m |
| Max. deflection up | 30° |
| Max. deflection down | 12° |
| Mass balance degree | Nil |
| Construction | Wood. Ply covered. Ribs spaced 0,2 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,57 m |
| Area of elevator and fixed tail (S′) | 1,64 m² |
| Area of elevator | 0,69 m² |
| Max. deflection up | 20° |
| Max. deflection down | 20° |
| Aerofoil section | Symm. 20% t/c |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,34 m |
| Elevator aerodynamic balance method | Nil |
| Horizontal tail volume coefficient (S′1′/SC) | 0,60 |
| Construction | Wood. Ply covered tailplane. Fabric covered elevator. Upper surface hinge. Ribs spaced 0,18 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,14 m² |
| Area of rudder | 0,58 m² |
| Aspect ratio | 2,4 |
| Tail arm | 4,3 m |
| Max. deflection | ± 30° |
| Aerofoil section | Symm. 12% t/c |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin, fabric covered rudder. 22° sweepback. Ribs spaced 0,27 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 1,22 m |
| Overall length | 6,8 m |
| Max. cross section | 0,43 m² |
| Wetted surface area | 10 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel. No brake. Sponge rubber mounted fixed skid |
| Construction | Ply monocoque. Fibre glass nose cap. Side opening blown perspex canopy |

**Lift increasing devices**

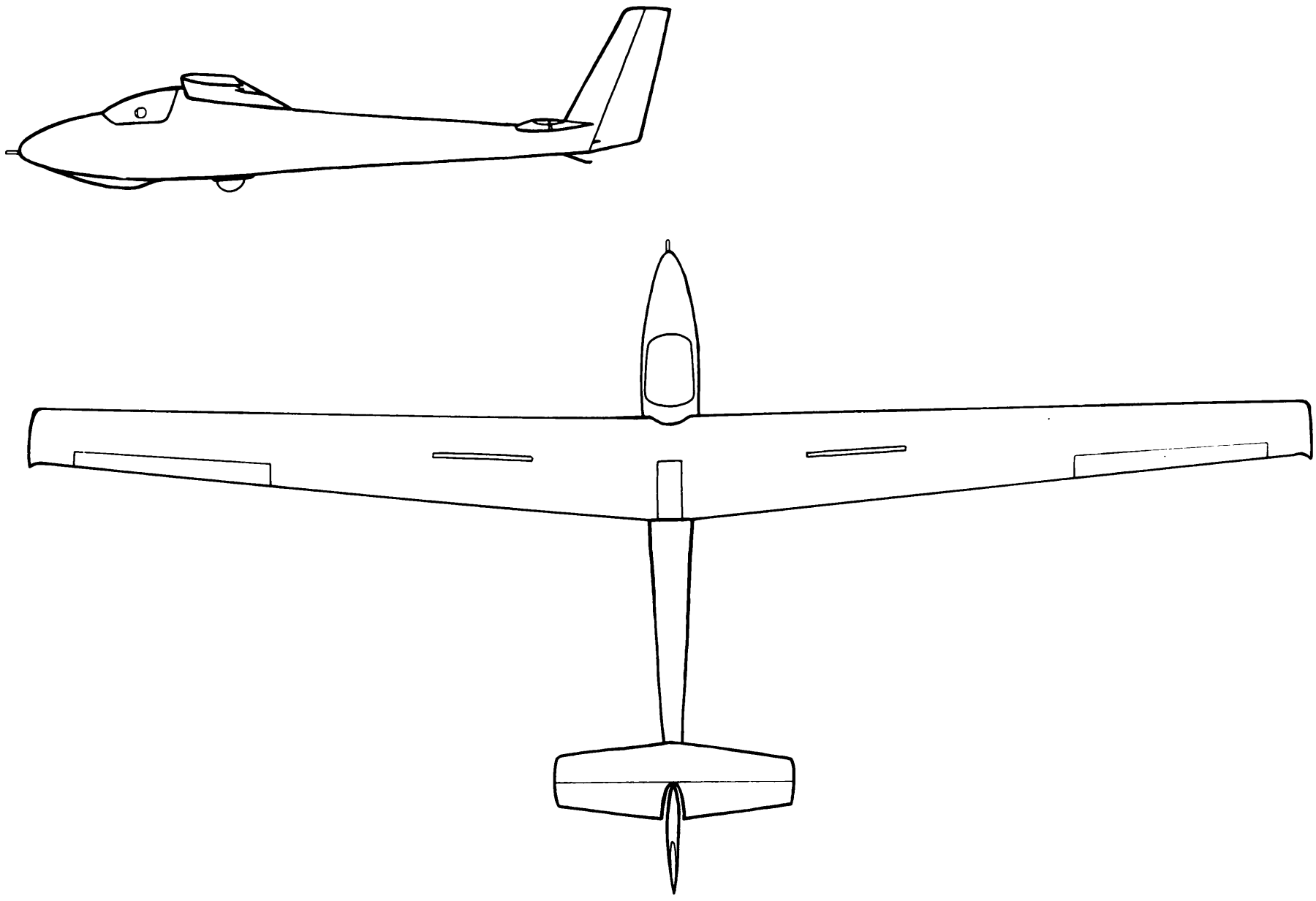
| | |
|---|---|
| Type | Nil |

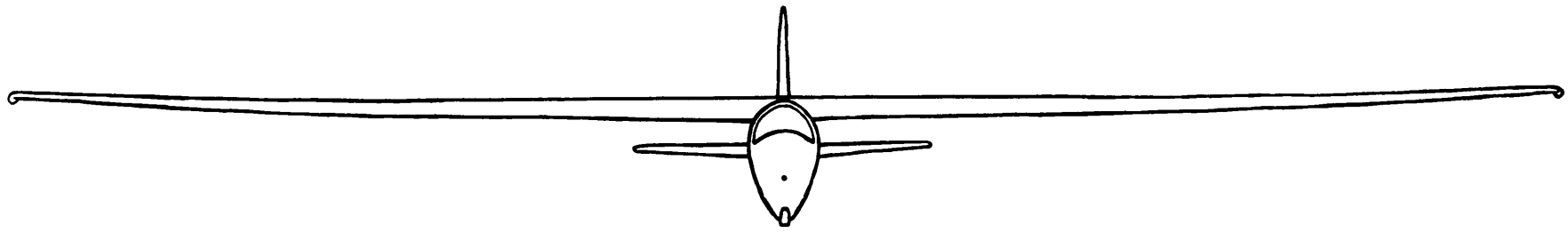
**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,265 m |
| Area | 2 × 0,20 m² |
| Location, % of chord | 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 90 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 76 kg |
| Tailplane and elevator | 4 kg |





| | |
|---|---|
| Empty weight (including any fixed ballast) | 170 kg |
| Instruments | 4 kg |
| Equipped weight | 174 kg |
| Flying weight | 280 kg |
| Wing loading | 25,5 kg/m² |

**Straight flight performance**

Calculated at flying weight of 245 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 68 | 0,73 |
| Max. L/D condition | 76 | 0,76 |
| | 102 | 1,26 |
| | 119 | 1,90 |
| | 136 | 2,87 |
| Stalling speed | 59,5 km/h | |
| Max. L/D | 27,8 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR Issue 2 Cloud flying category |
| Date of issue of these requirements | 16 May, 1960 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 138,5 | 5 |
| Point B | 250 | 4 |
| Point C | 250 | 0 |
| Point D | 136 | —2,5 |
| Factor of safety | | 1,5 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 138,5 | 20 |
| Point D | 138,5 | —20 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 238 km/h |
| Placard airspeed gusty conditions | 138,5 km/h |
| Aero-towing speed | 130 km/h |
| Winch launching speed | 115 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Loop, stall turn |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 21 to 39 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 232 km/h |

# EP 1

The EP 1 is a small span braced single-seater of normal wooden construction, using classical wing sections.

Der EP 1 ist ein Einsitzer mit kleiner Spannweite und verstrebtem Flügel, in normaler Holzkonstruktion und mit klassischen Flügelprofilen.

L'EP 1 est un planeur monoplace avec une petite envergure et une aile haubanée, en construction de bois normale et avec des profils d'aile classiques.

| | |
|---|---|
| Type designation | EP 1 |
| Country of design | Australia |
| Designer | E. A. Pascoe |
| Date of first flight of prototype | 26 October, 1955 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 11,25 m |
| Area (s) | 9,6 m² |
| Aspect ratio ($b^2/s$) | 13,1 |
| Wing root chord ($C_r$) | 1,0 m |
| Wing tip chord ($C_t$) | 0,53 m |
| Mean chord ($C = s/b$) | 0,85 m |
| Wing section, root | Gött. 549 |
| Wing section, mid | Gött. 549 |
| Wing section, tip | Gött. 676 |
| Dihedral | 2° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 2° |
| Taper ratio ($C_t/C_r$) | 0,53 |
| Construction | Single spar strutted wood construction with leading edge torsion box. 50–66% fabric covered. Ribs spaced 0,328 m aft of spar |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 2×2,13 m |
| Area (total) | 2×0,50 m² |
| Mean chord | 0,236 m |
| Max. deflection up | 25° |
| Max. deflection down | 12° |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 1,84 m |
| Area of elevator and fixed tail (S') | 0,92 m² |
| Area of elevator | 0,37 m² |
| Max. deflection up | 27° |
| Max. deflection down | 25° |
| Aerofoil section | Symmetrical |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼chord m.a.c. tail) | 2,92 m |
| Horizontal tail volume coefficient (S'1'/SC) | 0,374 |
| Construction | Wood. Ply and fabric covered. Permanently fixed to fuselage. Ribs spaced 0,24 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,67 m² |
| Area of rudder | 0,39 m² |
| Aspect ratio | 2,2 |
| Tail arm | 2,96 m |
| Max. deflection | 35° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply and fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,535 m |
| Max. height (at cockpit) | 0,85 m |
| Overall length | 5,4 m |
| Max. cross section | 0,37 m² |
| Number of seats/arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel and rubber mounted skid |
| Construction | Ply covered frame and stringer construction. Fibre glass nose cap. Rear opening blown perspex canopy |

**Lift increasing devices**

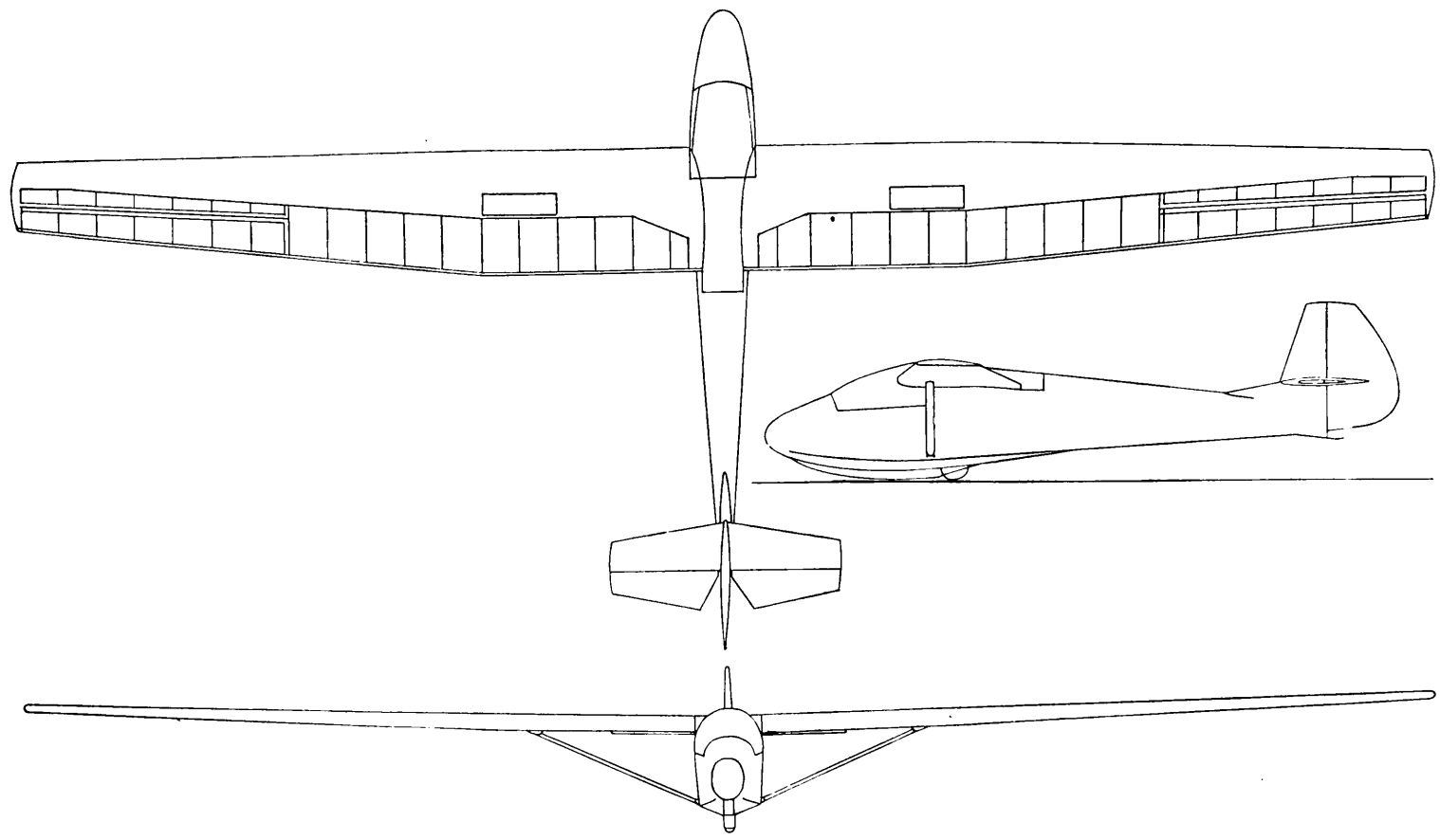
| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper surface spoilers without gap. Hinged at spoiler leading edge |
| Span (total) | 2×0,62 m |
| Area | 2×0,106 m² |
| Location, % of chord | 34 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 50,4 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 30,4 kg |
| Tailplane and elevator | 5,0 kg |
| Empty weight (including any fixed ballast) | 85,8 kg |
| Instruments | 5,0 kg |
| Equipped weight | 90,8 kg |



| | |
|---|---|
| Flying weight | 172,2 kg |
| Wing loading | 17,8 kg/m² |

**Straight flight performance**

Measured*
at flying weight of . . . . . 172,2 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 64 | 0,73 |
| Max. L/D condition | 75 | 0,8 |
| | 96 | 1,09 |
| | 112 | 1,6 |
| | 128 | 2,55 |

| | |
|---|---|
| Stalling speed | 60 km/h |
| Max. L/D | 26 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR 05 |
| Date of issue of these requirements | May 1940 |
| Certificate of airworthiness | Yes |

* Measurement of performance by pilot and two pilot balloon theodolites

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 129 | 4,67 |
| Point B | 161 | 4,67 |
| Point C | 161 | –2,33 |
| Point D | 110 | –2,33 |
| Factor of safety | 1,5 | |

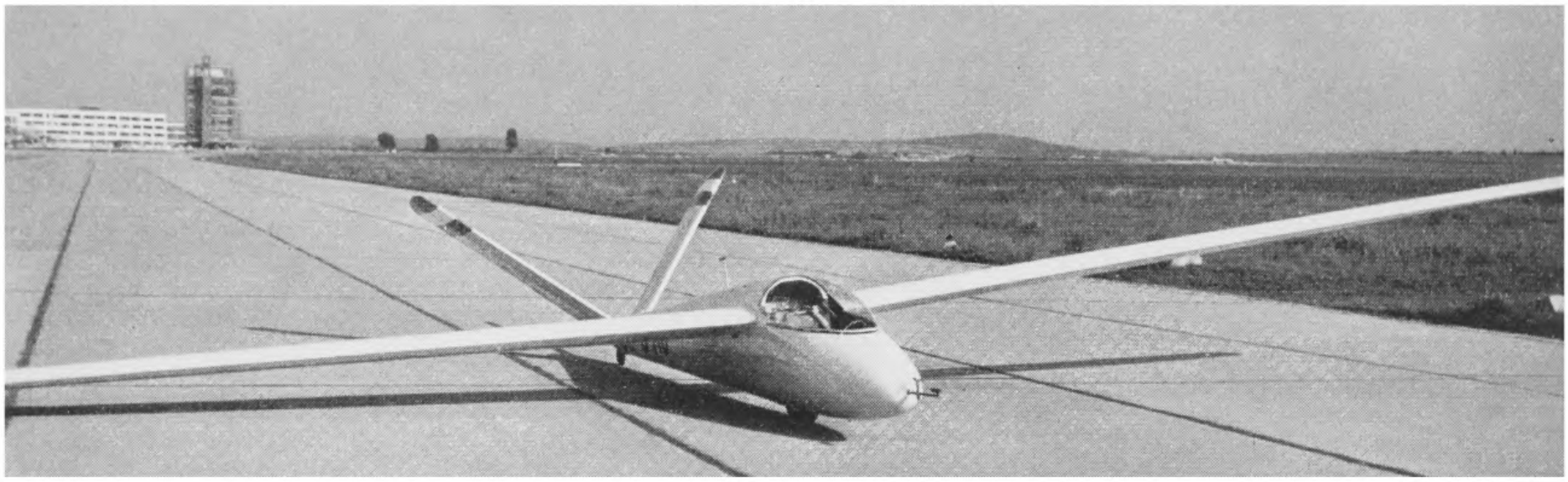
| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 129 | 12,2 |
| Point B | 161 | 9,7 |
| Point C | 161 | –9,7 |
| Point D | 110 | –11,9 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 145 km/h |
| Placard airspeed gusty conditions | 116 km/h |
| Aero-towing speed | 145 km/h |
| Winch launching speed | 103 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 22 to 33 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not speed limiting |

# AUSTRIA

# STANDARD AUSTRIA



The Standard Austria is a high performance sailplane developed and built for the Austrian Aero Club. The design conforms to the requirements of the F.A.I. Standard Class. A relatively small wing loading and good L/D has been aimed at and the designer has developed entirely new constructional methods to get the required accuracy and quality of surface and the rugged structure needed for regular competition and club flying. The wing is of stressed skin construction without spars and is entirely of wood. The method of jigging and other techniques used are described in Swiss Aero Revue, April 1960.

Fibre-glass-Polyester material has been used for the double curved surface on the nose to give smooth surface and a tough construction.

The photograph shows the prototype which has a swept V tail, whereas the 3-view drawing shows the production aircraft with an unswept V tail.

Die Standard Austria ist ein Hochleistungs-Segelflugzeug, entwickelt und gebaut für den österreichischen Aero-Club. Die Konstruktion entspricht den FAI-Bedingungen für die Standard-Klasse. Es wurde auf relativ geringe Flächenbelastung und guten Gleitwinkel tendiert; der Konstrukteur entwickelte völlig neue Methoden zur Erzielung einer genauen und guten Oberfläche und einer robusten Struktur für regelmäßige Wettbewerbs- und Klubflüge. Der ausschließlich aus Holz hergestellte Flügel ohne Holme ist mit selbsttragender Haut konstruiert. Bautechnik und andere Einzelheiten sind in der Schweizer Aero-Revue vom April 1960 dargestellt.

Für die doppelt gekurvte Oberfläche an der Nase wurde Fiberglas-Polyester-Material verwendet, um eine glatte und feste Konstruktion zu erzielen.

Die Photo zeigt den Prototyp mit einem gepfeilten V-Leitwerk, während die Dreiseitenansicht die Serieausführung mit ungepfeiltem V-Leitwerk darstellt.

Le Standard Austria est un planeur de haute performance développé et construit pour l'Aéro Club d'Autriche. Les caractéristiques techniques sont conformes aux exigences de classe standard de la F.A.I. On a recherché une charge alaire relativement faible et un bon angle de plané, et le constructeur a développé des méthodes de construction entièrement nouvelles afin d'obtenir l'exactitude et la qualité de surface requises, ainsi que la structure solide nécessaire pour les concours et les vols de club. L'aile, entièrement en bois, sans longerons, est à revêtement travaillant. Les techniques de montage et autres sont décrites dans l'Aéro-Revue Suisse d'avril 1960.

Un matériau fait de fibres de verre et de polyester a été employé pour la surface à double courbure du nez du fuselage, afin d'obtenir une superficie lisse et une construction résistante.

La photographie montre le prototype qui a le V de l'empennage en flèche, tandis que le dessin à 3 vues montre le planeur de production à empennage en V non en flèche.

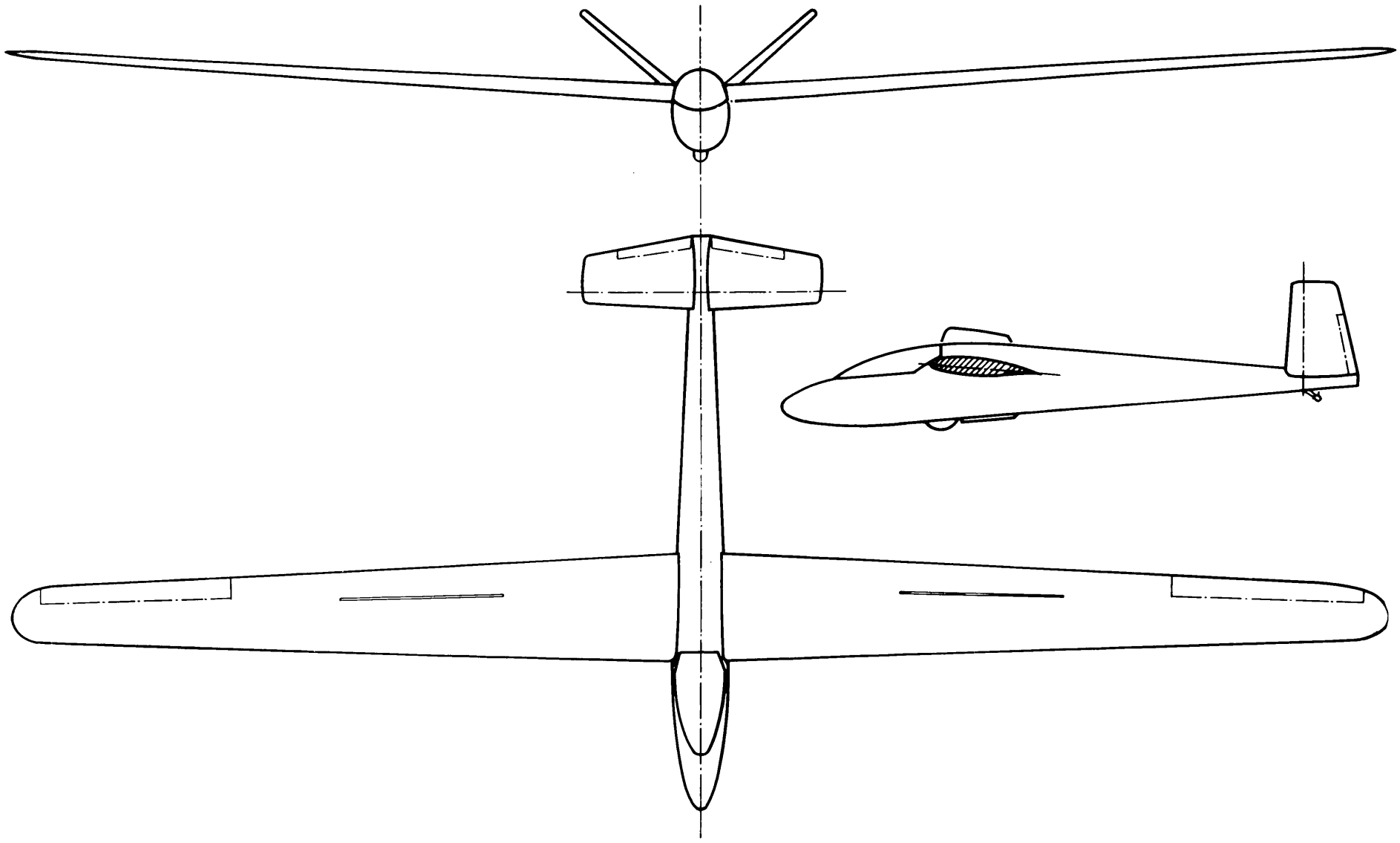
| | |
|---|---|
| Type designation | Standard Austria |
| Country of design | Austria |
| Designer | Ing. Rüdiger Kunz |
| Date of first flight of prototype | July 1959 |
| Number produced | 5 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 13,5 $m^2$ |
| Aspect ratio ($b^2/s$) | 16,7 |
| Wing root chord ($C_r$) | 1,2 m |
| Wing tip chord ($C_t$) | 0,6 m |
| Mean chord ($C = s/b$) | 0,95 m |
| Wing section, root | NACA $65_2$–415 |
| Wing section, mid | NACA $65_2$–415 |
| Wing section, tip | NACA $65_2$–415 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 1,5° |
| Taper ratio ($C_t/C_r$) | 0,5 |
| Construction | Wood, load bearing skin over ribs 23 cm spacing. Fabric covering from 65% chord. |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 4,14 m |
| Area (total) | 0,81 $m^2$ |
| Mean chord | 0,202 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Mass balance degree | Nil |



**Horizontal tail**

| | |
|---|---|
| Span | V-tail, 45° dihedral 2,6 m (horiz. proj.) |
| Area of elevator and fixed tail (S') | 2,0 m² (true) |
| Max. deflection up | 20° |
| Max. deflection down | 20° |
| Aerofoil section | NACA $64_1$–012 |
| Mass balance degree | 100% |
| Mass balance method | Nose weight |
| Tail arm (from ¼ (1') chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,8 m |
| Elevator aerodynamic balance method | All-moving tail with geared tab (gear ratio 1.0) |
| Elevator trimming method | Tab |
| Construction | Wood, rib spacing 23 cm. Low bearing skin, fabric from 25% chord. |

**Vertical tail**

Data as for horizontal tail

**Fuselage**

| | |
|---|---|
| Max. width | 0,62 m |
| Overall length | 6,2 m |
| Wetted surface area | 8,8 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed wheel with dive brake |
| Structure | Ply monocoque on frame and stringer. Fibreglass nose. Blown plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap and slot. |
| Span (total) | 3,52 m |
| Area | 0,7 m² including slots<br>0,5 m² excluding slots |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 122 kg |
| Fuselage | 75 kg |
| Tailplane and elevator | 8 kg |
| Empty weight[2] | 205 kg |
| Instruments | 3 kg |
| Equipped weight | 233 kg |
| Flying weight | 323 kg |
| Wing loading | 24 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS |
| Date of issue of these requirements | 1950 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| | V km/h | Ultimate load factor |
|---|---|---|
| *Manoeuvre loads* | | |
| Point A | 140 | 8 |
| Point B | 230 | 8 |
| Point C | 250 | 0 |
| Point D | 100 | 4 |
| *Gust loads* | V km/h | v m/sec. |
| Point B | 140 | ± 10 m/sec. |

[1] With struts, controls, flaps and brakes

[2] To include any fixed ballast

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 209 km/h |
| Aero-towing speed | 112,5 km/h |
| Winch launching speed | 112,5 km/h |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 32% to 43,7% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Estimated 219 km/h |

**Straight flight performance**

Calculated
at flying weight of 500 kg

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 68,3 | 0,78 |
| Max. L/D condition | 84,3 | 0,92 |
| | 102,5 | 1,31 |
| | 120 | 1,95 |
| | 136 | 2,75 |

| | |
|---|---|
| Stalling speed | 57 km/h |
| Max. L/D | 26 |

# BULGARIA

# KOMETA STANDARD


This machine, first flown in 1960, is a refined Standard Class sailplane with a well faired canopy and a butterfly tail. It has, however, a NACA 43012A wing, which is unusual for this type of machine.

Dieses Flugzeug, das 1960 erstmals flog, ist eine ausgezeichnete Konstruktion der Standard-Klasse mit guter Kabinenbedachung und Schmetterlingsleitwerk. Es ist indessen mit einem Flügel des Querschnitts NACA 43012A versehen, was für diese Art Maschine ungewöhnlich ist.

Ce planeur qui a été essayé dans l'air en 1960, est une construction de la classe Standard excellente, avec un toit de cabine bien construit et des gouvernes en papillon. La section alaire est cependant du type NACA 43012A, ce qui est peu habituel pour ce type de machine.

| | |
|---|---|
| Type designation | Kometa Standard |
| Country of design | Bulgaria |
| Designers | Panov, Panchovsky |
| Date of first flight of prototype | 5 August, 1960 |
| Number produced | 12 |

**Wings**

| | |
|---|---|
| Span (b) | 14,95 m |
| Area (s) | 12,70 m² |
| Aspect ratio ($b^2/s$) | 17,6 |
| Wing root chord ($C_r$) | 1,24 m |
| Wing tip chord ($C_t$) | 0,40 m |
| Mean chord ($C = s/b$) | 0,85 m |
| Wing section, root | NACA 43012 A |
| Wing section, mid | NACA 43012 A |
| Wing section, tip | NACA 43012 A |
| Dihedral | 4° |
| ¼ chord sweep | 0,35° |
| Aero. twist root/tip | —2° |
| Taper ratio ($C_t/C_r$) | 0,322 |
| Construction | Single spar wooden cantilever. Leading edge ply torsion box. Ribs spaced 0,125 and 0,25 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 3,9 m |
| Area (total) | 2 × 0,64 m² |
| Mean chord | 0,164 m |
| Max. deflection up | 30° |
| Max. deflection down | 20° |
| Mass balance method | Distributed |
| Construction | Wood. Fabric covered. Ribs spaced 0,25 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,60 m (projected) (110° V-tail) |
| Area of elevator and fixed tail (S′) | 1,54 m² (projected) |
| Area of elevator | 0,66 m² (projected) |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,14 m |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,25 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,08 m² (projected) (110° V-tail) |
| Area of rudder | 0,47 m² (projected) |
| Aspect ratio | 5,2 |
| Tail arm | 4,14 m |
| Max. deflection | 30° |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 0,93 m |
| Overall length | 6,95 m |
| Max. cross section | 0,40 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed wheel with brake. Fixed rubber mounted skid |
| Construction | Ply monocoque. Metal nose cap. Rear opening blown perspex canopy |

**Lift increasing devices**

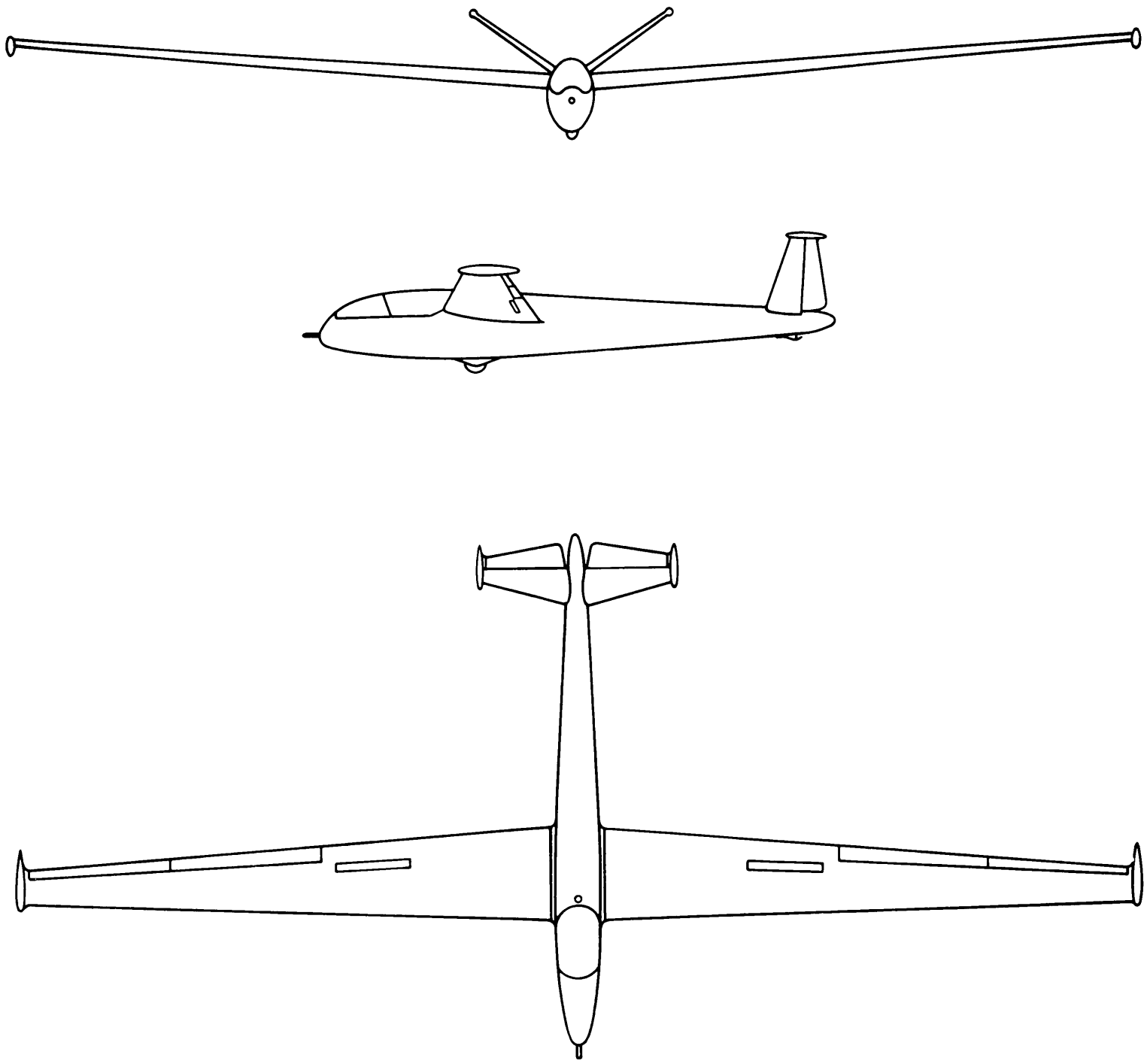
| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,0 m |
| Area | 2 × 0,20 m² |
| Location, % of chord | 60 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 130 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 90 kg |



| | |
|---|---|
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 240 kg |
| Instruments | 10 kg |
| Other equipment (e.g. oxygen, radio) | 10 kg |
| Equipped weight | 340 kg |
| Flying weight | 340 kg |
| Wing loading | 26,70 kg/m² |

**Straight flight performance**

Calculated at flying weight of 340 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 78 | 0,78 |
| Max. L/D condition | 82 | 0,82 |
| | 108 | 1,25 |
| | 126 | 1,70 |
| | 144 | 2,55 |
| Max. L/D | 28 | |

**Design standards**

Airworthiness requirements to which aircraft has been built USSR

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 150 | 6,25 |
| Point B | 240 | 6,25 |
| Point C | 220 | 3,3 |
| Point D | 130 | 3,3 |
| Factor of safety | | 1,725 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 150 | 10 |
| Point B | 250 | 4 |
| Point C | 250 | —4 |
| Point D | 150 | —10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 210 km/h |
| Placard airspeed gusty conditions | 150 km/h |
| Aero-towing speed | 150 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | Fully aerobatic |
| Spinning permitted? | Not possible to spin |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 25 to 35 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 220 km/h |

# JASTREB

This two-seat trainer has a braced wing with sweep forward to give the second man a good view. The sweep forward is not pronounced and there is zero sweep on the leading edge of the outer wing. This enables the spar to be uncranked although it is very close to the leading edge at the tip.

Zweisitziges Schulflugzeug mit abgestrebtem Flügel und Vorwärtspfeilung zwecks besserer Sicht des zweiten Piloten. Die Pfeilung ist nicht sehr stark und erreicht an der Flügeleintrittskante des Außenflügels den Wert Null. Der Holm ist deshalb nicht geknickt, trotzdem er an der Flügelspitze sehr nahe an der Eintrittskante liegt.

Biplace d'entraînement avec ailes haubanées, en flèche vers l'avant, afin de procurer une meilleure vue au second pilote. La flèche n'est pas très prononcée; elle atteint zéro au bord d'attaque de l'aile extérieure. Le longeron est donc droit malgré sa position très près du bord d'attaque au bout de l'aile.

| | |
|---|---|
| Type designation | Jastreb |
| Country of design | Bulgaria |
| Designers | Panov, Panchovsky |
| Date of first flight of prototype | 6 February, 1948 |
| Number produced | 13 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 19,5 $m^2$ |
| Aspect ratio ($b^2/s$) | 11,55 |
| Wing root chord ($C_r$) | 1,53 m |
| Wing tip chord ($C_t$) | 0,80 m |
| Mean chord ($C = s/b$) | 1,30 m |
| Wing section, root | NACA 43012 A |
| Wing section, mid | NACA 43012 A |
| Wing section, tip | NACA 43012 A |
| Dihedral | 3° |
| ¼ chord sweep | —5° |
| Aero. twist root/tip | —2° |
| Taper ratio ($C_t/C_r$) | 0,522 |
| Construction | Single spar strutted wing, wooden construction. Leading edge ply torsion box. Fabric covering 30%. Ribs spaced 0,15 and 0,30 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 4,5 m |
| Area (total) | 2 × 1,3 $m^2$ |
| Mean chord | 0,288 m |
| Max. deflection up | 28° |
| Max. deflection down | 15° |
| Mass balance degree | Nil |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 3,20 m |
| Area of elevator and fixed tail (S') | 2,50 $m^2$ |
| Area of elevator | 1,25 $m^2$ |
| Max. deflection up | 30° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 0009 |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,6 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S'1'/SC) | 0,355 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,25 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,24 $m^2$ |
| Area of rudder | 0,97 $m^2$ |
| Aspect ratio | 2,61 |
| Tail arm | 4,2 m |
| Max. deflection | 30° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,25 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,15 m |
| Overall length | 8 m |
| Max. cross section | 0,52 $m^2$ |
| Number of seats and arrangement | 2 tandem |
| Undercarriage type | Fixed unsprung wheel, no brake. Fixed rubber mounted skid |
| Construction | Ply covered frame and stringer. Metal nose cap. Side opening bent perspex canopy |

**Lift increasing devices**

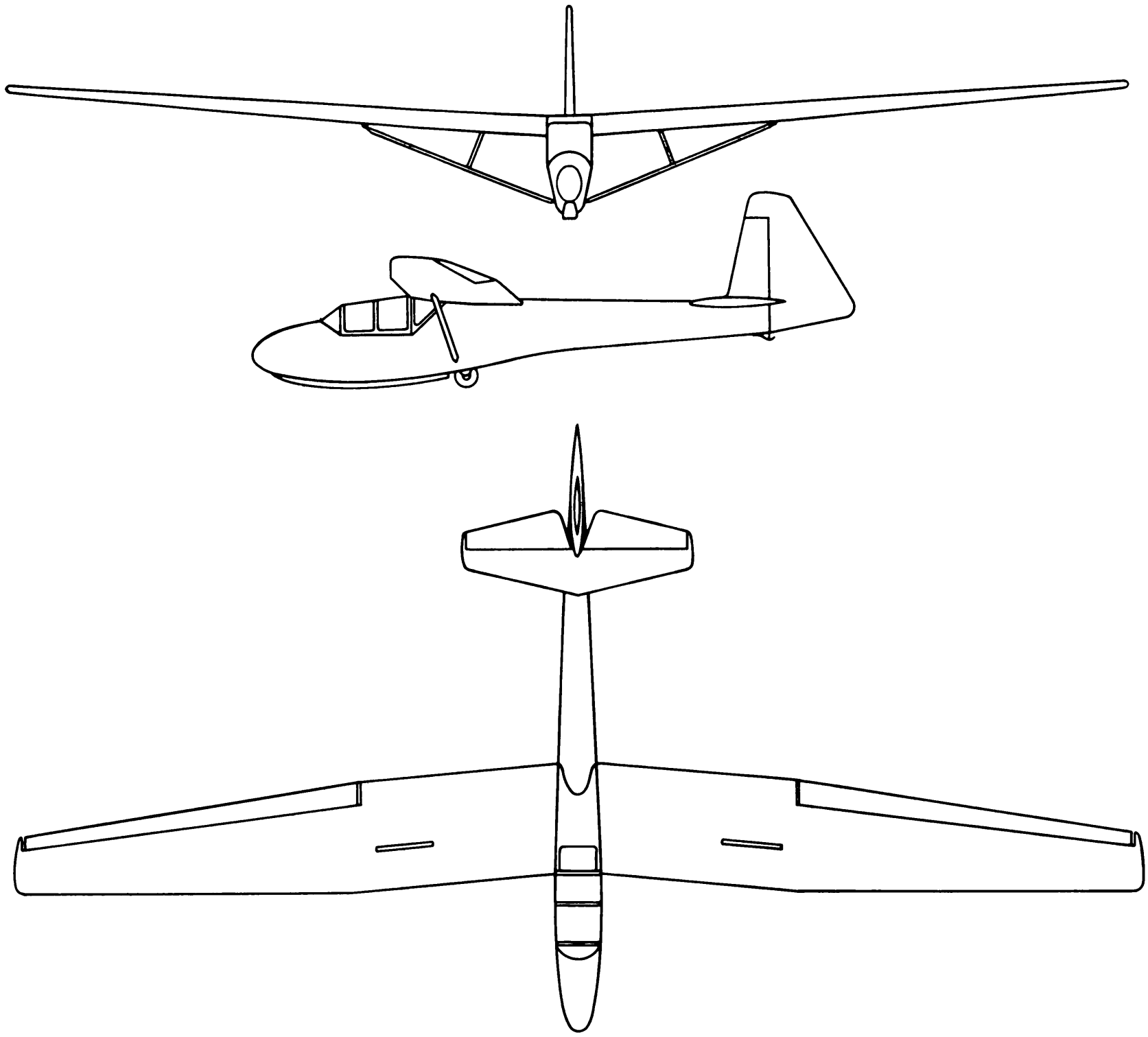
| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 0,90 m |
| Location, % of chord | 32 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 105 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 90 kg |
| Tailplane and elevator | 15 kg |
| Empty weight (including any fixed ballast) | 225 kg |



| | |
|---|---|
| Instruments | 10 kg |
| Other equipment (e.g. oxygen, radio) | 5 kg |
| Equipped weight | 385 kg |
| Flying weight | 385 kg |
| Wing loading | 19,75 kg/m² |

**Straight flight performance**

Calculated at flying weight of 385 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 60 | 0,90 |
| Max. L/D condition | 75 | 1,05 |
| | 90 | 1,45 |
| | 105 | 2,10 |
| | 120 | 2,80 |
| Stalling speed | 51 km/h | |
| Max. L/D | 20,5 | |

**Design standards**

Airworthiness requirements to which aircraft has been built USSR

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 130 | 6,25 |
| Point B | 200 | 6,25 |
| Point C | 180 | 3,3 |
| Point D | 111 | 3,3 |
| Factor of safety | | 1,725 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 127 | 10 |
| Point B | 214 | 4 |
| Point C | 214 | —4 |
| Point D | 130 | —10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | Fully aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 25 to 35 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 210 km/h |

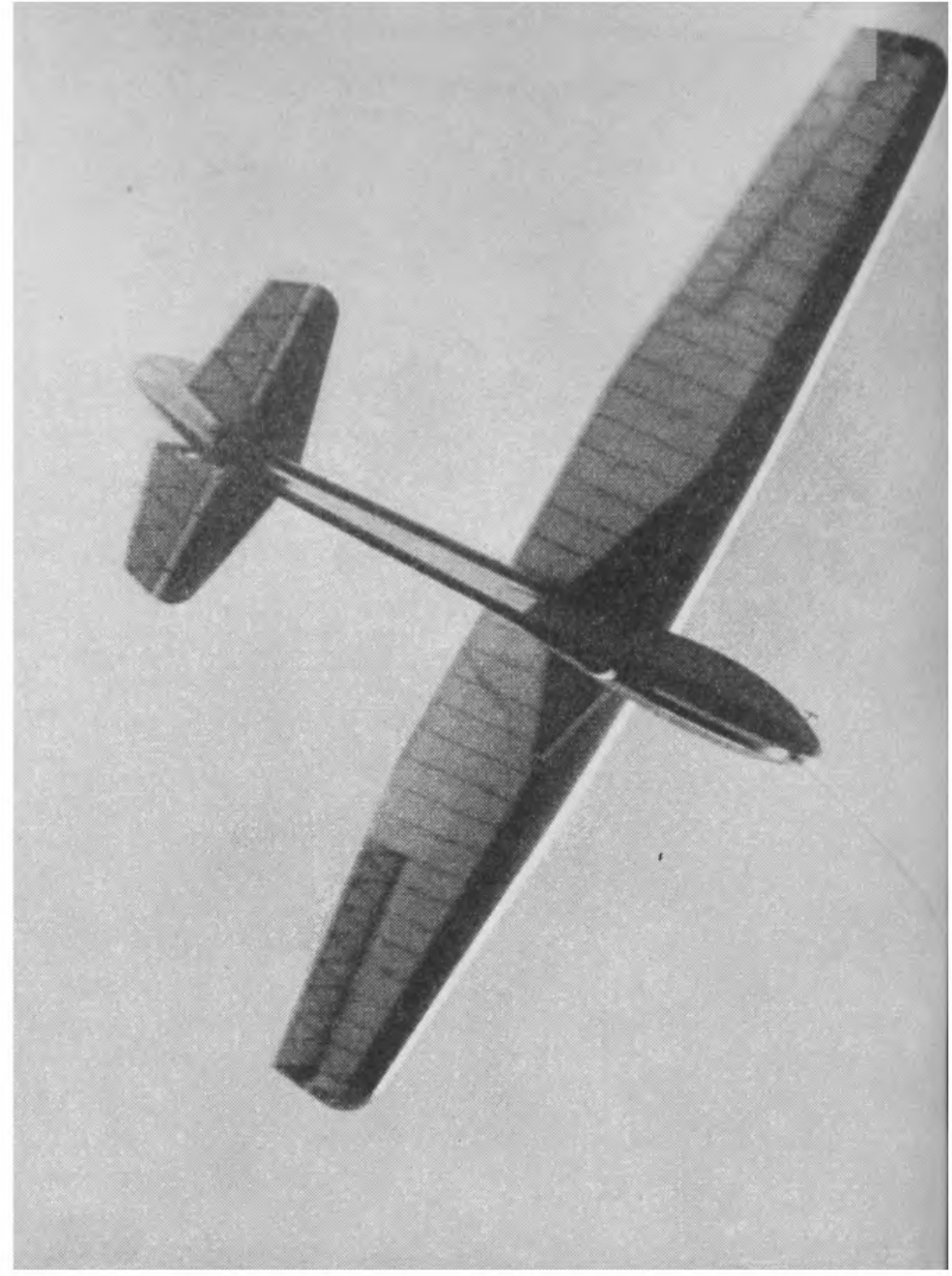
# Canada

# ROBIN

Robin is a development of Czerwinski's Salamandra, well known as a trainer in Poland before 1939.

Entwickelt aus Czerwinskis Salamandra, einem vor 1939 in Polen bekannten Schulungsflugzeug.

Développé du Salamandra de Czerwinski, planeur d'écolage bien connu en Pologne avant 1939.



| | |
|---|---|
| Type designation | Robin |
| Country of design | Canada |
| Designer | W. Czerwinski |
| Date of first flight of prototype | September 1944 |
| Number produced | 2 |

**Wings**

| | |
|---|---|
| Span (b) | 11,35 m |
| Aera (s) | 15,68 m² |
| Aspect ratio ($b^2/s$) | 8,2 |
| Wing root chord ($C_r$) | 1,6 m |
| Wing tip chord ($C_t$) | 0,977 m |
| Mean chord ($C = s/b$) | 1,366 m |
| Wing section, root | Sikorski G.S.1 |
| Wing section, mid | Sikorski G.S.1 |
| Wing section, tip | Sikorski G.S.1 |
| Dihedral | 2,5° |
| ¼ chord sweep | 0,45° |
| Aero. twist root/tip | 2° |
| Taper ratio ($C_t/C_r$) | 0,61 |
| Construction | Single spar, strutted, wooden construction with L.E. ply torsion box. 74% fabric covered. Ribs 0,305 m spacing. |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 5,34 m |
| Area (total) | 2,026 m² |
| Mean chord | 0,378 m |
| Max. deflection up | 25° |
| Max. deflection down | 14° |
| Mass balance degree | Nil |
| Mass balance method | Nil |
| Construction | Wood structure, fabric covered. |

**Horizontal tail**

| | |
|---|---|
| Span | 3,05 m |
| Area of elevator and fixed tail (S′) | 2,755 m² |
| Area of elevator | 1,355 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | Symmetrical |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,48 m |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,447 |
| Construction | Wood structure, fabric covered. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,746 m² |
| Area of rudder | 0,845 m² |
| Tail arm | 3,70 m |
| Max. deflection | + 30° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Structure | Wood. Fabric covered. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,65 m |
| Max. height (at cockpit) | 0,77 m |
| Overall length | 5,8 m |
| Max. cross section | 0,5 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed wheel and fixed rubber mounted skid. |
| Structure | Frame and stringer, ply covered. Fibre glass nose cap. Open cockpit with wind shield. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

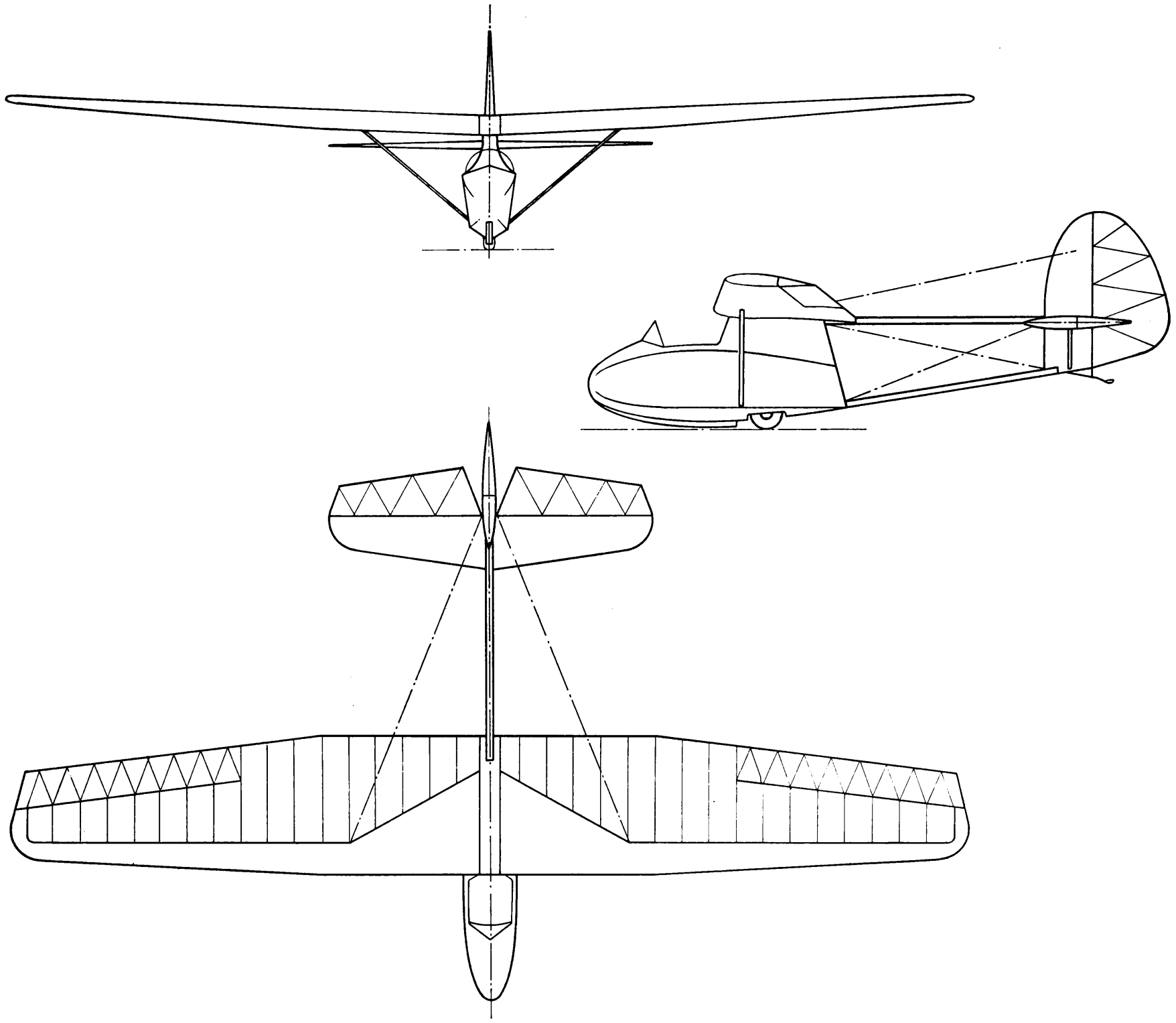
**Drag producing devices**

| | |
|---|---|
| Type | Nil |

**Weights**

| | |
|---|---|
| Wings[1] | 62 kg |
| Fuselage[2] | 47 kg |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment



| | |
|---|---|
| Tailplane and elevator | 11 kg |
| Empty weight[3] | 120 kg |
| Instruments | 4 kg |
| Equipped weight | 124 kg |
| Flying weight | 214 kg |
| Wing loading | 13,65 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR-05 |
| Date of issue of these requirements | 1940 |
| Certificate of airworthiness | January 1945 |

**Design flight envelope**

| | V km/h | Proof load factor |
|---|---|---|
| *Manoeuvre loads* | | |
| Point A | 93,8 | 6,05 |
| Point B | 173,6 | 6,05 |
| Point C | 107,7 | — 4,0 |
| Point D | 173,6 | — 4,0 |
| Factor of safety | | 1,5 |
| *Gust loads* | Incorporated in manoeuvre loads envelope for CAR-05. | |

[3] To include any fixed ballast

**Limiting flight conditions**

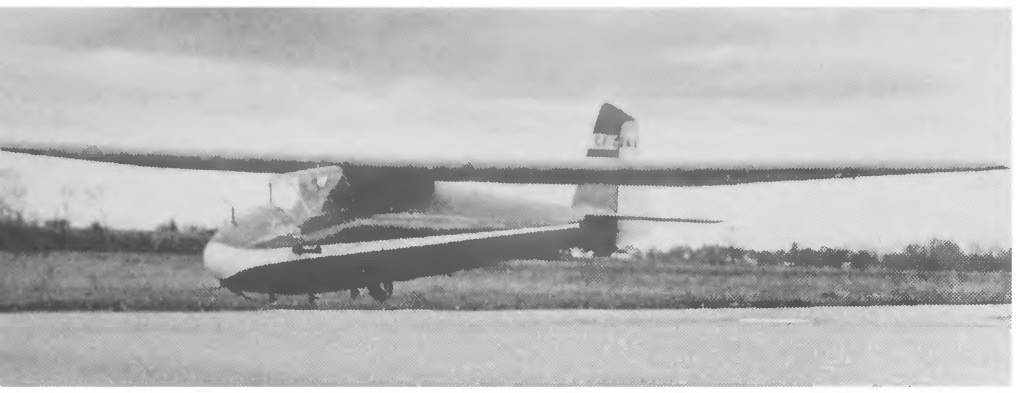
| | |
|---|---|
| Placard airspeed smooth conditions | 161 km/h |
| Placard airspeed gusty conditions | 161 km/h |
| Aero-towing speed | 161 km/h |
| Winch launching speed | 93,8 km/h |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 25,1 % to 32,3 % |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not applicable |

**Straight flight performance**

Calculated
at flying weight of 214 kg

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 51,4 | 0,823 |
| Max. L/D condition | 55,0 | 0,914 |
| | 77,0 | 1,4 |
| | 90,0 | 2,3 |
| | 102,8 | 3,2 |
| Stalling speed | 41,0 km/h | |
| Max. L/D | 16,4 | |



# LOUDON

The Loudon, designed and built at the University of Toronto as a 4th year engineering student exercise, was planned as a Cadet replacement with sufficiently improved performance for cross-country operation. In spite of somewhat inadequate penetration it made a Canadian distance record of 118 miles in 1950. The Loudon's normal two-piece wing incorporated a steel tube wing root diagonal internal strut instead of the usual wooden rib.

An der Universität von Toronto als Übung für die Ingenieurstudenten des 4. Jahres konstruiert und gebaut. Geplant als Ersatz für den Cadet mit genügend verbesserter Leistung für Überlandflüge. Trotz der nicht völlig untadeligen Flugeigenschaften stellte der Loudon 1950 mit 189 km einen kanadischen Streckenrekord auf. Der normale zweiteilige Flügel enthält an der Flügelwurzel eine diagonale innere Stahlrohrstrebe anstelle der üblichen Holzrippe.

Dessiné et construit à l'université de Toronto comme exercice pour les étudiants ingénieurs de la quatrième année. Le Loudon devait remplacer le Cadet et montrer des performances améliorées pour le vol de distance. Malgré ses qualités de vol quelque peu imparfaites, il battit le record canadien de distance en 1950 avec 189 km. L'aile normale en deux pièces contient un mât intérieur diagonal en tube d'acier près du fuselage, au lieu de la nervure habituelle en bois.

| | |
|---|---|
| Type designation | Loudon |
| Country of design | Canada |
| Designers | B.S. Shenstone, W. Czerwinski |
| Date of first flight of prototype | November 1949 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 13,72 m |
| Area (s) | 16,25 $m^2$ |
| Aspect ratio ($b^2/s$) | 11,6 |
| Wing root chord ($C_r$) | 1,377 m |
| Wing tip chord ($C_t$) | 0,682 m |
| Mean chord ($C = s/b$) | 1,395 m |
| Wing section, root | NACA 4416 |
| Wing section, mid | NACA 4416 |
| Wing section, tip | NACA 6412 |
| Dihedral | 0° |
| ¼ chord sweep | 0,4° |
| Aero. twist root/tip | 4° |
| Taper ratio ($C_t/C_r$) | 0,5 |
| Construction | Single spar cantilever, wooden construction. Ply sandwich L.E. 65% fabric covered. |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 5,42 m |
| Area (total) | 1,86 $m^2$ |
| Mean chord | 0,343 m |
| Mass balance degree | Nil |
| Mass balance method | Nil |
| Construction | Wood structure, fabric covered. |

**Horizontal tail**

| | |
|---|---|
| Span | 4,08 m |
| Area of elevator and fixed tail (S′) | 2,32 $m^2$ |
| Area of elevator | 1,8 $m^2$ |
| Max. deflection up | 26° |
| Max. deflection down | 23° |
| Aerofoil section | NACA 0012 |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,96 m |
| Elevator aerodynamic balance method | Shielded horn |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,477 |
| Construction | Wood structure, fabric covered. Ribs spaced 0,305 m. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,56 $m^2$ |
| Area of rudder | 0,72 $m^2$ |
| Aspect ratio | 2 (rudder) |
| Tail arm | 4,1 m |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Structure | Wood. Ply covered fin, fabric covered rudder. Zigzag ribs. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,63 m |
| Max. height (at cockpit) | 1,19 m |
| Overall length | 6,0 m |
| Max. cross section | 0,65 $m^2$ |
| Wetted surface area | 14,5 $m^2$ |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed wheel and rubber mounted skid. |
| Structure | Spruce frames and stringers. Birch ply covered. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper surface spoiler. Hinged at leading edge. |
| Span (total) | 1,54 m |
| Area | 0,25 $m^2$ |
| Location, % of chord | 32 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.? | No |

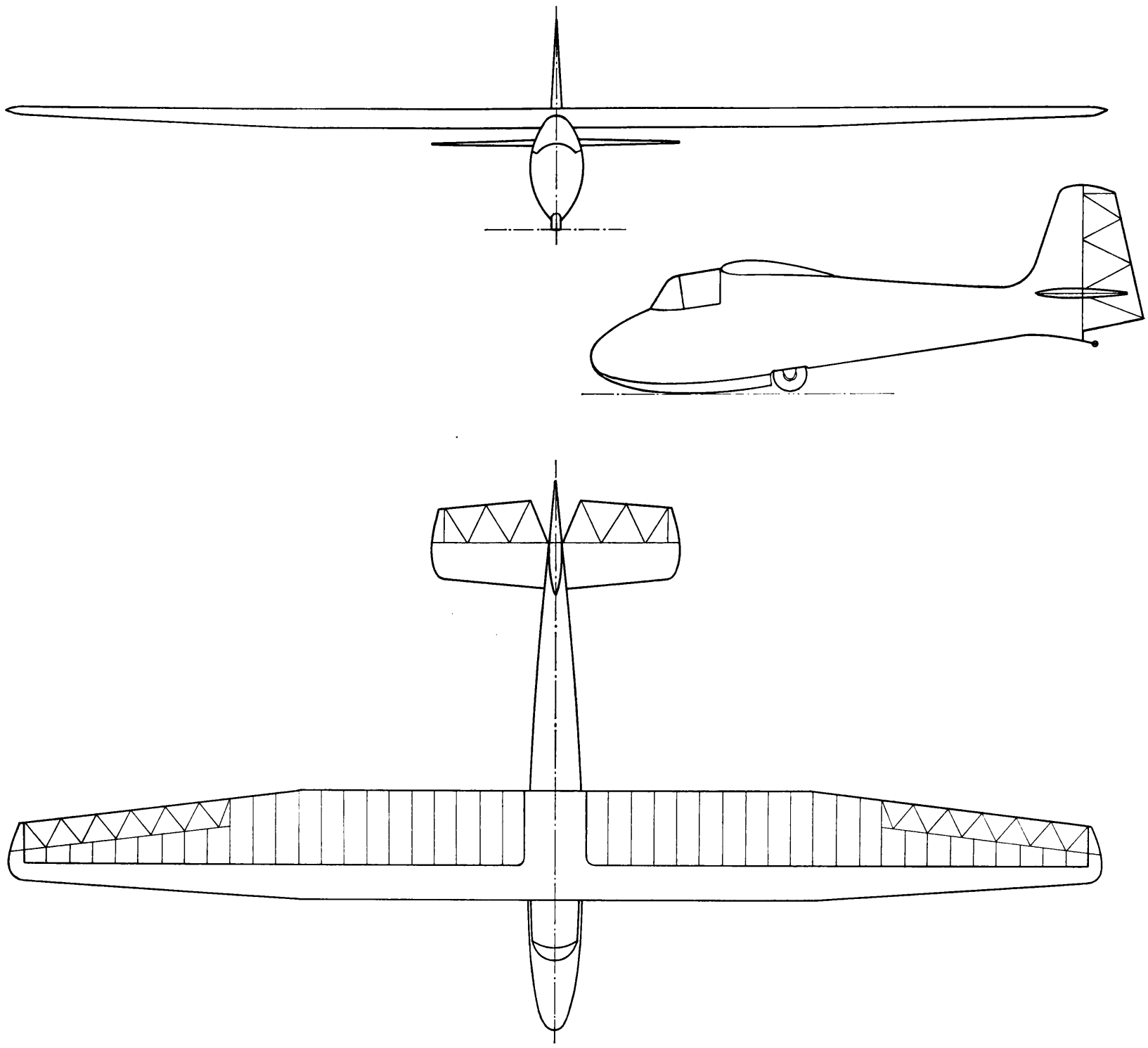
**Weights**

| | |
|---|---|
| Wings[1] | 85 kg |
| Fuselage[2] | 58 kg |
| Tailplane and elevator | 7 kg |
| Empty weight[3] | 150 kg |

[1] With struts, controls, flaps and brakes

[2] Complete with rudder and fin, less instruments and equipment

[3] To include any fixed ballast



| | |
|---|---|
| Instruments | 8 kg |
| Other equipment (e.g. oxygen, radio) | 7 kg |
| Equipped weight | 165 kg |
| Flying weight | 256 kg |
| Wing loading | 15,8 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR-05 |
| Date of issue of these requirements | 1948 |
| Certificate of airworthiness | November 1952 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 90 | 5,08 |
| Point B | 158 | 5,08 |
| Point C | 100 | — 3,08 |
| Point D | 158 | — 3,08 |
| Factor of safety | | 1,5 |
| *Gust loads* | Incorporated in manoeuvre loads envelope for CAR-05 | |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 145 km/h |
| Placard airspeed gusty conditions | 145 km/h |
| Aero-towing speed | 145 km/h |
| Winch launching speed | 105 km/h |
| Cloud flying permitted? | No |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 17,5% to 24,6% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not applicable |

**Straight flight performance**

Calculated
at flying weight of . . . . . 256 kg

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 46,7 | 0,74 |
| Max. L/D condition | 66,0 | 0,76 |
| | 70,0 | 0,91 |
| | 82,0 | 1,16 |
| | 93,4 | 1,43 |
| Stalling speed | 40,2 km/h | |
| Max. L/D | 22 | |

# HARBINGER

Harbinger was designed in 1947 for the British Gliding Association Design Competition and was placed 5th. It was designed to have about the same gliding angle as the Olympia or Meise. The design is a compromise to fill the requirements for a two-seater trainer with reasonable cross-country performance and a simple structure. It features a very good view for the rear as well as for the front pilot, a thin wing and a welded steel tube main frame which picks up the wing spar and the lower strut ends.

Im Jahre 1947 im Rahmen des Konstruktionswettbewerbs der British Gliding Association entworfen und an fünfter Stelle klassiert. Der Harbinger sollte einen ähnlichen Gleitwinkel wie die Olympia oder Meise erreichen. Es handelt sich um einen Kompromiß zwischen den Ansprüchen an ein zweisitziges Schulungsflugzeug, guter Leistung für Überlandflüge und einfacher Konstruktion. Bemerkenswert sind die ausgezeichnete Sicht auf beiden Pilotensitzen, der dünne Flügel und der geschweißte Stahlrohrrumpf, der den Flügelholm und die unteren Strebenenden in sich aufnimmt.

Construit en 1947 dans le cadre du concours de construction de la British Gliding Association et classé cinquième. Le Harbinger devait atteindre un angle de plané équivalent à celui de l'Olympia et de la Meise. Il s'agit d'un compromis entre les besoins d'un planeur d'écolage biplace, de bonnes performances pour le vol de distance et une structure simple. Il est caractérisé par une vue excellente pour les deux pilotes, une aile mince et un fuselage en tubes d'acier soudé recevant le longeron de l'aile et les parties inférieures des mâts.

| | |
|---|---|
| Type designation | Harbinger |
| Country of design | Canada |
| Designers | W. Czerwinski, B.S. Shenstone |
| Date of first flight of prototype | 1958 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 18,3 m |
| Area (s) | 22,3 m² |
| Aspect ratio ($b^2/s$) | 15 |
| Wing root chord ($C_r$) | 1,6 m |
| Wing tip chord ($C_t$) | 0,663 m |
| Mean chord ($C = s/b$) | 1,22 m |
| Wing section, root | NACA 4410 |
| Wing section, mid | NACA 4413 (at strut) |
| Wing section, tip | NACA 4409 |
| Dihedral | 2° |
| ¼ chord sweep | 16° forward on centre wing<br>0° L.E. sweep on outer |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,413 |
| Construction | Single spar, strutted, wooden construction with L.E. ply torsion box. 70% fabric covered. Steel internal torque tripod and steel struts. |

**Ailerons**

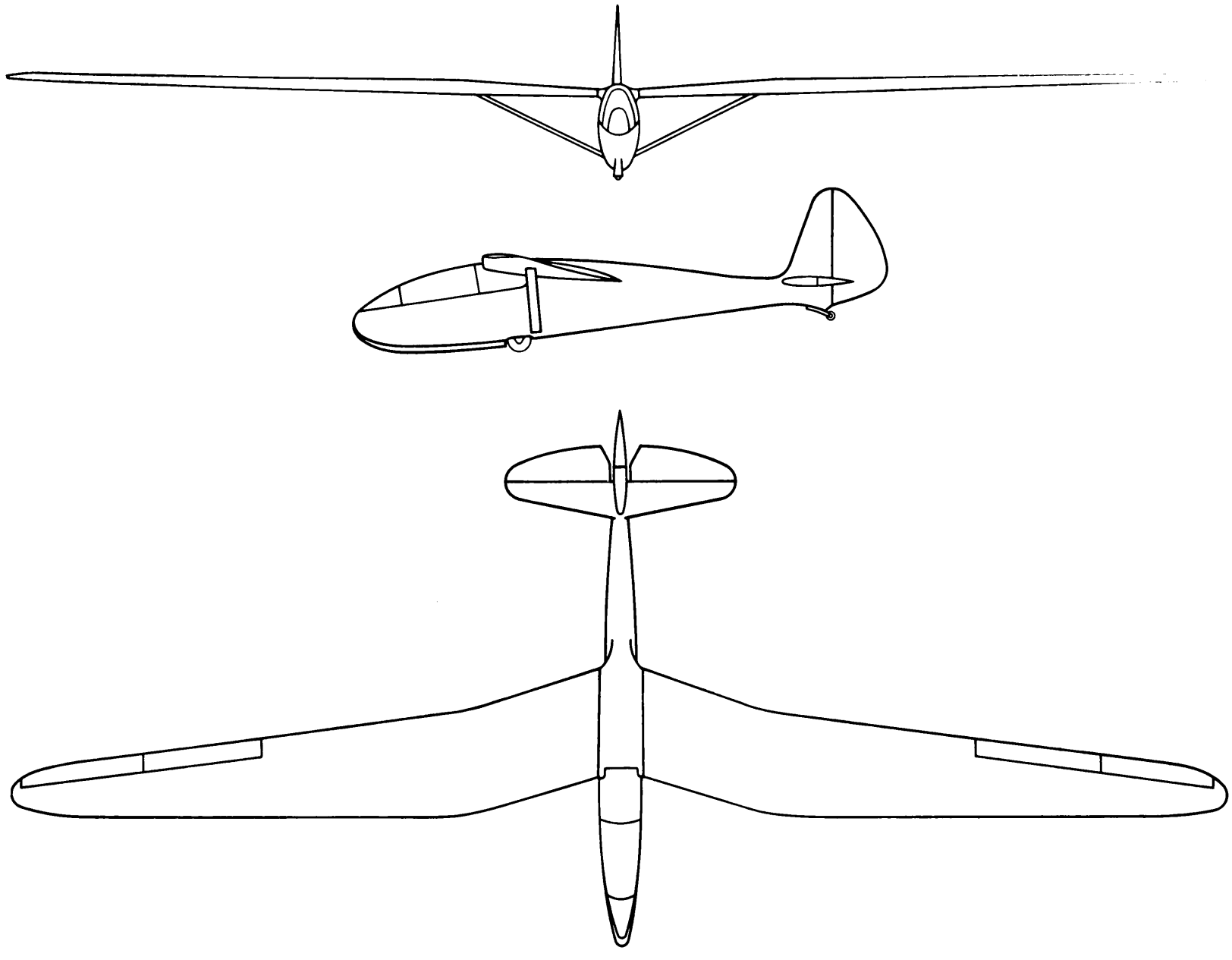
| | |
|---|---|
| Type | Slotted |
| Span (total) | 7,32 m |
| Area (total) | 2,42 m² |
| Mean chord | 0,33 m |
| Max. deflection up | 28,5° |
| Max. deflection down | 16,0° |
| Mass balance degree | 100% |
| Mass balance method | Distributed weight |
| Construction | Wood structure, fabric covered. Ribs 0,3 m spacing. |

**Horizontal tail**

| | |
|---|---|
| Span | 3,41 m |
| Area of elevator and fixed tail (S′) | 3,25 m² |
| Area of elevator | 1,58 m² |
| Max. deflection up | 22° |
| Max. deflection down | 21° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | Nil |
| Mass balance method | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,36 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,522 |
| Construction | Wood. Tailplane ply covered, elevator fabric covered. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,83 m² |
| Area of rudder | 0,93 m² |
| Aspect ratio | 2,1 |
| Tail arm | 4,76 m |



| | |
|---|---|
| Max. deflection | ± 23° |
| Aerofoil section | NACA 00 series |
| Aerodynamic balance | Nil |
| Structure | Wood. Ply covered fin, fabric covered rudder. Ribs spaced 0,3 m. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,635 m |
| Max. height (at cockpit) | 1,19 m |
| Overall length | 7,25 m |
| Max. cross section | 0,568 m² |
| Wetted surface area | 13,5 m² |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed unsprung wheel and fixed rubber mounted skid. |
| Structure | Frames and stringers ply covered. Steel tube main frame. Fibre glass nose cap. Side opening blown perspex canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Special segmented air brakes. |
| Span (total) | 4,30 m |
| Area | 0,52 m² |
| Location, % of chord | 40 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.? | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 182,5 kg |
| Fuselage[2] | 109,0 kg |
| Tailplane and elevator | 12,5 kg |
| Empty weight[3] | 303,0 kg |
| Instruments | 15,0 kg |
| Equipped weight | 318,0 kg |
| Flying weight | 500 kg |
| Wing loading | 22,5 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR-E |
| Date of issue of these requirements | 1948 |
| Certificate of airworthiness | Not yet |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 129 | 5 |
| Point B | 233 | 4 |
| Point C | 233 | 0 |
| Point D | 129 | — 2,5 |
| Factor of safety | | 1,5 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 116 | 18,3 |
| Point B | 233 | 8,55 |
| Point D | 112,5 | 17,8 |

(Rough gust case applied)

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 209 km/h |
| Aero-towing speed | 112,5 km/h |
| Winch launching speed | 112,5 km/h |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 32% to 43,7% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Estimated 219 km/h |

**Straight flight performance**

Calculated at flying weight of 500 kg

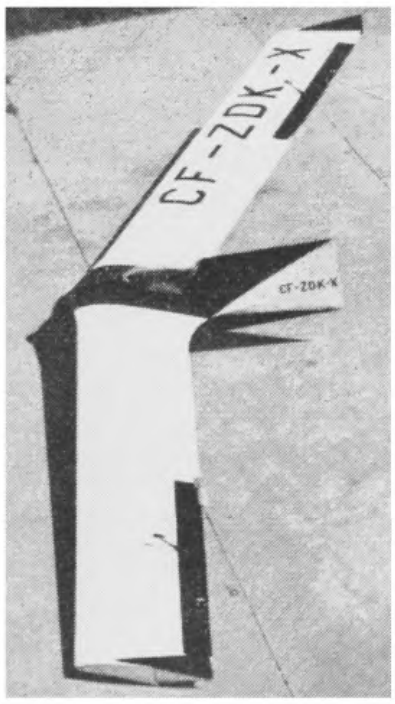
| No flap or brake | V km/h | V sink m/s |
|---|---|---|
| Min. sink condition | 68,3 | 0,78 |
| Max. L/D condition | 84,3 | 0,92 |
| | 102,5 | 1,31 |
| | 120 | 1,95 |
| | 136 | 2,75 |
| Stalling speed | 57 km/h | |
| Max. L/D | 26 | |

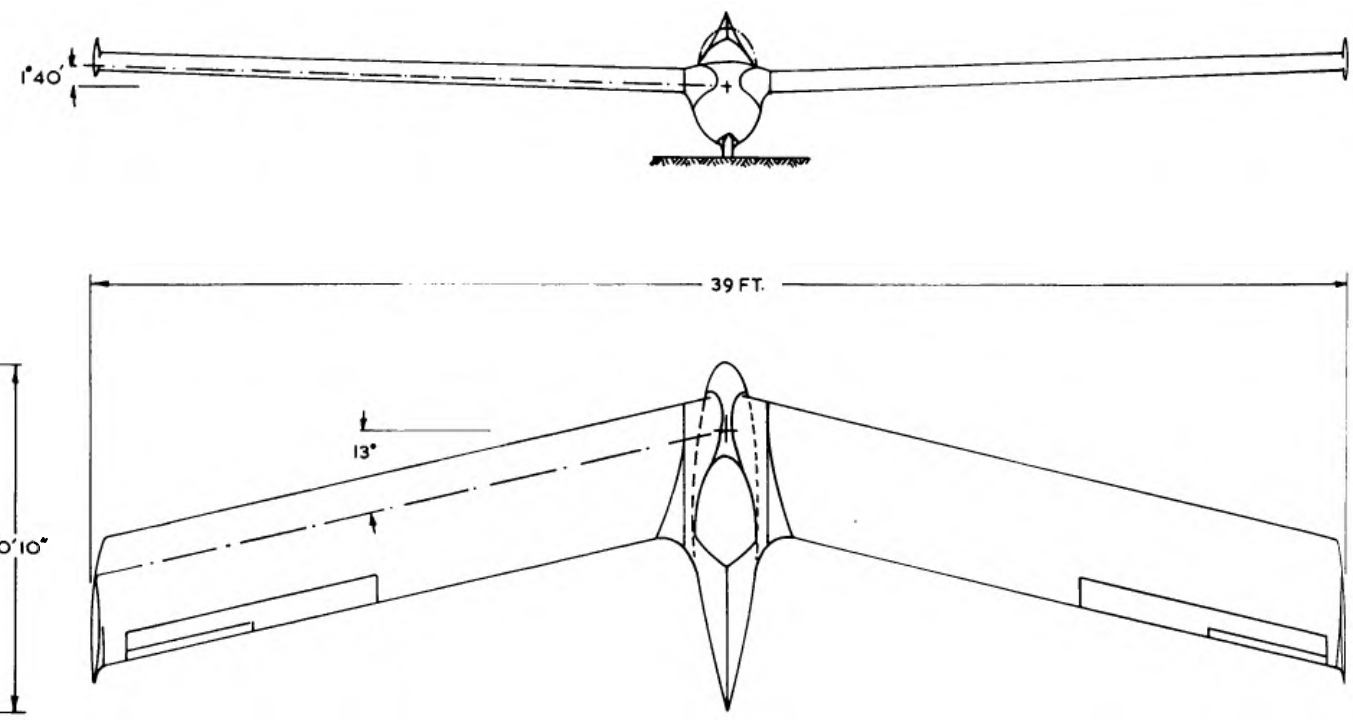
# BKB-1

This experimental tailless sailplane was designed for simplicity and compactness and ease of transport. Details of the development are given in a paper by S.K. Brochocki in Swiss Aero Revue, November 1960, and in OSTIV Publication VI.

Experimenteller Nurflügler, konstruiert im Hinblick auf Einfachheit, solide Bauweise und leichte Transportmöglichkeit. Einzelheiten über die Entwicklung durch S.K. Brochocki sind wiedergegeben in der Schweizer Aero-Revue vom November 1960 und in der OSTIV Publication VI.

Aile volante expérimentale, de construction simple et solide, facile à transporter. Des détails au sujet du développement par S.K. Brochocki sont publiés dans l'Aéro-Revue Suisse de novembre 1960 ainsi que dans la OSTIV Publication VI.




| | |
|---|---|
| Type designation | BKB-1 |
| Country of design | Canada |
| Designer | S.K. Brochocki |
| Date of first flight of prototype | 10 October 1959 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 11,9 m |
| Area (s) | 14,4 m² |
| Aspect ratio ($b^2/s$) | 10 |
| Wing root chord ($C_r$) | 1,22 m |
| Wing tip chord ($C_t$) | 1,22 m |
| Mean chord ($C = s/b$) | 1,22 m |
| Wing section, root | NACA 8-H-12 |
| Wing section, mid | NACA 8-H-12 |
| Wing section, tip | NACA 8-H-12 |
| Dihedral | 1,5° |
| ¼ chord sweep | 13,0° |
| Aero. twist root/tip | 5,0° |
| Taper ratio ($C_t/C_r$) | 1,0 |
| Construction | Single spar, wood construction |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge (elevon) |
| Span (total) | 4,88 m |
| Area (total) | 1,34 m² |
| Mean chord | 0,275 m |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Mass balance degree | 100% |
| Mass balance method | Bob weight |
| Construction | Wood. Fabric covered. |

**Horizontal tail** — Tailless

**Vertical tail**

| | |
|---|---|
| Area of rudder | 0,31 m² (wing tip rudder/brake) |
| Max. deflection | 75° |

**Fuselage**

| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 0,9 m |
| Overall length | 3,0 m |
| Max. cross section | 0,425 m² |
| Wetted surface area | 4,2 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Sprung fixed wheel and rubber mounted skid. No brakes. |
| Structure | Frame and stringer ply covered. Moulded perspex canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Brake/rudder at wing tip |
| Area | 0,31 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings[1] | 113 kg |
| Fuselage[2] | 37 kg |
| Equipped weight | 168 kg |
| Flying weight | 259 kg |
| Wing loading | 18 kg/m² |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment

**Design standards**

| | |
|---|---|
| Airworthiness requirements to wich aircraft has been built | CAR-05 |
| Certificate of airworthiness | Pending |

**Design flight envelope**

| | V km/h | Proof load factor |
|---|---|---|
| *Manoeuvre loads* | | |
| Point A | 96 | 5,33 |
| Point B | 180 | 5,33 |
| Point C | 180 | — 2,67 |
| Point D | 96 | — 2,67 |
| Factor of safety | 1,5 | |
| *Gust loads* | | |
| Point A | 96 | 13,1 |
| Point B | 180 | 7,3 |
| Point C | 180 | — 7,3 |
| Point D | 108 | — 11,9 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 162 km/h |
| Placard airspeed gusty conditions | 162 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Pending test results |
| Permitted aerobatic manoeuvres? | Pending test results |
| Spinning permitted? | Pending test results |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 18–23 % |

**Straight flight performance**

Calculated
at flying weight of 259 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 71 | 0,72 |
| Max. L/D condition | 87 | 0,76 |
| | 106 | 1,17 |
| | 124 | 1,69 |
| | 142 | 2,44 |
| Stalling speed | 56 km/h | |
| Max. L/D | 30 | |

# China

# LIE-FANG 1

This is the first sailplane designed in China. The project was undertaken by the Polish designer, Dipl. Ing. J. Niespal, with the assistance of Dipl. Ing. Tchen-Kuei-Wen and Li-Ti-Tiun, and was built in the sailplane factory at Shen-Yang.

The sailplane is for both dual instruction and cross-country flying. It is designed for bungee start, winching (nose and C.G. hooks) and aero-tow. It is also permitted to do limited aerobatics and flight in gust conditions from +10 to −7 m per second.

The structural material is wood, including the use of the Chinese light weight wood called «Poton». The cockpit is equipped with one set of instruments which can be seen from both seats. The front part of the cabin enclosure is fixed but the rear part can be opened sideways for the entrance of both pilots.

Erstes original-chinesisches Segelflugzeug, vom polnischen Konstrukteur Dipl. Ing. Niespal unter Mitarbeit von Dipl. Ing. Tchen-Kuei-Wen und Li-Ti-Tiun in der Segelflugzeugfabrik von Shen-Yang entworfen.

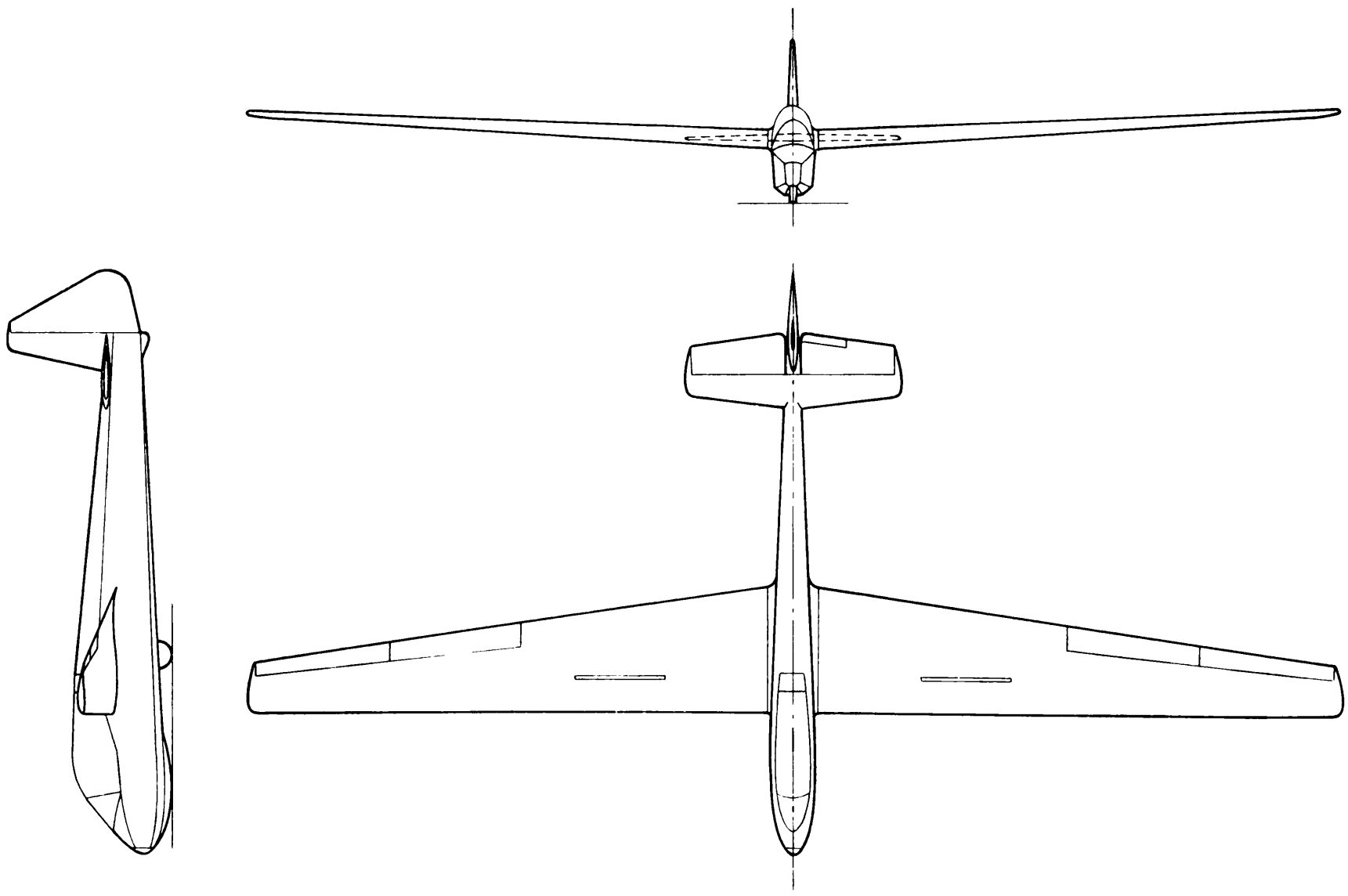
Das Segelflugzeug ist für Doppelsitzerschulung und Leistungsflug bestimmt. Es ist für Gummiseilstart, Windenschlepp (Vorder- und Schwerpunktskupplung), Flugzeugschlepp sowie beschränkten Kunstflug und Flug in böigem Wetter (+10 bis −7 m/sek) zugelassen.

Als Material wurde Holz gewählt, wobei auch das chinesische Leichtholz «Poton» Anwendung fand. Die Kabine ist mit einem Satz von Bordgeräten ausgerüstet, die jedoch von beiden Plätzen gut sichtbar sind. Der Vorderteil der Kabinenhaube ist fest; der Hinterteil ist für beide Plätze gemeinsam und wird seitwärts geöffnet.

Premier planeur d'origine chinoise, construit par le polonais Dipl. Ing. J. Niespal, en collaboration avec Dipl. Ing. Tchen-Kuei-Wen et Li-Ti-Tiun dans la fabrique de planeurs à Shen-Yang.

Destiné à l'écolage en biplace et aux vols de performance. Admis pour départ au treuil, remorquage au treuil (crochet avant et au centre de gravité) et par avion, acrobatie (limitée) et vol en rafales (+ 10, −7 m/sec.)

On a choisi du bois, entre autres le bois léger chinois «poton». Le poste de pilotage est équipé d'une série d'instruments normaux, bien visibles des deux places. La partie avant du couvercle du cockpit est fixe, la partie arrière est commune pour les deux places et peut être ouverte de côté.



| | |
|---|---|
| Type designation | Lie-Fang 1 |
| Country of design | Chinese Peoples Republic |
| Designer | J. Niespal in collaboration with Tchen-Kuei-Wen and Li-Ti-Tiun |
| Date of first flight of prototype | 10 May, 1958 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 18,5 m² |

| | |
|---|---|
| Aspect ratio ($b^2/s$) | 12,4 |
| Wing root chord ($C_r$) | 1,85 m |
| Wing tip chord ($C_t$) | 0,615 m |
| Mean chord ($C = {}^s/_b$) | 1,24 m |
| Wing section, root | Gö 549 |
| Wing section, mid | Gö 549 |
| Wing section, tip | NACA 4412 |
| Dihedral | 4° |
| ¼ chord sweep | —2° |
| Aero. twist root/tip | 2° |
| Taper ratio ($C_t/C_r$) | 0,33 |
| Construction | Single spar cantilever wooden structure. Leading edge torsion box. 68% fabric covered |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2×3,75 m |
| Area (total) | 2×0,86 m² |
| Mean chord | 0,235 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Mass balance degree | 100% |
| Mass balance method | Distributed weight |
| Construction | Wooden framework fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,0 m |
| Area of elevator and fixed tail (S′) | 2,5 m² |
| Area of elevator | 1,1 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0010 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,9 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,425 |
| Construction | Wood. Fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,7 m² |
| Area of rudder | 1,0 m² |
| Aspect ratio | 1,76 |
| Tail arm | 4,6 m |
| Max. deflection | ± 30° |
| Aerofoil section | NACA 0010/0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,615 m |
| Max. height (at cockpit) | 1,2 m |
| Overall length | 8,0 m |
| Max. cross section | 0,6 m² |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed wheel with brakes. Rubber mounted skid |
| Construction | Ply monocoque with light alloy nose cap. Side opening bent perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 3,0 m |
| Area | 0,4 m² |
| Location, % of chord | 39 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.? | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 120 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 100 kg |
| Tailplane and elevator | 9 kg |
| Empty weight (including any fixed ballast) | 229 kg |
| Instruments | 3 kg |
| Other equipment (e.g. oxygen, radio) | 10 kg |
| Equipped weight | 242 kg |
| Flying weight | 420 kg |
| Wing loading | 22,8 kg/m² |

**Straight flight performance**

Calculated at flying weight of 320

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 62 | 0,80 |
| Max. L/D condition | 86 | 0,90 |
| | 94 | 1,50 |
| | 109 | 2,30 |
| | 124 | 3,40 |
| Stalling speed | 55 km/h | |
| Max. L/D | 22 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish PBSL |
| Date of issue of these requirements | 1957 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 114 | 4,5 |
| Point B | 165 | 4,5 |
| Point C | 165 | 2,25 |
| Point D | 114 | 2,25 |
| Factor of safety | 1,75 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 138 | +10 |
| Point B | 165 | + 4 |
| Point C | 165 | — 3 |
| Point D | 138 | — 7 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 165 km/h |
| Placard airspeed gusty conditions | 138 km/h |
| Aero-towing speed | 140 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi-aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 23–35 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 165 km/h |

# CZECHOSLOVAKIA

# L-13 BLANIK

Blanik is an all-metal production two-seater, widely used in Czechoslovakia and Russia and generally available. Its measured performance, considering its moderate span and relatively roomy fuselage, is very good indeed.

Zweisitziges Ganzmetall-Segelflugzeug in Serienproduktion, das in der Tschechoslowakei und in Rußland eingesetzt und allgemein erhältlich ist. Die erflogenen Leistungen sind angesichts der geringen Spannweite und des relativ geräumigen Rumpfes sehr gut.

Planeur biplace entièrement en construction métallique, en production de série et employé surtout en Tchécoslovaquie et en Russie; peut être fourni à tous les intéressés. Ses performances mesurées sont excellentes, vu l'envergure modérée et le fuselage relativement spacieux.


| | |
|---|---|
| Type designation | L-13 Blanik |
| Country of design | Czechoslovakia |
| Designer | VZLÚ Letňany |
| Date of first flight of prototype | March 1956 |
| Number produced | 350 |

**Wings**

| | |
|---|---|
| Span (b) | 16,2 m |
| Area (s) | 19,15 m² |
| Aspect ratio ($b^2/s$) | 13,7 |
| Wing root chord ($C_r$) | 1,665 m |
| Wing tip chord ($C_t$) | 0,710 m |
| Mean chord ($C = s/b$) | 1,182 m |
| Wing section, root | NACA $63_2$A–615 |
| Wing section, tip | NACA $63_2$A–612 |
| Dihedral | 3° |
| ¼ chord sweep | –5° |
| Aero. twist root/tip | 3° |
| Taper ratio ($C_t/C_r$) | 0,427 |
| Construction | Light alloy. Single spar cantilever. Metal covered |

**Ailerons**

| | |
|---|---|
| Type | Setback hinge |
| Span (total) | 2×3,37 m |
| Area (total) | 2×1,140 m² |
| Mean chord | 0,338 m |
| Max. deflection up | 34° |
| Max. deflection down | 13° |
| Mass balance method | Distributed |
| Construction | Metal. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,45 m |
| Area of elevator and fixed tail (S′) | 2,66 m² |
| Area of elevator | 1,117 m² |
| Max. deflection up | 30° |
| Max. deflection down | 25° |
| Aerofoil section | Symmetrical |
| Mass balance method | Distributed |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,764 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,662 |
| Construction | All metal tailplane. Metal/fabric covered elevator. Ribs spaced 0,48 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,605 m² |
| Area of rudder | 0,904 m² |
| Aspect ratio | 1,45 |
| Tail arm | 4,742 m |
| Max. deflection | 30° |
| Aerofoil section | Symmetrical |
| Construction | All metal fin. Metal/fabric covered elevator. Ribs spaced 0,32 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,62 m |
| Max. height (at cockpit) | 1,14 m |
| Overall length | 8,40 m |
| Number of seats/arrangement | 2 tandem. |
| Undercarriage type | Retractable wheel with brake |
| Construction | Metal monocoque. Side opening moulded perspex canopy |

**Lift increasing devices**

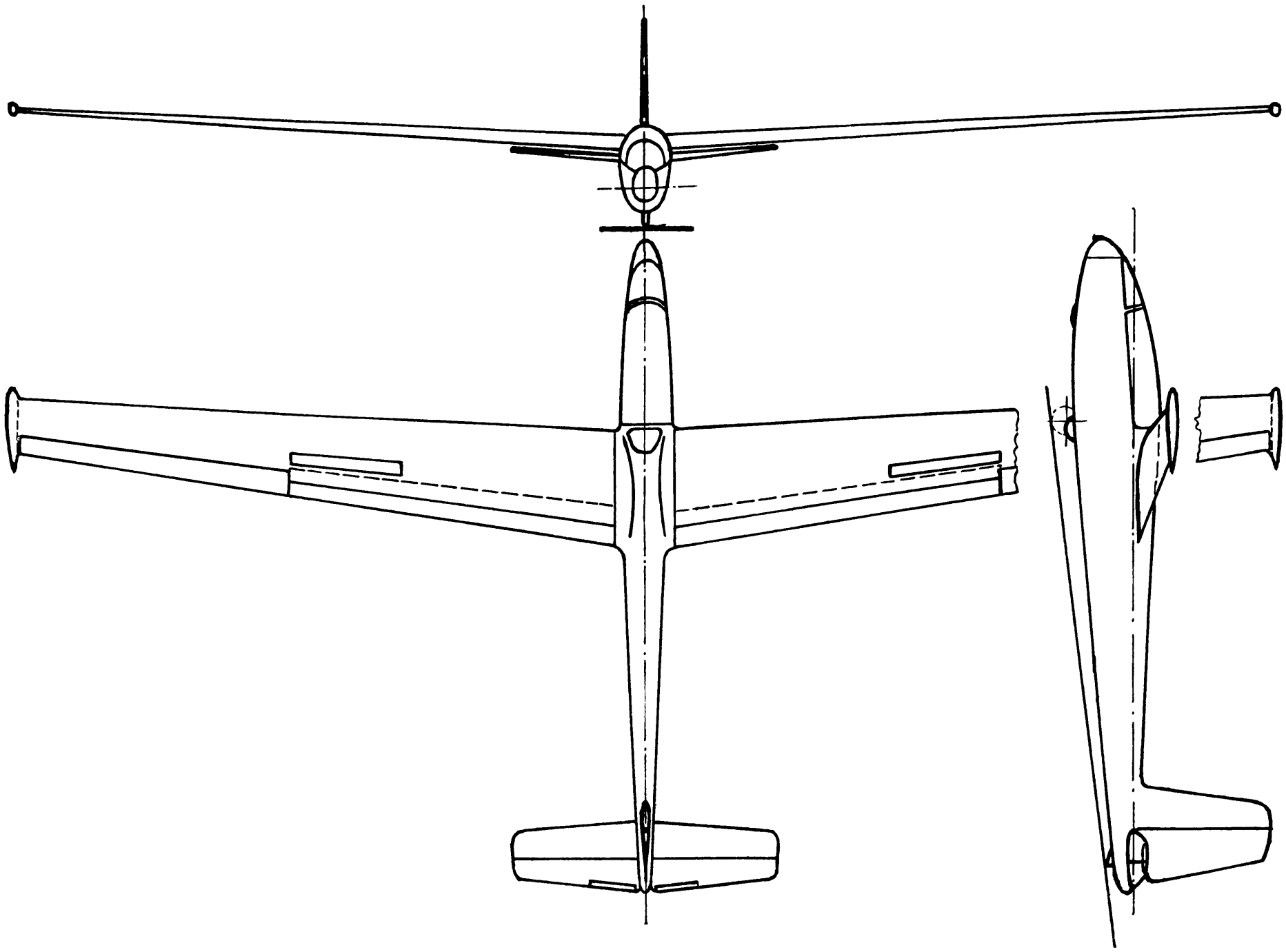
| | |
|---|---|
| Type | Fowler flap |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2×1,29 m |
| Area | 2×0,32 m² |
| Location, % of chord | 61 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 172 kg |



| | |
|---|---|
| Fuselage (with fin and rudder, less instruments and equipment) | 100 kg |
| Tailplane and elevator | 14 kg |
| Empty weight (including any fixed ballast) | 286 kg |
| Instruments | 6 kg |
| Other equipment (e.g. oxygen, radio) | 23 kg |
| Equipped weight | 292 kg |
| Flying weight | 500 kg |
| Wing loading | 26,1 kg/m² |

**Straight flight performance**

Measured at flying weight of 500 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 83 | 0,84 |
| Max. L/D condition | 93 | 0,917 |
| | 125 | 1,55 |
| | 145 | 2,24 |
| | 165 | 3,20 |
| Stalling speed | 62 km/h | 56 km/h |
| Flap deflection | 0° | 10° |
| Max. L/D | 28,2 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS, BCAR (with max. speed limitation) |
| Certificate of airworthiness | Yes, 1958 |

**Design flight envelope**

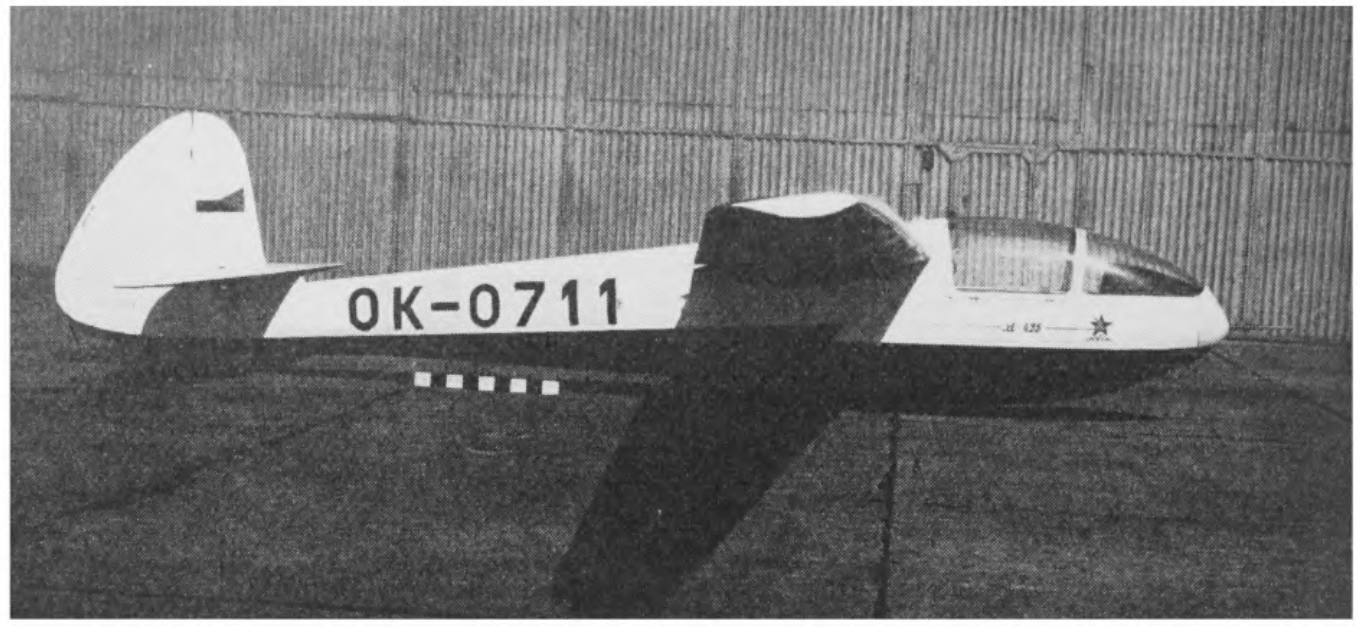
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 145 | 5,0 |
| Point B | 240 | 4,3 |
| Point C | 240 | 0 |
| Point D | 136 | -2,5 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 145 | +18 |
| Point B | 240 | +9,2 |
| Point C | 240 | -5,0 |
| Point D | 136 | -16,8 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 240 km/h |
| Placard airspeed gusty conditions | 145 km/h |
| Aero-towing speed | 140 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Aerobatic at 400 kg a.u.w. |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 23 to 38 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 258 km/h |

# L-425 SUPER ŠOHAJ




This is a development of the Šohaj, which has been very much cleaned up aerodynamically, and it is now claiming a gliding angle of 1 in 26. However, it still has non-laminar wing sections and large fixed wheel undercarriage.

Eine Weiterentwicklung des Šohaj, aerodynamisch verbessert, die jetzt einen Gleitwinkel von 1:26 erreichen soll. Indessen werden weiterhin keine laminaren Flügelquerschnitte verwendet, und das Fahrgestell weist ein festes Rad auf.

Un développement du Šohaj avec des améliorations aérodynamiques qui doit atteindre un angle de plané de 1 : 26. Les sections alaires ne sont cependant pas laminaires, et la roue du train d'atterrissage est fixe.

| | |
|---|---|
| Type designation | L-425 Super Šohaj |
| Country of design | Czechoslovakia |
| Designer | Smrček, Marcol |
| Date of first flight of prototype | 1955 |
| Number produced | 160 |

**Wings**

| | |
|---|---|
| Span (b) | 15,6 m |
| Area (s) | 14,20 m² |
| Aspect ratio ($b^2/s$) | 17,1 |
| Wing root chord ($C_r$) | 1,46 m |
| Wing tip chord ($C_t$) | 0,27 m |
| Mean chord ($C = s/b$) | 1,004 m |
| Wing section, root | NACA 23 015 |
| Wing section, tip | NACA 4412 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | —5° |
| Construction | Wooden single spar cantilever with torsion box |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 3,90 m |
| Area (total) | 2 × 0,995 m² |
| Mean chord | 0,255 m |
| Max. deflection up | 28° |
| Max. deflection down | 14° |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,50 m |
| Area of elevator and fixed tail (S′) | 2,30 m² |
| Area of elevator | 0,92 m² |
| Max. deflection up | 22° |
| Max. deflection down | 22° |
| Aerofoil section | Symmetrical |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,75 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′1′/SC) | 0,58 |
| Construction | Wood. Ply covered tailplane. Fabric covered elevator |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,50 m² |
| Area of rudder | 0,95 m² |
| Tail arm | 4,10 m |
| Max. deflection | ±30° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin. Fabric covered rudder |

**Fuselage**

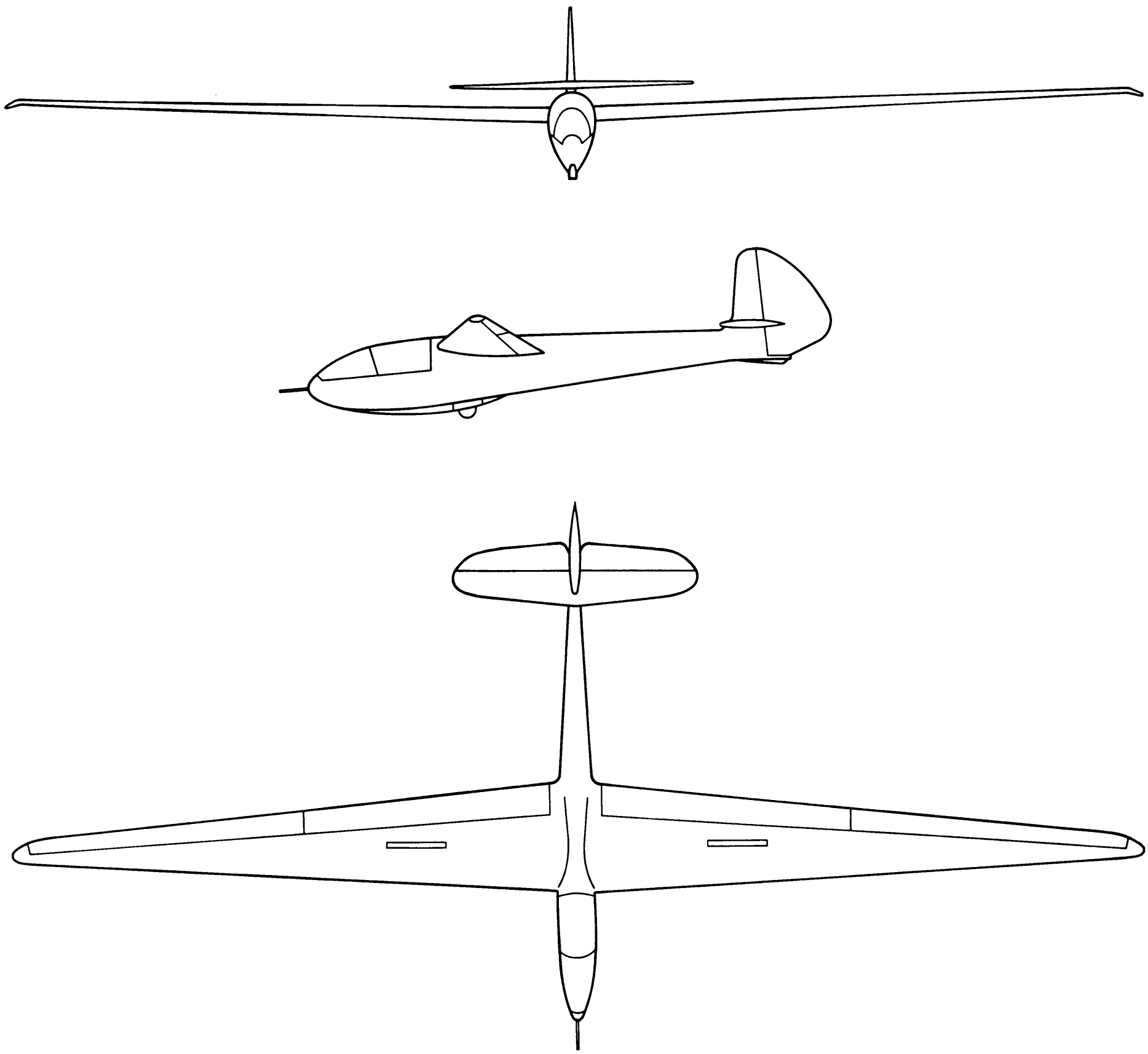
| | |
|---|---|
| Max. width | 0,60 m |
| Overall length | 7,19 m |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed wheel (35 cm diameter) and skid |
| Construction | Wood monocoque. Side opening blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Slotted flaps |
| Span (total) | 2 × 3,360 m |
| Area (total) | 2 × 1,139 m² |
| Max. deflection up | 0° |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface brakes with gap |
| Span (total) | 2 × 0,90 m |
| Area | 2 × 0,215 m² |



| | |
|---|---|
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Empty weight (including any fixed ballast) | 215 kg |
| Flying weight | 330 kg |
| Wing loading | 23,20 kg/m² |

**Straight flight performance**

| | |
|---|---|
| Flying weight | 330 kg |

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 66 | 0,78 |
| Max. L/D condition | 80 | 0,86 |
| | 100 | 1,22 |
| | 116 | 1,74 |
| | 132 | 2,46 |
| Stalling speed | 62 km/h | 56 km/h |
| Flap deflection | 0° | 10° |
| Max. L/D | 26 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS |
| Date of issue of these requirements | 1936 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 179 | 8 |
| Point D | 153 | —4 |
| Factor of safety | 1,0 | |

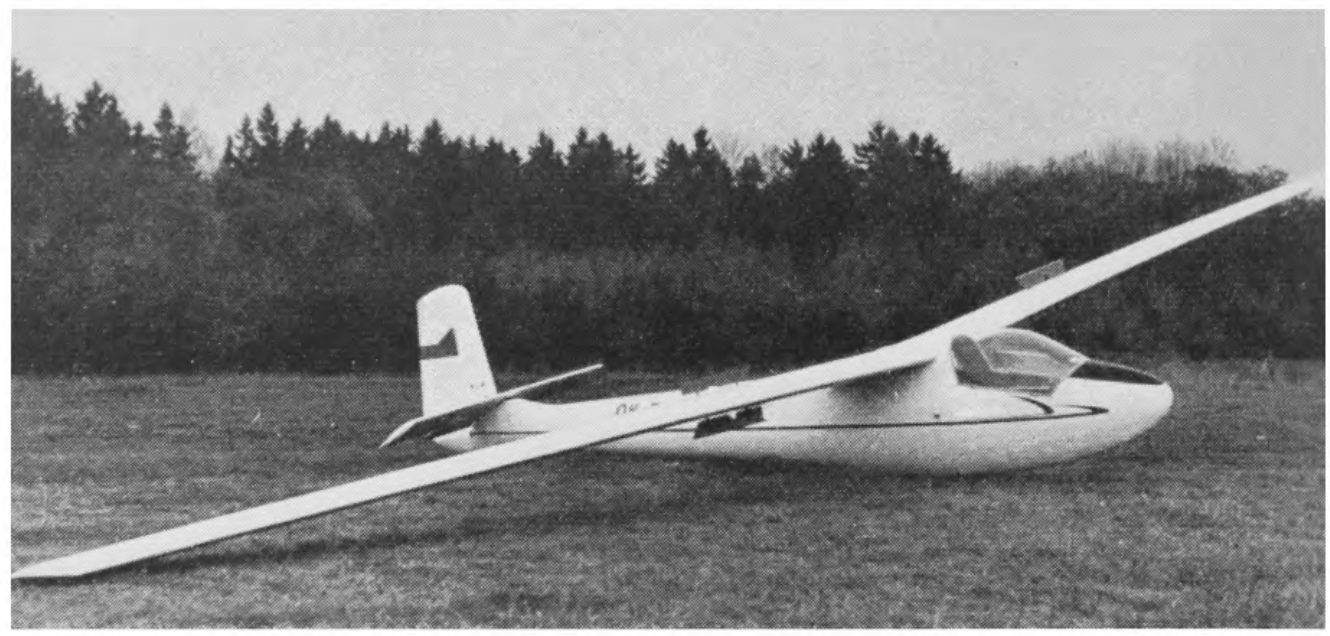
**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 220 km/h |
| Aero-towing speed | 140 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 28 |

# ORLIK

This is an all-wood machine but with skin stabilized by Polystyrene foam. It has a fixed undercarriage and no flaps. A very high gliding angle of 32.5 to 1 is claimed for this machine.

Segelflugzeug in Holzbauweise, wobei die Oberfläche mit Polystyrenschaum stabilisiert ist. Festes Fahrgestell, keine Klappen. Der Orlik soll einen Gleitwinkel von 32,5 : 1 erreichen.



Planeur entièrement en bois, la superficie étant stabilisée avec de la mousse de Polystyrène. Train d'atterrissage fixe, pas de volets. L'angle de plané doit atteindre 32,5 : 1.

| | |
|---|---|
| Type designation | Orlik |
| Country of design | Czechoslovakia |
| Designer | J. Matějček |
| Date of first flight of prototype | August, 1959 |
| Number produced | 25 |

**Wings**

| | |
|---|---|
| Span (b) | 16 m |
| Area (s) | 12,80 m² |
| Aspect ratio ($b^2/s$) | 20,0 |
| Wing root chord ($C_r$) | 1,00 m |
| Wing tip chord ($C_t$) | 0,60 m |
| Mean chord ($C = s/b$) | 0,818 m |
| Wing section, root | NACA 64-818 |
| Wing section, tip | NACA 64-818 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Taper ratio ($C_t/C_r$) | 0,60 |
| Construction | Wood. Single spar cantilever with torsion box. Wing skin stabilised with foamed polystyrene |

**Ailerons**

| | |
|---|---|
| Type | Plain, sealed |
| Span (total) | 2 × 3,80 m |
| Area (total) | 2 × 0,82 m² |
| Mean chord | 0,240 m |
| Max. deflection up | 27° |
| Max. deflection down | 16° |
| Mass balance method | Single internal weight |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 2,57 m |
| Area of elevator and fixed tail (S') | 1,40 m² |
| Area of elevator | 1,40 m² |
| Max. deflection up | 16° |
| Max. deflection down | 8° |
| Aerofoil section | NACA 64 012 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,40 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Controllable anti-balance geared tab |
| Horizontal tail volume coefficient (S'l'/SC) | 0,590 |
| Construction | All moving tailplane. Ply covered, stabilised with foamed polystyrene |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,120 m² |
| Area of rudder | 0,700 m² |
| Aspect ratio | 2,30 |
| Tail arm | 4,750 m |
| Max. deflection | ±30° |
| Aerofoil section | NACA 64 012A |
| Aerodynamic balance | Horn |
| Construction | Fin, ply stabilised with foamed polystyrene. Rudder, wood, fabric covered |

**Fuselage**

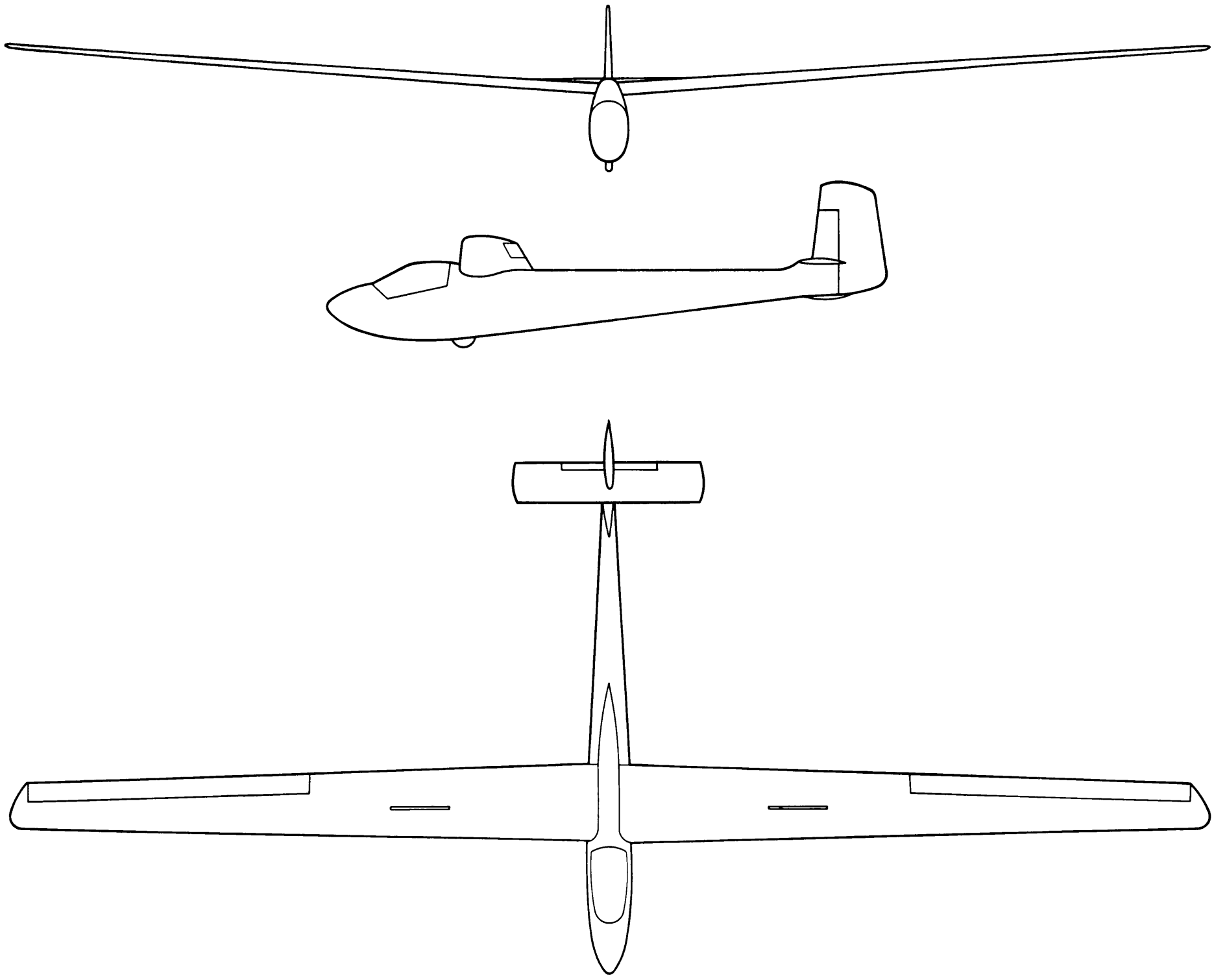
| | |
|---|---|
| Max. width | 0,60 m |
| Overall length | 7,40 m |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed wheel (35 cm diameter) |
| Construction | Wood monocoque. Side opening blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,00 m |
| Area | 2 × 0,18 m² |
| % of span | 16—22 |
| Location, % of chord | 42 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |



**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 120 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 86 kg |
| Tailplane and elevator | 6,5 kg |
| Instruments | 2,5 kg |
| Equipped weight | 215 kg |
| Flying weight | 320 kg |
| Wing loading | 25,0 kg/m² |

**Straight flight performance**

Calculated
at flying weight of . . . . . 313 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 63 | 0,56 |
| Max. L/D condition | 71 | 0,64 |
| | 95 | 0,93 |
| | 110 | 1,27 |
| | 126 | 1,79 |
| Stalling speed | 61 km/h | |
| Max. L/D | 32,5 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR |
| Date of issue of these requirements | 1948 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

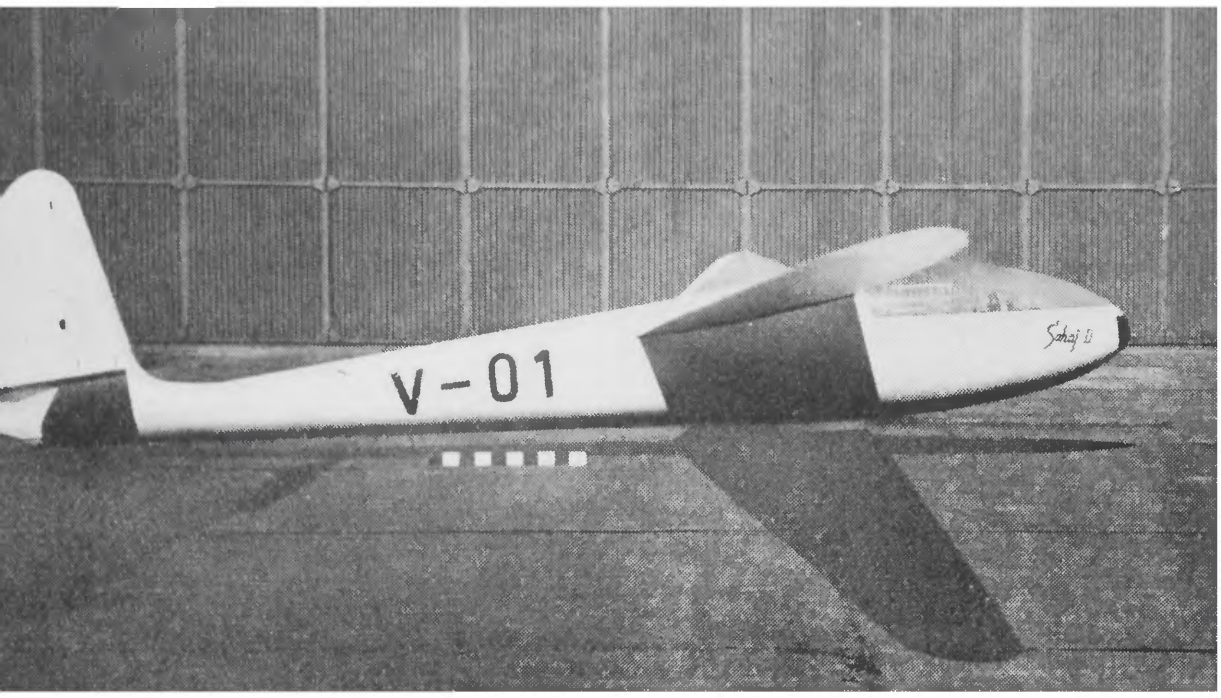
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 144 | 5,0 |
| Point B | 230 | 4,0 |
| Point C | 230 | 0 |
| Point D | 180 | —2,5 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A | 150 | 20,1 |
| Point D | 150 | —20,1 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Aero-towing speed | 140 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 28—47 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 225 km/h |

# VSM-40 DÉMANT




This very impressive single-seater, which has appeared in World Championships, was first produced some years ago. It is an all-wood machine, with slotted flaps and retractable undercarriage.

Dieser eindrückliche Einsitzer, der an Weltmeisterschaften teilnahm, wurde erstmals vor einigen Jahren gebaut. Es handelt sich um ein Segelflugzeug in Holzbauweise mit Spaltklappen und einziehbarem Fahrgestell.

Ce monoplace impressionnant a participé aux Championnats du monde et fut construit la première fois il y a quelques années. Il s'agit d'un planeur entièrement en bois, avec des volets à fente et un train d'atterrissage rétractable.

| | |
|---|---|
| Type designation | VSM-40 Démant |
| Country of design | Czechoslovakia |
| Designer | L. Smrček |
| Date of first flight of prototype | November, 1955 |
| Number produced | 7 |

**Wings**

| | |
|---|---|
| Span (b) | 18,00 m |
| Area (s) | 16,15 m² |
| Aspect ratio ($b^2/s$) | 20,0 |
| Wing root chord ($C_r$) | 1,44 m |
| Wing tip chord ($C_t$) | 0,36 m |
| Mean chord ($C = {}^s/_b$) | 1,010 m |
| Wing section, root | NACA $65_2$A515 |
| Wing section, tip | NACA 4412 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | —1° |
| Taper ratio ($C_t/C_r$) | 0,25 |
| Construction | Wooden single spar cantilever with torsion box |

**Ailerons**

| | |
|---|---|
| Type | Plain, sealed |
| Span (total) | 2 × 4,40 m |
| Area (total) | 2 × 1,05 m² |
| Mean chord | 0,24 m |
| Max. deflection up | 23° |
| Max. deflection down | 17° |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,60 m |
| Area of elevator and fixed tail (S′) | 1,815 m² |
| Area of elevator | 0,834 m² |
| Max. deflection up | 22° |
| Max. deflection down | 24° |
| Aerofoil section | Symmetrical |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,445 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,504 |
| Construction | Wood. Ply covered tailplane. Fabric covered elevator |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,573 m² |
| Area of rudder | 0,95 m² |
| Aspect ratio | 3,27 |
| Tail arm | 4,60 m |
| Max. deflection | ±30° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin. Fabric covered rudder |

**Fuselage**

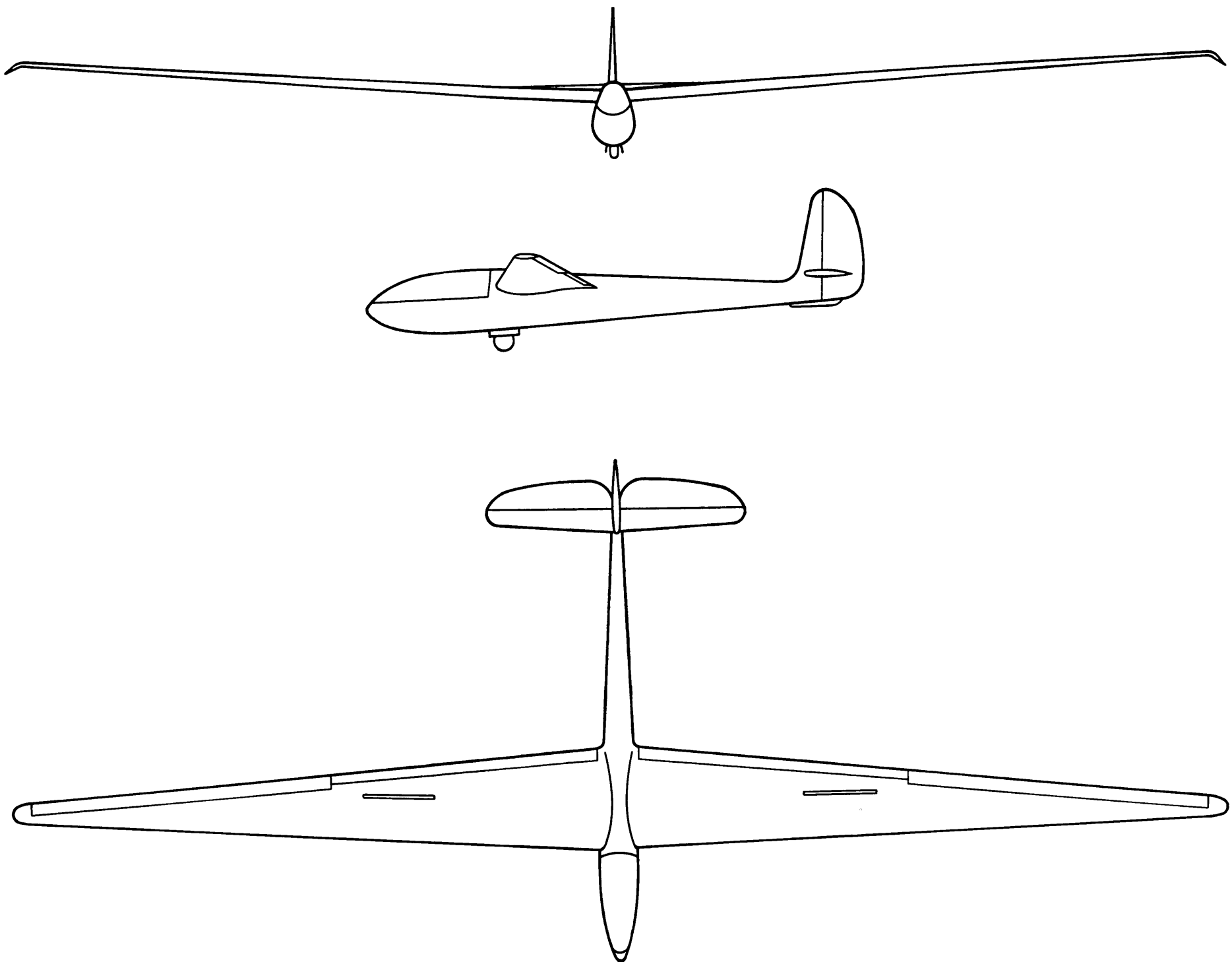
| | |
|---|---|
| Max. width | 0,65 m |
| Overall length | 7,35 m |
| Number seats/arrangement | 1 |
| Undercarriage type | Retractable wheel, 35 cm diameter |
| Construction | Wood monocoque. Forward sliding blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Slotted flaps |
| Span (total) | 2 × 4,050 m |
| Area (total) | 2 × 1,223 m² |
| Max. deflection up | 0° |
| Max. deflection down | 25° |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface brakes with gap |



| | |
|---|---|
| Span (total) | 2 × 1,50 m |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Empty weight (including any fixed ballast) | 280 kg |
| Other equipment (e.g. oxygen, radio) | 60 kg water ballast |
| Flying weight | 372 kg (with ballast 460 kg) |
| Wing loading | 23,0 kg/m² (28,5 kg/m²) |

**Straight flight performance**

| | |
|---|---|
| Flying weight | 390 kg |

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 78 | 0,69 |
| Max. L/D condition | 88 | 0,74 |
| | 117 | 1,26 |
| | 137 | 1,89 |
| | 156 | 2,64 |
| With 10° flap | 67 | 0,78 |
| Stalling speed | 65 km/h | 53 km/h |
| Flap deflection | 0° | 10° |
| Max. L/D | 33 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS/BCAR |
| Date of issue of these requirements | 1936/1948 |
| Certificate of airworthiness | Yes |

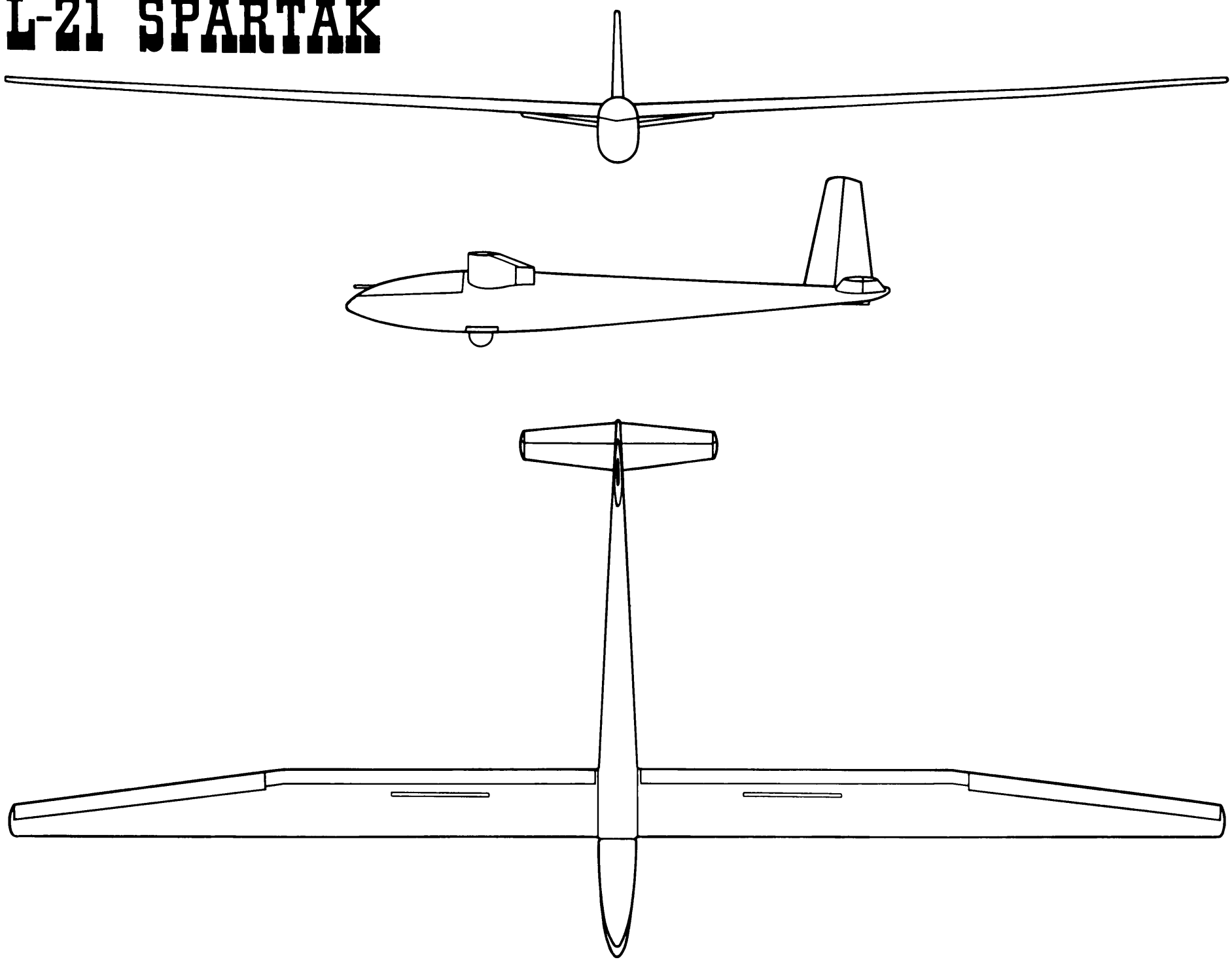
**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 155 | 8 (460 kg) |
| | | 9,5 (372 kg) |
| Point D | 150 | —4 (460 kg) |
| | | —4 (372 kg) |
| Factor of safety | 1,0 | |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 240 km/h |
| Aero-towing speed | 140 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 24—38 |

# L-21 SPARTAK



This is a very advanced sailplane design with laminar wing sections and retractable undercarriage. It has slotted flaps and lower surface spoilers and a tail parachute. It is also equipped to use water ballast.

Moderne Konstruktion mit Laminarprofil und einziehbarem Fahrgestell. Spaltklappen, untere Störklappen und Heckfallschirm; ausgerüstet zum Einsatz mit Wasserballast.

Construction moderne avec profil alaire laminaire et train d'atterrissage rétractable. Volets à fente, parachute de poupe, équipé pour employer du lest d'eau.

| | |
|---|---|
| Type designation | L-21 Spartak |
| Country of design | Czechoslovakia |
| Designer | K. Dlouhí |
| Date of first flight of prototype | August, 1959 |
| Number produced | 3 |

**Wings**

| | |
|---|---|
| Span (b) | 18,00 m |
| Area (s) | 15,95 $m^2$ |
| Aspect ratio ($b^2/s$) | 20,3 |
| Wing root chord ($C_r$) | 1,00 m |
| Wing tip chord ($C_t$) | 0,50 m |
| Mean chord ($C = s/b$) | 0,918 m |
| Wing section, root | NACA $65_3$-618 |
| Wing section, tip | NACA $63_1$-612 |
| Dihedral | 3° |
| ¼ chord sweep | —2° |
| Aero. twist root/tip | —3° |
| Taper ratio ($C_t/C_r$) | 0,50 |
| Construction | Wood. Single spar cantilever to 50% span. Outer semi span stabilised skin |

**Ailerons**

| | |
|---|---|
| Type | Plain, sealed |
| Span (total) | 2 × 3,74 m |
| Area (total) | 2 × 0,935 $m^2$ |
| Mean chord | 0,250 m |
| Max. deflection up | 32° |
| Max. deflection down | 13° |
| Mass balance method | Nil |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S') | 1,52 $m^2$ |
| Area of elevator | 0,68 $m^2$ |
| Max. deflection up | 25° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 5,350 m |

| | |
|---|---|
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S'l'/SC) | 0,565 |
| Construction | Wood. Tailplane ply covered. Elevator fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,230 m² |
| Area of rudder | 0,634 m² |
| Aspect ratio | 2,25 |
| Tail arm | 5,070 m |
| Max. deflection | ±30° |
| Aerofoil section | NACA 0012 |
| Aerodynamic balance | Nil |
| Construction | Wood. Fin ply covered. Rudder fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Overall length | 8,10 m |
| Max. cross section | 0,42 m² |
| Wetted surface area | 13,30 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Retractable wheel (35 cm diameter) |
| Construction | Wood monocoque. Forward sliding blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Slotted flaps |
| Span (total) | 2 × 4,920 m |
| Area (total) | 2 × 1,715 m² |
| Max. deflection up | 0° |
| Max. deflection down | 6° |

**Drag producing devices**

| | |
|---|---|
| Type | Lower surface wing spoiler with gap, tail parachute |
| Span (total) | 2 × 1,548 m |
| Area | 2 × 0,1815 m² |
| % of span | 11—20 |
| Location, % of chord | 62 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 185 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 98 kg |
| Other equipment (e.g. oxygen, radio) | 80 kg water ballast |
| Equipped weight | 295 kg |
| Flying weight | 480 kg |
| Wing loading | 30,10 kg/m² |

**Straight flight performance**

Calculated at flying weight of 400 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 74 | 0,60 |
| Max. L/D condition | 79 | 0,62 |
| | 111 | 1,10 |
| | 130 | 1,61 |
| | 148 | 2,28 |
| Min. sink with flap (—°) | (6°) 62 | 0,70 |
| Stalling speed | 67 | 57 |
| Flap deflection | 0 | 6 |
| Max. L/D | 35,5 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS/BCAR |
| Date of issue of these requirements | 1936/1948 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 152 | 4,45 |
| Point B | 250 | 4,45 |
| Point C | 278 | 0 |
| Point D | 132 | —2,23 |
| Factor of safety | | 1,8 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 275 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 140 km/h |
| Winch launching speed | 110 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 36—44 |

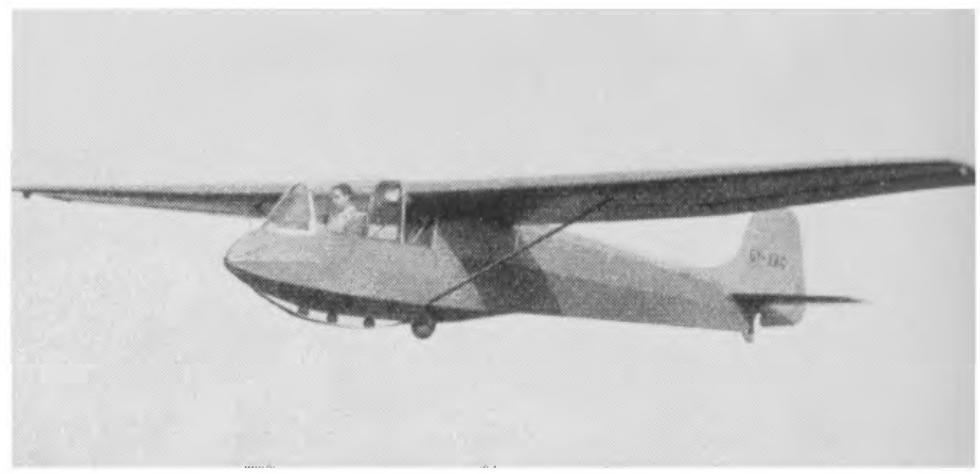
# DENMARK

# POLYT III B

This is essentially a two-seat trainer of moderate performance and simple structure. The wing and tailplane are wooden, but fuselage, fin, rudder and elevators are welded steel tube. An unusual feature is that the steel elevator spar takes all the tail unit bending loads.

Grundsätzlich ein zweisitziges Übungsflugzeug bescheidener Leistung und mit einfachem Aufbau. Flügel und Höhenflosse aus Holz, aber Rumpf, Seitenflosse, Seitenruder und Höhenruder aus geschweißten Stahlröhren. Als außergewöhnlich ist zu bezeichnen, daß der stählerne Höhenruderholm die gesamte Biegebeanspruchung des Leitwerks auf sich vereinigt.

En principe un planeur d'entraînement biplace avec des performances modestes et de construction simple. Les ailes et le stabilisateur sont en bois, mais le fuselage, le plan de dérive, le gouvernail de direction et le gouvernail de profondeur en tubes d'acier soudé. Particulièrement à remarquer que le longeron en acier du gouvernail de profondeur porte la charge totale des efforts de flexion de l'empennage entier.



| | |
|---|---|
| Type designation | POLYT III B |
| Country of design | Denmark |
| Designer | Polyteknisk Flyvegruppe |
| Date of first flight of prototype | 19 May 1960 |
| Number produced | 1 Series A<br>1 Series B |

**Wings**

| | |
|---|---|
| Span (b) | 15,4 m |
| Area (s) | 19,0 m² |
| Aspect ratio ($b^2/s$) | 12,5 |
| Wing root chord ($C_r$) | 1,48 m |
| Wing tip chord ($C_t$) | 0,79 m |
| Mean chord ($C = s/b$) | 1,23 m |
| Wing section, root | Clark Y 15,7% |
| Wing section, mid | Clark Y 15,7% |
| Wing section, tip | NACA 6412 |
| Dihedral | 1° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,54 |
| Construction | Single spar, strutted wooden construction with leading edge torsion box. 30% fabric covered. |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 3,8 m |
| Area (total) | 1,52 m² |
| Mean chord | 0,40 m |
| Max. deflection up | 20° |
| Max. deflection down | 15° |
| Mass balance degree | 50% |
| Mass balance method | Distributed lot |
| Construction | Wood. Fabric covered, ribs spaced 0,26 m. |

**Horizontal tail**

| | |
|---|---|
| Span | 3,40 m |
| Area of elevator and fixed tail (S′) | 2,0 m² |
| Area of elevator | 1,1 m² |
| Max. deflection up | 20° |
| Max. deflection down | 20° |
| Aerofoil section | Symmetrical |
| Mass balance degree | 50% |
| Mass balance method | Bob weight in fuselage, with spring. |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,75 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,7 |
| Construction | Wooden stressed skin tailplane. Steel tube elevator, fabric covered. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,3 m² |
| Area of rudder | 0,8 m² |
| Aspect ratio | 1,1 |
| Tail arm | 5,0 m |
| Max. deflection | 30° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Unshielded horn |
| Structure | Steel tube, fabric covered. |

**Fuselage**

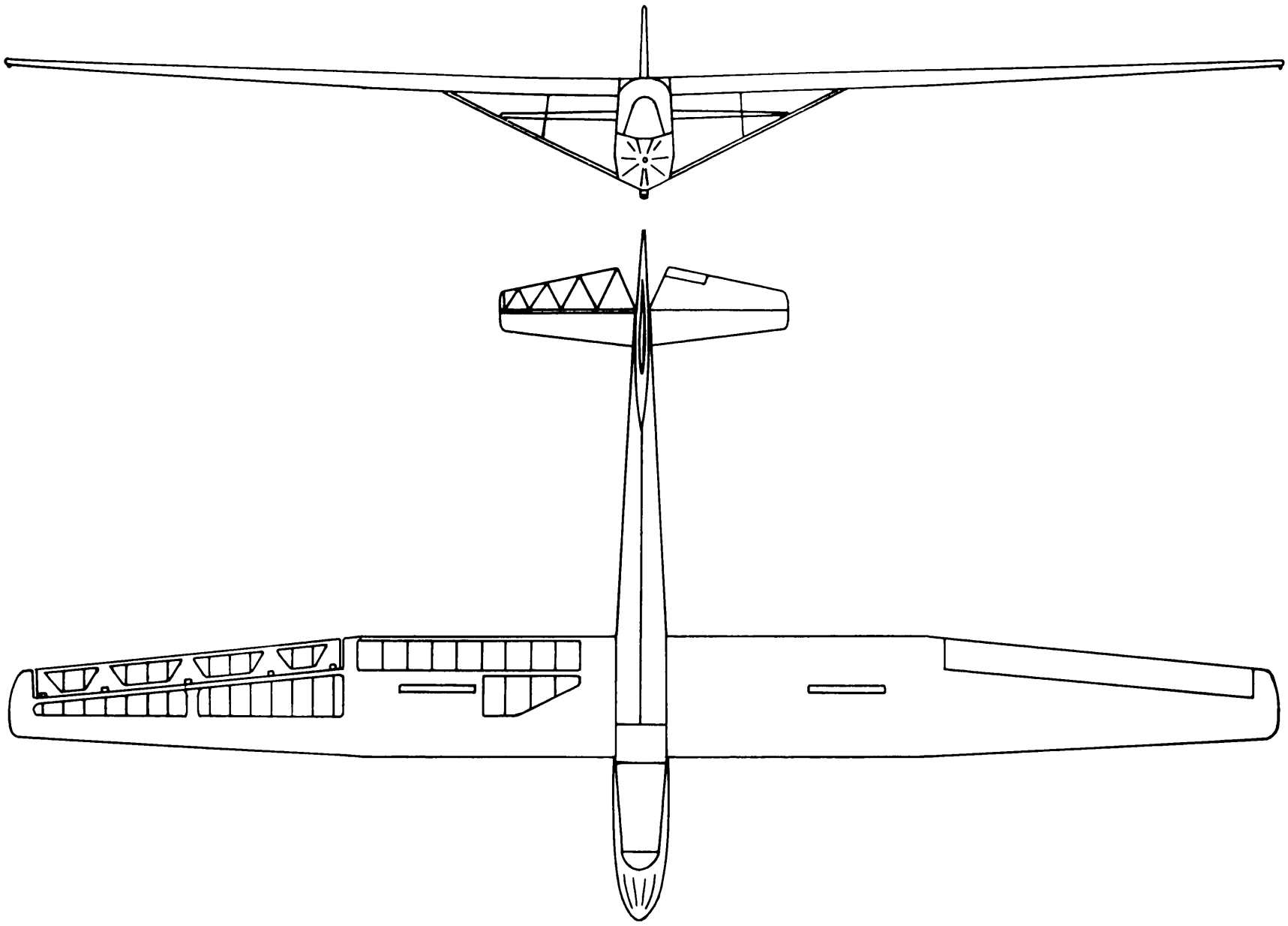
| | |
|---|---|
| Max. width | 0,65 m |
| Max. height (at cockpit) | 1,60 m |
| Overall length | 8,50 m |
| Max. cross section | 0,9 m² |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Unsprung fixed wheel and rubber mounted skid. |
| Structure | Fabric covered steel tube frame. Side opening bent sheet perspex canopy. |

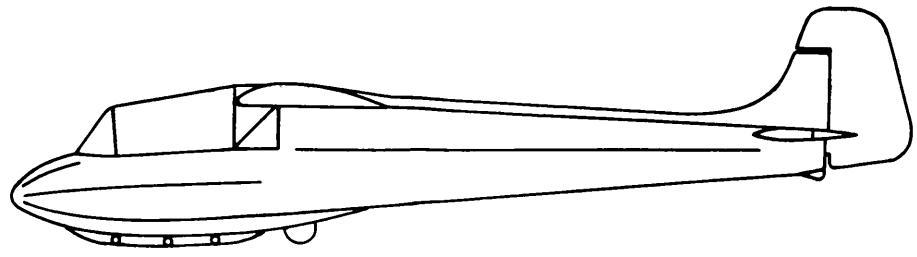
**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap. |
| Span (total) | 1,8 m |
| Area | 0,45 m² |
| Location, % of chord | 55 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |





**Weights**

| | |
|---|---|
| Wings[1] | 120 kg |
| Fuselage[2] | 160 kg |
| Tailplane and elevator | |
| Equipped weight | 280 kg |
| Flying weight | 460 kg |
| Wing loading | 24 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR |
| Date of issue of these requirements | May 1960 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor n |
|---|---|---|
| Point A | 125 | 5 |
| Point B | 225 | 4 |
| Point D | | — 2,5 |
| Factor of safety | | 1,5 |

| *Gust loads* | V km/h | v/m sec |
|---|---|---|
| Point A | 125 | 10 |
| Point D | 125 | 10 |

[1] With struts, controls, flaps and brakes

[2] Complete with rudder and fin, less instruments and equipment

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 140 km/h |
| Placard airspeed gusty conditions | 120 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 120 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi-aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 25–37% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not applicable |

**Straight flight performance**

Calculated
at flying weight of 460 kg

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 60 | 0,75 |
| Max. L/D condition | 65 | 0,8 |
| Stalling speed | 56 km/h | |
| Max. L/D | 23 | |

# FINLAND

# PIK-16 VASAMA


The PIK-16 Vasama (Arrow) is a Standard Class Sailplane, designed to the OSTIV Standard Class Requirements. An effort was made to obtain the best possible gliding angle with a fairly thin wing but strong enough to permit flying in rough conditions.

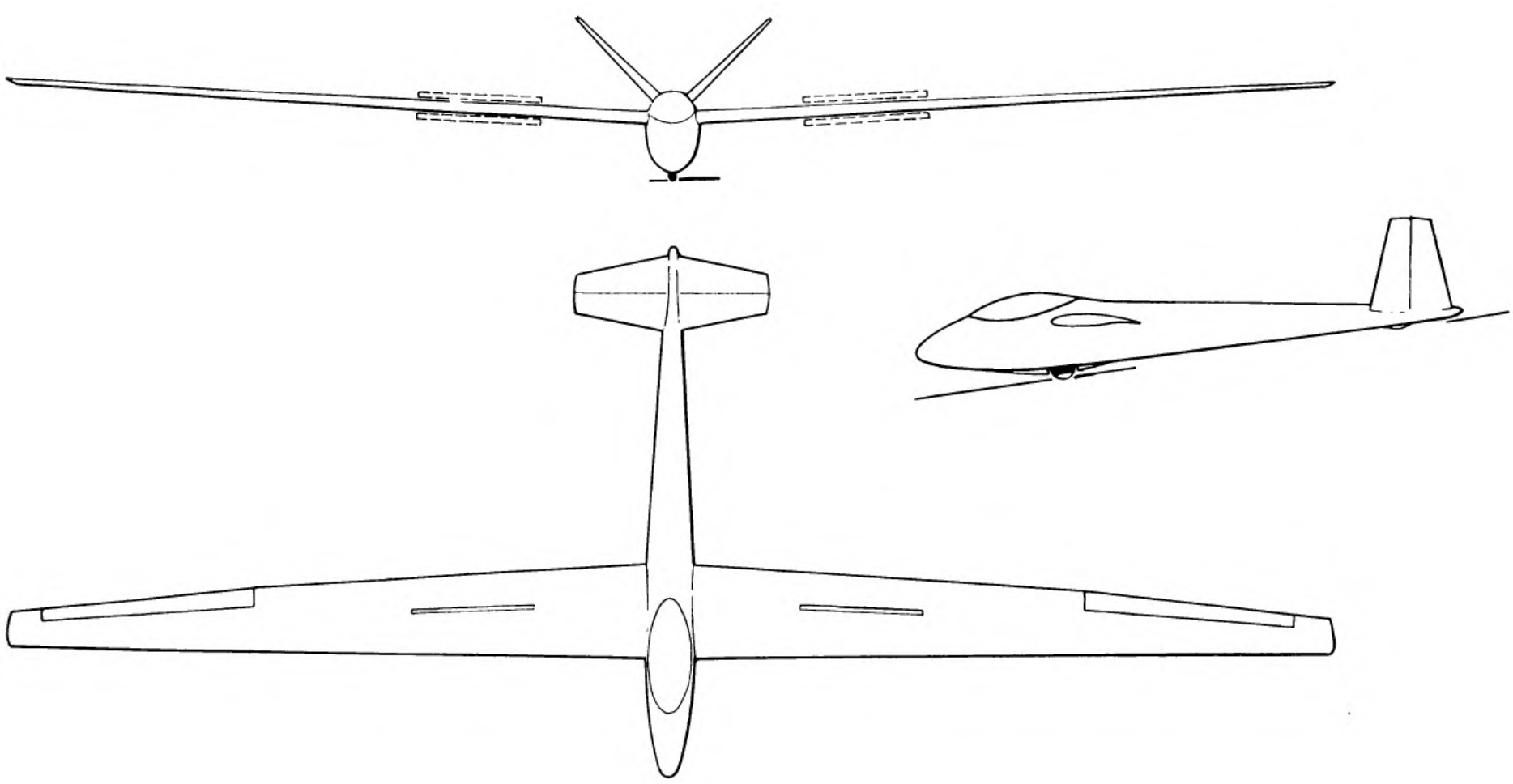
The structure is mainly of Finnish pine and birch. The controls are operated by push rods and all the control surfaces are mass balanced.

Der PIK-16 Vasama (Pfeil) ist ein Segelflugzeug der Standardklasse, konstruiert auf Grund der OSTIV-Bedingungen. Es wurde versucht, den besten Gleitwinkel mit einem eher dünnen Flügel zu erreichen, der jedoch für den Einsatz bei stark belastenden Flugbedingungen genügt.

Der Bau erfolgte unter hauptsächlicher Verwendung finnischen Kiefern- und Birkenholzes. Die Steuer werden mit Stoßstangen gelenkt, und alle Leitwerkelemente sind mit Gewichtsausgleich versehen.

Le PIK-16 Vasama (flèche) est un planeur de la classe standard, construit selon les conditions établies par l'OSTIV. On a essayé d'obtenir le meilleur angle de plané avec une aile relativement mince, mais assez forte pour le vol sous des conditions sévères.

On a employé surtout du bois de pin et de bouleau finlandais pour la construction. Les empennages sont actionnés par des barres, et leur surfaces sont équilibrées.



| | |
|---|---|
| Type designation | PIK-16 Vasama |
| Country of design | Finland |
| Designers | Tuomo Tervo, Jorma Jalkanen, Kurt Hedström |
| Date of first flight of prototype | 1 June, 1961 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 15,00 m |
| Area (s) | 11,70 $m^2$ |
| Aspect ratio ($b^2/s$) | 19,2 |
| Wing root chord ($C_r$) | 1,075 m |
| Wing tip chord ($C_t$) | 0,400 m |
| Mean chord ($C = s/b$) | 0,787 m |

| | |
|---|---|
| Wing section, root | Wortmann FX-05-188 t/c = 14% |
| Wing section, tip | NACA $63_2$-615 |
| Dihedral | 3,5° |
| ¼ chord sweep | —0,2° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,372 |
| Construction | 40% of chord formed by shaped box spar taking bending and torsion. Remainder ply covered. Finnish pine and birch ply |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 2,4 m |
| Area (total) | 2 × 0,492 m² |
| Mean chord | 0,205 m |
| Max. deflection up | 30° |
| Max. deflection down | 10° |
| Mass balance degree | 50% |
| Construction | Wood. Ply covered. Ribs 0,4 m spacing |

**Horizontal tail**

| | |
|---|---|
| Span | 2,38 m |
| Area of elevator and fixed tail (S') | 1,68 m² Horizontal projection |
| Area of elevator | 0,84 m² Horizontal projection |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | Symmetrical |
| Mass balance degree | 100% |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,60 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | 2 tabs |
| Horizontal tail volume coefficient (S'1'/SC) | 0,543 |
| Construction | V-tail 45° dihedral. Wood structure, ply covered fixed tail. Fabric covered elevator |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | V-tail |

**Fuselage**

| | |
|---|---|
| Max. width | 0,65 m |
| Max. height (at cockpit) | 0,90 m |
| Overall length | 5,97 m |
| Max. cross section | 0,42 m² |
| Wetted surface area | 9,5 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed wheel with brake and skid |
| Construction | Ply monocoque. Fibre glass nose cap. Blown perspex canopy, removable |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 3,2 m |
| Area | 0,51 m² |
| Location, % of chord | 57,5 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 105 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 50 kg |
| Tailplane and elevator | 11 kg |
| Empty weight (including any fixed ballast) | 166 kg |
| Instruments | 5 kg |
| Equipped weight | 171 kg |
| Flying weight | 230–281 kg |
| Wing loading | 19,7–24,0 kg/m² |

**Straight flight performance**

Calculated at flying weight of 280 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 73 | 0,59 |
| Max. L/D condition | 86 | 0,64 |
| | 112 | 1,0 |
| | 132 | 1,5 |
| Stalling speed | 62 km/h | |
| Max. L/D | 34,5 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | OSTIV Requirements for Standard Class, draft 3 |
| Date of issue of these requirements | October 1959 |
| Certificate of airworthiness | No |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 165 | 7 |
| Point B | 250 | 4 |
| Point C | 250 | —2 |
| Point D | 160 | —4 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 170 | 30 |
| Point D | 170 | —30 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 250 km/h |
| Placard airspeed gusty conditions | 180 km/h |
| Aero-towing speed | 150 km/h |
| Winch launching speed | 140 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Loop, Stall turn |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 23,5–37,0 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 235 km/h |

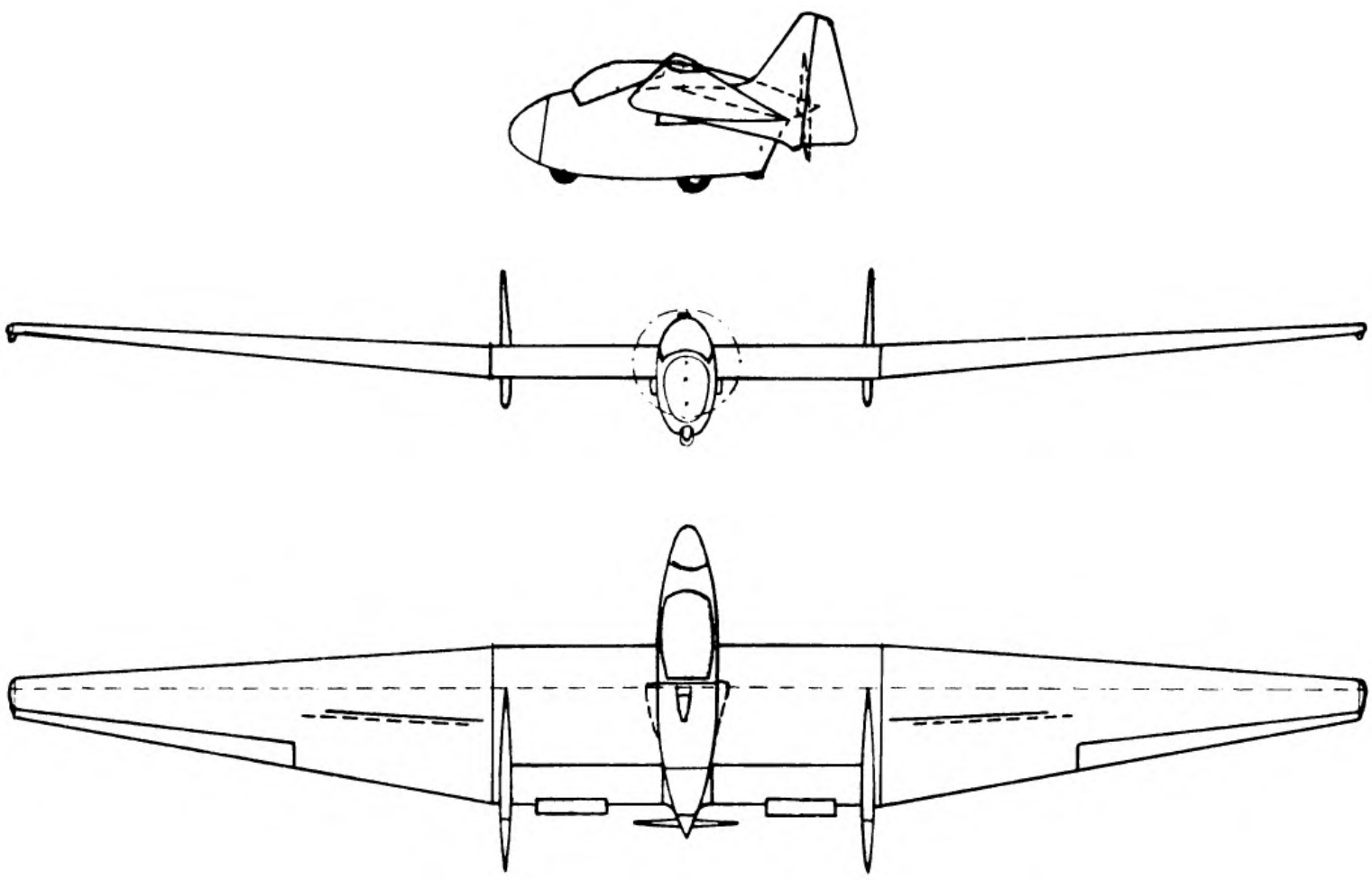
# France

# AV 45

A single seater auxiliary powered sailplane with full soaring capabilities when the engine is stopped and propeller feathered. The AV 45 is intended to provide a «self launching» soaring machine, not requiring external launching aids; it is based on the AV 36, but with a slightly enlarged centre section. It is powered by a flat-four Nelson H59A giving 40 BHP at 3730 r.p.m. Initial rate of climb is approximately 6 m/ sec.

Einsitziges Segelflugzeug mit Hilfsmotor; volle Segelflugeigenschaften bei gestopptem Motor und Propeller auf Segelstellung. Der AV 45 ist als selbststartendes Segelflugzeug gedacht, das keiner äußeren Starthilfen bedarf. Er beruht auf dem AV 36, weist aber einen etwas vergrößerten Mittelquerschnitt auf. Ausgerüstet mit Motor Nelson H59A; Leistung 40 Brems-PS bei 3730 U./min. Anfangs-Steiggeschwindigkeit mit Motor ca. 6 m/sec.

Monoplace avec moteur auxiliaire; performances de vol plané parfaites avec moteur arrêté et hélice en position de vol plané. Le AV 45 est construit comme planeur avec auto-départ n'ayant pas besoin d'aides extérieures. Il est basé sur le AV 36, mais avec une section médiane élargie. Equipé d'un moteur Nelson H59A; performance 40 BHP avec 3730 t./min; vitesse de montée initiale avec moteur environ 6 m/sec.



| | |
|---|---|
| Type designation | AV 45 |
| Country of design | France |
| Designer | Charles Fauvel |
| Date of first flight of prototype | May 1960 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 13,68 m |
| Area (s) | 16,12 m² |
| Aspect ratio ($b^2/s$) | 11,6 |
| Wing root chord ($C_r$) | 1,61 m |
| Wing tip chord ($C_t$) | 0,405 m |
| Mean chord ($C = {}^{s}/_{b}$) | 1,18 m |
| Wing section, root | $F_2$ 17% |
| Wing section, mid | $F_2$ 17% |
| Wing section, tip | $F_2$ 17% |
| Dihedral | Centre section nil<br>Outer wing 5° 13′ |
| ¼ chord sweep | 0° at 27% chord |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,25 |
| Construction | Single spar wooden cantilever structure. Ply covered leading edge torsion box. Fabric over rear 60% chord. |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 5,80 m |
| Area (total) | 1,032 m² |
| Mean chord | 0,179 m |
| Max. deflection up | — 28° |
| Max. deflection down | + 11° |

| | |
|---|---|
| Mass balance degree | Nil |
| Construction | Fabric covered wooden structure. Ribs 0,40 m spacing with diagonal brace. |

**Horizontal tail**

| | |
|---|---|
| Span | No horizontal tail |
| Area of elevator | 1,312 m² |
| Max. deflection up | — 20° |
| Max. deflection down | + 12° |
| Aerofoil section | Part of wing |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Construction | Fabric covered wooden structure. Ribs at 0,40 m spacing. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,15 × 2 m² |
| Area of rudder | 0,459 × 2 m² |
| Max. deflection | 42° outwards<br>16° inwards |
| Aerofoil section | Symm. 6% |
| Mass balance degree | Nil |
| Aerodynamic balance | Nil |
| Structure | Fin ply covered wood structure. Rudders fabric covered, wood structure. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,605 m |
| Max. height (at cockpit) | 1,16 m |
| Overall length | 2,94 m |
| Wetted surface area | 4,95 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Tandem wheels front steerable by pedals. Rear wheel fitted with mechanical brake. |
| Structure | Fibre-glass skin. Side opening blown plexiglass canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Perforated upper and lower surface spoilers with gap (Schempp-Hirth type). |
| Span (total) | 3,12 m |
| Area | 0,624 m² |
| Location, % of chord | 43% |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Empty weight[1] | 215 kg |
| Instruments | 4 kg |
| Equipped weight | 219 kg |
| Flying weight | 350 kg max.<br>302 kg normal glider condition |
| Wing loading | 18,7 kg/m²<br>(at 302 kg AUW) |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Règlement Air 2104 |
| Date of issue of these requirements | 1 August 1954 |
| Certificate of airworthiness | In process |

**Design flight envelope** (at 350 kg)

| | V km/h | Proof load factor n |
|---|---|---|
| *Manoeuvre loads* | | |
| Point A | 142 | 6 |
| Point B | 265 | 6 |
| Factor of safety | 1,5 | |

| | V km/h | v m/s |
|---|---|---|
| *Gust loads* | | |
| Point B | 208 | 16 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 220 km/h |
| Placard airspeed gusty conditions | To be determined after completion of tests. |
| Aero-towing speed | |
| Winch launching speed | |
| Cloud flying permitted? | |
| Permitted aerobatic manoeuvres? | |
| Spinning permitted? | |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 170 km/h (estimated) |

**Straight flight performance**

Calculated
at flying weight of 302 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 75 | 0,85 |
| Max. L/D | 26 with feathered propeller | |

[1] To include any fixed ballast

# AV 361

An improved version of the well tried AV 36 with increased span and higher performance. New fin and rudder design and larger ailerons have improved control harmony; dive brakes have replaced the earlier lower surface spoilers. Fuselage is slightly wider and of oval cross-section. The blown canopy, of smoother shape than the earlier AV 36 type, gives more room and improved view. An AV 36 made a distance flight of 357 km (pilot André Simon) in 1959 to win the Coupe Survol and a goal flight of 303 km (pilot Jack Lambie) in 1960 in Southern California. The AV 36 has a long list of distance flights to its credit.

Verbesserte Ausführung des erprobten AV 36 mit größerer Spannweite und besserer Leistung. Durch Neukonstruktion von Seitenflosse und Seitenruder und breitere Querruder wurde eine bessere Abstimmung der Steuer erzielt; die früheren Störklappen wurden durch Sturzflugbremsen ersetzt. Der Rumpf ist etwas weiter und von ovalem Querschnitt. Das geblasene Kabinendach mit weicheren Formen als beim ursprünglichen AV 36 gibt dem Piloten mehr Raum und bessere Sicht. Ein AV 36 gewann die Coupe Survol 1959 mit dem Piloten André Simon in einem Streckenflug von 357 km; Jack Lambie erzielte bei einem Zielflug 1960 in Süd-Kalifornien 303 km. Mit dem AV 36 wurden zahlreiche Streckenflüge durchgeführt.

Version améliorée du AV 36 bien connu, avec une envergure plus grande et de meilleures performances. Une nouvelle construction du plan de dérive et du gouvernail de direction, ainsi que des ailerons plus larges ont permis d'harmoniser le contrôle du planeur; les volets de freinage ont été remplacés par des freins de piqué. Le fuselage est plus large et a une section ovale. Le toit de la cabine soufflé avec ses formes plus harmonieuses que celles du AV 36 original donne plus d'espace et une meilleure vue au pilote. Un AV 36 a gagné la Coupe Survol avec un vol de distance de 357 km (pilote André Simon); Jack Lambie a atteint un but distant de 303 km en Californie du Sud, en 1960. De nombreux vols de distance ont été faits avec le AV 36.


| | |
|---|---|
| Type designation | AV 361 (or AV 36 MK II) |
| Country of design | France |
| Designer | Charles Fauvel |
| Date of first flight of prototype | June 1960 |
| Number produced | 1 prototype (NB. More than 100 MK I built) |

**Wings**

| | |
|---|---|
| Span (b) | 12,78 m |
| Area (s) | 14,6 m² |
| Aspect ratio ($b^2/s$) | 11,4 |
| Wing root chord ($C_r$) | 1,60 m |
| Wing tip chord ($C_t$) | 0,40 m |
| Mean chord ($C = s/b$) | 1,14 m |
| Wing section, root | $F_2$ 17% |
| Wing section, mid | $F_2$ 17% |
| Wing section, tip | $F_2$ 17% |
| Dihedral | Centre section nil<br>Outer wing 5° 13′ |
| ¼ chord sweep | 0° at 30% chord |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,25 |
| Construction | Single spar wooden cantilever structure. Ply covered leading edge torsion box. Fabric over rear 60% chord. |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 6,20 m |
| Area (total) | 1,14 m² |
| Mean chord | 0,1875 m |
| Max. deflection up | — 24° 30′ |
| Max. deflection down | + 9° 30′ |
| Mass balance degree | Nil |
| Construction | Fabric covered wooden structure. Ribs 0,40 m spacing with diagonal brace. |

**Horizontal tail**

| | |
|---|---|
| Span | No horizontal tail |
| Area of elevator | 1,056 m² |
| Max. deflection up | — 23° |
| Max. deflection down | + 12° |
| Aerofoil section | Part of wing |
| Mass balance degree | 40% |
| Mass balance method | Head bob weight in fuselage |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Construction | Fabric covered, wooden structure. Ribs at 0,40 m spacing. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,14 × 2 m² |
| Area of rudder | 0,458 × 2 m² |
| Max. deflection | 40° outwards<br>16° inwards |
| Aerofoil section | Symm. 6% |
| Mass balance degree | Nil |
| Structure | Fin ply covered, wood structure. Rudders fabric covered. |

**Fuselage**

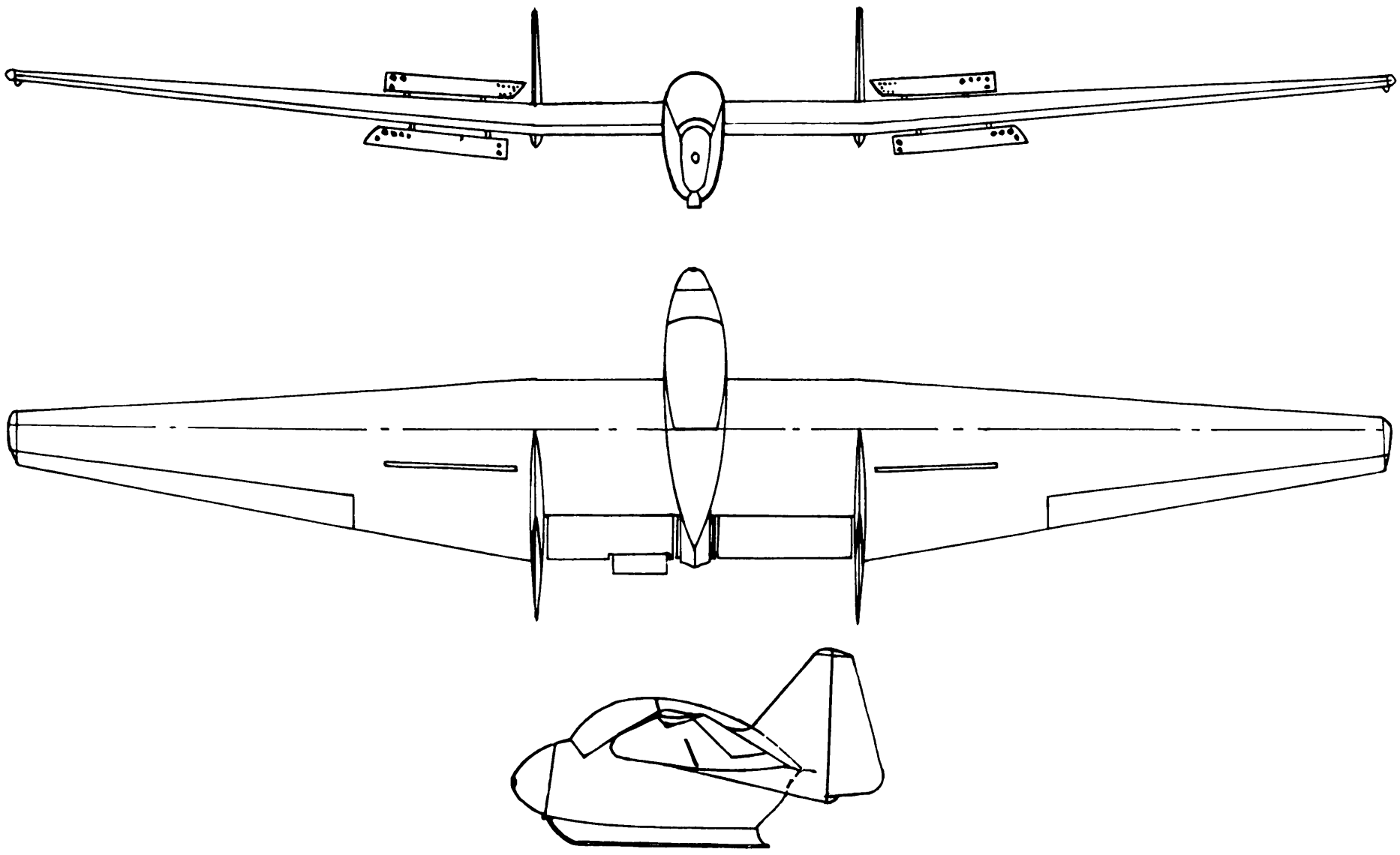
| | |
|---|---|
| Max. width | 0,545 m |
| Max. height (at cockpit) | 1,20 m |
| Overall length | 2,48 m |
| Max. cross section | 0,51 m² |
| Wetted surface area | 4,5 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed skid. Rubber mounted. Fixed wheel and short skid also available. |
| Structure | Ply covered wood frame. Fibre-glass nose cap. Side opening blown plexiglass canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Perforated upper and lower surface spoilers with gap (Schempp-Hirth type). |
| Span (total) | 2,72 m |
| Area | 0,544 m² |
| Location, % of chord | 43% |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |



**Weights**

| | |
|---|---|
| Wings[1] | Monobloc |
| Fuselage[2] | Monobloc |
| Tailplane and elevator | Monobloc |
| Empty weight[3] | 122 kg |
| Instruments | 3 kg |
| Other equipment (e.g. oxygen, radio) | 17 kg (optional) |
| Equipped weight | 125 (142) kg |
| Flying weight | 215 kg (normal) to 258 kg (max.) |
| Wing loading | 14,7 to 17,7 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Règlement Air 2104 Cat. IV aerobatic at 215 kg |
| Date of issue of these requirements | 1 August 1954 |
| Certificate of airworthiness | French, Canadian, German, Swiss for AV 36. Modifications to AV 361 accepted by French authorities. |

**Design flight envelope** (at 215 kg)

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 148 | 8 |
| Point B | 254 | 8 |
| Point C | 254 | — 4 |
| Point D | 121 | — 4 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | v m/s |
|---|---|---|
| Point B | 208 | 16 |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 220 km/h |
| Placard airspeed gusty conditions | 158 km/h |
| Aero-towing speed | 128 km/h |
| Winch launching speed | 119 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres? | No inverted flight. No aerobatics at rear CG position. |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | Range 8% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 165 km/h |

**Straight flight performance**

| | |
|---|---|
| Measured | Based on measured performance of AV 361, corrected for differences. |
| at flying weigth of | 210 kg |

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 65 | 0,75 |
| Max. L/D condition | 84 | 0,90 |
| | 100 | 1,30 |
| | 114 | 2,05 |
| | 130 | 3,15 |
| Stalling speed | 58 km/h | |
| Flap deflection | 0° | |
| Max. L/D | 26 | |

# AV 22 S

Production version of AV 22. In service with clubs in 1959, it has carried out distance flights both as single and two seater. In April 1960 it made a flight of 340 km.

Produktionsversion des AV 22. Bei Klubs seit 1959 im Einsatz; führte Streckenflüge als Ein- und Zweisitzer durch, worunter 1960 über 340 km.

Version de production du AV 22. En service chez les clubs depuis 1959; vols de distance comme monoplace et biplace, parmi lesquels une performance de 340 km en 1960.

| | |
|---|---|
| Type designation | AV 22 S |
| Country of design | France |
| Designer | Charles Fauvel |
| Date of first flight of prototype | Prototype 1: April 1956<br>Prototype 2: April 1957<br>1st production May 1959 |
| Number produced | 6 |

**Wings**

| | |
|---|---|
| Span (b) | 15,04 m |
| Area (s) | 2,75 $m^2$ |
| Aspect ratio ($b^2/s$) | 10,4 |
| Wing root chord ($C_r$) | 1,90 m |
| Wing tip chord ($C_t$) | 0,60 m |
| Mean chord ($C = s/b$) | 1,445 m |
| Wing section, root | $F_2$ 17% |
| Wing section, mid | $F_2$ 17% |
| Wing section, tip | $F_2$ 17% |
| Dihedral | 5° 2′ |
| ¼ chord sweep | — 5° 39′ (at 30% chord) |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,32 |
| Construction | Single spar wooden cantilever structure. Ply covered leading edge torsion box. Fabric over rear 60% chord |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 6,40 m |
| Area (total) | 1,67 $m^2$ |
| Mean chord | 0,261 m |
| Max. deflection up | — 27° |
| Max. deflection down | + 11° |
| Mass balance degree | Nil |
| Construction | Fabric covered wooden structure. Ribs 0,40 m spacing with diagonal brace. |

**Horizontal tail**

| | |
|---|---|
| Span | No horizontal tail |
| Area of elevator | 1,946 $m^2$ |
| Max. deflection up | — 21° |
| Max. deflection down | + 12° |
| Aerofoil section | Part of wing |
| Mass balance degree | 40% |
| Mass balance method | Head bob weight in fuselage |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Construction | Fabric covered wooden structure. Ribs at 0,40 m spacing. |

**Vertical tail**

| | |
|---|---|
| Area of rudder | 0,91 $m^2$ |
| Max. deflection | ± 33° |
| Aerofoil section | Symm. 6,5% |
| Mass balance degree | Nil |
| Structure | Fin fibre glass/polyester resin skin on wood ribs. Rudder fabric covered, wooden structure. |

**Fuselage**

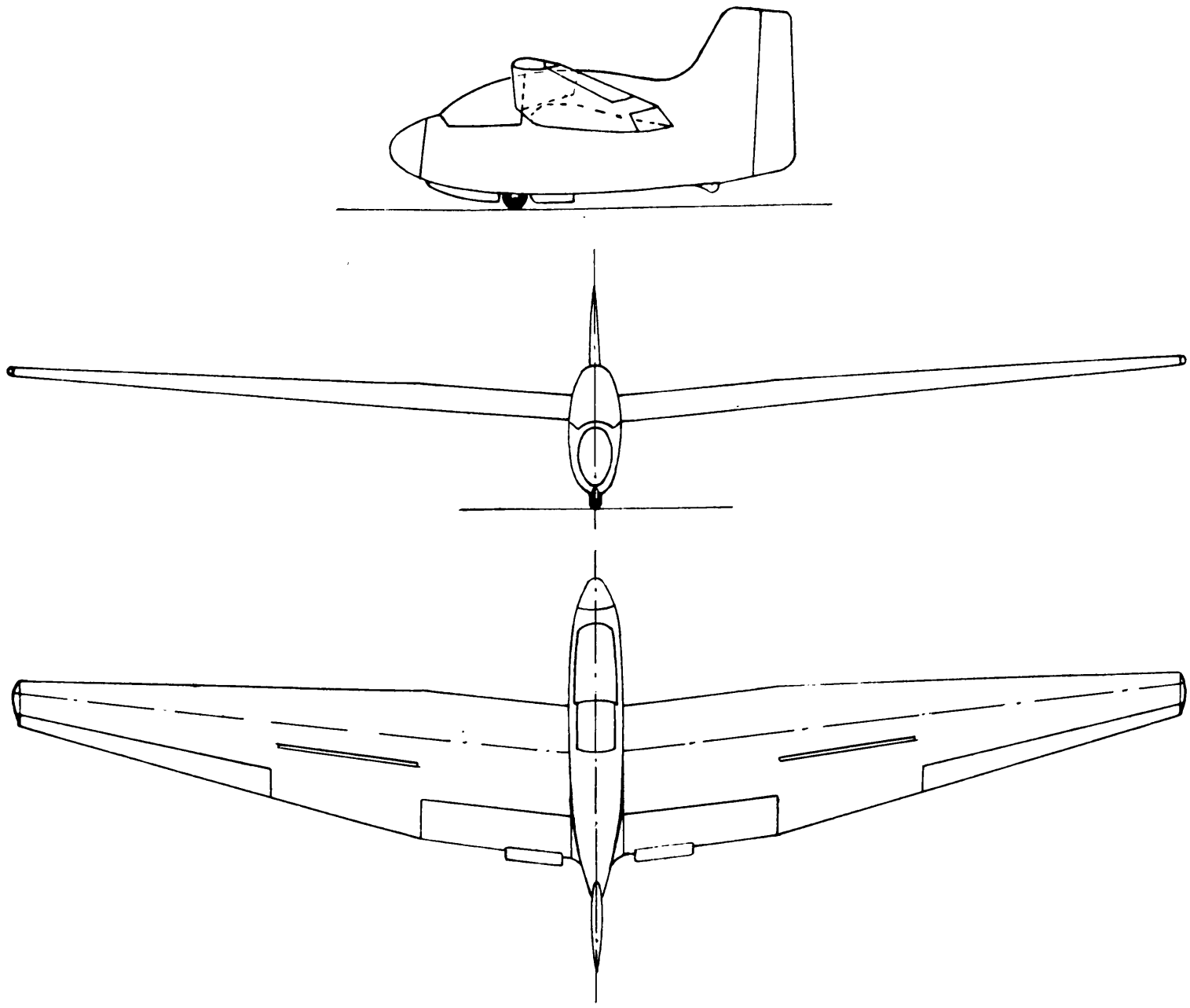
| | |
|---|---|
| Max. width | 0,655 m |
| Max. height (at cockpit) | 1,500 m |
| Overall length | 4,550 m |
| Max. cross section | 0,79 $m^2$ |
| Wetted surface area | 1,75 $m^2$ |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Wheel with skid fore and aft. Wheel retracted for braked landing. |
| Structure | Ply covered wood frame. Fibre-glass nose cap. Side opening blown plexiglass canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Perforated upper and lower surface spoilers with gap (Schempp-Hirth type). |
| Span (total) | 3,12 m |
| Area | 0,696 $m^2$ |
| Location, % of chord | 43% |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |



**Weights**

| | |
|---|---|
| Wings[1] | 134 kg |
| Fuselage[2] | 112 kg |
| Empty weight[3] | 246 kg |
| Instruments | 3 kg |
| Other equipment (e.g. oxygen, radio) | 17 kg |
| Equipped weight | 266 kg |
| Flying weight | 495 kg |
| Wing loading | 20,4 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Règlement Air 2104 Cat. III nuages at 445 kg Cat. IV aerobatic at 360 kg |
| Date of issue of these requirements | 1 August 1954 |
| Certificate of airworthiness | Yes |

**Design flight envelope** (at 360 kg)

| *Manoeuvre loads* | V km/h | Proof load factor n |
|---|---|---|
| Point A | 148 | 8 |
| Point B | 254 | 8 |
| Point C | 254 | — 4 |
| Point D | 125 | — 4 |
| Factor of safety | | 1,5 |

| *Gust loads* | V km/h | v m/s |
|---|---|---|
| Point B | 208 | 16 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 210 km/h |
| Placard airspeed gusty conditions | 157 km/h |
| Aero-towing speed | 160 km/h (128 in gusts) |
| Cloud flying permitted? | Yes—up to 445 kg |
| Permitted aerobatic manoeuvres | Yes—loop, stall turn up to 360 kg. |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | Range 8% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 165 km/h |

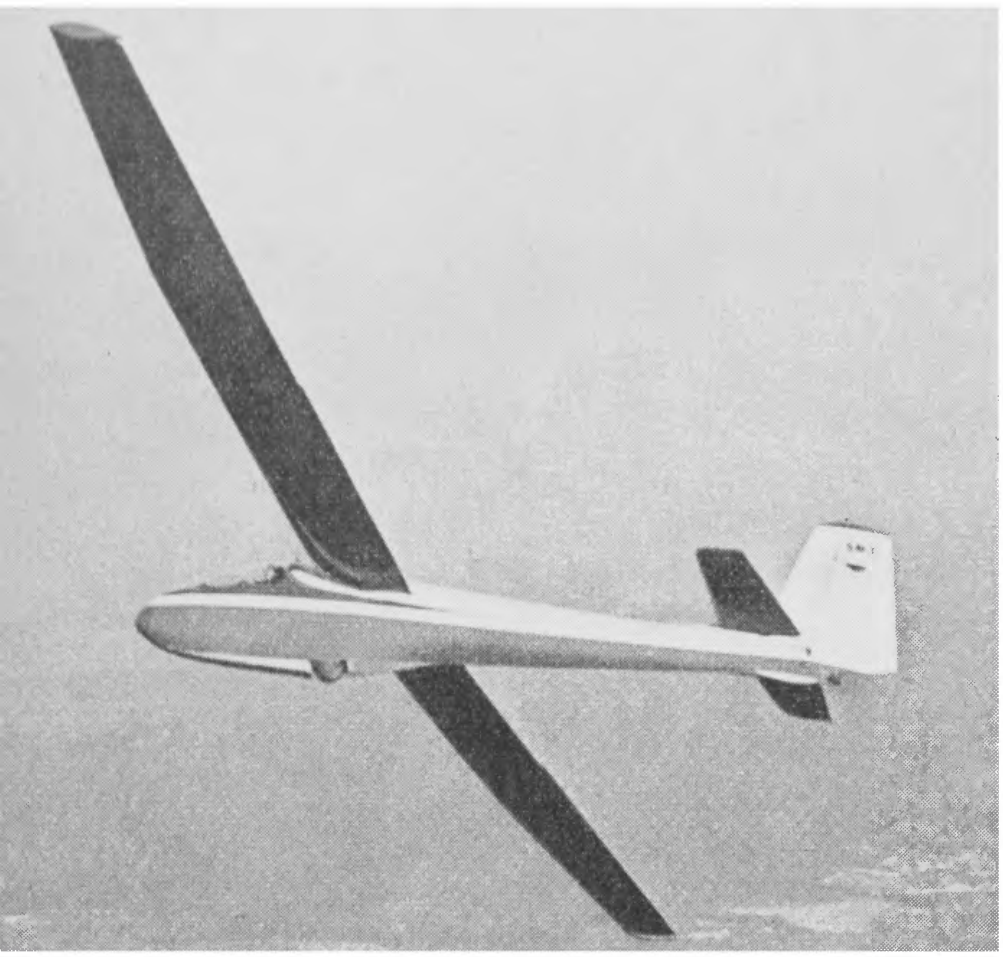
**Straight flight performance**

Measured at flying weight of 423 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 70 | 0,84 |
| Max. L/D condition | 83 | 0,89 |
| | 105 | 1,35 |
| | 122 | 2,05 |
| | 140 | 3,25 |
| Stalling speed | 60 km/h | |
| Flap deflection | 0° | |
| Max. L/D | 26 | |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast



# S.M. 31

This is a high performance sailplane derived from the experimental S. 30 by re-design, a new structure for the tail unit and an improvement to the cockpit.

Hochleistungssegelflugzeug, abgeleitet vom S. 30 (Versuchsmuster), aber neu durchkonstruiert, mit neu gestaltetem Rumpfende und verbessertem Pilotenraum.

Planeur de performance dérivé du S. 30 expérimental. Reconstruit, en particulier pour la partie arrière et avec des améliorations au cockpit.

| | |
|---|---|
| Type designation | S.M. 31 |
| Country of design | France |
| Designer | R. Cartier |
| Date of first flight of prototype | 11 January 1960 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 18,06 m |
| Area (s) | 18 $m^2$ |
| Aspect ratio ($b^2/s$) | 18 |
| Wing root chord ($C_r$) | 1,08 m |
| Wing tip chord ($C_t$) | 0,70 m |
| Wing section, root | NACA $65_4$ 421 |
| Wing section, tip | NACA $64_3$ 618 |
| Dihedral | 2,3° |
| ¼ chord sweep | 6° (outer only) |
| Aero. twist root/tip | 2° |
| Taper ratio ($C_t/C_r$) | 0,65 |
| Construction | Single spar, wood, with ply leading edge. Fabric over rear 48% chord. Ribs of spruce and balsa at 0,11 m spacing. |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 10,02 m |
| Area (total) | 1,86 $m^2$ |
| Mean chord | 0,185 m |
| Max. deflection up | 23° |
| Max. deflection down | 15° |
| Mass balance degree | 40% |
| Mass balance method | Distributed weight |
| Construction | Wood. Ply and fabric covered. |

**Horizontal tail**

| | |
|---|---|
| Span | 3,5 m |
| Area of elevator and fixed tail (S′) | 2,36 $m^2$ |
| Area of elevator | 1,16 $m^2$ |
| Max. deflection up | 21° |
| Max. deflection down | 21° |
| Tail arm (from ¼ [1′] chord m. a. c. wing to ¼ chord m.a.c. tail) | 4,44 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,570 |
| Construction | Wood. Ply covered tailplane. Fabric covered elevator. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,68 $m^2$ |
| Area of rudder | 1,06 $m^2$ |
| Aspect ratio | 1,60 |
| Tail arm | 4,98 m |
| Max. deflection | 30° |
| Aerodynamic balance | Nil |
| Structure | Wood. Ply covered fin. Fabric covered rudder. Rib spacing 0,21 m. |

**Fuselage**

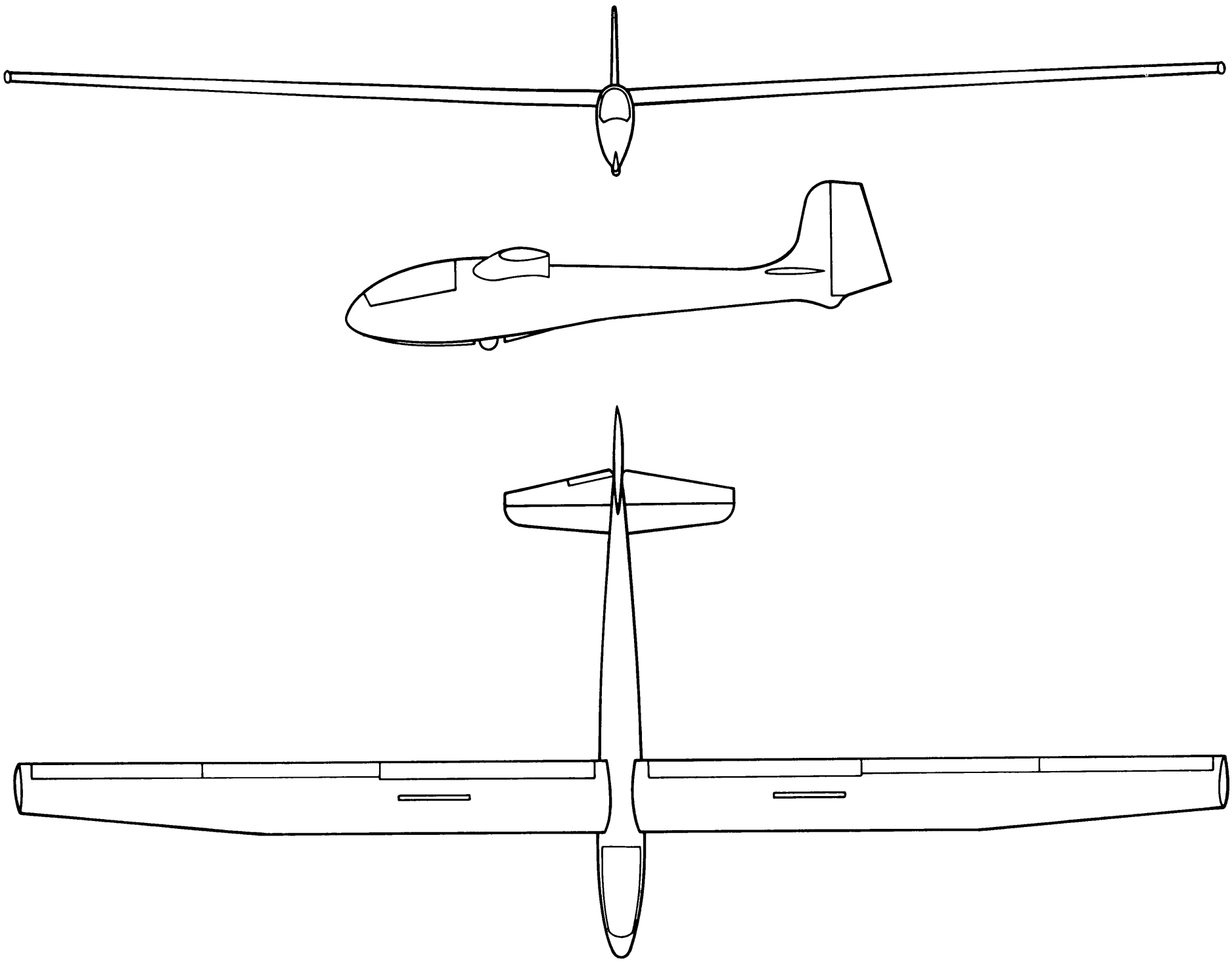
| | |
|---|---|
| Max. width | 0,560 m |
| Max. height (at cockpit) | 1,070 m |
| Overall length | 7,60 m |
| Max. cross section | 0,52 $m^2$ |
| Wetted surface area | 12,50 $m^2$ |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel. Fixed skid. Hydraulic brake. |
| Structure | Ply covered frame and stringer. Side opening plexiglass canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Fowler flap. |
| Span (total) | 7,10 m |
| Area (total) | 2,04 $m^2$ |
| Max. deflection up | Nil |
| Max. deflection down | 25° |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap. |
| Span (total) | 1,88 m |
| Area | 0,64 $m^2$ |
| Location, % of chord | 57,5 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |



**Weights**

| | |
|---|---|
| Wings[1] | 202 kg |
| Fuselage[2] | 112,2 kg |
| Tailplane and elevator | 9,8 kg |
| Empty weight[3] | 324 kg |
| Instruments | 3,5 kg |
| Other equipment (e.g. oxygen, radio) | 32 kg |
| Equipped weight | 360 kg |
| Flying weight | 460 kg |
| Wing loading | 25,5 kg/m$^2$ |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Règlement Air 2104 Cat. III |
| Date of issue of these requirements | 1 August 1954 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | Proof load factor |
|---|---|
| Point A | 5 |
| Point B | 5 |
| Point C | —2 |
| Point D | —2 |
| Factor of safety | 2 |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

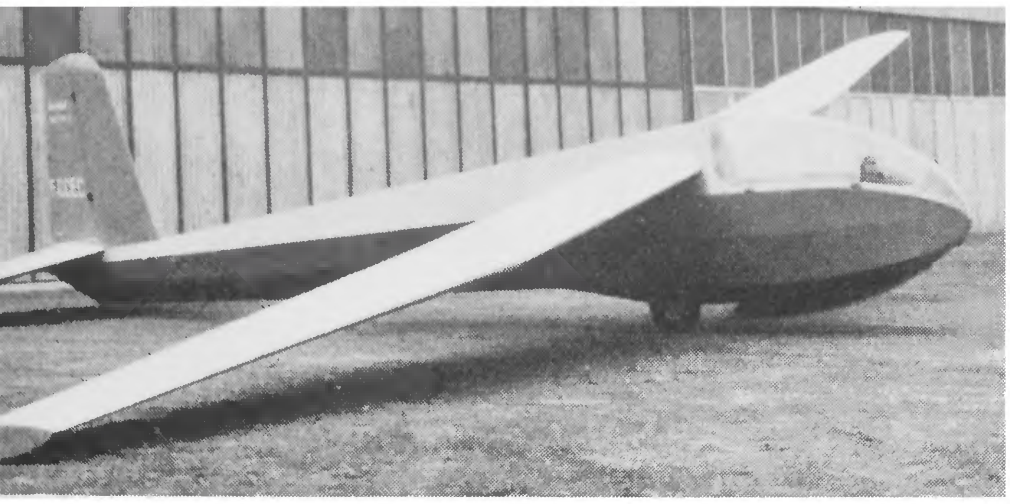
**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 220 km/h |
| Placard airspeed gusty conditions | 180 km/h |
| Aero-towing speed | 100 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Nil |
| Spinning permitted? | No |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 30 to 39 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not tested. |

**Straight flight performance**

Measured
at flying weight of 440 kg

| **No flap or brake** | V km/h | V sink m/s |
|---|---|---|
| Min. sink condition | 80 | 0,78 |
| Max. L/D condition | 98 | 0,84 |
| | 120 | 1,25 |
| | 140 | 2,00 |
| | 160 | 3,20 |
| Max. L/D | 32,5 | |



# JAVELOT II

This sailplane has been developed from the Javelot I, a 16 metre span aircraft described in the first volume of the "Worlds Sailplanes". 12 machines of this type were built. The developments have been designed to make the sailplane comply with the standard class requirements.

Entwickelt aus dem Javelot I, einem Segelflugzeug mit 16 m Spannweite (Beschreibung im ersten Band «Segelflugzeuge der Welt»), von welchem 12 Stück gebaut wurden. Die Neuentwicklung wurde durchgeführt, um das Flugzeug den Bestimmungen der Standard-Klasse anzupassen.

Développé du Javelot I, planeur avec une envergure de 16 m (voir description dans «Les Planeurs du Monde», vol. I) dont 12 exemplaires furent construits. Le développement a été effectué afin d'adapter le planeur aux conditions imposées pour la classe standard.

| | |
|---|---|
| Type designation | Javelot II |
| Country of design | France |
| Designer | M. Collard |
| Date of first flight of prototype | March 1958 |
| Number produced | 47 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 14,4 m² |
| Aspect ratio ($b^2/s$) | 15,7 |
| Wing root chord ($C_r$) | 1,1 m |
| Wing tip chord ($C_t$) | 0,50 m |
| Mean chord ($C = s/b$) | 0,96 m |
| Wing section, root | NACA 63821 |
| Wing section, mid | NACA 63821 |
| Wing section, tip | NACA 63415 |
| Dihedral | 3,0° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 3° 30′ |
| Taper ratio ($C_t/C_r$) | 0,45 |
| Construction | Single spar, wood with leading edge torsion box. 3 piece wing. Fabric covering over rear half of wing. Ribs of 0,3 m spacing. |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 7,2 m |
| Area (total) | 1,44 m² |
| Max. deflection up | 25° (inner) 15° (outer) |
| Max. deflection down | 15° (inner) 10° (outer) |
| Mass balance degree | Nil |
| Construction | Wood. Fabric covering. Ribs 0,3 m spacing. |

**Horizontal tail**

| | |
|---|---|
| Span | 2,6 m |
| Area of elevator and fixed tail (S′) | 2,17 m² |
| Area of elevator | 0,91 m² |
| Max. deflection up | 30° |
| Max. deflection down | 22° |
| Aerofoil section | Symmetrical |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,55 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,72 |
| Construction | Wood. Fabric covered. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,1 m² |
| Area of rudder | 0,62 m² |
| Tail arm | 4,2 m |
| Max. deflection | 30° |
| Aerofoil section | Symmetrical |
| Structure | Wood. Fabric covered. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,65 m |
| Max. height (at cockpit) | 1,26 m |
| Overall length | 7,00 m |
| Wetted surface area | 11 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed wheel. Rubber mounted skid. Hydraulic brake. |
| Structure | Steel tube structure, fabric covered. Fibre glass nose cap. Side opening canopy of bent perspex sheet. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

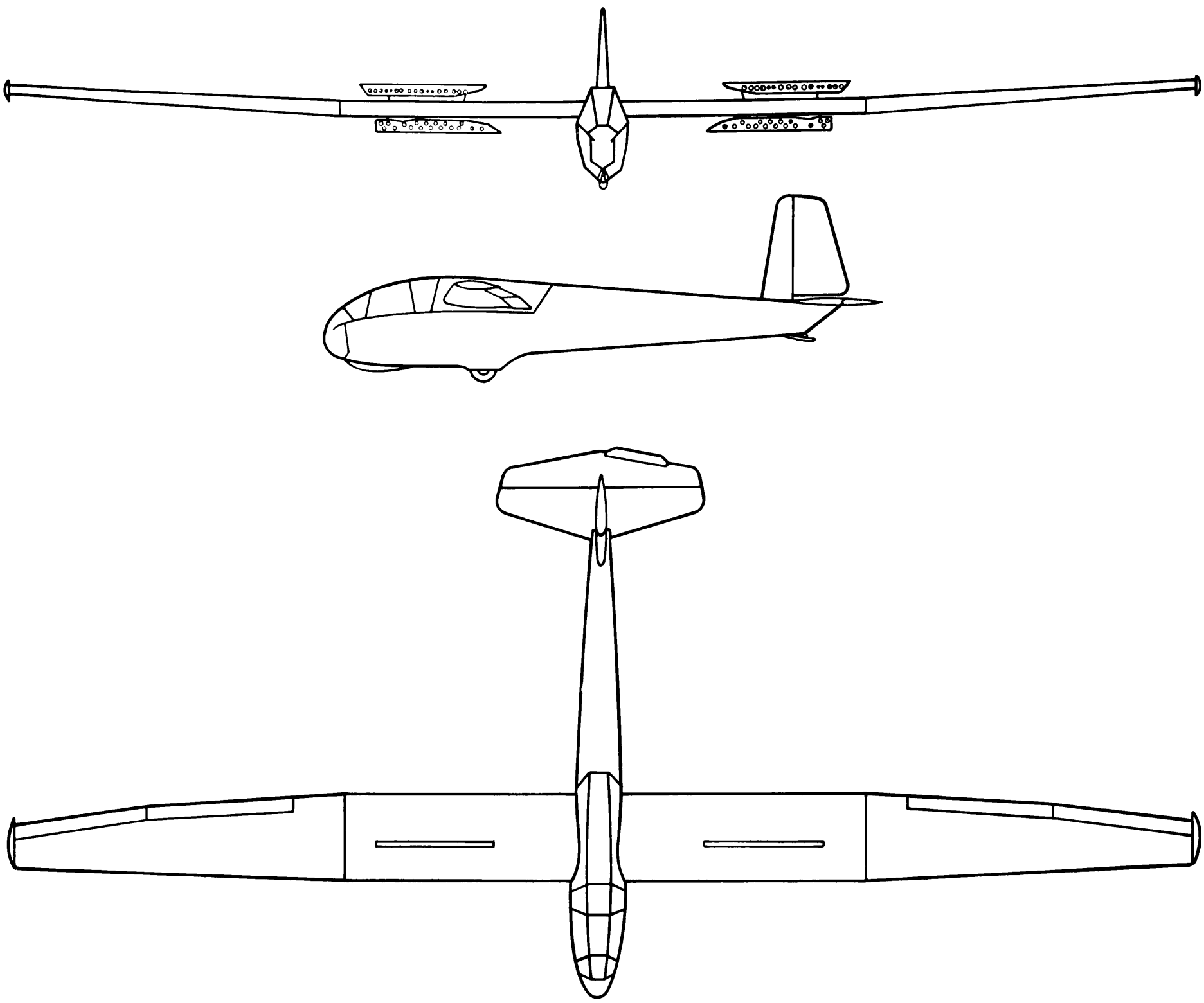
**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap. |
| Span (total) | 3,0 m |
| Area | 0,90 m² |
| Location, % of chord | 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 120 kg |
| Fuselage[2] | 66 kg |
| Tailplane and elevator | 9 kg |
| Empty weight[3] | 195 kg |
| Instruments | 5 kg |
| Other equipment (e.g. oxygen, radio) | 15 kg |
| Equipped weight | 215 kg |
| Flying weight | 350 kg |
| Wing loading | 24 kg/m² |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Norme Air 2104 |
| Date of issue of these requirements | 1 August 1954 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 148 | 6,7 |
| Point B | 230 | 6,7 |
| Point C | 230 | —2,7 |
| Point D | 108 | —2,7 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. v m/s |
|---|---|---|
| Point A | | 16 |
| Point B | 200 | 16 |
| Point C | 200 | 16 |
| Point D | 115 | 16 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 150 km/h |
| Aero-towing speed | 140 km/h |
| Winch launching speed | 100 km/h |

| | |
|---|---|
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Inverted flight prohibited |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 30 to 46 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 160 km/h |

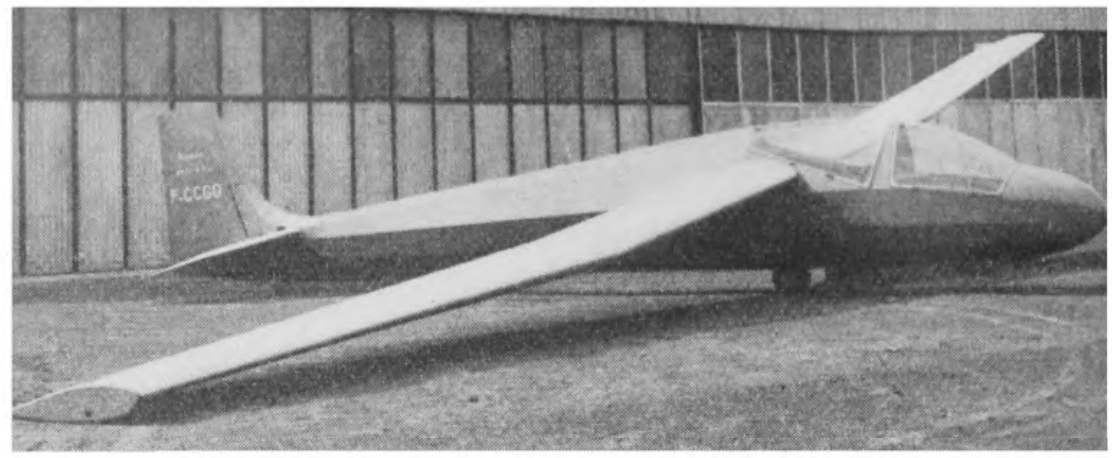
**Straight flight performance**

| | |
|---|---|
| Measured at flying weight of | 310 kg |

**No flap or brake**

| | V km/h | V sink m/s |
|---|---|---|
| Min. sink condition | 72 | 0,75 |
| Max. L/D condition | 80 | 0,80 |
| | 108 | 1,35 |
| | 126 | 2,05 |
| | 144 | 3,5 |
| Stalling speed | 58 km/h | |
| Flap deflection | 0° | |
| Max. L/D | 28 | |

# BIJAVE



The Bijave is a two-seater school sailplane specially developed for the use of pupils in a mixed school operating both sailplanes and powered aircraft. The performance of this sailplane is very similar to a standard class single seater and the pupil trained in the two-seater can then progress to the single seater type. The design conception is similar to that of the Javelot with the notable differences of a blown perspex canopy and an all-moving tailplane.

Zweisitziges Schul-Segelflugzeug, besonders für die Verwendung in Schulen mit gemischtem Betrieb (Motor- und Segelflug) entwickelt. Leistungen ähnlich denjenigen eines einsitzigen Flugzeugs der Standard-Klasse; der auf dem Zweisitzer geschulte Flugschüler geht anschließend auf den Einsitzer über. Konstruktive Grundlagen wie beim Javelot, aber mit dem Unterschied, daß der Bijave ein Kabinendach aus geblasenem Plexiglas und eine vollbewegliche Höhenflosse aufweist.

Biplace d'écolage développé spécialement pour l'emploi dans des écoles avec activité mixte (vol à moteur et à voile). Les performances ressemblent beaucoup à celles d'un monoplace de la classe standard; l'élève commence avec le biplace et continue plus tard sur le monoplace. L'idée fondamentale de construction est la même que celle du Javelot, mais avec la différence que le Bijave possède un toit de cabine en perspex et un empennage de profondeur entièrement mobile.

| | |
|---|---|
| Type designation | Bijave |
| Country of design | France |
| Designer | M. Collard |
| Date of first flight of prototype | 17 December 1958 |
| Number produced | 2 |

**Wings**

| | |
|---|---|
| Span (b) | 16,85 m |
| Area (s) | 19,2 m² |
| Aspect ratio ($b^2/s$) | 15 |
| Wing root chord ($C_r$) | 1,30 m |
| Wing tip chord ($C_t$) | 0,74 m |
| Mean chord ($C = s/b$) | 1,14 m |
| Wing section, root | NACA 63821 |
| Wing section, tip | NACA 63415 |
| Dihedral | 5° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 2° |
| Taper ratio ($C_t/C_r$) | 0,57 |
| Construction | Single spar wooden wing. Leading edge torsion box. Fabric covering over rear 45%. Wing in 3 pieces. |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 8,4 m |
| Area (total) | 2,23 m² |
| Mean chord | 0,27 m |
| Max. deflection up | 25° |
| Max. deflection down | 12° |
| Mass balance degree | Nil |
| Construction | Wood. Fabric covered. |

**Horizontal tail**

| | |
|---|---|
| Span | 3,2 m |
| Area of elevator and fixed tail (S′) | 2,56 m² (all moving) |
| Area of elevator | 2,56 m² (all moving) |
| Max. deflection up | 16° |
| Max. deflection down | 12° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 90 |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 5,02 m |
| Elevator aerodynamic balance method | All moving with anti-balance tab |
| Elevator trimming method | Tab |
| Construction | Fabric covered wood. Ribs spaced 0,25 m. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,8 m² |
| Area of rudder | 1,2 m² |
| Tail arm | 5,5 m |
| Max. deflection | 28° |
| Aerofoil section | Symmetrical |
| Structure | Wood. Fibreglass, ply and fabric covered. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,62 m |
| Max. height (at cockpit) | 1,50 m |
| Overall length | 9,00 m |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed unsprung wheel. Rubber mounted skid. Hydraulic brake. |
| Structure | Steel tube, fabric covered. Fibreglass nose cap. Side opening canopy in blown perspex. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

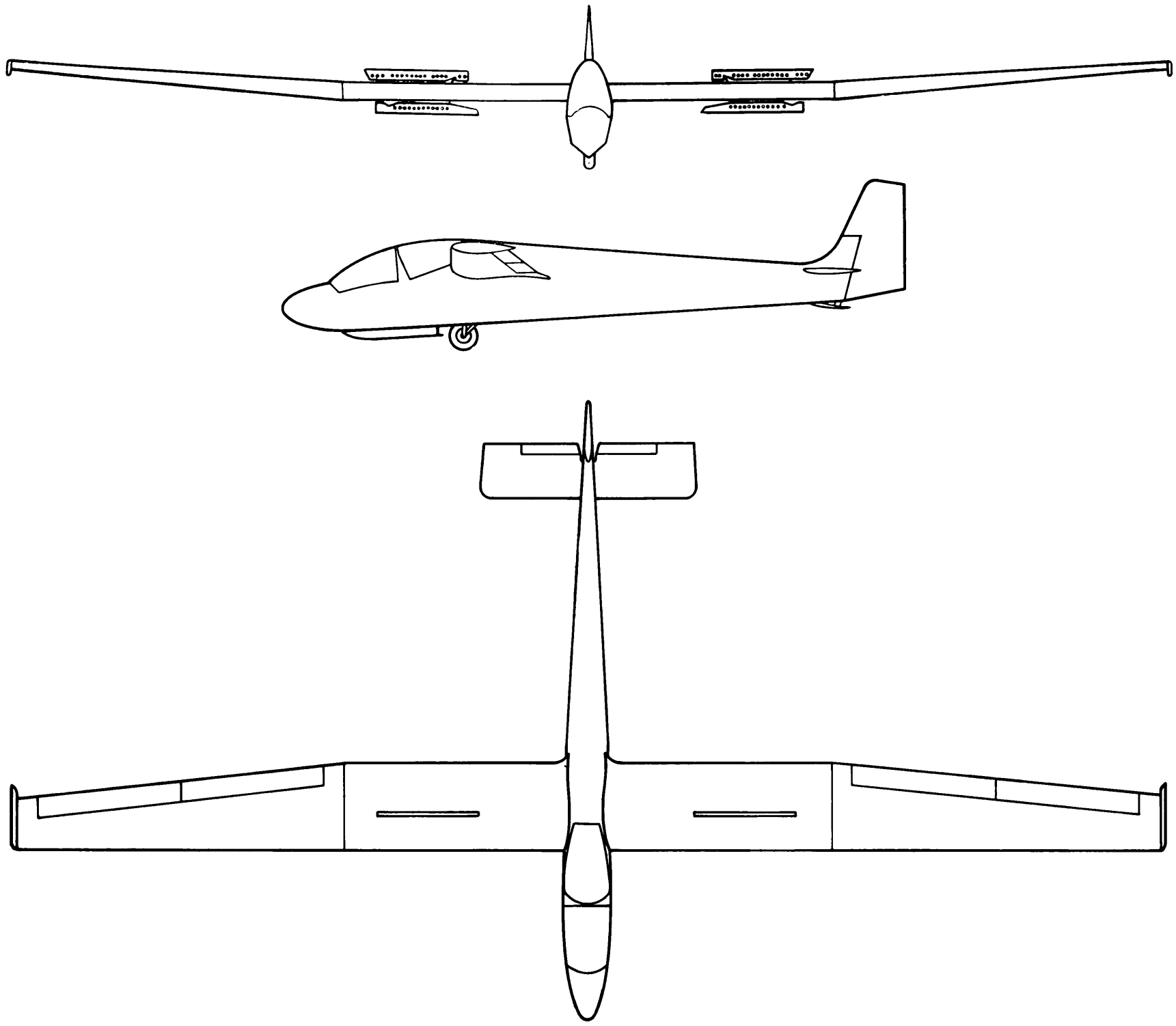
**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 3,0 m |
| Area | 1,0 m² |
| Location, % of chord | 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 160 kg |
| Fuselage[2] | 120 kg |
| Tailplane and elevator | 15 kg |
| Empty weight[3] | 295 kg |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast



| | |
|---|---|
| Instruments | 5 kg |
| Flying weight | 500 kg |
| Wing loading | 26 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Norme Air 2104 |
| Date of issue of these requirements | 1 August 1954 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 133 | 5,33 |
| Point B | 220 | 5,33 |
| Point C | 220 | —2,13 |
| Point D | 115 | —2,13 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. v m/s |
|---|---|---|
| Point A | | 16 |
| Point B | 200 | 16 |
| Point C | 200 | 16 |
| Point D | 130 | 16 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 150 km/h |

| | |
|---|---|
| Aero-towing speed | 130 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Nil |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 20 to 40 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 190 km/h |

**Straight flight performance**

Measured
at flying weight of 500 kg

**No flap or brake**

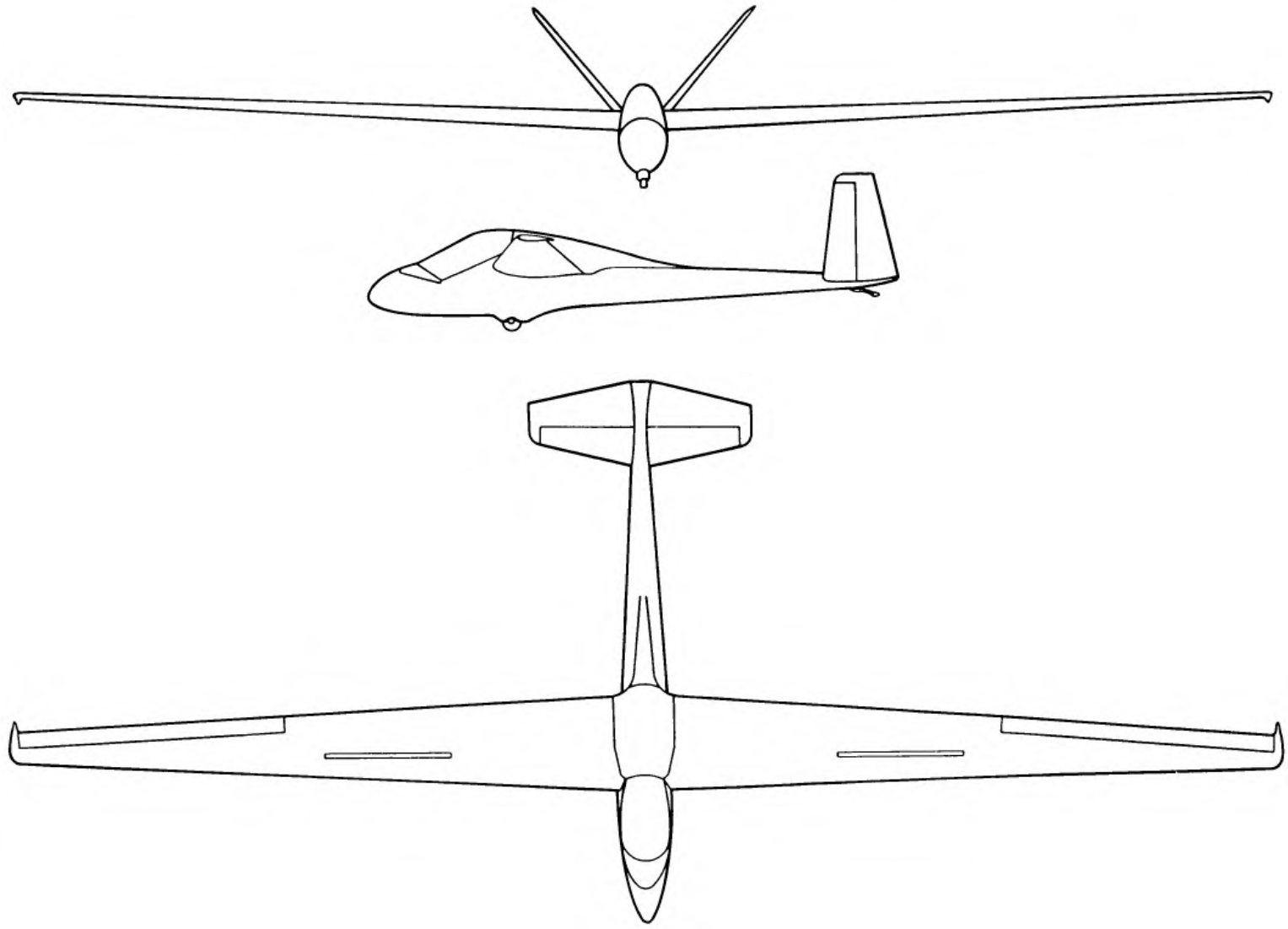
| | V km/h | V sink m/s |
|---|---|---|
| Min. sink condition | 78 | 0,75 |
| Max. L/D condition | 85 | 0,85 |
| | 117 | 1,60 |
| | 136 | 2,10 |
| | 156 | 4,50 |
| Stalling speed | 60 km/h | |
| Flap deflection | 0° | |
| Max. L/D | 29 | |


# FAUVETTE

A standard class sailplane designed for series production and a reasonable price. The sailplane has been made as small and light as possible, using sandwich construction where possible. Systematic design using replaceable components has aimed at easy repair by replacement of standard parts without professional labour. This should minimize unserviceability and costs of repair and maintenance. Detail design has used metal/wood bonding instead of bolts where possible, special steels and plastic bearings needing no lubrication.

Segelflugzeug der Standard-Klasse, gebaut für Serienproduktion und geringe Kosten. Die Fauvette wurde so klein und leicht als möglich gehalten, wobei, so weit zulässig, die Sandwich-Bauweise angewandt wurde. Durch wohldurchdachte Konstruktion unter Verwendung standardisierter Bauteile wurden leichte Reparaturen ohne Beiziehung von Fachkräften angestrebt. Damit bezweckte man kurze Betriebsunterbrüche und geringe Kosten für Reparatur und Unterhalt. Bei der Detailkonstruktion wurde die Metall-Holz-Abbindung den Bolzen so weit möglich vorgezogen; die Lager aus Spezialstahl und Plastik benötigen keine Schmierung.

Planeur de la classe standard, construit pour la production en série et un prix raisonnable. La Fauvette fut construite aussi petite et légère que possible, en employant la construction sandwich partout où cela s'avérait admissible. Le travail systématique a permis de prévoir des pièces de rechange standardisées et de faire exécuter des travaux de réparation par une main d'œuvre non-professionnelle. Le temps de réparation ainsi que les frais de l'entretien sont donc réduits considérablement. Au lieu des boulons on a préféré autant que possible un système en métal et bois; les paliers en acier spécial et en plastique n'ont pas besoin de lubrifiants.



| | |
|---|---|
| Type designation | Breguet 905 Fauvette |
| Country of design | France |
| Designer | Breguet |
| Date of first flight of prototype | 15 April 1958 |
| Number produced | 50 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 11,25 $m^2$ |
| Aspect ratio ($b^2/s$) | 20 |
| Wing root chord ($C_r$) | 1,136 m |

| | |
|---|---|
| Wing tip chord ($C_t$) | 0,365 m |
| Mean chord ($C = {}^{s}/_{b}$) | 0,75 m |
| Wing section, root | NACA 63420 |
| Wing section, tip | NACA 63613 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Taper ratio ($C_t/C_r$) | 0,33 |
| Construction | Cantilever. Single wood spar. Leading edge of ply/plastic sandwich. Fabric on undersurface only. |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 6,4 m |
| Area (total) | 2,22 m² |
| Mean chord | 0,173 m |
| Max. deflection up | 27° |
| Max. deflection down | 16° |
| Mass balance degree | Nil |
| Construction | Wood. Stabilised skin. |

**Tail** (45°)

| | |
|---|---|
| ½ span | 1,90 m |
| Area of elevator and fixed tail (S') | 2,30 m² |
| Area of elevator/rudder | 1,15 m² |
| Max. deflection as elevator | ± 20° |
| as rudder | ± 30° |
| Aerofoil section | Hoff |
| Mass balance degree | 25% |
| Mass balance method | Weight in horn |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,80 m |
| Elevator aerodynamic balance method | Horn |
| Elevator trimming method | Spring |
| Construction | Wood. Sandwich construction for fixed tail. Ribs and fabric covering for moving tail. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,58 m |
| Max. height (at cockpit) | 1,0 m |
| Overall length | 6,22 m |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed wheel with brakes. |
| Structure | Welded steel tube central frame with ply/plastic sandwich tail centre section and cockpit attachments. Side opening plexiglass hood. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers without gap. |
| Span (total) | 2,55 m |
| % of span (where applicable) | 17% |
| Location, % of chord | 38% |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 78 kg |
| Fuselage[2] | 65 kg |
| Tailplane and elevator | 12 kg |
| Empty weight[3] | 155 kg |
| Instruments, Other equipment (e.g. oxygen, radio) | 37 kg |
| Equipped weight | 192 kg |
| Flying weight | 275 kg |
| Wing loading | 24,5 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | French Air 2104 |
| Date of issue of these requirements | 1 October 1951 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load n |
|---|---|---|
| Point A | 137 | 5,33 |
| Point B | 231 | 5,33 |
| Point C | 231 | — 2,13 |
| Point D | 158 | — 3,31 |
| Factor of safety | | 1,5 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 170 km/h |
| Aero-towing speed | 120 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Nil |
| Spinning permitted? | No |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 28–45 |

**Straight flight performance**

Calculated at flying weight of 260 kg

| **No flap or brake** | V km/h | v m/s |
|---|---|---|
| Min. sink condition | 65 | 0,65 |
| Max. L/D condition | 78 | 0,70 |
| | 98 | 1,05 |
| | 115 | 1,40 |
| | 130 | 2,00 |
| Stalling speed | 54 km/h | |
| Max. L/D | 30 | |

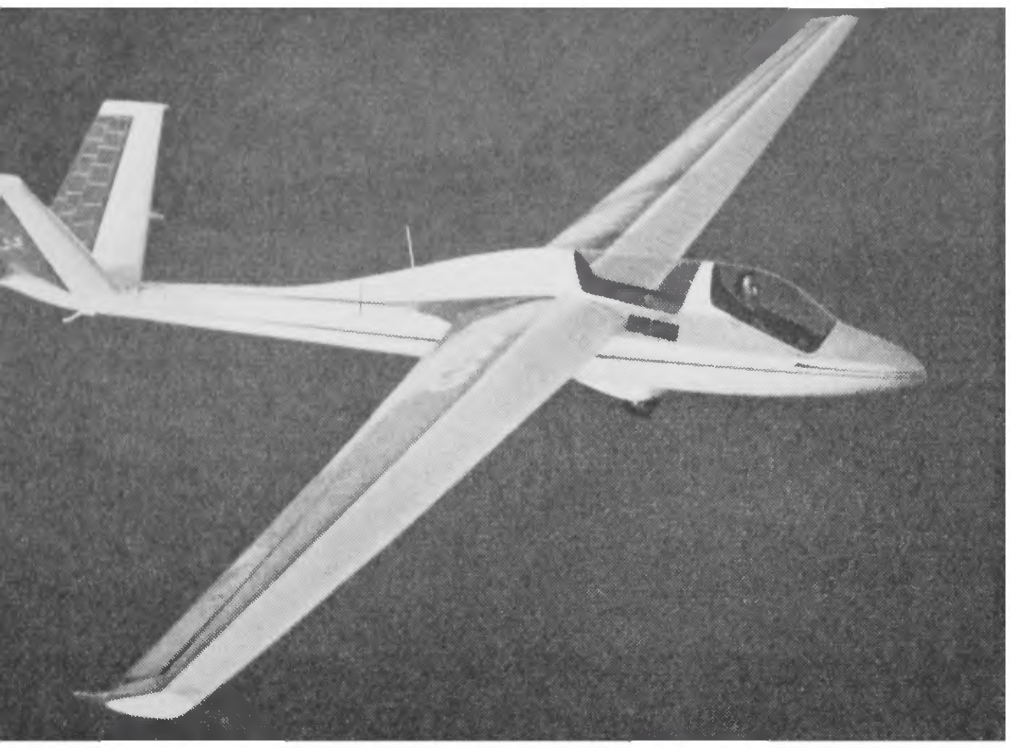
[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

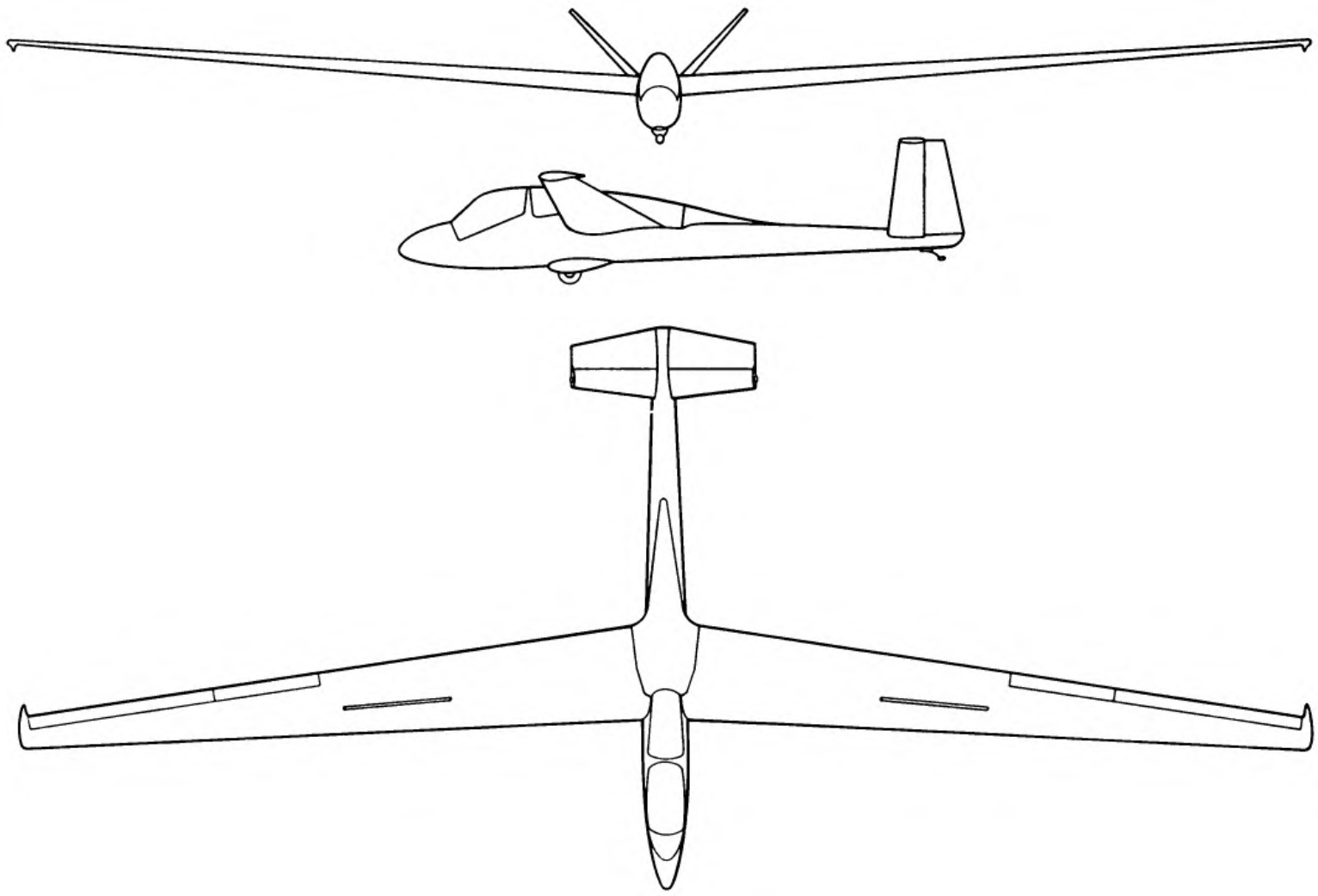
# CHOUCAS

A two seater based on the same design philosophy as "Fauvette", providing a school sailplane for training pilots in soaring flight in a practical and economic fashion. The front cockpit is the same as that of "Fauvette".

Zweisitzer mit derselben Konstruktion. Grundgedanken wie für die Fauvette. Dabei entstand ein Schulungsflugzeug zur Einführung der Piloten in den Segelflug auf praktischer, wirtschaftlich tragbarer Grundlage. Der vordere Pilotenraum ist gleich gestaltet wie bei der Fauvette.

Biplace avec la même idée de construction que pour la Fauvette. Ce planeur d'écolage permet l'introduction du pilote dans le vol à voile d'une façon pratique et économique. Le cockpit de front est le même que celui de la Fauvette.





| | |
|---|---|
| Type designation | Breguet 906 Choucas |
| Country of design | France |
| Designer | Breguet |
| Date of first flight of prototype | 26 October 1959 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span | 18 m |
| Area (s) | 17,06 m² |
| Aspect ratio ($b^2/s$) | 19 |
| Wing root chord ($C_r$) | 1,460 m |
| Wing tip chord ($C_t$) | 0,465 m |
| Mean chord ($C = s/b$) | 0,898 m |
| Wing section, root | NACA 63820 |
| Wing section, tip | NACA 63013 |
| Dihedral | 3° |
| ¼ chord sweep | — 4° 30′ |
| Taper ratio ($C_t/C_r$) | 0,33 |
| Construction | Cantilever. Single wood spar. Leading edge of ply/plastic sandwich. Fabric on undersurface only. |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 8,0 m |
| Area (total) | 4,0 m² |
| Mean chord | 0,250 m |
| Max. deflection up | 28° |
| Max. deflection down | 18° |
| Mass balance degree | Nil |
| Construction | Wood. Stabilised skin. |

**Tail** (45°)

| | |
|---|---|
| ½ span | 1,98 m |
| Area of elevator and fixed tail (S′) | 3,00 m² |
| Area of elevator/rudder | 1,65 m² |
| Max. deflection as elevator | ± 20° |
| as rudder | ± 30° |
| Aerofoil section | Hoff |
| Mass balance degree | 25% |
| Mass balance method | Weight in horn |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,60 m |
| Elevator aerodynamic balance method | Horn |
| Elevator trimming method | Spring |
| Construction | Wood. Sandwich construction for fixed tail. Ribs and fabric covering for moving tail. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,07 m |
| Overall length | 7,90 m |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed wheel with brakes. |
| Structure | As for "Fauvette" |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers without gap. |
| Span (total) | 3,06 m |
| % of span (where applicable) | 17% |
| Location, % of chord | 38% |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 145 kg |
| Fuselage[2] | 105 kg |
| Tailplane and elevator | 17 kg |
| Empty weight[3] | 267 kg |
| Instruments, Other equipment (e.g. oxygen, radio) | 27 kg |
| Equipped weight | 294 kg |
| Flying weight | 460 kg |
| Wing Loading | 27,0 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | French Air 2104 |
| Date of issue of these requirements | 1 October 1951 |
| Certificate of airworthiness | In process of certification |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load n |
|---|---|---|
| Point A | 148 | 5,33 |
| Point B | 231 | 5,33 |
| Point C | 231 | — 2,13 |
| Point D | 165 | — 2,75 |
| Factor of safety | 1,5 | |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 170 km/h |
| Aero-towing speed | 120 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Nil |
| Spinning permitted? | No |
| Foremost and aftmost c. g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 28–45 |

**Straight flight performance**

| | |
|---|---|
| Calculated at flying weight of | 460 kg |

| **No flap or brake** | V km/h | v m/s |
|---|---|---|
| Min. sink condition | 70 | 0,70 |
| Max. L/D condition | 82 | 0,74 |
| | 105 | 0,95 |
| | 123 | 1,40 |
| | 140 | 2,10 |
| Stalling speed | 58 km/h | |
| Max. L/D | 31 | |

# GERMAN DEMOCRATIC REPUBLIC

# LOM 59/I Libelle Standard


The Lom. 58/I and Lom. 58/II are developments of the Lom. 55/I Libelle which appeared in the first volume of "The World's Sailplanes".

In the case of the Lom. 58/I, the development is a reproduction of the Standard Class version of this machine, and the 58/II is an aircraft which is essentially the same as the original Libelle which has been equipped with a modern laminar flow wing section.

Die Lom. 58/I und Lom. 58/II sind Weiterentwicklungen der Lom. 55/I Libelle, die im ersten Band der «Segelflugzeuge der Welt» beschrieben wurde.

Im Falle der Lom. 58/I handelt es sich um eine Standardklasse-Ausführung dieser Maschine; die 58/II ist im wesentlichen die ursprüngliche Libelle, aber mit einem modernen Laminar-Flügelquerschnitt.

Les Lom. 58/I et Lom. 58/II sont des développements du Lom. 55/I Libelle, décrit dans le volume I des «Planeurs du monde».

Le Lom. 58/I représente la version Standard de cette machine; le Lom. 58/II ressemble beaucoup au Libelle original, mais il a reçu un profil laminaire moderne de l'aile.

| | |
|---|---|
| Type designation | Lom. 58/I Libelle Standard |
| Country of design | German Democratic Republic |
| Designers | Entwicklungskollektiv des VEB Apparatebau Lommatzsch |
| Date of first flight of prototype | 27 February, 1959 |
| Number produced | 88 |

**Wings**

| | |
|---|---|
| Span (b) | 15,0 m |
| Area (s) | 13,76 m² |
| Aspect ratio ($b^2/s$) | 16,35 |
| Wing root chord ($C_r$) | 1,20 m |
| Wing tip chord ($C_t$) | 0,649 m |
| Mean chord ($C = s/b$) | 0,917 m |
| Wing section, root | Gött. 549 mod. |
| Wing section, mid | Gött. 549 |
| Wing section, tip | Gött. 549 mod. |
| Dihedral | 3,0° |
| ¼ chord sweep | 0,54° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,543 |
| Construction | Wood. Single spar cantilever with stabilized skin. Fabric covering 56% chord. Rib spacing 0,3 m. Wing interchangeable with Lom. 57/I |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 2,55 m |
| Area (total) | 2 × 0,625 m² |
| Mean chord | 0,245 m |
| Max. deflection up | 26° |
| Max. deflection down | 13° |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,2 m |
| Area of elevator and fixed tail (S′) | 1,98 m² |
| Area of elevator | 0,81 m² |
| Max. deflection up | 16° |
| Max. deflection down | 14,5° |
| Aerofoil section | NACA 65010–15 |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,68 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,58 |
| Construction | 6° Dihedral. Wood structure. 50% fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,31 m² |
| Area of rudder | 0,76 m² |
| Aspect ratio | 1,63 |
| Tail arm | 3,77 m |
| Max. deflection | 20° |
| Aerofoil section | NACA 64009–11 |
| Aerodynamic balance | Nil |
| Construction | Wood. Rudder fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 0,92 m |
| Overall length | 6,60 m |
| Max. cross section | 0,47 m² |
| Wetted surface area | 8,60 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed wheel, spring mounting, with brakes. Fixed rubber mounted skid |
| Construction | Monocoque. Fibre glass nose cap. Side opening moulded perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,53 m |
| Area | 2 × 0,144 m² (optional 2 × 0,22 m²) |
| Location, % of chord | 45–51 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 115 kg |

| | |
|---|---|
| Fuselage (with fin and rudder, less instruments and equipment) | 84 kg |
| Tailplane and elevator | 8,6 kg |
| Empty weight (including any fixed ballast) | 207,6 kg |
| Instruments | 2,4 kg |
| Equipped weight | 210 kg |
| Flying weight | 300 kg |
| Wing loading | 21,8 kg/m² |

**Straight flight performance**

Measured
at flying weight of 300 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 74 | 0,73 |
| Max. L/D condition | 78,5 | 0,76 |
| | 111 | 1,60 |
| | 130 | 2,46 |
| | 148 | 3,65 |
| Stalling speed | 50 km/h | |
| Max. L/D | 28,5 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS and appendices |
| Date of issue of these requirements | 1939 and additions in 1958 |
| Certificate of airworthiness | Yes |

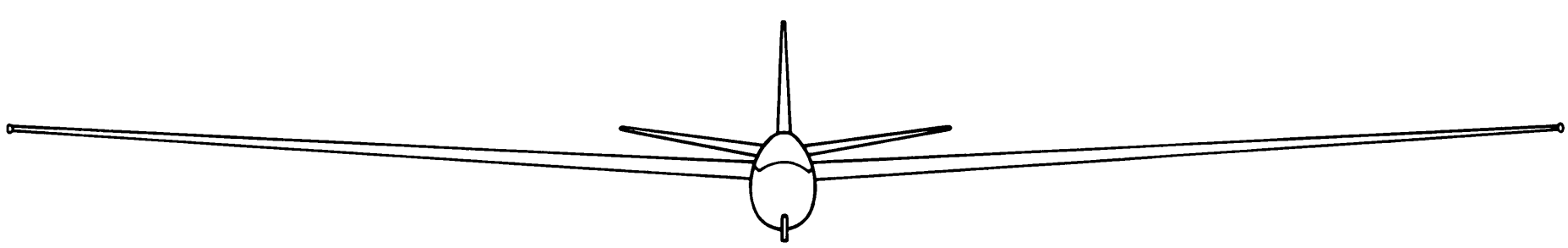
**Design flight envelope**

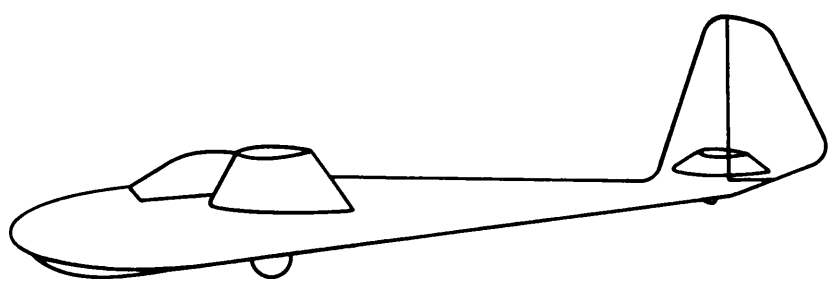
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 154 | 6,67 |
| Point B | 233 | 6,67 |
| Point C | 224 | —3,34 |
| Point D | 194 | —3,34 |
| Factor of safety | 1,5 | |

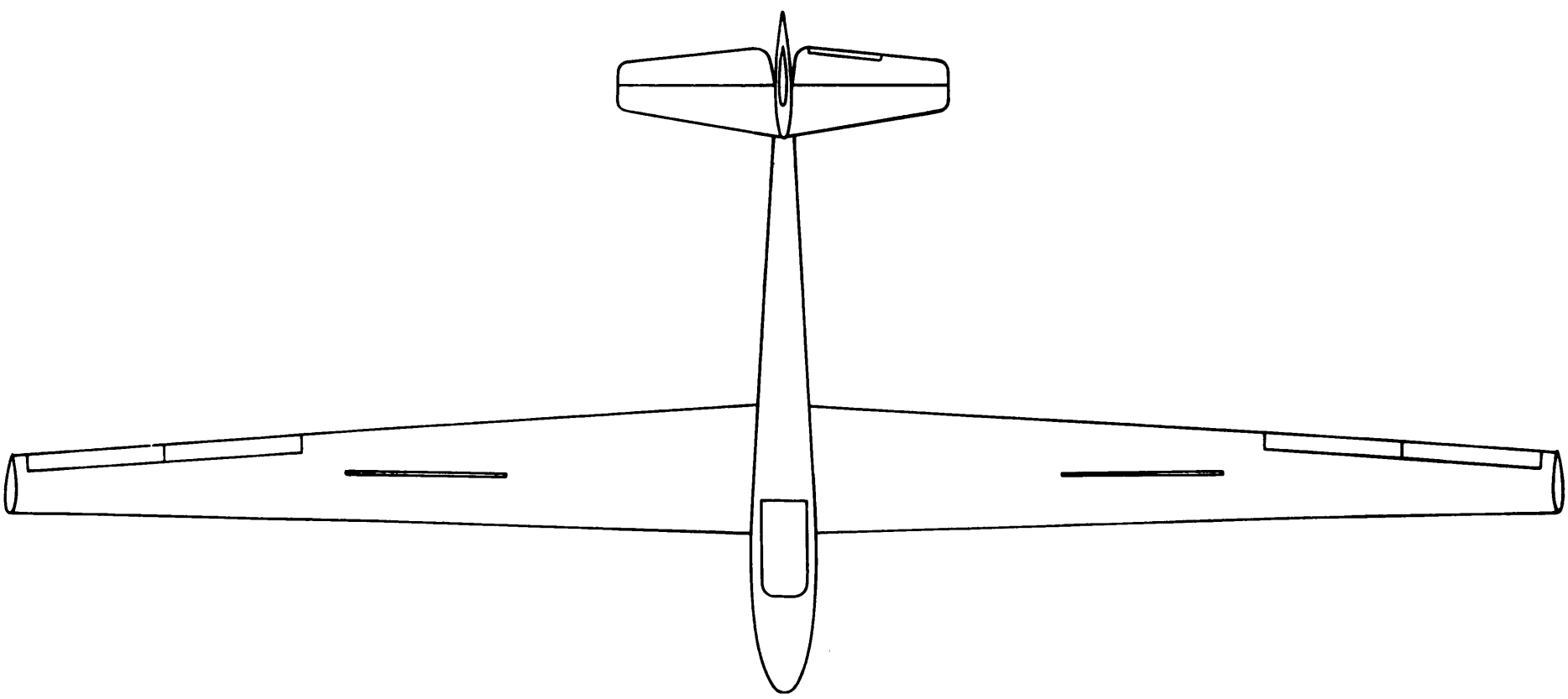
| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 151 | 15 |
| Point B | 233 | 5 |
| Point C | 233 | — 5 |
| Point D | 151 | —15 |

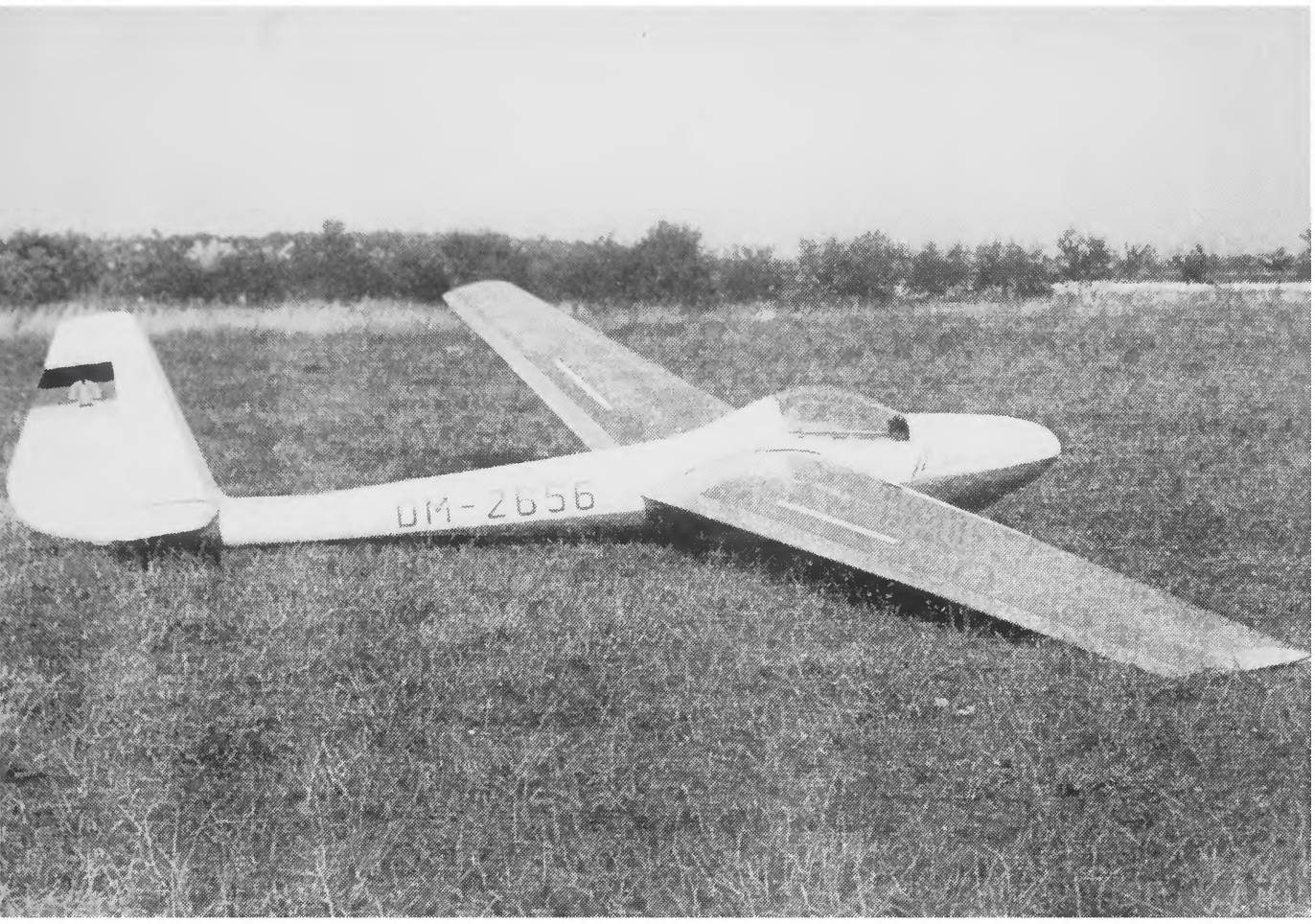
**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 130 km/h |
| Aero-towing speed | 130 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 23–34 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 200 km/h |










# LOM 56/II

## Libelle
## Laminar

| | |
|---|---|
| Type designation | Lom. 58/II Libelle Laminar |
| Country of design | German Democratic Republic |
| Designers | Entwicklungskollektiv des VEB Apparatebau Lommatzsch |
| Date of first flight of prototype | 1959 |
| Number produced | 21 |

### Wings

| | |
|---|---|
| Span (b) | 16,5 m |
| Area (s) | 14,85 m² |
| Aspect ratio ($b^2/s$) | 18,35 |
| Wing root chord ($C_r$) | 1,2 m |
| Wing tip chord ($C_t$) | 0,6 m |
| Mean chord ($C = s/b$) | 0,9 m |
| Wing section, root | NACA $65_2$–$615_15$ |
| Wing section, mid | NACA $65_2$–$615_15$ |
| Wing section, tip | NACA $65_2$–$615_15$ |
| Dihedral | 3,0° |
| ¼ chord sweep | 0,54° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,5 |
| Construction | Wood. Single spar cantilever with stabilized skin. Rib spacing 0,3 m |

### Ailerons

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 3,34 m |
| Area (total) | 2 × 0,365 m² |
| Max. deflection up | 26° |
| Max. deflection down | 13° |
| Construction | Wood. Stabilized skin. Ailerons deflect symmetrically as flaps over range —5° to +16° |

### Horizontal tail

| | |
|---|---|
| Span | 3,2 m |
| Area of elevator and fixed tail (S′) | 1,98 m² |
| Area of elevator | 0,81 m² |
| Max. deflection up | 16° |
| Max. deflection down | 14,5° |
| Aerofoil section | NACA 65010–15 |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,68 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,546 |
| Construction | 6° Dihedral. Wood structure. 50% fabric covered |

### Vertical tail

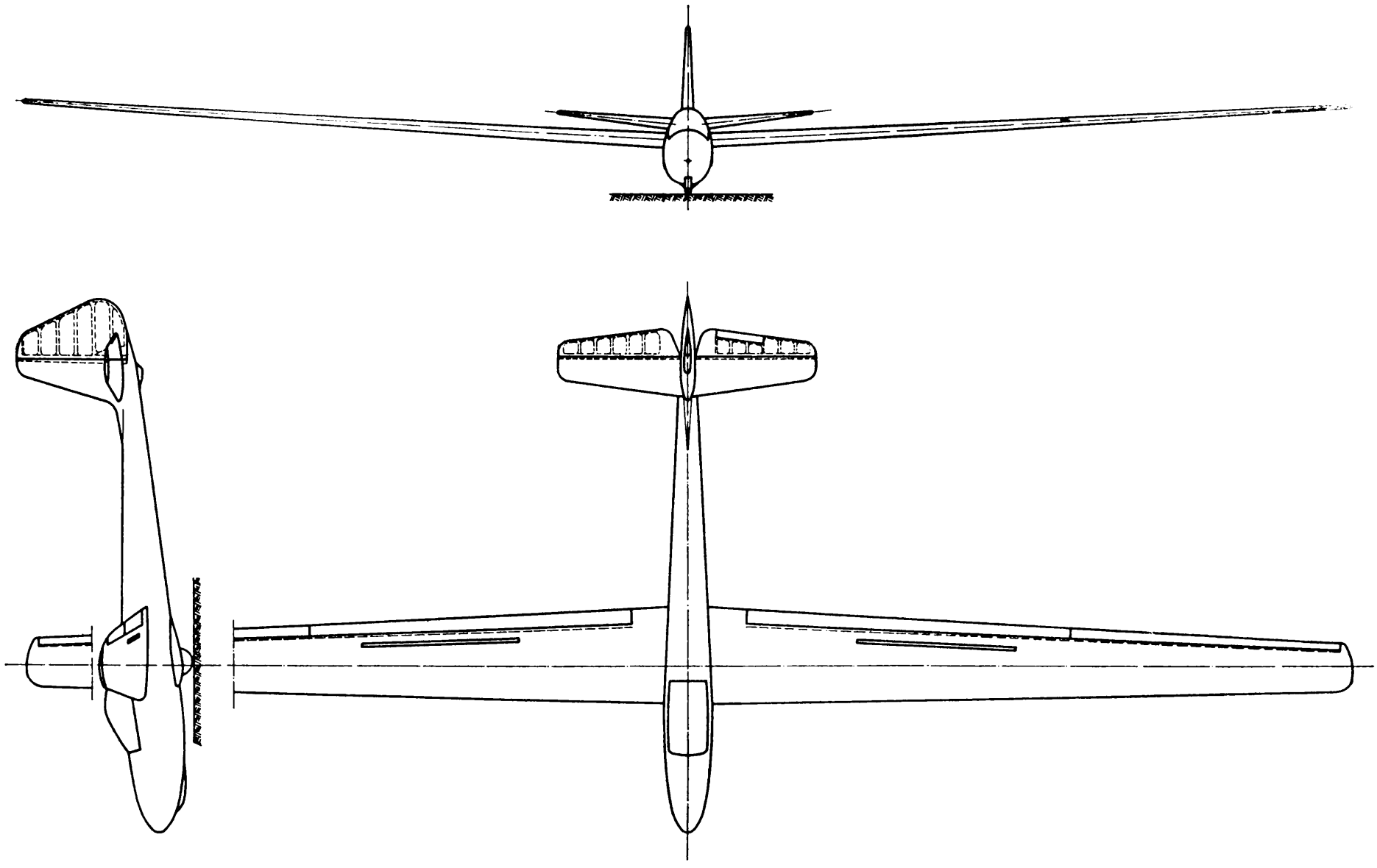
| | |
|---|---|
| Area of fin and rudder | 1,31 m² |
| Area of rudder | 0,76 m² |
| Aspect ratio | 1,63 |
| Tail arm | 3,77 m |
| Max. deflection | 20° |
| Aerofoil section | NACA 64009–11 |
| Aerodynamic balance | Nil |
| Construction | Wood. Rudder fabric covered |

### Fuselage

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 0,92 m |
| Overall length | 6,60 m |
| Max. cross section | 0,47 m² |
| Wetted surface area | 8,6 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed wheel 350 × 135 spring mounting. Fixed rubber mounted skid. Wheel brakes |
| Construction | Monocoque. Fibre glass nose cap. Side opening moulded perspex canopy |

### Lift increasing devices

| | |
|---|---|
| Type | Trailing edge plain flaps |
| Span (total) | 2 × 4,03 m |
| Area (total) | 2 × 0,605 m² |
| Max. deflection up | 5° |
| Max. deflection down | 10° |



**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 2,0 m |
| Area | 2 × 0,376 m² |
| Location, % of chord | 68 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 165 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 94 kg |
| Tailplane and elevator | 8 kg |
| Empty weight (including any fixed ballast) | 267 kg |
| Instruments | 3 kg |
| Equipped weight | 270 kg |
| Flying weight | 380 kg |
| Wing loading | 25,6 kg/m² |

**Straight flight performance**

Measured at flying weight of 380 kg

| No flap or brake | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 76 | 0,65 |
| Max. L/D condition | 88 | 0,70 |
| | 114 | 1,2 |
| | 133 | 1,84 |
| | 152 | 2,55 |
| Stalling speed | 65 km/h | |
| Flap deflection | +10° | |
| Max. L/D | 36 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS-DDR |
| Date of issue of these requirements | 1959–1960 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 143 | 5,5 |
| Point B | 240 | 4,0 |
| Point C | 240 | —2,0 |
| Point D | 163 | —3,0 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 130 | 15 |
| Point B | 240 | 5 |
| Point C | 240 | — 5 |
| Point D | 130 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 130 km/h |
| Aero-towing speed | 130 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 21–34 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 200 km/h |

# LEHRMEISTER II


The Lehrmeister II is a development of the FES 530 Lehrmeister which was described in the first volume of "The World's Sailplanes". This development has 2 metres less span than the original machine and other differences.

Der Lehrmeister II ist eine Weiterentwicklung des FES 530 Lehrmeister, der im Band I der «Segelflugzeuge der Welt» beschrieben ist. Die Ausführung II weist zwei Meter weniger Spannweite und andere Unterschiede auf.

Le Lehrmeister II est un développement du FES 530 Lehrmeister décrit dans le volume I des «Planeurs du monde». Il est caractérisé par une envergure réduite de deux mètres et d'autres différences.

| | |
|---|---|
| Type designation | Lehrmeister II |
| Country of design | German Democratic Republic |
| Designers | Entwicklungskollektiv des VEB Apparatebau Lommatzsch |
| Date of first flight of prototype | 27 February, 1959 |
| Number produced | 65 |

**Wings**

| | |
|---|---|
| Span (b) | 15,0 m |
| Area (s) | 17,93 m² |
| Aspect ratio ($b^2/s$) | 12,54 |
| Wing root chord ($C_r$) | 1,80 m |
| Wing tip chord ($C_t$) | 0,607 m |
| Mean chord ($C = s/b$) | 1,195 m |
| Wing section, root | Gött. 549 |
| Wing section, mid | Gött. 549 |
| Wing section, tip | Gött. 676 |
| Dihedral | 2° |
| ¼ chord sweep | 0,46° |
| Aero. twist root/tip | —2,3° |
| Taper ratio ($C_t/C_r$) | 0,337 |
| Construction | Wood. Single spar cantilever. Ply covered leading edge torsion box. Fabric covering 66%. Wing interchangeable with Lehrmeister I |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 3,45 m |
| Area (total) | 2 × 1,03 m² |
| Mean chord | 0,298 m |
| Max. deflection up | 28° |
| Max. deflection down | 13,5° |
| Construction | Wood. Fabric covered |

**Horizontal tail**

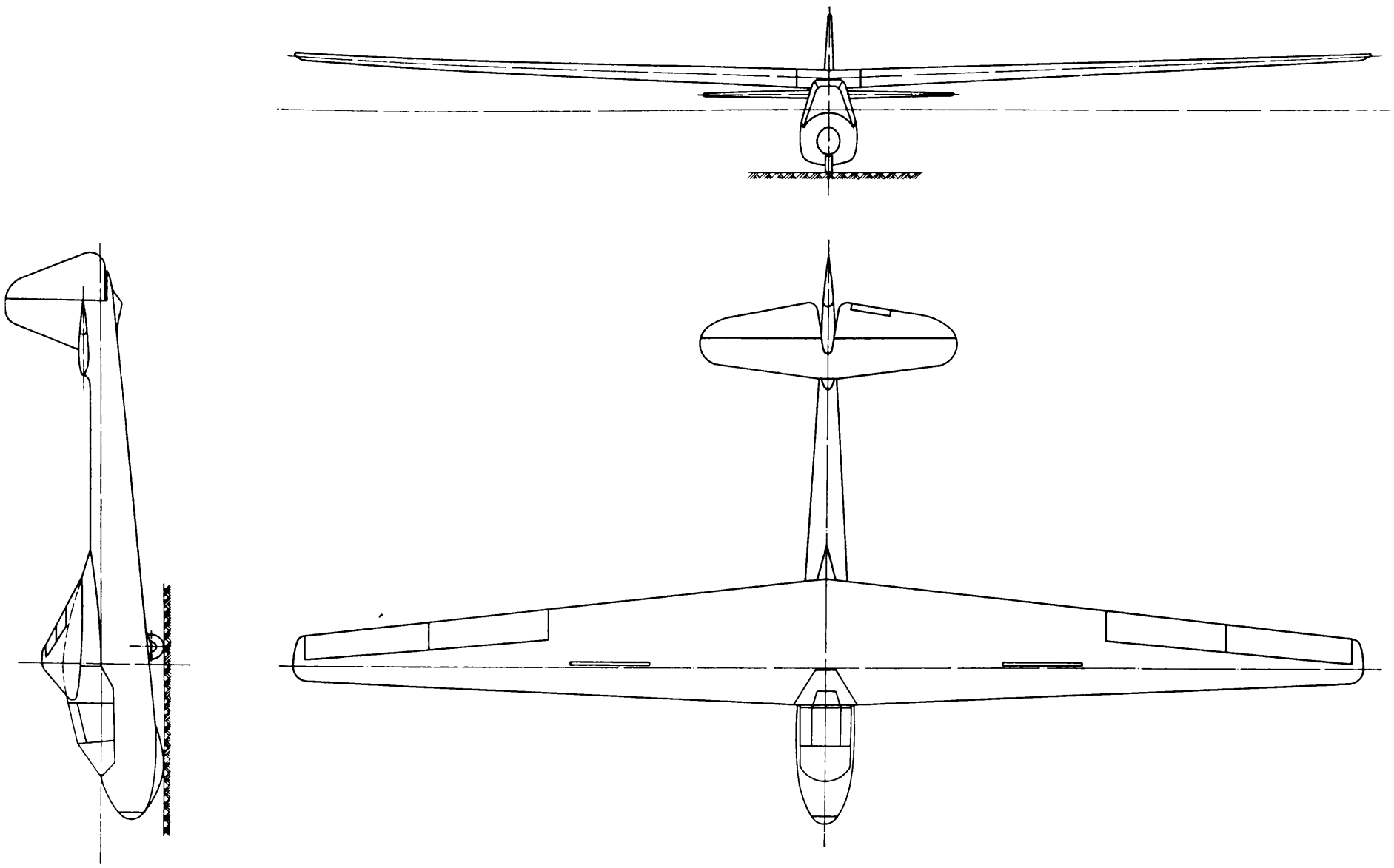
| | |
|---|---|
| Span | 3,6 m |
| Area of elevator and fixed tail (S') | 2,85 m² |
| Area of elevator | 1,14 m² |
| Max. deflection up | 22,5° |
| Max. deflection down | 19,5° |
| Aerofoil section | NACA 0009 |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,42 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S'1'/SC) | 0,586 |
| Construction | Wood. Fabric covered. Ribs spaced 0,2 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,46 m² |
| Area of rudder | 0,67 m² |
| Aspect ratio | 1,44 |
| Tail arm | 4,81 m |
| Max. deflection | 28° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Rudder fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,82 m |
| Max. height (at cockpit) | 1,25 m |
| Overall length | 7,95 m |
| Max. cross section | 0,59 m² |
| Wetted surface area | 14,6 m² |
| Number seats/arrangement | 2 |
| Undercarriage type | Fixed, spring mounted, with brakes. Fixed rubber mounted skid |



| | |
|---|---|
| Construction | Monocoque. Fibre glass nose cap. Side opening moulded perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,00 m |
| Area | 2 × 0,22 m² |
| Location, % of chord | 35 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 135 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 120 kg |
| Tailplane and elevator | 11,8 kg |
| Empty weight (including any fixed ballast) | 266,8 kg |
| Instruments | 3,2 kg |
| Equipped weight | 270 kg |
| Flying weight | 470 kg |
| Wing loading | 26,2 kg/m² |

**Straight flight performance**

Calculated at flying weight of . . . . . 470 kg

**No flap or brake**

| V km/h | v sink m/s |
|---|---|
| 72,5 | 0,95 |
| 83 | 1,08 |
| 109 | 1,66 |
| 127 | 2,53 |
| 145 | 3,83 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS-DDR appendices |
| Date of issue of these requirements | 1958–1959 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 151 | 5,34 |
| Point B | 231 | 5,34 |
| Point C | 262 | —2,67 |
| Point D | 191 | —2,67 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A | 130 | 15 |
| Point B | 235 | 5 |
| Point C | 235 | — 5 |
| Point D | 130 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 130 km/h |
| Aero-towing speed | 130 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 24–38 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 165 km/h |

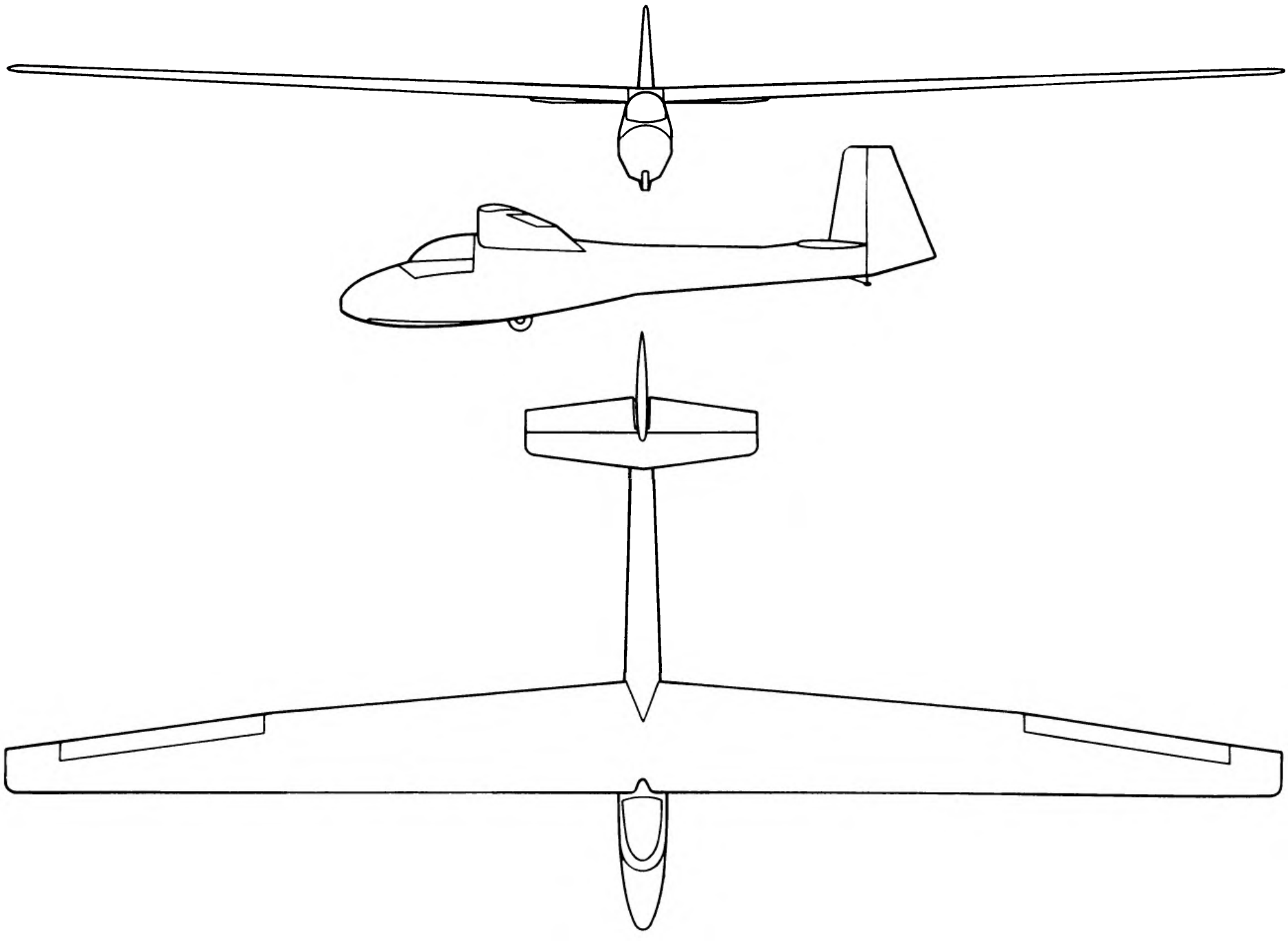
# German Federal Republic

# K-8B

This sailplane has been developed for club use to provide a simple and robust aircraft with good flight characteristics. It is derived from the Ka-6 but has been simplified for amateur construction. Emphasis has been put on rugged construction, good climbing ability in thermals and good natured handling characteristics. Flight tests carried out by clubs have confirmed that these objectives have been met.

Entwickelt für den Gebrauch in Klubs, mit dem Zweck, ein einfaches, robustes Segelflugzeug mit guten Flugeigenschaften zu schaffen. Abgeleitet vom K-6, aber vereinfacht für den Selbstbau. Es wurde auf feste Bauweise, guten Steigflug in Thermik und gutmütige Flugeigenschaften Wert gelegt. Die von Klubs durchgeführten Flugerprobungen zeigten, daß dieses Ziel erreicht wurde.

Planeur développé pour l'emploi dans les clubs, simple, robuste et avec de bonnes caractéristiques de vol. Dérivé du K-6, mais simplifié pour la construction amateur. On a cherché d'obtenir une construction robuste, de bonnes performances de montée dans la thermique et des caractéristiques de vol rassurantes. Des vols d'épreuve dans des clubs ont montré que ce but a été atteint.



| | |
|---|---|
| Type designation | K-8 B |
| Country of design | German Federal Republic |
| Designer | Ing. Rudolf Kaiser |
| Date of first flight of prototype | November 1957 |
| Number produced | 90 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 14,15 $m^2$ |
| Aspect ratio ($b^2/s$) | 15,9 |
| Wing root chord ($C_r$) | 1,3 m |

| | |
|---|---|
| Wing tip chord ($C_t$) | 0,5 m |
| Mean chord ($C = {}^{s}/_{b}$) | 0,943 m |
| Wing section, root | Gö 533 16,7% |
| Wing section, mid | Gö 533 |
| Wing section, tip | Gö 532 |
| Dihedral | 3° |
| ¼ chord sweep | —1,8° |
| Aero. twist root/tip | 4° |
| Taper ratio ($C_t/C_r$) | 0,382 |
| Construction | Wood. Single spar. Ply covered, 30 cm spaced wooden ribs. Fabric covering over rear 65%. |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 4,8 m |
| Area (total) | 1,08 m² |
| Mean chord | 0,225 m |
| Max. deflection up | 30° |
| Max. deflection down | 12,5° |
| Mass balance degree | Nil |
| Construction | Ply covered wood |

**Horizontal tail**

| | |
|---|---|
| Span | 2,8 m |
| Area of elevator and fixed tail (S′) | 1,95 m² |
| Area of elevator | 0,95 m² |
| Max. deflection up | 20° |
| Max. deflection down | 20° |
| Aerofoil section | Symmetrical |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,9 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,568 |
| Construction | Ply covered wood |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,4 m² |
| Area of rudder | 0,76 m² |
| Aspect ratio | 1,61 |
| Tail arm | 4,2 m |
| Max. deflection | 30° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Structure | Ply covered wood |

**Fuselage**

| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 1,05 m |
| Overall length | 7,0 m |
| Max. cross section | 0,45 m² |
| Wetted surface area | 10,5 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel. Fixed rubber mounted skid |
| Structure | Fabric covered steel tube. Fibre glass nose cap. Rear opening blown plexiglass canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2,0 m |
| Area (total) | 0,68 m² |
| Location, % of chord | 39 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 110 kg |
| Fuselage[2] | 72 kg |
| Tailplane and elevator | 7,2 kg |
| Empty weight[3] | 189,2 kg |
| Instruments | 1,8 kg |
| Other equipment (e.g. oxygen, radio) | Nil |
| Equipped weight | 191 kg |
| Flying weight | 310 kg |
| Wing loading | 21,8 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | German B.V.S. |
| Date of issue of these requirements | 1939 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 114 | 4 |
| Point B | 219 | 4 |
| Point C | 151 | —2 |
| Point D | 239 | 0 |
| Factor of safety | | 2,0 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airsped gusty conditions | 130 km/h |
| Aero-towing speed | 130 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 24% to 40% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 207 km/h |

**Straight flight performance**

Measured
at flying weight of 280 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 60 | 0,67 |
| Max. L/D condition | 73 | 0,75 |
| | 90 | 1,05 |
| | 105 | 1,50 |
| | 120 | 2,05 |
| Stalling speed | 55 km/h | |
| Max. L/D | 27 | |

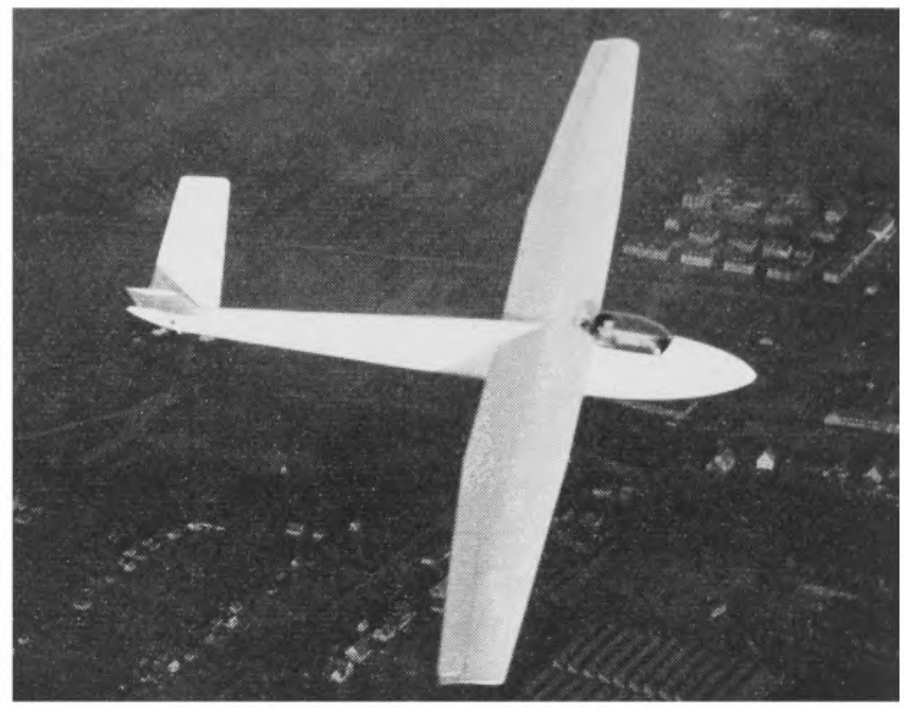
[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

# SB-5

This sailplane is designed to standard class limitations making use of modern constructional techniques to give an aerodynamically smooth surface to the wing and butterfly tail to simplify and clean up the tail unit design.

Dieses Segelflugzeug ist gemäß den Vorschriften für die Standard-Klasse gebaut. Es wurden moderne Konstruktionsgrundsätze angewandt, um eine aerodynamisch einwandfreie Oberfläche auf Flügel und V-Leitwerk zu erzielen, und um die Konstruktion der Leitwerkspartie zu vereinfachen und sauber zu gestalten.

Ce planeur est prévu pour satisfaire aux prescriptions de la classe standard. On a fait usage de techniques modernes de construction pour donner à l'aile une surface aérodynamiquement lisse, afin de simplifier et d'épurer le dessin de l'empennage à queue de papillon.



| | |
|---|---|
| Type designation | SB-5 |
| Country of design | German Federal Republic |
| Designer | Akaflieg Braunschweig |
| Date of first flight of prototype | 3 June 1959 |
| Number produced | 2 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 13 m² |
| Aspect ratio ($b^2/s$) | 17,3 |
| Wing root chord ($C_r$) | 1,00 m |
| Wing tip chord ($C_t$) | 0,56 m |
| Mean chord ($C = s/b$) | 0,87 |
| Wing section, root | NACA $63_3$–618 |
| Wing section, mid | NACA $63_3$–618 |
| Wing section, tip | NACA $63_3$–618 |
| Dihedral | 2,5° |
| ¼ chord sweep | Nil |
| Aero. twist root/tip | Nil |
| Taper ratio ($C_t/C_r$) | 0,56 |
| Construction | Single spar, wood, with ribs at 90 mm spacing. Ply nose covered with thick epoxy resin; fabric over rear 50%. |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 5,4 m |
| Area (total) | 1,36 m² |
| Mean chord | 0,25 m |
| Max. deflection up | 24° |
| Max. deflection down | 10° |
| Mass balance degree | Nil |
| Mass balance method | Nil |
| Construction | Wood, resin covered ply over ribs at 80 mm spacing |

**Horizontal tail**

| | |
|---|---|
| Span | V-tail, 35° dihedral 2,8 m (horiz. projection) |
| Area of elevator and fixed tail (S') | 1,7 m² (horiz. projection) |
| Area of elevator | 0,7 m² (horiz. projection) |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 64-009 |
| Mass balance degree | Nil |
| Mass balance method | Nil |
| Tail arm (from ¼ (1') chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,962 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S' 1'/SC) | 0,595 |
| Construction | Wood, rib spacing 75 mm. Resin covered ply on fixed surface, fabric elevator |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,2 m² (Vert. projection) |
| Area of rudder | 0,5 m² |
| Tail arm | 3,962 m |
| Max. deflection | 32° with elevator free |
| Aerofoil section | NACA 64-009 |
| Mass balance degree | Nil |
| Mass balance type | Nil |
| Aerodynamic balance | Nil |
| Structure | (See horizontal tail) |

**Fuselage**

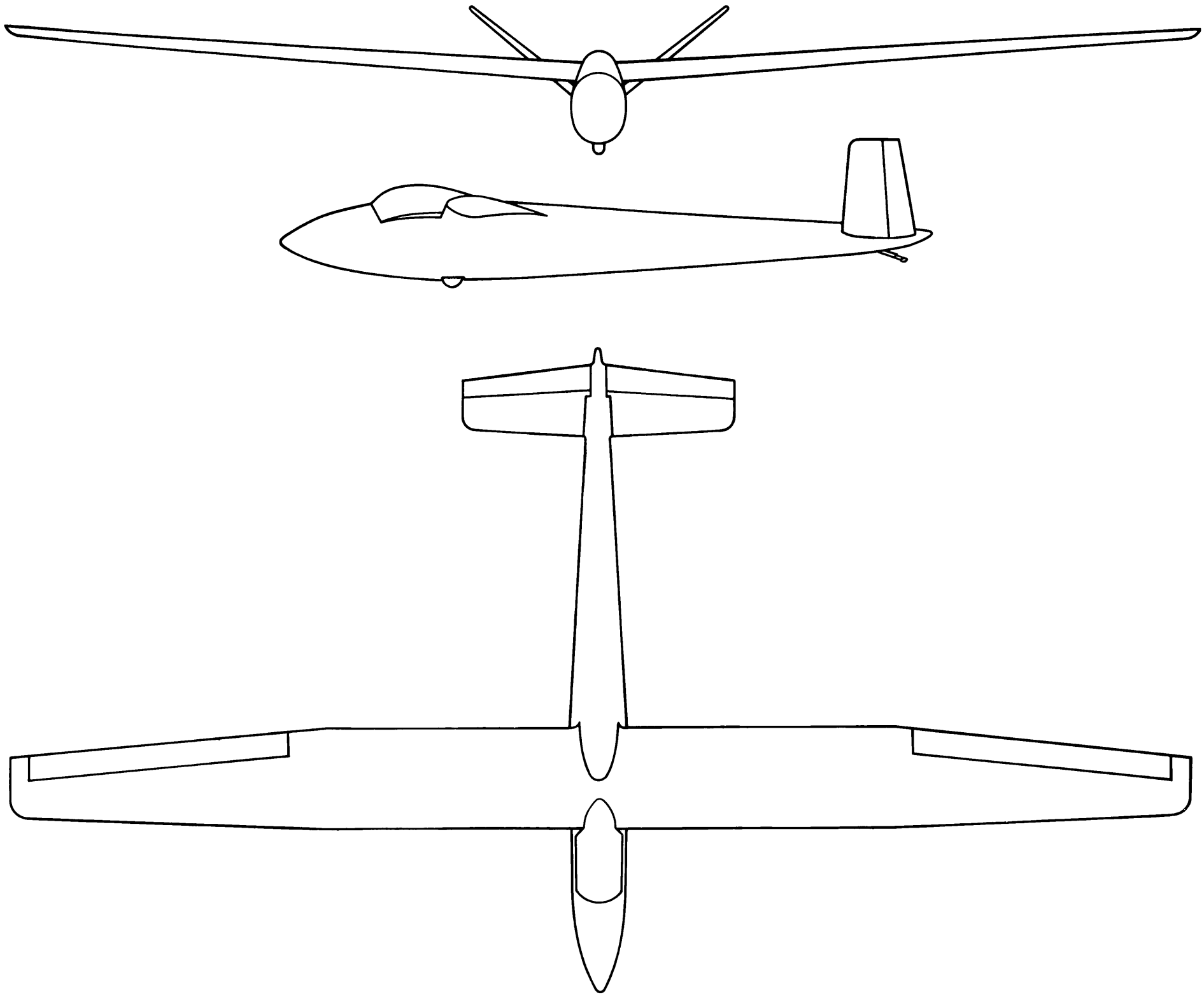
| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 0,98 m |
| Overall length | 6,5 m |
| Max. cross section | 0,45 m² |
| Wetted surface area | 9,5 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed spring wheel, with brake. |
| Structure | Ply monocoque on frame and stringer. Ply, balsa, fibreglass nose cap. Removable blower. Plexiglass canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Tail parachute |



| | |
|---|---|
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 122 kg |
| Fuselage | 69 kg |
| Tailplane and elevator | 12 kg |
| Empty weight[2] | 203 kg |
| Instruments | (included in fuselage weight) |
| Flying weight | 300 kg |
| Wing Loading | 23,1 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Bauvorschriften für Segelflugzeuge |

**Design flight envelope**

| | V km/h | Proof load factor |
|---|---|---|
| *Manoeuvre loads* | | |
| Point B | 200 | 5 |
| Factor of safety | | 2,0 |

[1] With struts, controls, flaps and brakes
[2] To include any fixed ballast

| | V km/h | v m/s |
|---|---|---|
| *Gust loads* | | |
| Point B | 140 | 10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 110 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Not tested, but suitable |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 20–45 |

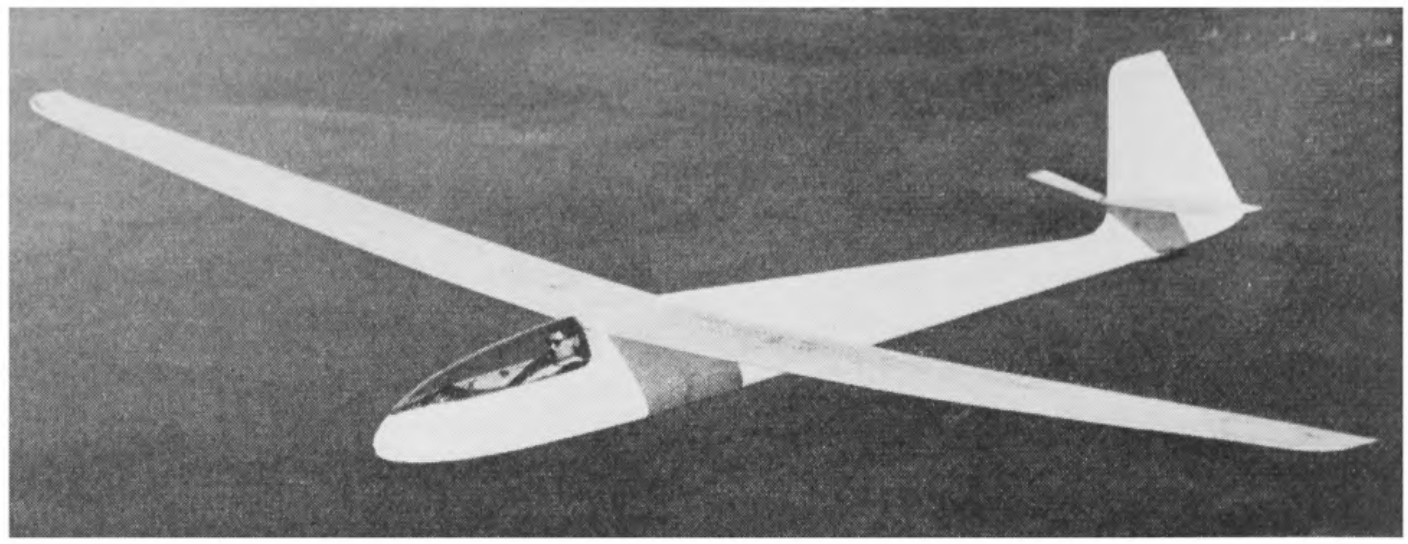
**Straight flight performance** calculated

at flying weight of 300 kg

**No flap or brake**

| | V km/h | V sink m/s |
|---|---|---|
| Min. sink condition | 66 | 0,63 |
| Max. L/D condition | 77 | 0,66 |
| | 100 | 1,00 |
| | 165 | 3,5 |
| Stalling speed | 52 km/h | |
| Flap deflection | 0° | |
| Max. L/D | 32,5 | |

# SB-6



This high performance single-seater uses balsa wood and fibreglass widely in its structure, and an Eppler wing section of laminar flow type. It is an experimental machine, and an extremely high performance is claimed.

Dieser Hochleistungseinsitzer verwendet bei der Konstruktion weitgehend Balsaholz und Fiberglas und weist ein Laminar-Flügelprofil, Typ Eppler, auf. Es handelt sich um eine Versuchsmaschine, welche äußerst gute Leistungen vollbringen soll.

Ce monoplace de haute performance est construit avant tout en bois balsa et fibre de verre; il a une section alaire laminaire du type Eppler. Il s'agit d'un planeur expérimental qui semble atteindre des performances extrêmement bonnes.

| | |
|---|---|
| Type designation | SB-6 |
| Country of design | German Federal Republic |
| Designers | B. Stender, O. Heise |
| Date of first flight of prototype | 2 February, 1961 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 18,0 m |
| Area (s) | 13,0 m² |
| Aspect ratio ($b^2/s$) | 25 |
| Wing root chord ($C_r$) | 0,9 m |
| Wing tip chord ($C_t$) | 0,48 m |
| Mean chord ($C = {}^s/_b$) | 0,72 m |
| Wing section, root | Eppler STE 871–514 |
| Wing section, mid | Eppler STE 871–514 |
| Wing section, tip | Eppler STE 871–514 |
| Dihedral | 1,5° |
| ¼ chord sweep | 0,6° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,53 |
| Construction | Balsa/Fibreglass spar. Balsa/Fibreglass sandwich covering. 8 cm rib spacing |

**Ailerons**

| | |
|---|---|
| Type | Lower surface hinge |
| Span (total) | 2×2,5 m |
| Area (total) | 2×0,3 m² |
| Mean chord | 0,12 m |
| Max. deflection up | 22° |
| Max. deflection down | 22° |
| Mass balance degree | Nil |
| Construction | Balsa/Fibreglass |

**Horizontal tail**

| | |
|---|---|
| Span | 2,6 m |
| Area of elevator and fixed tail (S′) | 1,2 m² (all moving tail) |
| Area of elevator | 1,2 m² |
| Max. deflection up | 4° |
| Max. deflection down | 10° |
| Aerofoil section | Eppler EA 8(–1)–009 |
| Mass balance degree | 50% |
| Mass balance method | Set back hinge |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,47 m |
| Elevator aerodynamic balance method | Set back hinge |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S′1′/SC) | 0,573 |
| Construction | Balsa/Fibreglass |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,27 m² |
| Area of rudder | 0,51 m² |
| Aspect ratio | 1,71 |
| Tail arm | 4,51 m |
| Max. deflection | 35° |
| Aerofoil section | Eppler EA 6 (–1)–012 |
| Aerodynamic balance | Nil |
| Construction | Balsa/Fibreglass |

**Fuselage**

| | |
|---|---|
| Max. width | 0,56 m |
| Max. height (at cockpit) | 0,84 m |
| Overall length | 7,5 m |
| Max. cross section | 0,39 m² |
| Wetted surface area | 1,1 m² |
| Number of seats/arrangement | 1 |
| Undercarriage type | Retractable unsprung wheel with brakes. No skid |
| Construction | Balsa/Fibreglass. Detachable blown plexiglass canopy |

**Lift increasing devices**

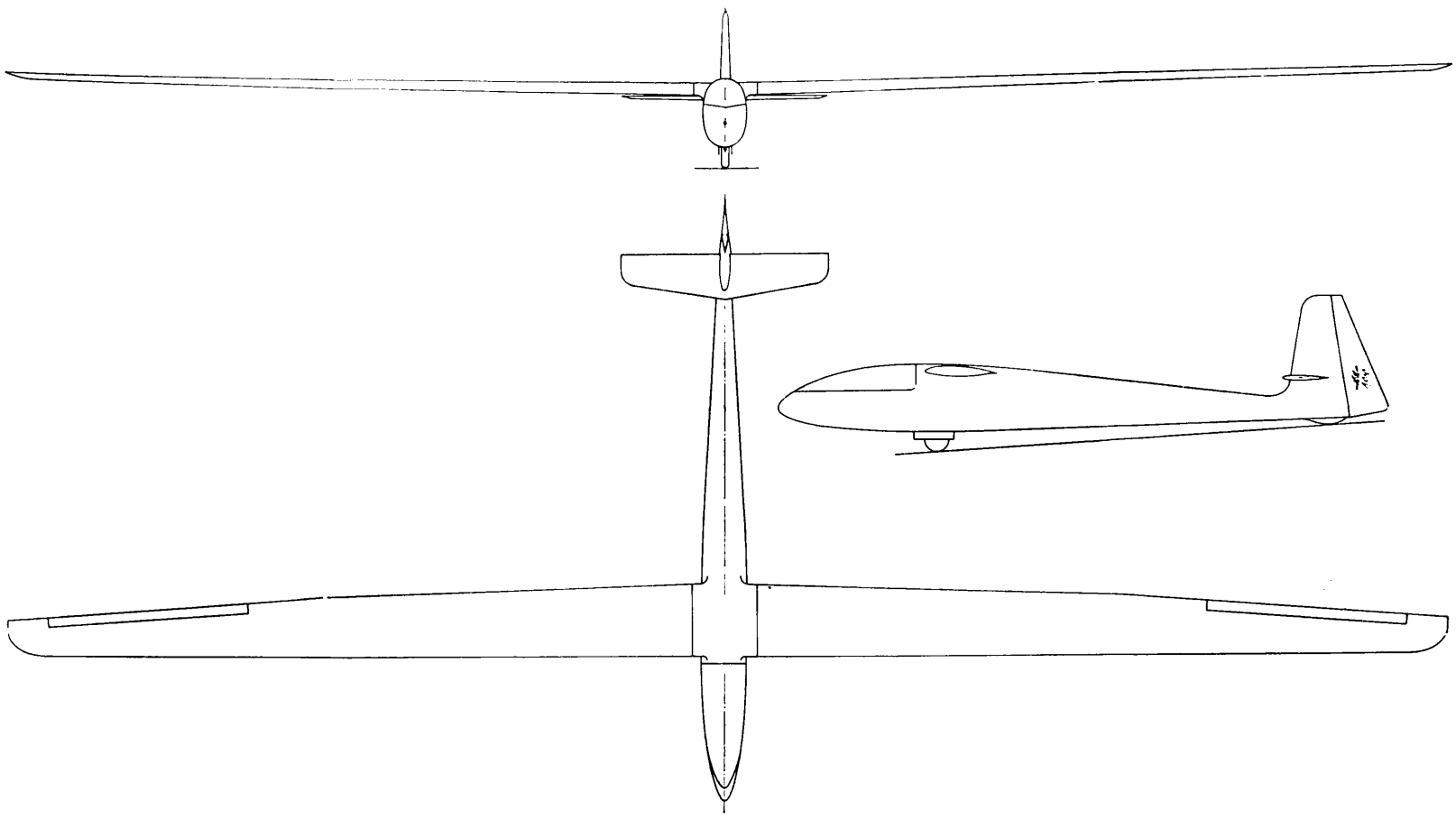
| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Ribbon brake parachute |
| Span (total) | 1,3 m diameter |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 140,2 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 90 kg |
| Tailplane and elevator | 5,8 kg |
| Empty weight (including any fixed ballast) | 243 kg |
| Instruments | 7 kg |



| | |
|---|---|
| Other equipment (e.g. oxygen, radio) . . | 8 kg radio |
| Flying weight . . . . . | 350 kg |
| Wing loading . . . . . | 27 kg/m² |

**Straight flight performance**

Calculated
at flying weight of . . . . . 320 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition . . . . . | 85 | 0,55 |
| Max. L/D condition . . . . . | 85 | 0,55 |
| | 87 | 0,57 |
| | 102 | 0,77 |
| | 116 | 1,02 |

| | |
|---|---|
| Stalling speed . . . . . | 58 km/h |
| Max. L/D . . . . . | 43 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built . . . . . | BVS |
| Certificate of airworthiness . . . . . | No |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A . . . . . | 135 | 5 |
| Point B . . . . . | 265 | 5 |
| Factor of safety . . . . . | | 2 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point B . . . . . | 200 | 10 |
| Point C . . . . . | 200 | –10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions . . . | 200 km/h |
| Placard airspeed gusty conditions . . . . | 200 km/h |
| Aero-towing speed . . . . . | 130 km/h |
| Winch launching speed . . . . . | 110 km/h |
| Cloud flying permitted? . . . . . | No |
| Permitted aerobatic manoeuvres . . . . | None |
| Spinning permitted? . . . . . | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) . . . . | 20 to 45 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) . . . . . | Not yet tested |

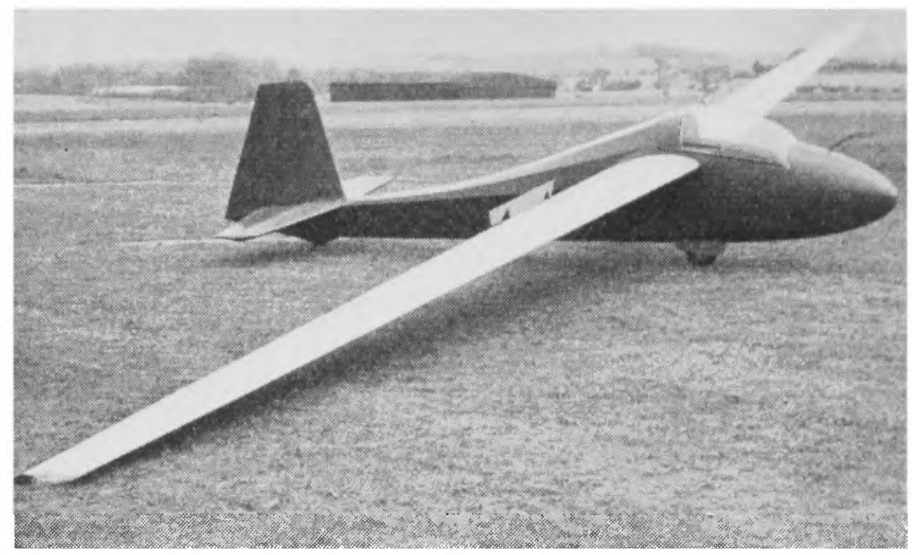
# Great Britain

# TYPE 460 STANDARD EON SERIES 1

A high performance Standard Class sailplane. The wing is aerodynamically similar to that of the type 419 but scaled down to 15 m span. Structure has been redesigned to save weight; light alloy spar booms and compact root fittings are important in this respect. Apart from the nose section ahead of the seat, the fuselage has also been redesigned, with saving in weight.

Hochleistungs-Segelflugzeug der Standard-Klasse. Aerodynamisch ähnlicher Flügel wie beim Typ 419, aber maßstäblich verkleinert auf 15 m Spannweite. Konstruktiv erneuert zwecks Gewichtsersparnis; dabei spielen Gurten am Holmsteg aus Leichtmetall-Legierung und kompakte Befestigung der Flügelwurzel eine wichtige Rolle. Neben dem Profil der Rumpfnase vor dem Sitz wurde auch der Rumpf neu konstruiert und dadurch das Gewicht verkleinert.

Planeur de performance de la classe standard. Caractéristiques aérodynamiques de l'aile ressemblant à celles du type 419, mais réduites à une envergure de 15 m. Reconstruction de la structure pour réduire le poids; une membrure de longeron en alliage léger et une fixation compacte de l'aile près du fuselage sont importantes à cet égard. A part le profil de la section du fuselage avant le siège, le fuselage a été reconstruit. Il en résulte une réduction du poids.



| | |
|---|---|
| Type designation | Type 460 Standard EON Series 1 |
| Country of design | Great Britain |
| Designer | Aviation and Engineering Projects Ltd. |
| Date of first flight of prototype | April 1960 |
| Number produced | 3 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 11,15 m² |
| Aspect ratio ($b^2/s$) | 20,2 |
| Wing root chord ($C_r$) | 1,093 m |
| Wing tip chord ($C_t$) | 0,375 m |
| Mean chord ($C = s/b$) | 0,735 m |
| Wing section, root | NACA $64_3618$ |
| Wing section, tip | NACA $64_4421$ |
| Dihedral | 3° |
| ¼ chord sweep | — 0,25° |
| Aero. twist root/tip | 2,2° |
| Taper ratio ($C_t/C_r$) | 0,343 |
| Construction | Light alloy/wood reduxed main spar. Ribs 13 cm spacing. Birch ply covering to rear spar. |

**Ailerons**

| | |
|---|---|
| Type | Frise |
| Span (total) | 7,47 m |
| Area (total) | 1,23 m² |
| Mean chord | 0,165 m |
| Max. deflection up | 28° |
| Max. deflection down | 13° |
| Mass balance degree | Nil |
| Construction | Wood. Ply nose with spruce. Frise beak. Fabric covered. |

**Horizontal tail**

| | |
|---|---|
| Span | 2,54 m |
| Area of elevator and fixed tail (S′) | 1,547 m² |
| Area of elevator | 0,557 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA $64_2015$ |
| Mass balance degree | 80% |
| Mass balance method | Weight on control lever |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,50 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,64 |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,208 m² |
| Area of rudder | 0,743 m² |
| Aspect ratio | 1,5 |
| Tail arm | 3,581 m |
| Max. deflection | 28° |
| Aerofoil section | NACA $64_1012$ |
| Mass balance degree | Nil |
| Aerodynamic balance | Nil |

**Fuselage**

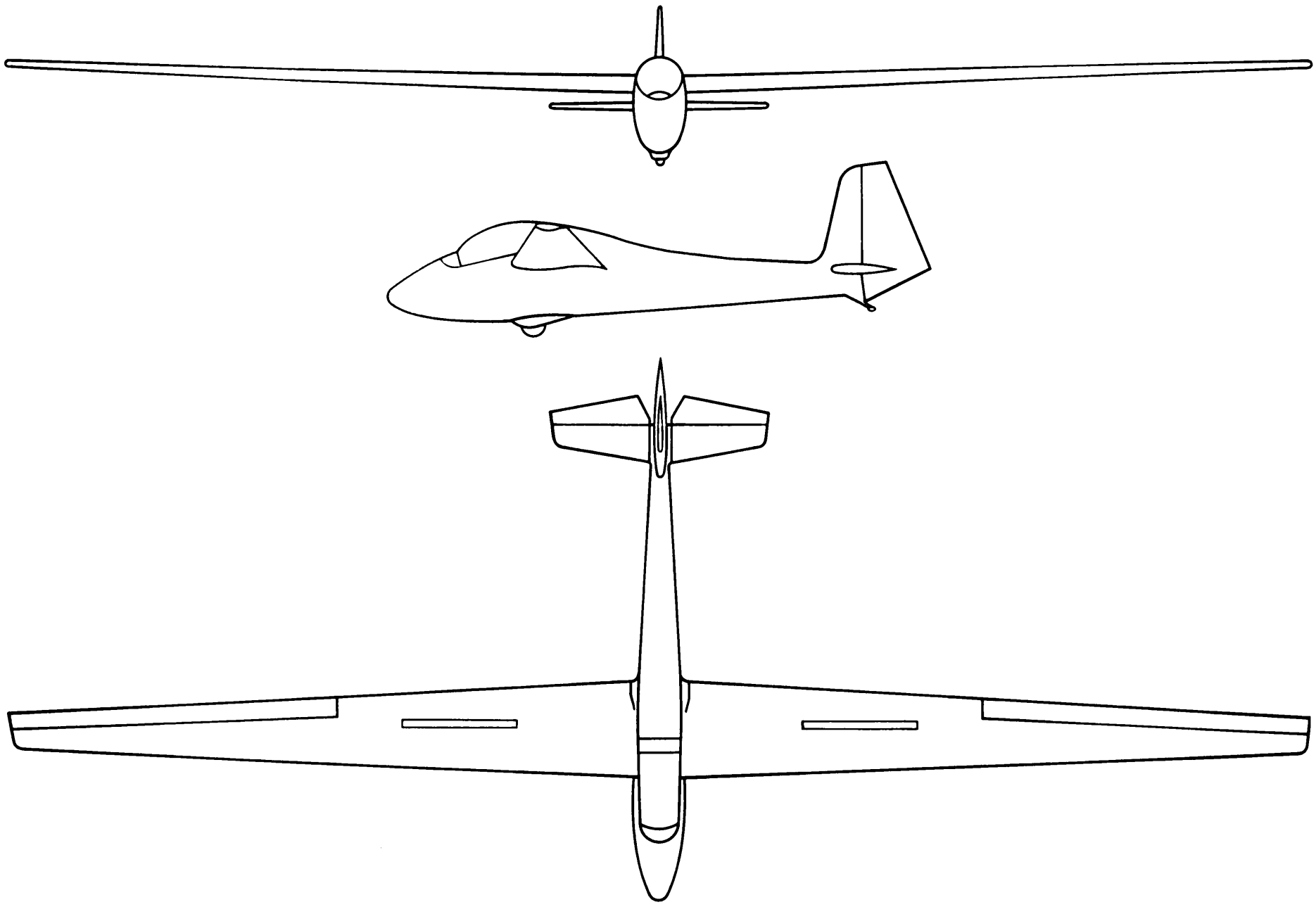
| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 1,27 m |
| Overall length | 6,25 m |
| Max. cross section | 0,58 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed wheel ahead of C.G. No skid. |
| Structure | Warren girder sides aft of rear spar frame. Fabric/stringer top fairing, fabric sides. Ply nose, aluminium nose cap. Blown perspex canopy, side hinged. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | D.F.S. |
| Span (total) | 2,236 m |



| | |
|---|---|
| Area (total) | 0,465 m² |
| % of span | 30 |
| Location, % of chord | 60 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 82 kg |
| Fuselage[2] | 77 kg |
| Tailplane and elevator | |
| Empty weight[3] | 159 kg |
| Instruments | 5 kg |
| Equipped weight | 164 kg |
| Flying weight | 272 kg |
| Wing loading | 24,4 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | B.C.A.R. |
| Date of issue of these requirements | 1960 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor n |
|---|---|---|
| Point A | 142 | 5 |
| Point B | 228 | 4 |
| Point C | 228 | 0 |
| Point D | 126 | — 2,5 |
| Factor of safety | | 1,5 |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

| *Gust loads* | V km/h | Gust vel. v m/s |
|---|---|---|
| Point A | 142 | + 20,1 |
| Point D | 142 | — 20,1 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 216 km/h |
| Placard airspeed gusty conditions | 144 km/h |
| Aero-towing speed | 154 km/h |
| Winch launching speed | 122 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Rolls, loops, inverted flight |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a. c. | 28% to 42% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 190 km/h |

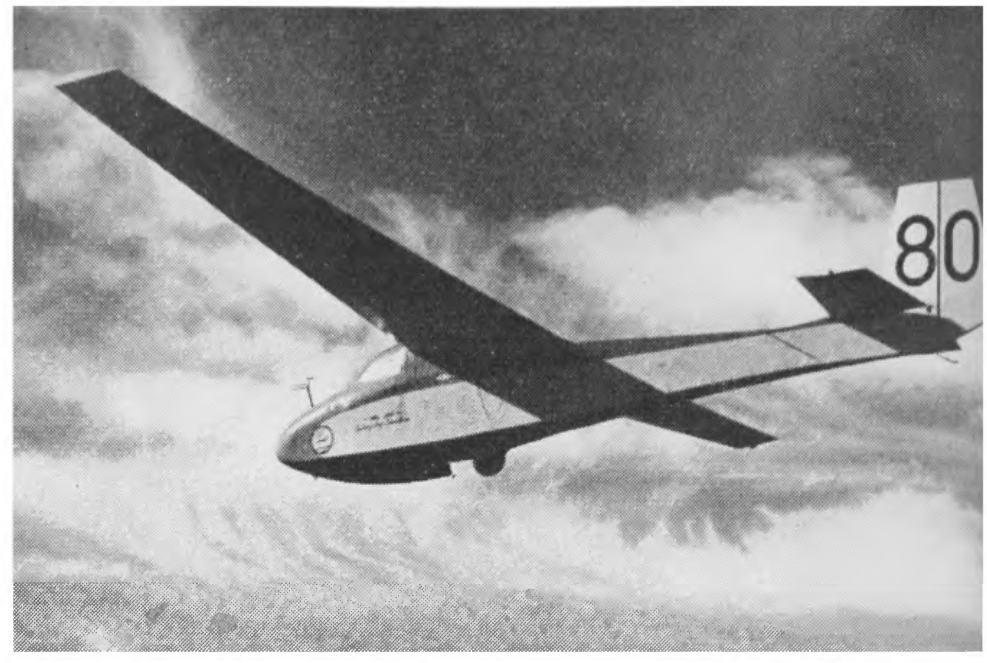
**Straight flight performance**

Calculated
at flying weight of 263 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 70 | 0,61 |
| Max. L/D condition | 74 | 0,64 |
| | 93 | 0,91 |
| | 111 | 1,35 |
| | 130 | 1,89 |
| Stalling speed | 61 km/h | |
| Max. L/D | 32 | |

# SLINGSBY SWALLOW




The design is intended to meet the need for a small sailplane with good performance. Low drag wing and generally clean design has been achieved. The wing leading edge is covered with thick low density plywood to maintain a smooth surface.

Zweck dieser Konstruktion war die Schaffung eines kleinen Segelflugzeuges mit guten Leistungen. Dabei wurde ein Flügel mit geringem Widerstand und eine im allgemeinen saubere Konstruktion erreicht. Die Flügeleintrittskante ist mit dikkem Sperrholz geringer Dichte bedeckt, um eine glatte Oberfläche zu gewährleisten.

Construit pour créér un petit planeur avec de bonnes performances. On a obtenu une aile avec un freinage aérodynamique réduit et une construction généralement propre. Le bord d'attaque de l'aile est couvert de contreplaqué de petite densité, afin d'obtenir une surface lisse.

| | |
|---|---|
| Type designation | Slingsby Swallow |
| Country of design | Great Britain |
| Designer | Slingsby Sailplanes Ltd. |
| Date of first flight of prototype | October 1957 |
| Number produced | 13 |

**Wings**

| | |
|---|---|
| Span (b) | 13,05 m |
| Area (s) | 13,55 $m^2$ |
| Aspect ratio ($b^2/s$) | 12,6 |
| Wing root chord ($C_r$) | 1,52 m |
| Wing tip chord ($C_t$) | 0,51 m |
| Mean chord ($C = s/b$) | 1,04 m |
| Wing section, root | NACA $63_3618$ |
| Wing section, tip | NACA 4412 (mod.) |
| Dihedral | 3,3° |
| ¼ chord sweep | 1,0° |
| Aero. twist root/tip | 7,0° |
| Taper ratio ($C_t/C_r$) | 0,335 |
| Construction | Single spar wood construction. Leading edge torsion box of thick low density plywood. |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 5,9 m |
| Area (total) | 1,46 $m^2$ |
| Mean chord | 0,25 m |
| Max. deflection up | 24,4° |
| Max. deflection down | 12,0° |
| Mass balance degree | Nil |
| Construction | Wood. Ply and fabric covered. Ribs 0,3 m spacing. |

**Horizontal tail**

| | |
|---|---|
| Span | 2,38 m |
| Area of elevator and fixed tail (S') | 2,16 $m^2$ |
| Area of elevator | 1,00 $m^2$ |
| Max. deflection up | 14,0° |
| Max. deflection down | 22,0° |
| Aerofoil section | Symmetrical |
| Mass balance degree | 42% |
| Mass balance method | Bob weight in fuselage. |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,69 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S' 1'/SC) | 0,564 |
| Construction | Wood. Ply covered tailplane. Fabric covered elevator. Ribs 0,2 m spacing. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,41 $m^2$ |
| Area of rudder | 0,70 $m^2$ |
| Aspect ratio | 1,30 |
| Tail arm | 4,01 m |
| Max. deflection | 25,1° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Structure | Wood. Ply covered fin, fabric covered rudder. Ribs 0,2 m spacing. |

**Fuselage**

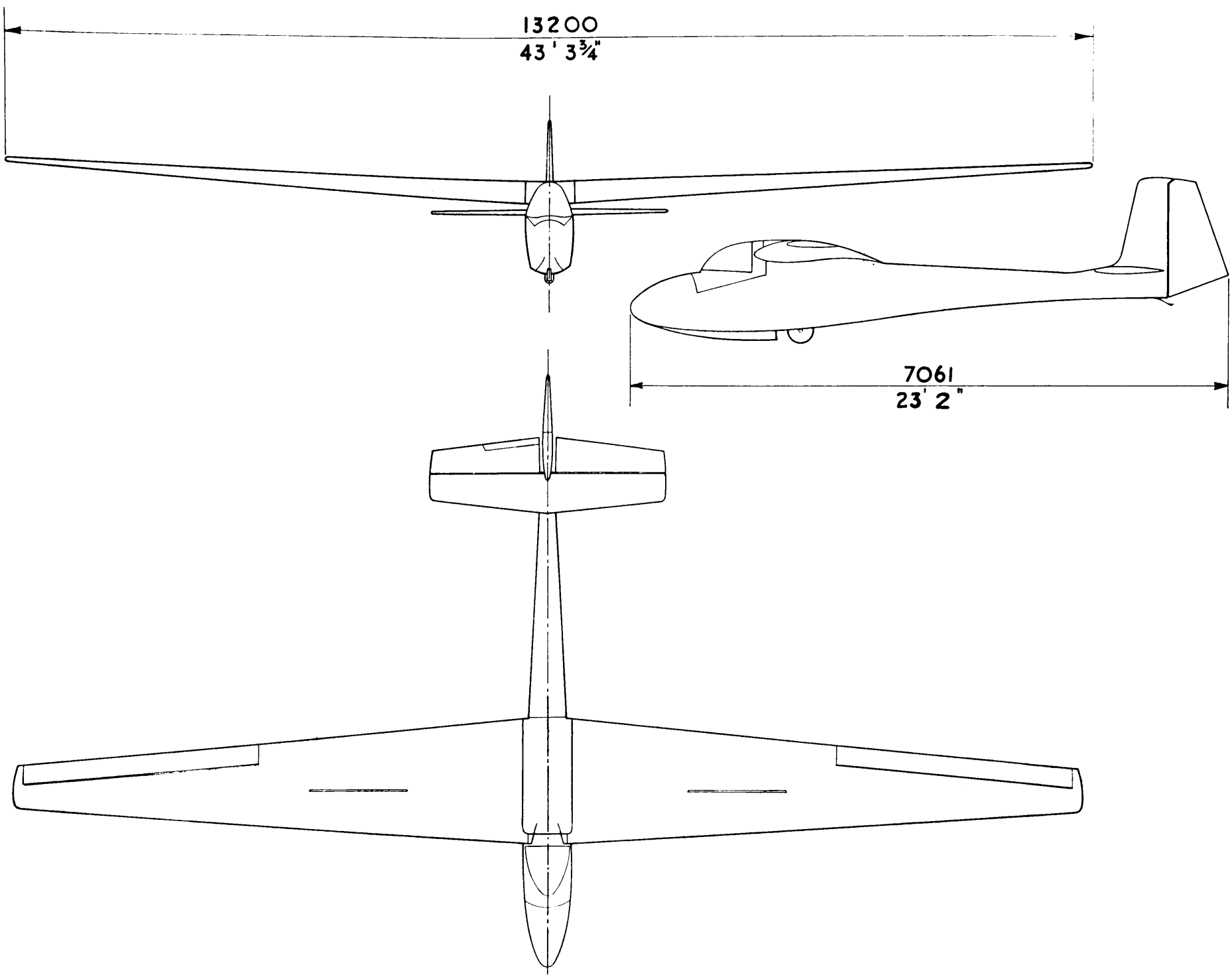
| | |
|---|---|
| Max. width | 0,622 m |
| Max. height (at cockpit) | 1,25 m |
| Overall length | 7,04 m |
| Max. cross section | 0,558 $m^2$ |
| Wetted surface area | 12,91 $m^2$ |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel and rubber mounted skid. No brakes. |
| Structure | Frame and stringer. Warren girder sides, fabric covered. Fibre glass nose cap. Blown perspex canopy, removable. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap. |
| Span (total) | 1,994 m |
| Area (total) | 0,395 $m^2$ |
| Location, % of chord | 41,5 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |




**Weights**

| | |
|---|---|
| Wings[1] | 96,6 kg |
| Fuselage[2] | 85,3 kg |
| Tailplane and elevator | 10,4 kg |
| Empty weight[3] | 192,3 kg |
| Instruments | 3,2 kg |
| Equipped weight | 195,5 kg |
| Flying weight | 317,5 kg |
| Wing loading | 23,4 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | B.C.A.R. |
| Date of issue of these requirements | 1957 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor n |
|---|---|---|
| Point A | 140 | 5 |
| Point B | 252 | 4 |
| Point C | 252 | 0 |
| Point D | 113 | — 2,5 |
| Factor of safety | | 1,5 |

| *Gust loads* | V km/h | Gust vel. v m/s |
|---|---|---|
| Point A | 140 | 20 |
| Point D | 140 | 20 |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

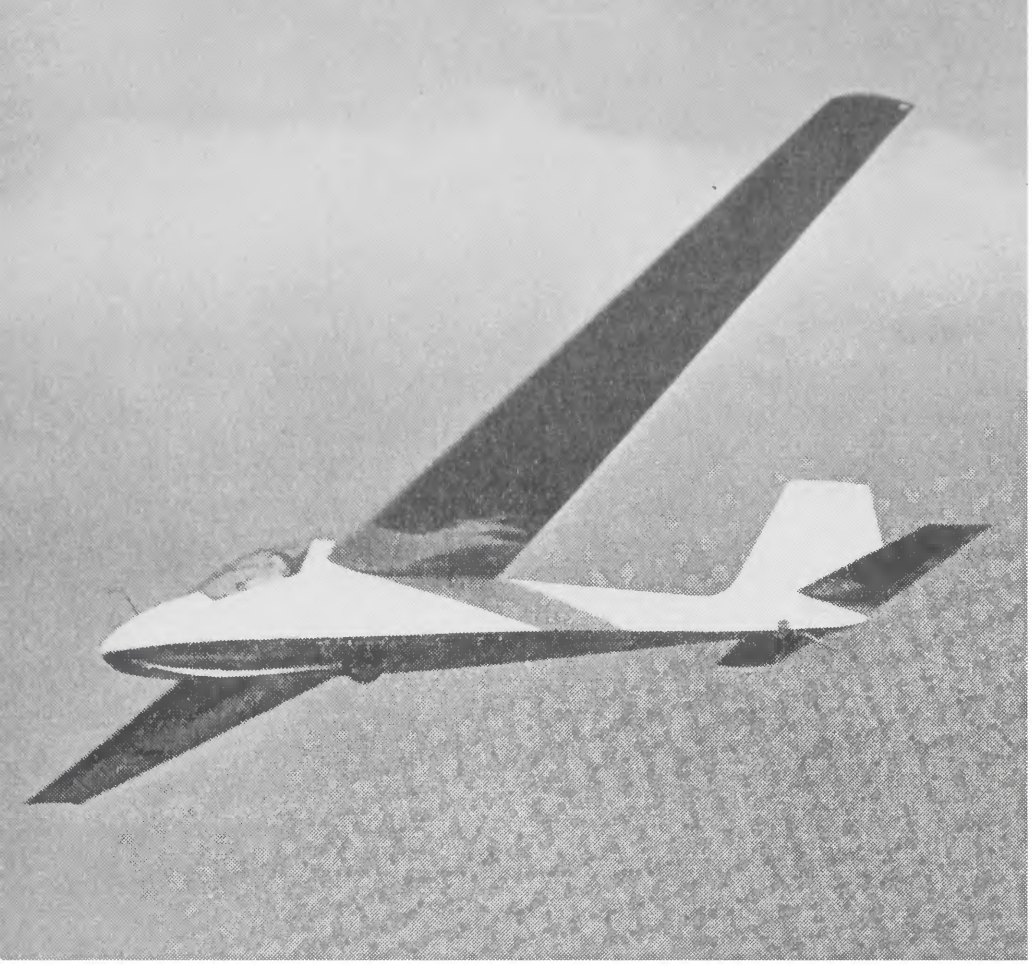
**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 227 km/h |
| Placard airspeed gusty conditions | 139 km/h |
| Aero-towing speed | 139 km/h |
| Winch launching speed | 130 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Loop, stall turn |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 28% to 38% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 218 km/h |

**Straight flight performance**

Calculated
at flying weight of . . . . . 286 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 67 | 0,76 |
| Max. L/D condition | 79 | 0,84 |
| | 121 | 2,00 |
| Stalling speed | 62 km/h | |
| Max. L/D | 26 | |



# T48 CAPSTAN

A comprehensive two-seater designed for all stages of training and club or private flying. The performance is comparable with the more advanced Standard class single-seaters. Pilots trained to solo-standard on this machine should be capable of flying high performance single-seaters without intermediate styles of training.

The robust structure is intended to stand up to intensive utilisation in any climate. Large access panels are provided at all important parts in the airframe simplifying inspection and maintenance.

The large moulded canopy provides good all round visibility. The seat position and control columns are readily adjustable to suit any size of pilot. The wide c.c. range allows the machine to be flown solo or two-up.

Mehrzweck-Zweisitzer für alle Schulungsstufen und Gebrauch in Klubs oder privat. Leistungen ähnlich wie bei besseren Einsitzern der Standardklasse. Piloten mit Training auf dem einsitzig geflogenen T 49 sollten imstande sein, Hochleistungs-Einsitzer ohne zusätzliches Training zu beherrschen.

Die robuste Struktur ist für intensiven Einsatz in jedem Klima gedacht. Große abnehmbare Verkleidungsteile sind an allen Orten der Zelle angebracht, um Kontrolle und Unterhalt zu vereinfachen.

Die geräumige Haube des Pilotensitzes gewährt ausgezeichnete Sicht nach allen Seiten. Sitz und Steuersäulen können der Größe des Piloten angepaßt werden. Das Flugzeug kann ein- oder zweisitzig geflogen werden.

Biplace à buts multiples pour tout l'écolage, l'emploi dans les clubs ou par des privés. Les performances sont les mêmes que celles d'un monoplace Standard de bonne qualité. Un pilote ayant fait son entraînement sur le T 49 monoplace devrait être capable de maîtriser un monoplace de haute performance sans entraînement supplémentaire.

La structure robuste prédestine ce planeur à l'emploi intense dans tous les climats. La cellule est facilement accessible par le moyen de planches détachables, afin de faciliter le maintien et les contrôles.

Une bonne visibilité de tous les côtés est assurée. La position des sièges et des colonnes de contrôle peut être ajustée à la grandeur des pilotes. Ce planeur peut facilement être piloté solo ou avec un équipage de deux.

| | |
|---|---|
| Type designation | T 49 Capstan |
| Country of design | Great Britain |
| Designers | Slingsby Sailplanes, Ltd. |
| Date of first flight of prototype | 4 November, 1961 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 16,78 m |
| Area (s) | 20,43 $m^2$ |
| Aspect ratio ($b^2/s$) | 13,75 |
| Wing root chord ($C_r$) | 1,678 m |
| Wing tip chord ($C_t$) | 0,686 m |
| Mean chord ($C = s/b$) | 1,219 m |
| Wing section, root | NACA $63_3$ 620 |
| Wing section, tip | NACA 6412 |
| Dihedral | 3° |
| ¼ chord sweep | 1,1° |
| Aero. twist root/tip | 3° |
| Taper ratio ($C_t/C_r$) | 0,409 |
| Construction | Wooden single spar cantilever with leading edge torsion box. 60% fabric covered. Ribs spaced 0,33 m |

**Ailerons**

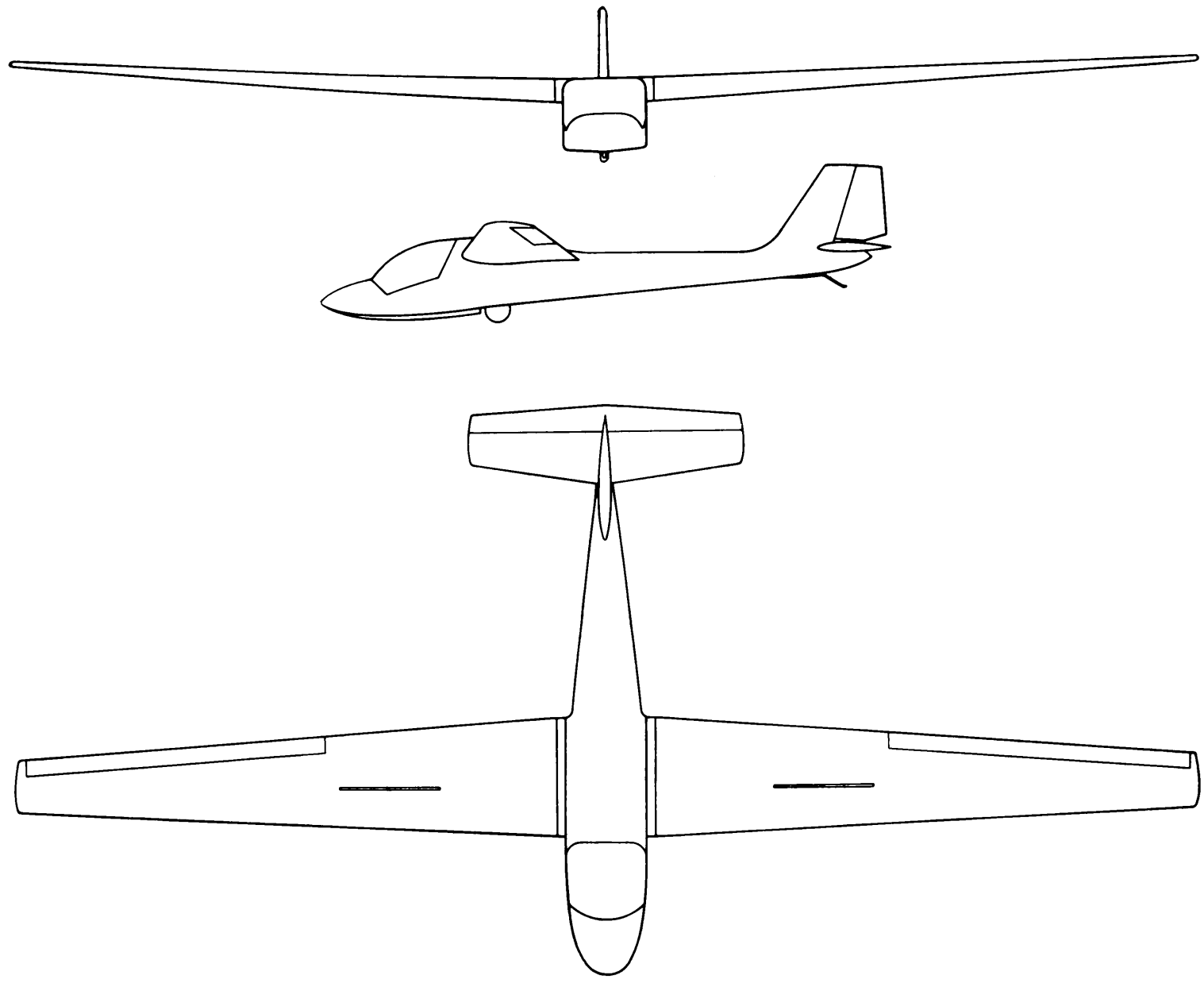
| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 3,66 m |
| Area (total) | 2 × 1,07 $m^2$ |
| Mean chord | 0,2925 m |
| Max. deflection up | 25° |
| Max. deflection down | 12,5° |
| Mass balance degree | 50% |
| Mass balance method | Single internal weight |
| Construction | Wood. Ply covered. Ribs spaced 0,1 m |

**Horizontal tail**

| | |
|---|---|
| Span | 3,81 m |
| Area of elevator and fixed tail (S′) | 3,51 $m^2$ |
| Area of elevator | 1,235 $m^2$ |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA $66_1$ 012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,97 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,705 |
| Construction | Wood. Ply covered. Ribs spaced 0,225 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,605 $m^2$ |
| Area of rudder | 0,556 $m^2$ |
| Aspect ratio | 1,26 |
| Tail arm | 4,57 m |
| Max. deflection | 30° |
| Aerofoil section | NACA 64009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Fabric and ply covered |



**Fuselage**

| | |
|---|---|
| Max. width | 1,22 m |
| Max. height (at cockpit) | 1,188 m |
| Overall length | 7,72 m |
| Max. cross section | 1,082 m² |
| Wetted surface area | 20,1 m² |
| Number seats/arrangement | 2 side by side |
| Undercarriage type | Fixed unsprung wheel and fixed rubber mounted skid |
| Construction | Frame and stringer, fabric covered. Fibre glass nose. Front opening moulded perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,438 m |
| Area | 2 × 0,296 m² |
| Location, % of chord | 40 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 164 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 162,2 kg |
| Tailplane and elevator | 19,2 kg |
| Empty weight (including any fixed ballast) | 345,4 kg |
| Instruments | 3,6 kg |
| Equipped weight | 349 kg |
| Flying weight | 567 kg |
| Wing loading | 27,7 kg/m² |

**Straight flight performance**

Calculated

at flying weight of 567 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 70 | 0,66 |
| Max. L/D condition | 76 | 0,69 |
| | 100 | 1,03 |
| | 120 | 1,57 |
| | 150 | 2,70 |
| Stalling speed | 60 km/h | |
| Max. L/D | 30 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR |
| Date of issue of these requirements | 16 May, 1961 |

**Design flight envelope**

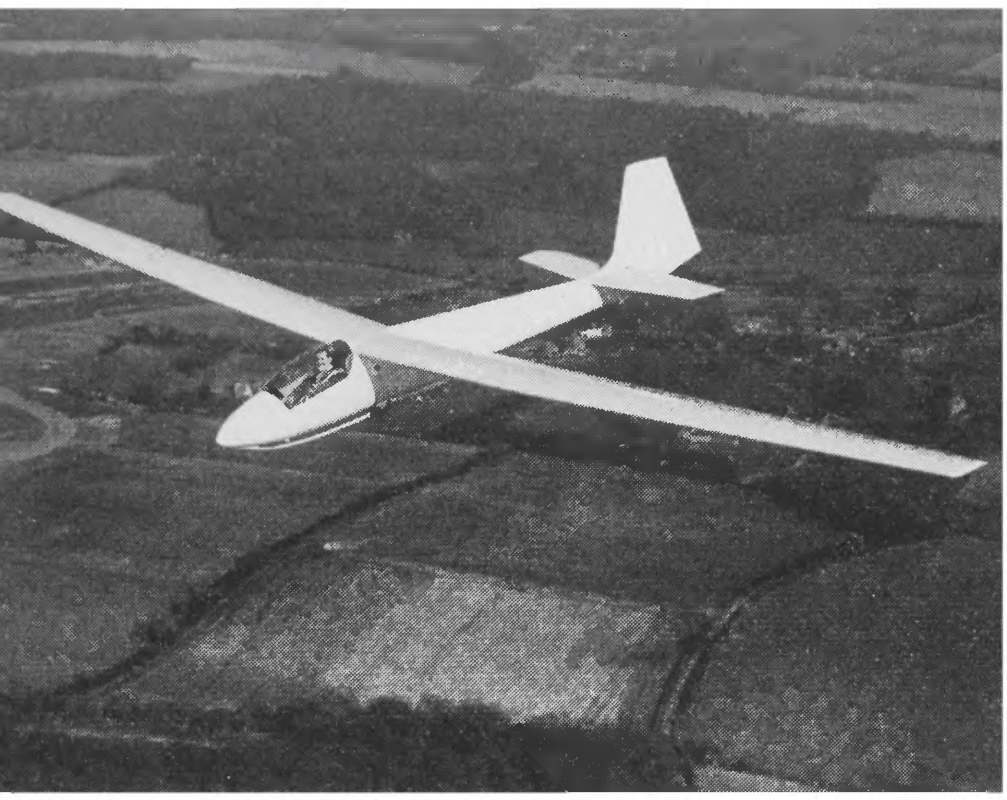
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 148,5 | 5 |
| Point B | 241 | 4 |
| Point C | 241 | 0 |
| Point D | 133,5 | 2,5 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A | 148,5 | +20,1 |
| Point D | 148,5 | —20,1 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 217 km/h |
| Placard airspeed gusty conditions | 148 km/h |
| Aero-towing speed | 148 km/h |
| Winch launching speed | 148 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | Not available |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not available |

# T50 SKYLARK 4



A development of the later versions of the Skylark 3, incorporating a new fuselage design and new outer wings and ailerons. The all-round performance is in advance of the Skylark 3 particularly at the high speed end of the range. The handling qualities are of a very high standard.

The canopy is made by a new process developed by the manufacturers and allows all-round visibility while preserving good aerodynamic shape.

Eine Entwicklung aus den späteren Ausführungen des Skylark 3 mit neuer Konstruktion des Rumpfes sowie neuen Außenflügeln und Querrudern. Die Leistungen gegenüber dem Skylark 3 sind namentlich im Gebiete des Schnellfluges wesentlich verbessert. Die guten Steuereigenschaften sind besonders bemerkenswert.

Die Haube des Pilotensitzes wurde mit einem durch den Hersteller entwickelten neuen Verfahren gebaut; sie erlaubt gute Sicht nach allen Seiten bei gleichzeitiger guter aerodynamischer Form.

Un développement des dernières versions du Skylark 3 avec une nouvelle construction du fuselage, ainsi que de nouvelles ailes extérieures et des ailerons. Les performances ont été sensiblement améliorées vis-à-vis du Skylark 3, en particulier pour le vol en vitesse. Les commandes sont maniables d'une façon excellente.

La capote a été faite avec un nouveau système développé par le fabricant; elle permet une bonne visibilité de tous les côtés, tout en gardant une bonne forme aérodynamique.

| | |
|---|---|
| Type designation | T 50 Skylark 4 |
| Country of design | Great Britain |
| Designers | Slingsby Sailplanes, Ltd. |
| Date of first flight of prototype | February, 1961 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 18,2 m |
| Area (s) | 16,1 m² |
| Aspect ratio ($b^2/s$) | 20,5 |
| Wing root chord ($C_r$) | 1,07 m |
| Wing tip chord ($C_t$) | 0,53 m |
| Mean chord ($C = {}^s/_b$) | 0,89 m |
| Wing section, root | NACA $63_3$ – 620 |
| Wing section, mid | NACA $63_3$ – 620 |
| Wing section, tip | NACA 6415 |
| Dihedral | 2° |
| ¼ chord sweep | 0,2° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,495 |
| Construction | Wooden single spar cantilever with leading edge torsion box. 50% fabric covered. Ribs spaced 0,315 m |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 2 × 5,08 m |
| Area (total) | 2 × 0,938 m² |
| Mean chord | 0,185 m |
| Max. deflection up | 25° |
| Max. deflection down | 11° |
| Mass balance degree | 50% |
| Mass balance method | Single internal weight |
| Construction | Wood. Ply covered. Ribs spaced 0,1 m |

**Horizontal tail**

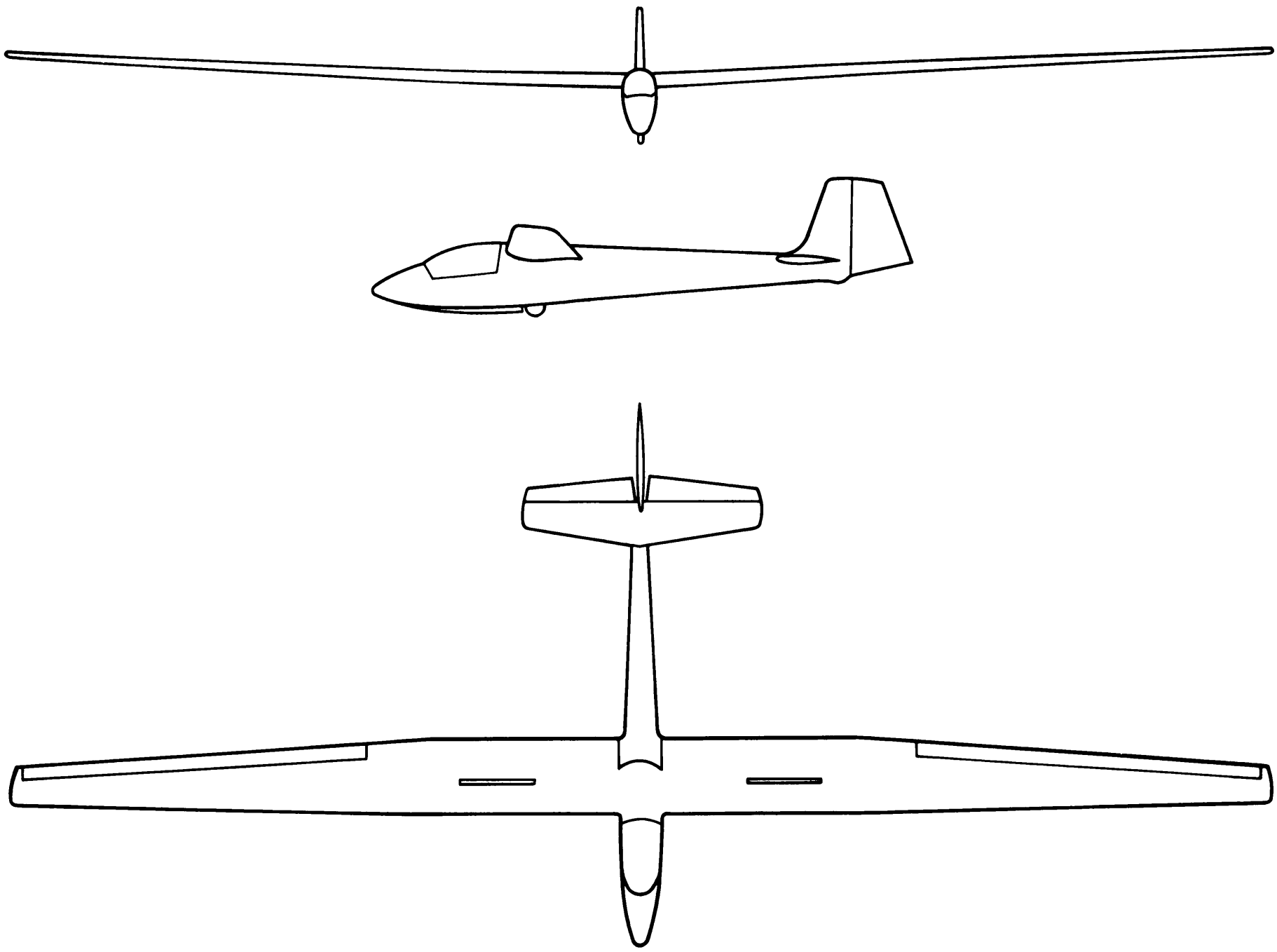
| | |
|---|---|
| Span | 3,26 m |
| Area of elevator and fixed tail (S′) | 2,56 m² |
| Area of elevator | 0,855 m² |
| Max. deflection up | 32° |
| Max. deflection down | 24° |
| Aerofoil section | NACA 0009 |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,94 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,712 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,20 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,762 m² |
| Area of rudder | 0,836 m² |
| Aspect ratio | 1,13 |
| Tail arm | 4,40 m |
| Max. deflection | 25° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Construction | Wood. Fabric and ply covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,62 m |
| Max. height (at cockpit) | 1,04 m |
| Overall length | 7,60 m |
| Max. cross section | 0,432 m² |
| Wetted surface area | 11,75 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Retractable or fixed wheel. Rubber mounted skid |
| Construction | Ply monocoque. Fibre glass nose. Side opening moulded perspex canopy |



**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,16 m |
| Area | 2 × 0,219 m² |
| Location, % of chord | 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 160 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 82 kg |
| Tailplane and elevator | 11 kg |
| Empty weight (including any fixed ballast) | 253 kg |
| Instruments | 3 kg |
| Equipped weight | 256 kg |
| Flying weight | 376 kg |
| Wing loading | 23,35 kg/m² |

**Straight flight performance**

Calculated
at flying weight of . . . . . 376 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 69 | 0,53 |
| Max. L/D condition | 76 | 0,58 |
| | 100 | 0,87 |
| | 130 | 1,50 |
| | 170 | 3,00 |

| | |
|---|---|
| Stalling speed | 60 km/h |
| Max. L/D | 36 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR |
| Date of issue of these requirements | 16 May, 1961 |

**Design flight envelope**

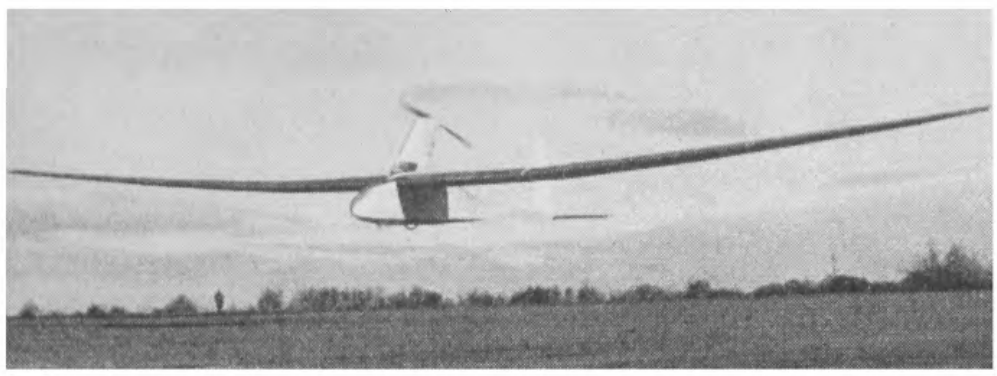
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 131 | 5 |
| Point B | 222 | 4 |
| Point C | 222 | 0 |
| Point D | 120 | 2,5 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 131 | +20,1 |
| Point D | 131 | —20,1 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 219 km/h |
| Placard airspeed gusty conditions | 132 km/h |
| Aero-towing speed | 132 km/h |
| Winch launching speed | 132 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | Not available |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not available |

# SOUTHAMPTON UNIVERSITY MANPOWERED AIRCRAFT



This single-seat manpowered aircraft was designed and built by a small group of post-graduate students at Southampton University in England.

It is intended for competition for the Kremer Prize which is for the first manpowered flight within the British Commonwealth to achieve a figure 8 flight around two pylons half a mile apart.

The manufacture of this aircraft was financially assisted by the Royal Aeronautical Society.

Dieses einsitzige, mit menschlicher Kraft angetriebene Flugzeug wurde von einer kleinen Gruppe, bestehend aus ehemaligen Studenten der Universität Southampton in England, konstruiert und gebaut.

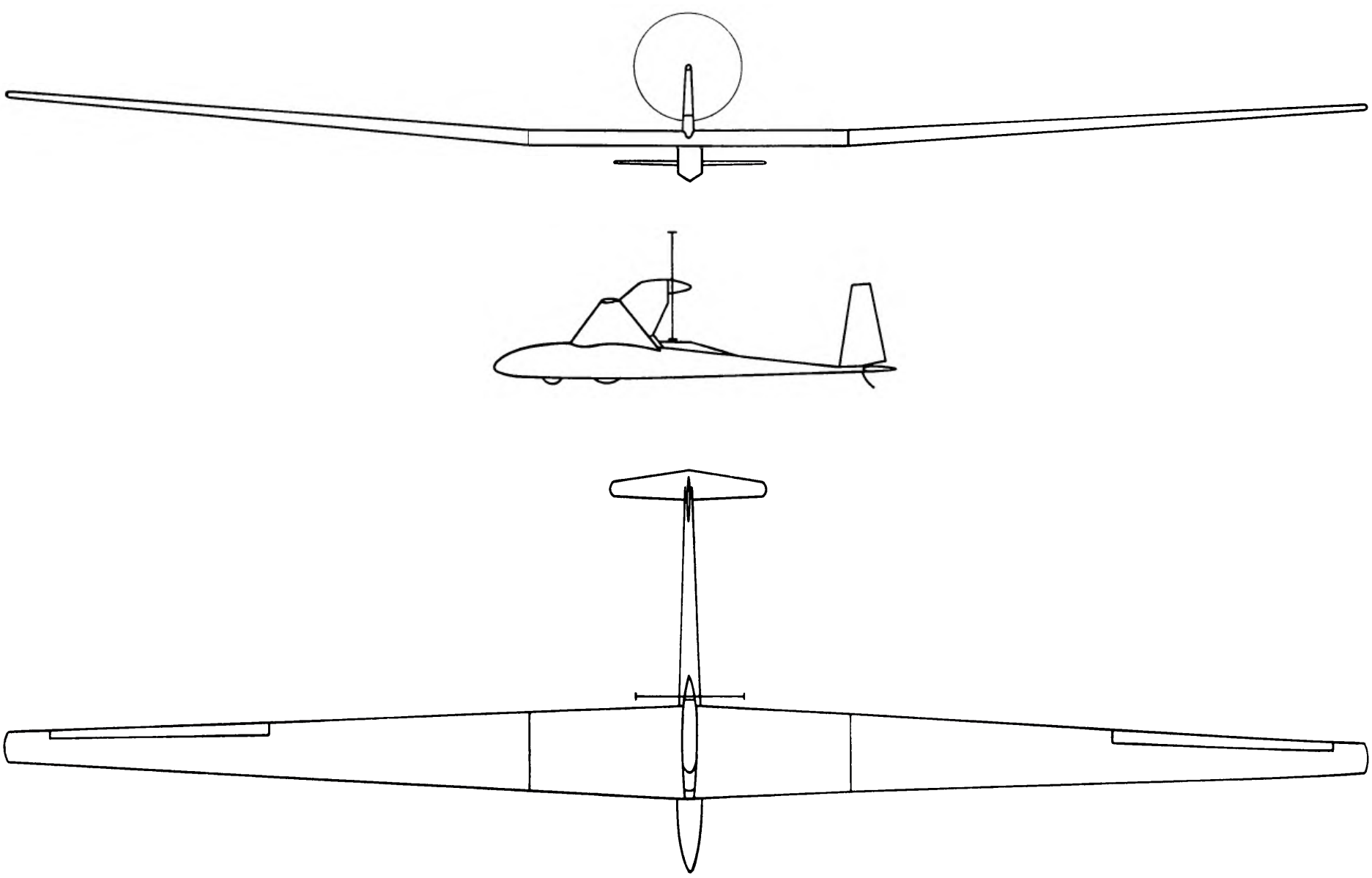
Es ist vorgesehen für den Wettbewerb um den Kremer-Preis, ausgesetzt für den ersten Muskelkraft-Flug im britischen Commonwealth, wobei eine Acht um zwei 800 m voneinander entfernte Stangen geflogen werden muß.

Die Herstellung dieses Flugzeugs wurde von der Royal Aeronautical Society finanziell unterstützt.

Monoplace de vol musculaire dessiné et construit par un petit groupe d'anciens étudiants de l'université de Southampton en Angleterre.

Il est prévu pour la participation au Prix Kremer pour le premier vol musculaire au Commonwealth britannique; ce prix demande un vol en 8 autour de deux pylons distants de 800 m.

La construction a été partiellement financée par la Royal Aeronautical Society.



| | |
|---|---|
| Type designation | Southampton University Manpowered Aircraft |
| Country of design | Great Britain |
| Designers | D.I.M. Williams, A.J. Marsden, A. Lassière |
| Date of first flight of prototype | 9 November, 1961 |
| Number produced | 1 |
| **Wings** | |
| Span (b) | 24,4 m |
| Area (s) | 27,9 m² |

| | |
|---|---|
| Aspect ratio ($b^2/s$) | 21,3 |
| Wing root chord ($C_r$) | 1,83 m |
| Wing tip chord ($C_t$) | 0,457 m |
| Mean chord ($C = s/b$) | 1,142 m |
| Wing section, root | NACA $65_3$ 818 |
| Wing section, mid | NACA $65_3$ 818 |
| Wing section, tip | NACA $65_3$ 818 |
| Dihedral | 2,2° on outer wing |
| ¼ chord sweep | 1,25° |
| Aero. twist root/tip | Inboard aileron +3°<br>Over aileron span 0°<br>Outboard of aileron −10° |
| Taper ratio ($C_t/C_r$) | 0,25 |
| Construction | Two spar wooden cantilever, cross braced between spars for torsional stiffness. 80% fabric covered. Ribs of spruce and balsa, spaced 0,229 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 4,57 m |
| Area (total) | 2 × 1,00 m² |
| Mean chord | 0,22 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Mass balance degree | Nil |
| Construction | Wood. Fabric covered. $^1/_{16}$″ balsa torque box at L.E. |

**Horizontal tail**

| | |
|---|---|
| Span | 3,05 m (all moving) |
| Area of elevator | 1,395 m² |
| Max. deflection up | 15° |
| Max. deflection down | 5° |
| Aerofoil section | NACA $65_3$ 018 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 6,07 m. Hinge at 0,21 c |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S′1′/SC) | 0,267 |
| Construction | Wood. Fabric covered. Ribs spaced 0,229 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder<br>Area of rudder | } 1,47 m² all moving |
| Aspect ratio | 2,28 |
| Tail arm | 5,5 m |
| Max. deflection | ±15° |
| Aerofoil section | NACA $65_3$ 009 |
| Aerodynamic balance | Hinge at 0,25 c |
| Construction | Wood. Fabric covered. Ribs spaced 0,229 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,578 m |
| Max. height (at cockpit) | 0,872 m |
| Overall length | 7,54 m |
| Max. cross section | 0,505 m² |
| Wetted surface area | 7,44 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Sprung front wheel. Fixed rear wheel |
| Construction | Frame and stringer. Fabric covered. Aluminium alloy tube seat and undercarriage frame. Bent perspex sheet canopy. Pilot entry through nose. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Nil |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 36 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 9,1 kg |
| Tailplane and elevator | 1,2 kg |
| Undercarriage<br>Drive mechanism | } 10,3 kg |
| Propeller | 1,4 kg |
| Empty weight (including any fixed ballast) | 58 kg |
| Instruments | 0,1 kg |
| Equipped weight | 58,1 kg |
| Flying weight | 121,6 kg |
| Wing loading | 4,35 kg/m² |

**Straight flight performance**

| | |
|---|---|
| Calculated at flying weight of | 121,6 kg |
| Take-off speed | 33 kph |
| Cruising speed | 33 kph |
| Cruising power | 0,34 Thrust horsepower<br>0,42 Pilot horsepower |
| Min. sink condition | 27 kph 0,19 m/s sinking speed |
| Max. L/D | 32 kph 0,21 m/s sinking speed |
| Max. L/D in free air | 36 |
| Max. L/D at 13 m ht. | 42,3 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR modified |
| Date of issue of these requirements | 16 May, 1960 |
| Certificate of airworthiness | Not required |

**Design flight envelope**

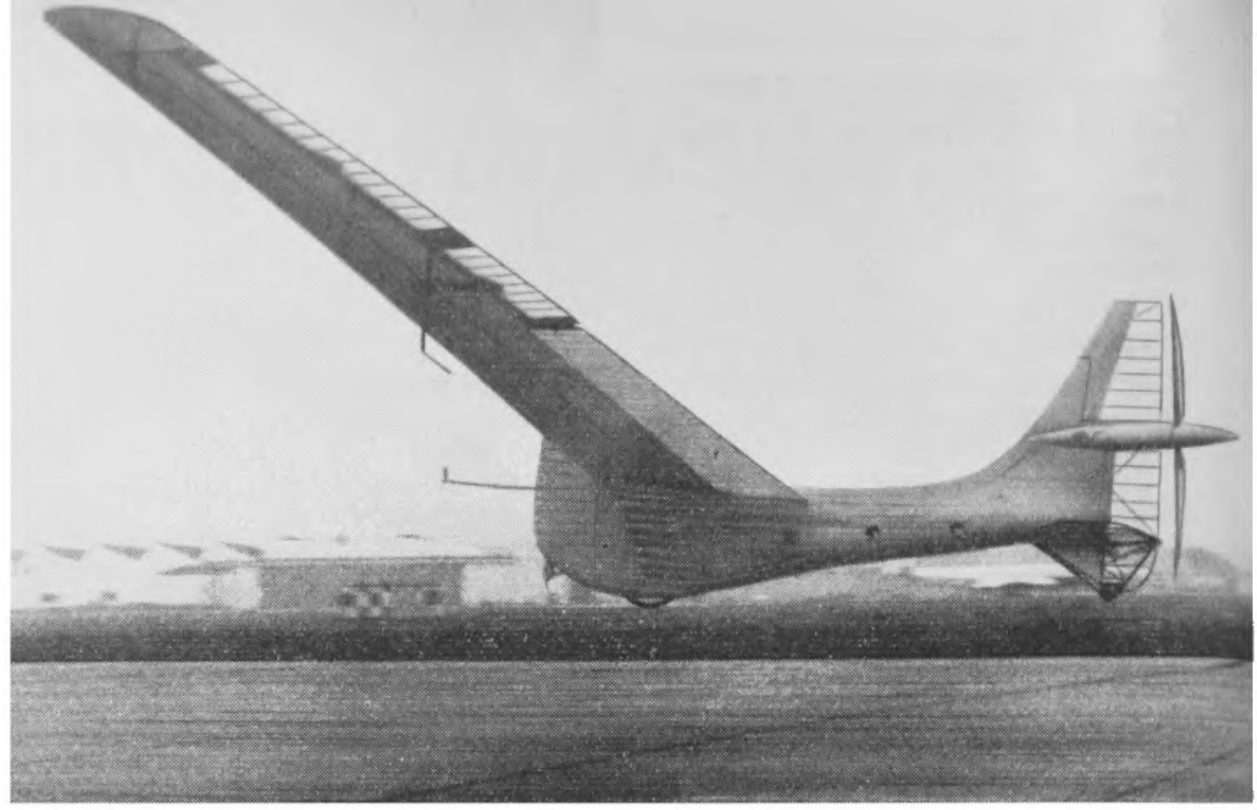
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 33 | 1,5 |
| Point B | 58,2 | 1,0 |
| Point C | 58,2 | 0 |
| Point D | 26,4 | −1 |
| Factor of safety | 2,0 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 33 | 0,5 |
| | Load factor 1,5 | |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 33 km/h |
| Placard airspeed gusty conditions | Not applicable |
| Aero-towing speed | Not applicable |
| Winch launching speed | 33 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | No |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 4–40,8 |

# PUFFIN



The Puffin manpowered aircraft is built by the Hatfield Manpowered Aircraft Club with the financial help of the Royal Aeronautical Society. It is built to compete in the Kremer competition, which requires a flight, in the form of a figure of eight, around two pylons ½ mile apart. At the time of writing this competition has not yet been won, but on May 2nd 1962 a distance of 910 metres was covered by this machine over level ground after a completely unassisted take-off. The average altitude was about 1½ metres. This is the furthest yet flown by manpower with unassisted take-off.

The manpowered aircraft are of technical interest because of their very light weights and spans rather greater than that of normal sailplanes detailed in this publication.

Das mit menschlicher Kraft angetriebene Flugzeug Puffin wird vom Hatfield Manpowered Aircraft Club mit finanzieller Unterstützung der Royal Aeronautical Society gebaut. Es ist vorgesehen für die Teilnahme am Kremer-Wettbewerb, der einen Flug in einer Acht um zwei Stangen in 800 m Entfernung verlangt. Im Zeitpunkt der Veröffentlichung war der Preis noch nicht gewonnen, doch legte der Puffin am 2. Mai 1962 eine Strecke von 910 m über Grund ohne Starthilfe zurück. Die mittlere Höhe betrug 1½ Meter. Es handelt sich um die längste bisher mit Muskelkraft zurückgelegte Strecke ohne Starthilfe.

Der Puffin wie auch der vorhergenannte Southampton sind von technischem Interesse wegen ihres sehr leichten Gewichts und der Spannweiten, die eher größer sind als jene der gewöhnlichen, in dieser Publikation erwähnten Segelflugzeuge.

L'avion de vol musculaire Puffin est construit par le Hatfield Manpowered Aircraft Club, avec l'aide financière de la Royal Aeronautical Society. Il est prévu pour la participation au Prix Kremer pour le premier vol musculaire, demandant un vol en 8 autour de deux pylons distants de 800 m. Au moment de la publication, ce prix n'a pas encore été gagné, mais le Puffin avait atteint, le 2 mai 1962, une distance de 910 m au-dessus du sol et sans aide de départ. L'altitude moyenne était de 1½ m. Il s'agit du vol musculaire le plus long enregistré sans aide de départ.

Le Puffin, ainsi que le Southampton, sont d'un intérêt technique à cause de leur poids réduit, ainsi que de l'envergure qui est plus grande que celle des planeurs ordinaires décrits dans cette publication.

| | |
|---|---|
| Type designation | Puffin |
| Country of design | Great Britain |
| Designers | Hatfield Manpowered Aircraft Club |
| Date of first flight of prototype | 16 November, 1961 |
| Number produced | 1 |

**Wings**

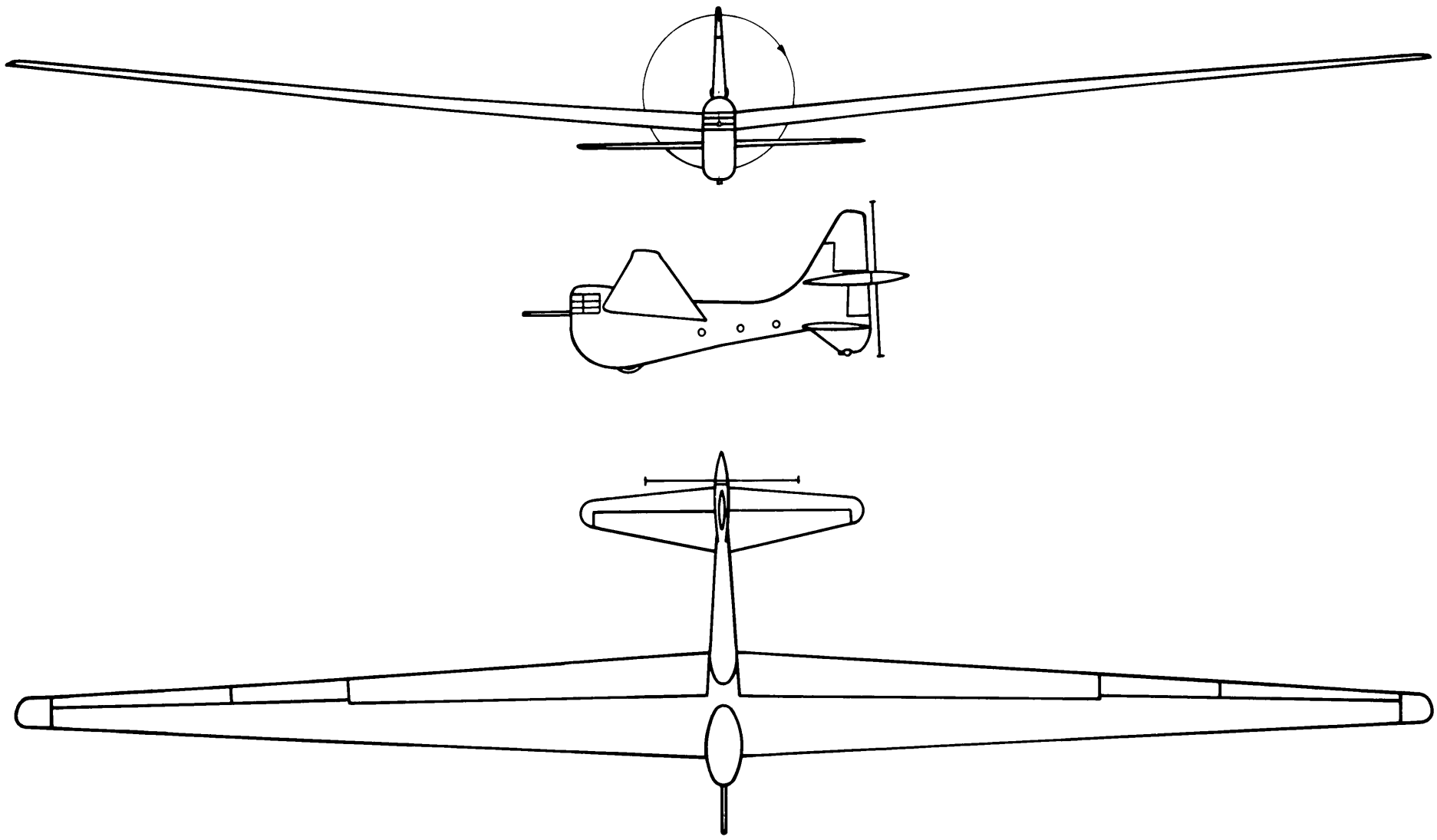
| | |
|---|---|
| Span (b) | 25,6 m |
| Area (s) | 30,6 $m^2$ |
| Aspect ratio ($b^2/s$) | 21,4 |
| Wing root chord ($C_r$) | 1,87 m |
| Wing tip chord ($C_t$) | 0,534 m |
| Mean chord ($C = s/b$) | 1,20 m |
| Wing section, root | 12% $t/c$ Wortmann type laminar |
| Wing section, mid | 12% $t/c$ Wortmann type laminar |
| Wing section, tip | 12% NACA 6412 modified |
| Dihedral | 5,25° (in flight) |
| ¼ chord sweep | 0,64° |
| Aero. twist root/tip | 2° |
| Taper ratio ($C_t/C_r$) | 0,286 |
| Construction | Wood. Main spar and false rear spar. Torsion box 0–62% c. Stabilized skin. Fabric covering on rear 38% c. Balsa ribs spaced 0,178 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 10,4 m |
| Area (total) | 2 × 2,74 $m^2$ |
| Mean chord | 0,264 m |
| Max. deflection up | 70° |
| Max. deflection down | 70° |
| Mass balance degree | Nil |
| Construction | Wood. Plastic film covered. Ribs spaced 0,178 m |

**Horizontal tail**

| | |
|---|---|
| Span | 5,12 m |
| Area of elevator and fixed tail (S′) | 3,93 $m^2$ |
| Area of elevator | 1,38 $m^2$ |
| Max. deflection up | 7° |
| Max. deflection down | 22° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,5 m |
| Elevator aerodynamic balance method | Unshielded horn |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′1′/SC) | 0,374 |
| Construction | Wood. Plastic film covered. Ribs spaced 0,178 m |



**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 2,30 m² |
| Area of rudder | 1,05 m² |
| Aspect ratio | 2,92 |
| Tail arm | 3,4 m |
| Max. deflection | 28° |
| Aerofoil section | NACA 0012 |
| Aerodynamic balance | Unshielded horn |
| Construction | Wood. Balsa sheet covering |

**Fuselage**

| | |
|---|---|
| Max. width | 0,626 m |
| Max. height (at cockpit) | 1,45 m |
| Overall length | 6,1 m |
| Max. cross section | 0,86 m² |
| Wetted surface area | 9,3 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed unsprung front wheel. Spring mounted rear wheel. Brakes fitted |
| Construction | Balsa monocoque. Nose cap of balsa with plastic film covering |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Nil |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 29,5 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 10,5 kg |
| Tailplane and elevator | 1,8 kg |
| Undercarriage and drive mechanism | 6,8 kg |
| Propeller | 0,9 kg |
| Empty weight (including any fixed ballast) | 49,5 kg |
| Instruments, Other equipment (e.g. oxygen, radio) | 0,5 kg |
| Equipped weight | 50,0 kg |
| Flying weight | 113,5 kg |
| Wing loading | 3,7 kg/m² |

**Straight flight performance**

Calculated

| | |
|---|---|
| at flying weight of | 113,5 kg |

**No flap or brake**

| | | |
|---|---|---|
| Take-off speed | 29 km/h | |
| Cruising speed | 33 km/h | |
| Cruising power required (in ground effect) | 0,30 Thrust horsepower<br>0,36 Pilot horsepower | |
| Min. sink condition (free air) | 30,8 km/h | 0,283 m/s |
| Max. L/D condition | 33 | 0,284 |
| Max. L/D | 31,2 (free air)<br>41,4 (at 8 ft.) | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Special |

**Design flight envelope**

| *Manoeuvre loads* | Proof load factor |
|---|---|
| Point A | 2,0 |
| Point B | 2,0 |
| Point C | —0,5 |
| Point D | —0,5 |
| Factor of safety | 1,5 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 40 km/h |
| Placard airspeed gusty conditions | Not applicable |
| Aero-towing speed | Not applicable |
| Winch launching speed | Not applicable |
| Cloud flying permitted? | Not applicable |
| Permitted aerobatic manoeuvres | Not applicable |
| Spinning permitted? | Not applicable |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 25–37 |

# HUNGARY

# R-25

The following all-metal sailplanes are designed to cover all needs from elementary training to advanced soaring. To facilitate production and maintenance, the R-25 and the R-27 employ the same fuselage, whereas the R-26 and the R-27 have 80% of all parts common. They are developed from the R-23 Gébics.

The R-25 is a single-seat, standard class high performance sailplane. The R-26 is a two-seater for elementary and advanced instruction. The R-27 is a single-seat sailplane and can be employed as a primary or advanced trainer and for short cross-country flights as well.

The data given refer to the prototypes which employed different types of control surfaces and airbrakes. From the R-26 a series production of 50 is envisaged in 1962.

Die nachfolgenden Ganzmetall-Segelflugzeuge sind gebaut für den Einsatz von der Grundschulung bis zum Leistungssegelflug. Zur Erleichterung von Bau und Unterhalt verwenden R-25 und R-27 denselben Rumpf, während R-26 und R-27 80% aller Teile gemeinsam haben. Alle sind vom R-23 Gébics weiterentwickelt.

Der R-25 ist ein einsitziges Hochleistungsflugzeug der Standard-Klasse. Der R-26 ist zweisitzig für Grundschulung und höhere Schulung vorgesehen. Der R-27 als Einsitzer kann für die gesamte Schulung wie für kurze Überlandflüge eingesetzt werden.

Die vorliegenden Daten beziehen sich auf die Prototypen, welche gegenüber der Serieausführung andere Steuerflächen und Bremsklappen aufweisen. Vom R-26 ist eine Serie von 50 Stück für 1962 vorgesehen.

Les planeurs suivants, entièrement en métal, sont construits pour l'emploi dans l'écolage jusqu'au vol de performance. Pour faciliter la production et le maintien, le R-25 et le R-27 employent le même fuselage, pendant que le R-26 et le R-27 ont les 80% en commun. Ils sont tous développés du R-23 Gébics.

Le R-25 est un monoplace de la classe Standard pour des vols de performance. Le R-26, biplace, est employé pour l'écolage élémentaire et avancé. Le R-27, monoplace, peut être employé pour l'écolage et des petits vols de distance.

Les dates techniques se réfèrent aux prototypes qui ont des types différents des surfaces d'empennage et des aérofreins. Une série de 50 exemplaires du R-26 est prévue pour 1962.

| | |
|---|---|
| Type designation | R-25 |
| Country of design | Hungary |
| Designer | E. Rubik |
| Manufacturer | Müszeripari Müvek Esztergom |
| Date of first flight of prototype | 29 September, 1960 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 15,0 m |
| Area (s) | 11,2 m² |
| Aspect ratio ($b^2/s$) | 20,09 |
| Wing root chord ($C_r$) | 1,02 m |
| Wing tip chord ($C_t$) | 0,48 m |
| Mean chord ($C = s/b$) | 0,746 m |
| Wing section, root | NACA $64_3$–618 |
| Wing section, mid | NACA $64_3$–618 |
| Wing section, tip | NACA $64_3$–618 |
| Dihedral | 3° |
| ¼ chord sweep | —1,33° |
| Taper ratio ($C_t/C_r$) | 0,47 |
| Construction | Metal, cantilever single spar, leading edge torsion box. Fabric covering from 40% chord |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 2,75 m |
| Area (total) | 2 × 0,565 m² |
| Mean chord | 0,205 m |
| Max. deflection up | 28° |
| Max. deflection down | 26° |
| Mass balance degree | Nil |
| Construction | Metal, fabric covered. Ribs spacing 0,275 m |

**Horizontal tail**

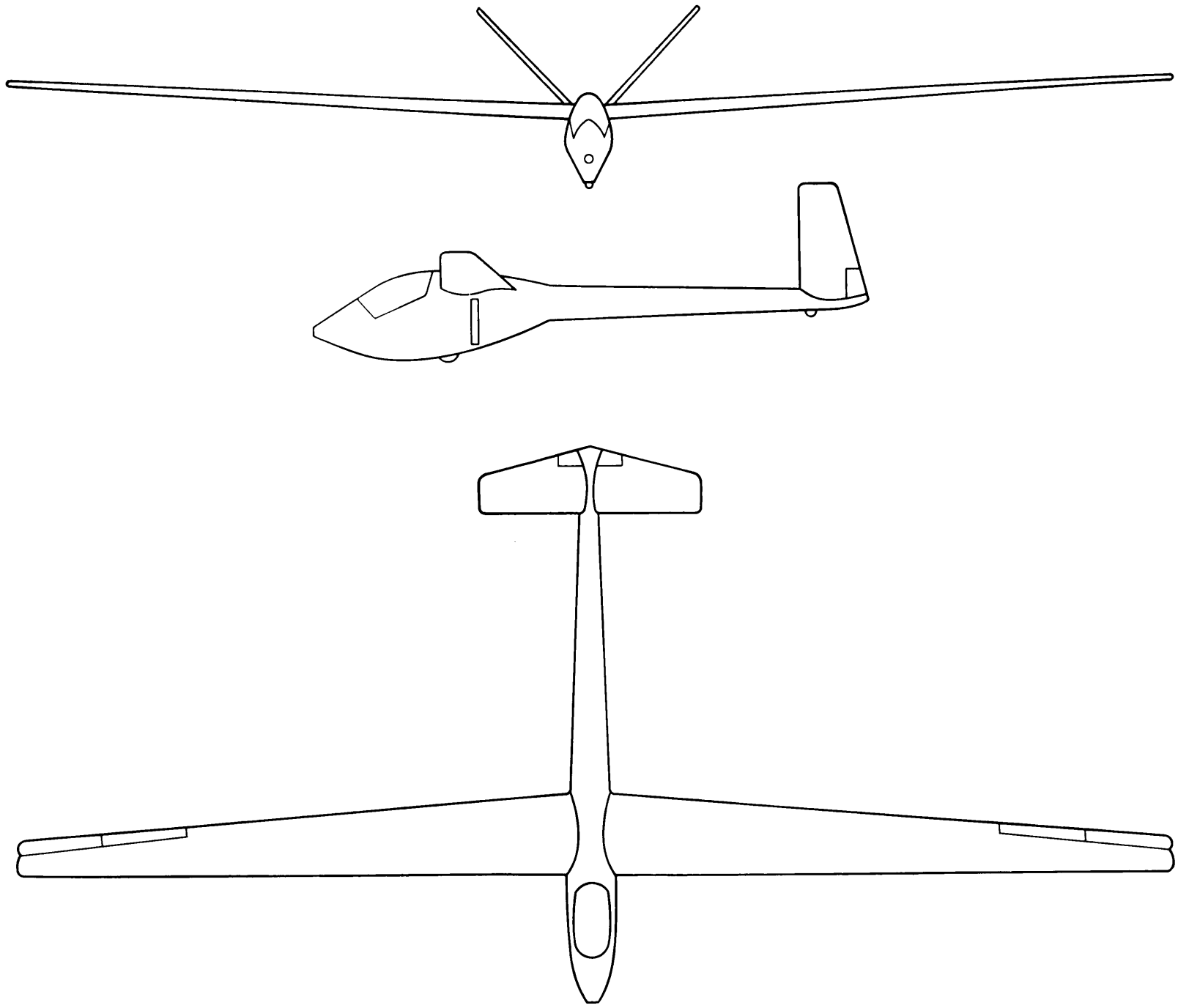
| | |
|---|---|
| Span | V-tail, 45° dihedral, 2,9 m horizontal projection |
| Area of elevator and fixed tail (S') | 2,38 m² true |
| Area of elevator | 2,38 m² true |
| Max. deflection up | 20° |
| Max. deflection down | 20° |
| Aerofoil section | Symmetrical |
| Mass balance degree | 100% |
| Mass balance method | External bob weight |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,30 m |
| Elevator aerodynamic balance method | All-moving tail with geared tab |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S'1'/SC) | 0,87 |
| Construction | Metal. Fabric covered |

**Vertical tail**

As for horizontal tail

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,16 m |
| Overall length | 7,30 m |
| Max. cross section | 0,78 m² |
| Wetted surface area | 15,0 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed wheel with torsion rubber spring. Brakes |
| Construction | Metal monocoque. Removable blown plexiglass canopy |



**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Fuselage brakes. Metal ribs, fabric covered |
| Area | 0,596 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wing (with struts, controls, flaps and brakes) | 85 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 91 kg |
| Tailplane and elevator | 9 kg |
| Empty weight (including any fixed ballast) | 185 kg |
| Instruments | 15 kg |
| Equipped weight | 200 kg |
| Flying weight normal/max. | 284/310 kg |
| Wing loading normal/max. | 25,36/27,68 kg/m² |

**Straight flight performance**

Measured at flying weight of 284 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 74,5 | 0,68 |
| Max. L/D condition | 82,0 | 0,73 |
| | 96,0 | 1,04 |
| | 112,0 | 1,51 |
| Stalling speed | | 64,0 km/h |
| Max. L/D | | 31,2 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Vitorlázó Repülögépek Szilárdsagi Elöirása |
| Date of issue of these requirements | 1959 |
| Certificate of airworthiness | Restricted |

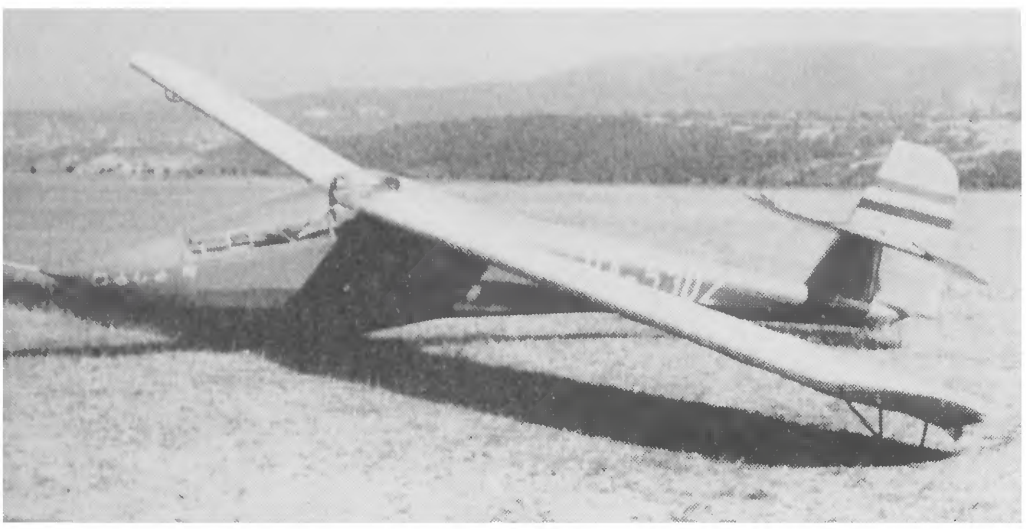
**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 135 | +4,5 |
| Point B | 250 | +3,6 |
| Point C | 250 | —1,8 |
| Point D | 114 | —2,5 |
| Factor of safety | 1,8 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 165 | ±10 |
| Point B | 250 | ± 4 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 220 km/h |
| Placard airspeed gusty conditions | 165 km/h |
| Aero-towing speed | 135 km/h |
| Winch launching speed | 115 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 27,0 to 49,5 |



# R-28 GÓBÉ

| | |
|---|---|
| Type designation | R-26 Góbé |
| Country of design | Hungary |
| Designer | E. Rubik |
| Manufacturer | Müszeripari Müvek Esztergom |
| Date of first flight of prototype | 6 May, 1961 |
| Number produced | 2 |

**Wings**

| | |
|---|---|
| Span (b) | 14,0 m |
| Area (s) | 18,0 m² |
| Aspect ratio ($b^2/s$) | 10,88 |
| Wing root chord ($C_r$) | 1,30 m |
| Wing tip chord ($C_t$) | 1,30 m |
| Mean chord ($C = {}^{s}/_{b}$) | 1,30 m |
| Wing section, root | Gö 549 mod. |
| Wing section, mid | Gö 549 mod. |
| Wing section, tip | Gö 549 mod. |
| Dihedral | 3° |
| ¼ chord sweep | —1,5° |
| Aero. twist root/tip | —1,0° |
| Taper ratio ($C_t/C_r$) | 1,0 |
| Construction | Metal, cantilever single spar, leading edge torsion box. Fabric covering from 35% chord |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 2,20 m |
| Area (total) | 2 × 0,99 m² |
| Mean chord | 0,45 m |
| Max. deflection up | 28° |
| Max. deflection down | 28° |
| Mass balance degree | Nil |
| Construction | Metal, fabric covered. Ribs spaced 0,4 m |

**Horizontal tail**

| | |
|---|---|
| Span | 3,2 m |
| Area of elevator and fixed tail (S′) | 2,22 m² |
| Area of elevator | 1,00 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | Symmetrical |
| Mass balance degree | 100% |
| Mass balance method | External bob weight |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,30 m |
| Elevator aerodynamic balance method | Unshielded horn balance |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′l′/SC) | 0,405 |
| Construction | Metal. Fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,70 m² |
| Area of rudder | 1,05 m² |
| Aspect ratio | 1,60 |
| Tail arm | 4,30 m |
| Max. deflection | 25° |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Unshielded horn balance |
| Construction | Metal. Fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,70 m |
| Max. height (at cockpit) | 1,28 m |
| Overall length | 8,96 m |
| Max. cross section | 0,90 m² |
| Wetted surface area | 16,5 m² |
| Number seats/arrangement | 2 tandem |
| Undercarriage type | Fixed wheel with torsion rubber spring. Brakes |
| Construction | Metal monocoque, part fabric covered. Side opening blown plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | DFS |
| Span (total) | 2 × 0,88 m |
| Area | 2 × 0,228 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

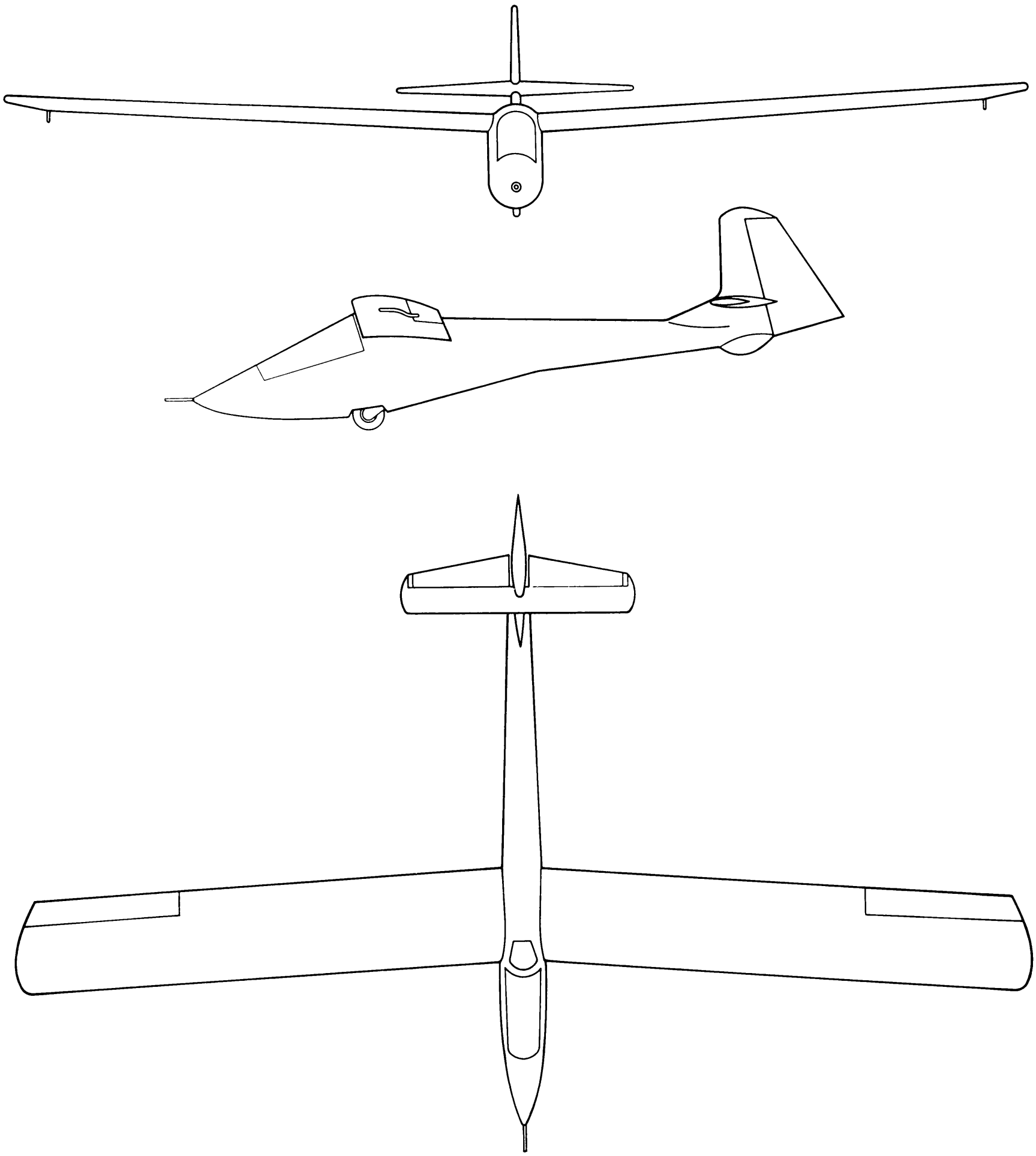
| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 90 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 104 kg |
| Tailplane and elevator | 12 kg |
| Empty weight (including any fixed ballast) | 206 kg |
| Instruments | 4 kg |
| Equipped weight | 210 kg |
| Flying weight normal/max. | 370/400 kg |
| Wing loading normal/max. | 20,56/22,22 kg/m² |

**Straight flight performance**

Calculated at flying weight of 360 kg

| No flap or brake | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 75,0 | 0,96 |
| Max. L/D condition | 81,0 | 0,97 |
| | 90,0 | 1,10 |
| | 105,0 | 1,58 |

| | |
|---|---|
| Stalling speed | 60,0 km/h |
| Max. L/D | 23,7 |



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Vitorlázó Repülögépek Szilárdsagi Elöirása |
| Date of issue of these requirements | 1959 |
| Certificate of airworthiness | Restricted |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 111 | +3,5 |
| Point B | 170 | +2,8 |
| Point C | 170 | —1,0 |
| Point D | 83,5 | —1,5 |
| Factor of safety | 1,8 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 110 | ±10 |
| Point B | 170 | ± 4 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 170 km/h |
| Placard airspeed gusty conditions | 110 km/h |
| Aero-towing speed | 110 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 29,0 to 45,0 |

# R-27 KÓPÉ


| | |
|---|---|
| Type designation | R-27 Kópé |
| Country of design | Hungary |
| Designer | E. Rubik |
| Manufacturer | Müszeripari Müvek Esztergom |
| Date of first flight of prototype | 7 October, 1961 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 12,0 m |
| Area (s) | 15,4 m² |
| Aspect ratio ($b^2/s$) | 9,35 |
| Wing root chord ($C_r$) | 1,30 m |
| Wing tip chord ($C_t$) | 1,30 m |
| Mean chord ($C = s/b$) | 1,30 m |
| Wing section, root | Gö 549 mod. |
| Wing section, mid | Gö 549 mod. |
| Wing section, tip | Gö 549 mod. |
| Dihedral | 3° |
| Taper ratio ($C_t/C_r$) | 1,0 |
| Construction | Metal, cantilever single spar, leading edge torsion box. Fabric covering from 35% chord |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 2,20 m |
| Area (total) | 2 × 0,99 m² |
| Mean chord | 0,45 m |
| Max. deflection up | 28° |
| Max. deflection down | 26° |
| Mass balance degree | Nil |
| Construction | Metal, fabric covered. Ribs spaced 0,4 m |

**Horizontal tail**

| | |
|---|---|
| Span | V-tail, 45° dihedral 2,7 m horizontal projection |
| Area of elevator and fixed tail (S') | 2,85 m² true |
| Area of elevator | 1,95 m² true |
| Max. deflection up | 14,5° |
| Max. deflection down | 14,5° |
| Aerofoil section | Symmetrical |
| Mass balance degree | 60% |
| Mass balance method | External bob weight |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,86 m |
| Elevator aerodynamic balance method | Unshielded horn balance |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S'1'/SC) | 0,388 |
| Construction | Metal. Fabric covered |

**Vertical tail**

As for horizontal tail

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,20 m |
| Overall length | 7,00 m |
| Max. cross section | 0,80 m² |
| Wetted surface area | 15,0 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed wheel with torsion rubber spring. Brakes |
| Construction | Metal monocoque, part fabric covered. Removable blown plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | DFS |
| Span (total) | 2 × 0,88 m |
| Area | 2 × 0,228 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 80 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 67 kg |
| Tailplane and elevator | 9 kg |
| Empty weight (including any fixed ballast) | 156 kg |
| Instruments | 4 kg |
| Equipped weight | 160 kg |
| Flying weight normal/max. | 245/270 kg |
| Wing loading normal/max. | 15,91/17,53 kg/m² |

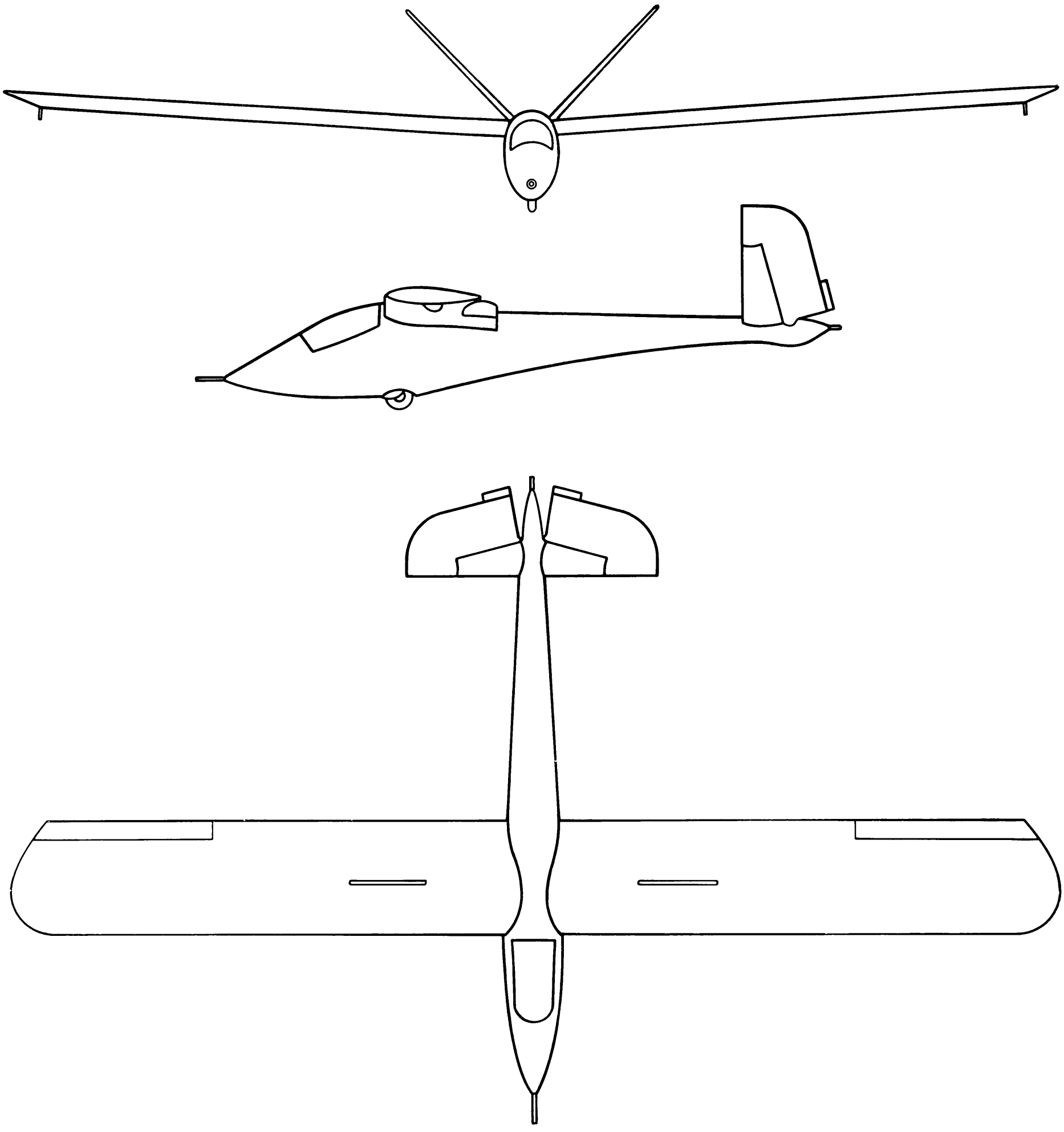
**Straight flight performance**

Calculated
at flying weight of 245 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 70,0 | 1,00 |
| Max. L/D condition | 75,0 | 1,04 |
| | 87,5 | 1,36 |

| | |
|---|---|
| Stalling speed | 50,0 km/h |
| Max. L/D | 20,0 |



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Vitorlázó Repülögépek Szilárdsagi Elöirása |
| Date of issue of these requirements | 1959 |
| Certificate of airworthiness | No |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 111 | +4,5 |
| Point B | 200 | +3,6 |
| Point C | 200 | —1,8 |
| Point D | 120 | —2,5 |
| Factor of safety | 1,8 | |

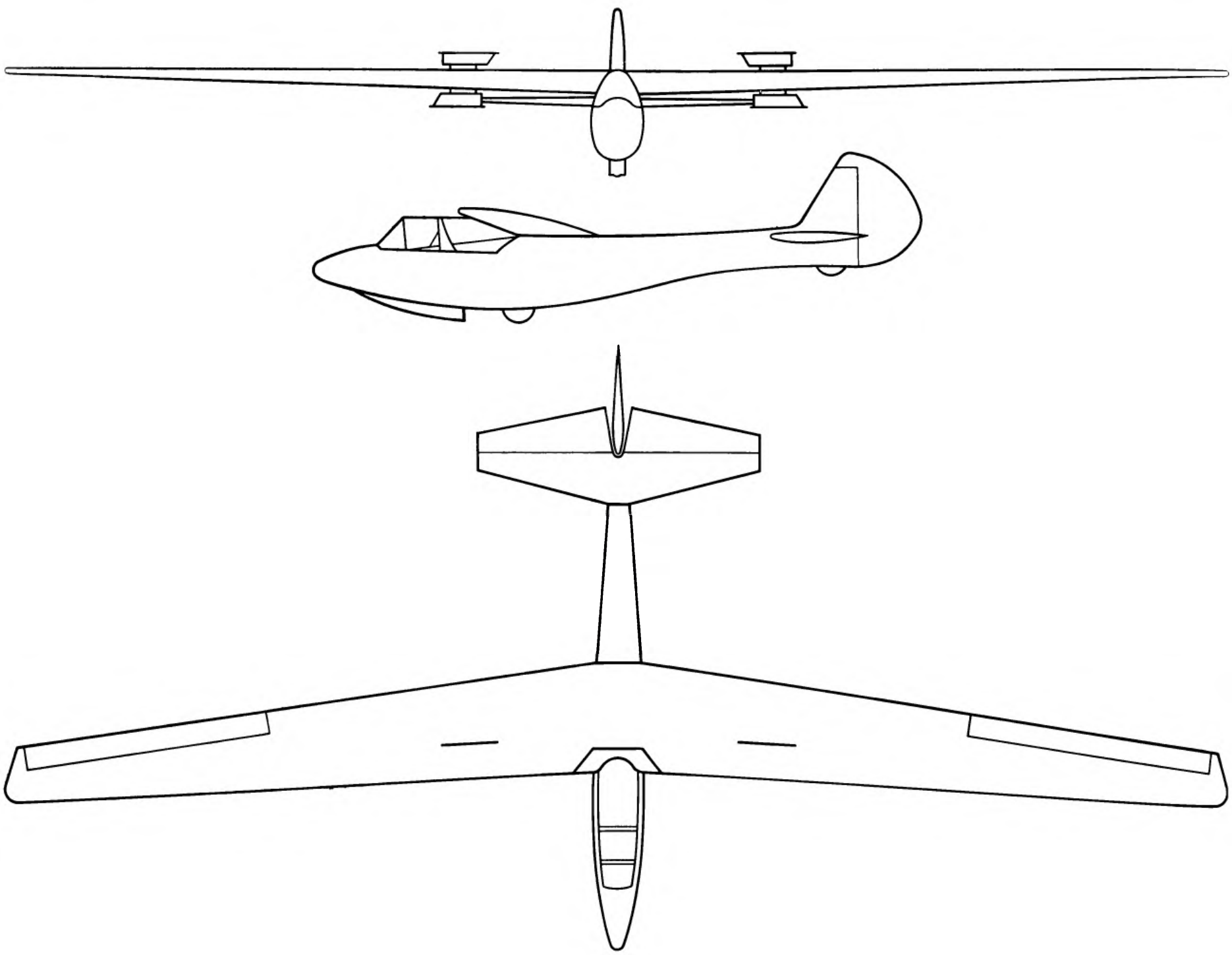
| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 117 | ±10 |
| Point B | 200 | ± 4 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 117 km/h |
| Aero-towing speed | 100 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes, but appears unspinnable |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 25,0 to 37,0 |

# India

# ASHVINI



This sailplane is the first 2-seater to be designed and constructed in India. It was produced by the Technical Centre of the Civil Aviation Department to meet the requirements of Civil Gliding centres and the National Cadet Corps. A distinctive design feature is its swept-forward wing, the section of which has been chosen for the best performance under the atmospheric conditions prevalent in India. All structural components with the exception of fittings are constructed of wood and plywood. The design is based on the strength properties of Himalayan spruce and fir and indigenously manufactured white cedar plywood.

Erster in Indien konstruierter und gebauter Zweisitzer; vom Technischen Zentrum der Abteilung für Zivilluftfahrt hergestellt, um den Bedarf der zivilen Segelflugschulen und des nationalen Kadettenkorps zu decken. Charakteristisch für die Konstruktion ist der vorwärts gepfeilte Flügel, dessen Querschnitt für beste Leistung unter den meteorologischen Verhältnissen in Indien ausgewählt wurde. Sämtliche Bauteile mit Ausnahme der Beschläge sind aus Holz und Sperrholz hergestellt. Die Konstruktion beruht auf den Festigkeitseigenschaften des Holzes von Himalaya-Tannen, Fichten und im Lande hergestelltem weißem Zedern-Sperrholz.

Premier biplace dessiné et construit aux Indes. Produit par le Centre Technique du Département de l'Aviation Civile pour satisfaire aux besoins des écoles de vol à voile civiles et du Corps National des Cadets. L'aile en flèche en avant est caractéristique pour cette construction; la section de l'aile a été choisie en vue de la meilleure performance sous les conditions météorologiques du pays. Toutes les parties de la construction, à l'exception de la ferrure, consistent en bois et en contreplaqué. La construction se base sur les caractéristiques du bois de sapin de l'Himalaya, du pin et du contreplaqué de bois du cèdre blanc manufacturé dans le pays même.

| | |
|---|---|
| Type designation | Ashvini |
| Country of design | India |
| Designer | S. Ramamritham |
| Date of first flight of prototype | 3 September 1958 |
| Number produced | 4 |

**Wings**

| | |
|---|---|
| Span (b) | 17,70 m |
| Area (s) | 19,51 m² |
| Aspect ratio ($b^2/s$) | 16 |
| Wing root chord ($C_r$) | 1,56 m |
| Wing tip chord ($C_t$) | 0,65 m |
| Mean chord ($C = s/b$) | 1,10 m |
| Wing section, root | NACA 4418 |
| Wing section, tip | NACA 4412 |
| Dihedral | 1° (measured on top of spar) |
| ¼ chord sweep | — 4° |
| Aero. twist root/tip | — 2,7° |
| Taper ratio ($C_t/C_r$) | 0,414 |
| Construction | 2 spar, wood. Fabric over rear 30% of wing. Ribs at 0,25 m spacing. |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 6,96 m |
| Area (total) | 1,95 m² |
| Mean chord | 0,28 m |
| Max. deflection up | 25° |
| Max. deflection down | 15° |
| Mass balance degree | Nil |
| Construction | Wood. Fabric covered. |

**Horizontal tail**

| | |
|---|---|
| Span | 4,02 m |
| Area of elevator and fixed tail (S′) | 3,58 m² |
| Area of elevator | 1,60 m² |
| Max. deflection up | 30° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0009 |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,48 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S′1′/SC) | 0,747 |
| Construction | Wood. Ply and fabric covered. Ribs at 0,25 m spacing. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,64 m² |
| Area of rudder | 1,1 m² |
| Aspect ratio | 1,6 |
| Tail arm | 4,48 m |
| Max. deflection | 30° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Structure | Wood. Fabric and ply covered. Ribs at 0,17 m spacing. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,61 m |
| Max. height (at cockpit) | 1,14 m |
| Overall length | 8,69 m |
| Max. cross section | 0,6 m² |
| Wetted surface area | 14,2 m² |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed unsprung wheel and rubber mounted skid. No brakes. |
| Structure | Ply monocoque. Bent sheet perspect canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap. |
| Span (total) | 1,26 m |
| Area | 0,48 m² |
| Location, % of chord | 35% |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings[1] | 182 kg |
| Fuselage[2] | 110 kg |
| Tailplane and elevator | 14 kg |
| Empty weight[3] | 306 kg |
| Instruments | 6 kg |
| Equipped weight | 312 kg |
| Flying weight | 500 kg |
| Wing loading | 25,6 kg/m² |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR Sect. E |
| Date of issue of these requirements | February 1949 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 131 | 5 |
| Point B | 277 | 4 |
| Point C | 277 | 0 |
| Point D | 129 | — 2,5 |
| Factor of safety | | 1,5 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 131 | 20 |
| Point B | 277 | 7 |
| Point C | 277 | — 2,4 |
| Point D | 129 | — 18 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 222 km/h |
| Aero-towing speed | 113 km/h |
| Winch launching speed | 96 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | Loop, stall turn |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 34,2 to 45,2 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not speed limiting |

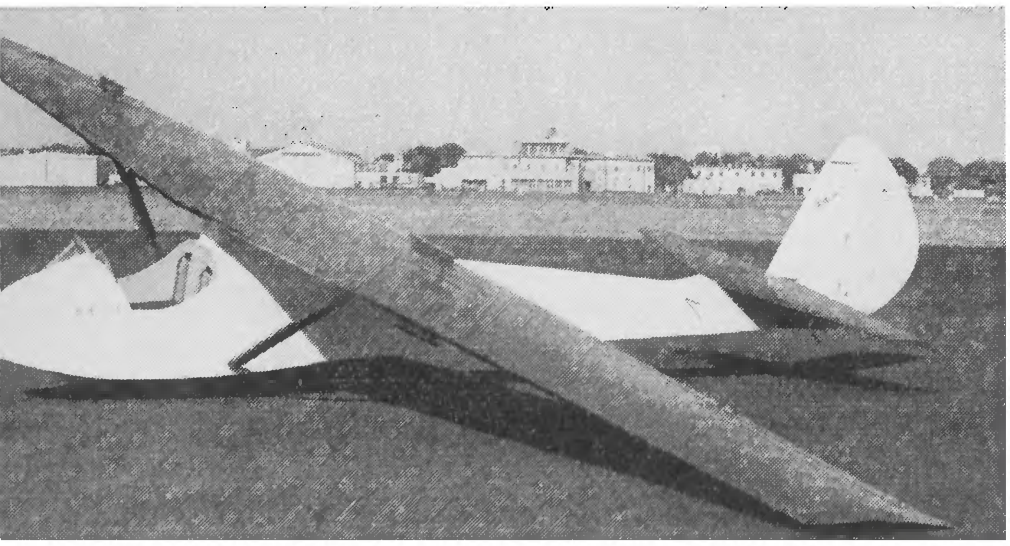
**Straight flight performance**

Calculated
at flying weight of . . . . . 500 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 58 | 0,82 |
| Max. L/D condition | 79 | 0,95 |
| | 87 | 1,10 |
| | 102 | 1,4 |
| | 116 | 1,86 |
| Stalling speed | 48 km/h | |
| Max. L/D | 23 | |

# ROHINI 1



The Rohini, like the Ashvini, was designed by Ramamritham for two-seater training in India. Although the Ashvini was a tandem two-seater, the Rohini is a side-by-side two-seater and it will serve to supplement the training on the Ashvini.

The Rohini uses a number of components and fittings identical to those on the Ashvini. Among such components are vertical fin, rudder, tailplane, elevators, airbrakes, and a large number of wing ribs.

As in the case of the Ashvini, the Rohini uses wood from indigenous Indian trees.

Der Rohini wurde wie der Ashvini von Ramamritham für die Doppelsitzerschulung in Indien konstruiert. Während der Ashvini die Tandemanordnung der Sitze bevorzugte, weist der Rohini die Anordnung nebeneinander auf; er soll die Schulung auf dem Ashvini ergänzen.

Der Rohini weist eine große Anzahl gleicher Bauelemente wie der Ashvini auf; darunter befinden sich Seitenflosse, Seitenruder, Höhenflosse, Höhenruder, Bremsklappen und eine große Anzahl der Flügelrippen.

Wie beim Ashvini wurde auch beim Rohini das Holz einheimischer indischer Bäume verwendet.

Le Rohini a été construit, comme l'Ashvini, par Ramamritham, pour l'écolage en biplace aux Indes. Pendant que l'Ashvini avait les places en tandem, celles du Rohini se trouvent côte-à-côte. Le Rohini servira de supplément pour l'écolage sur l'Ashvini.

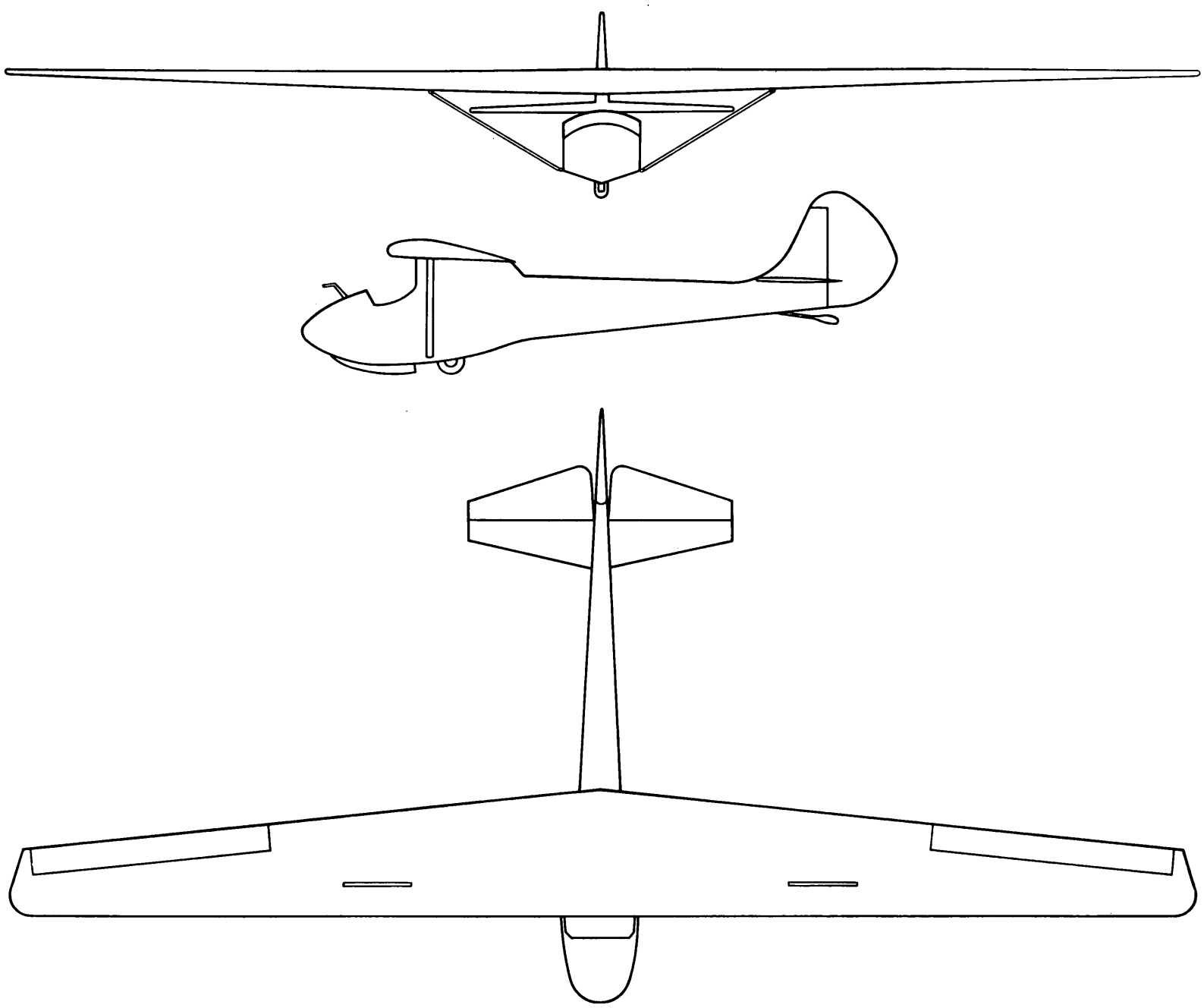
Le Rohini emploie un certain nombre d'éléments analogues à ceux de l'Ashvini, parmi lesquels se trouvent le plan de dérive, le gouvernail de direction, le gouvernail de profondeur, le stabilisateur, les volets de freinage, ainsi qu'un grand nombre des nervures de l'aile.

Comme dans le cas de l'Ashvini, on a fait emploi du bois d'arbres indigènes indiens.

| | |
|---|---|
| Type designation | Rohini 1 |
| Country of design | India |
| Designer | S. Ramamritham |
| Date of first flight of prototype | 10 May, 1961 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 16,56 m |
| Area (s) | 20,76 m² |
| Aspect ratio ($b^2/s$) | 13,2 |
| Wing root chord ($C_r$) | 1,69 m |



| | |
|---|---|
| Wing tip chord ($C_t$) | 0,817 m |
| Mean chord ($C = {}^{s}/_{b}$) | 1,253 m |
| Wing section, root | NACA 4418 |
| Wing section, tip | NACA 4412 (mod.) |
| Dihedral | 0° (top of spar) |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | –2,5° |
| Taper ratio ($C_t/C_r$) | 0,483 |
| Construction | Two spar, strut braced. Ply covered back to rear spar. Ribs 0,25 m spacing. Two piece wing |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2×3,5 m |
| Area (total) | 2×1,16 m² |
| Mean chord | 0,331 m |
| Max. deflection up | 25° |
| Max. deflection down | 15° |
| Mass balance degree | Nil |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 4,02 m |
| Area of elevator and fixed tail (S′) | 3,58 m² |
| Area of elevator | 1,60 m² |
| Max. deflection up | 25° |
| Max. deflection down | 22° |
| Aerofoil section | NACA 0009 |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,67 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S′1′/SC) | 0,647 |
| Construction | Wood. Ply and fabric covered. Ribs at 0,25 m spacing |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,64 m² |
| Area of rudder | 1,1 m² |
| Aspect ratio | 1,6 |
| Tail arm | 5,55 m |
| Max. deflection | 30° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Horn balance |
| Construction | Wood. Ply and fabric covered. Ribs at 0,17 m spacing |

**Fuselage**

| | |
|---|---|
| Max. width | 1,04 m |
| Overall length | 7,18 m |
| Max. cross section | 1,00 m² |
| Wetted surface area | 15,5 m² |
| Number of seats/arrangement | 2 side by side |
| Undercarriage type | Fixed unsprung wheel and rubber mounted skid. No brakes |
| Construction | Ply monocoque up to wing rear spar attachement bulkhead. Truss type, fabric and ply covered at rear |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface airbrakes with gap |
| Span (total) | 2×0,63 m |
| Area | 2×0,12 m² |
| Location, % of chord | 35 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 162 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 98 kg |
| Tailplane and elevator | 14 kg |
| Empty weight (including any fixed ballast) | 274 kg |
| Instruments | 3 kg |
| Equipped weight | 277 kg |
| Flying weight | 494 kg |
| Wing loading | 23,76 kg/m² |

**Straight flight performance**

Calculated
at flying weight of . . . . . 494 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 61 | 0,85 |
| Stalling speed | 48 km/h | |
| Max. L/D | 21 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR, Sect. E |
| Date of issue of these requirements | 16 May, 1960 |
| Certificate of airworthiness | In process |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 127 | 5 |
| Point B | 226 | 4 |
| Point C | 226 | 0 |
| Point D | 125 | –2,5 |
| Factor of safety | 1,5 | |

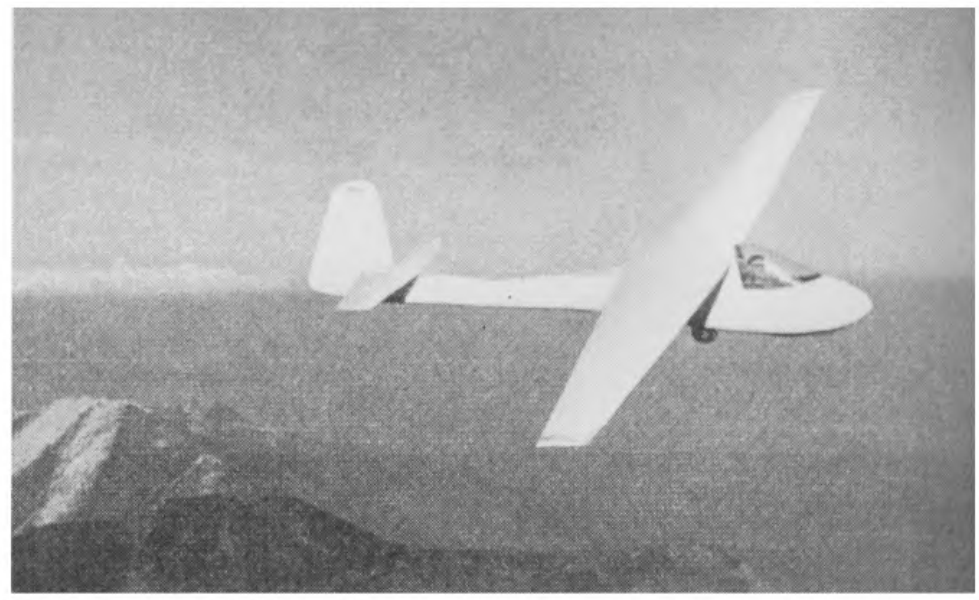
| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 106 | 20 |
| Point D | 148 | –20 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 184 km/h |
| Aero-towing speed | 112 km/h |
| Winch launching speed | 96 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | Loop, stall turn |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 31,2 to 43,1 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not speed limiting |

# Italy

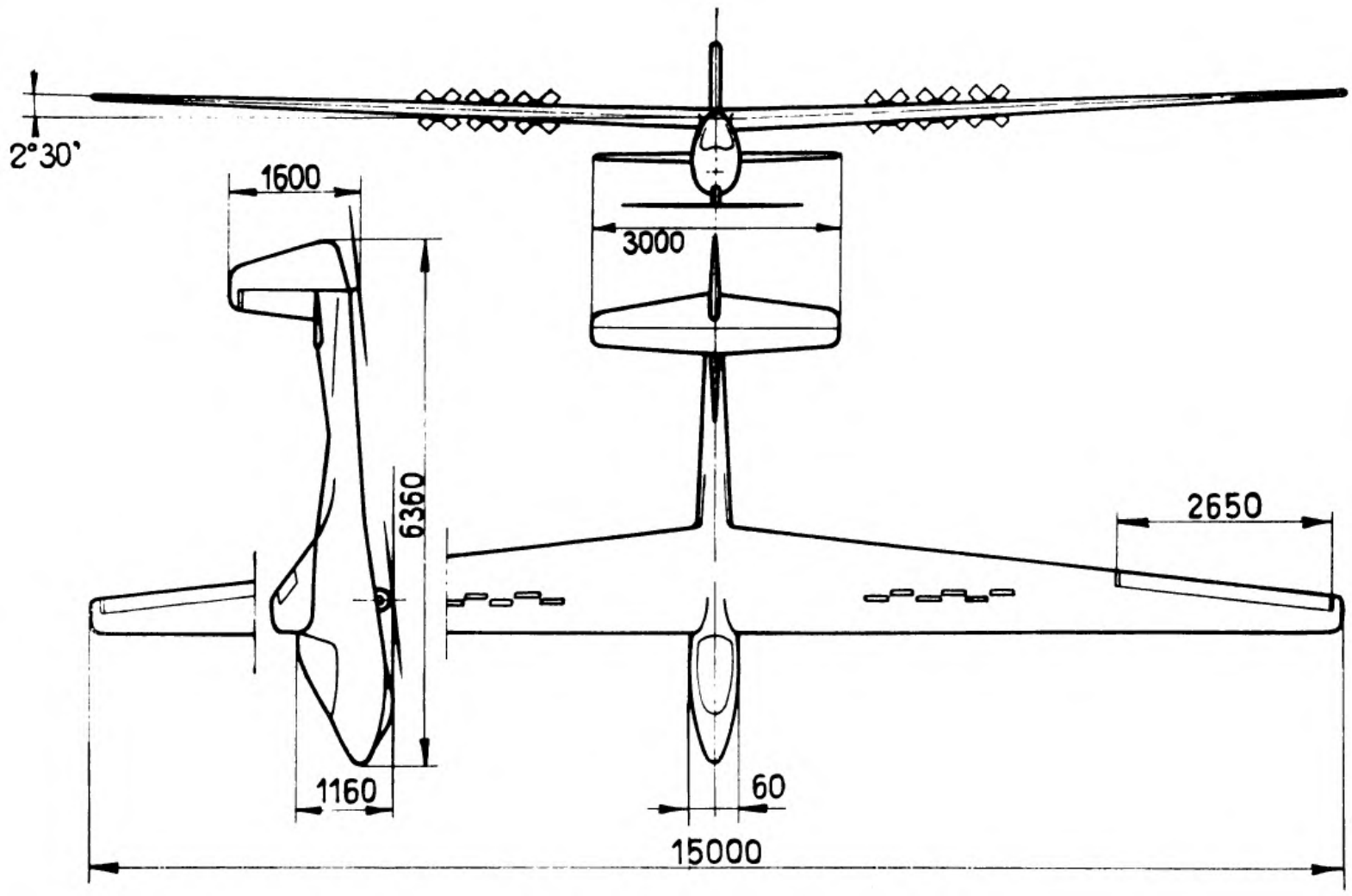
# M-100 S



A standard class sailplane designed by the Brothers Morelli. A production batch of 10 has been started by Aeromere S.p.A., Trento.

Segelflugzeug der Standard-Klasse, konstruiert von Gebr. Morelli. Eine Serie von 10 Exemplaren wurde durch Aeromere S.p.A. in Trento aufgelegt.

Planeur de la classe standard, construit par les frères Morelli. Une série de 10 exemplaires a été mise en chantier par Aeromere S.p.A., Trento.




| | |
|---|---|
| Type designation | M-100 S |
| Country of design | Italy |
| Designers | Ing. Alberto and Piero Morelli |
| Date of first flight of prototype | January 1960 |
| Number produced | 1+10 in production at March 1960 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 13,1 m² |
| Aspect ratio ($b^2/s$) | 17,1 |
| Wing root chord ($C_r$) | 1,30 m |
| Wing tip chord ($C_t$) | 0,45 m |
| Mean chord ($C = s/b$) | 0,875 m |
| Wing section, root | NACA 63–618 modified |
| Wing section, tip | NACA 63–615 modified |
| Dihedral | 2½° |
| ¼ chord sweep | −1,1° |
| Aero. twist root/tip | −3° |
| Taper ratio ($C_t/C_r$) | 0,35 |
| Construction | Single spar, wood, ribs spaced 30 cm, with leading edge torsion box. Fabric covering over rear 45%. |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 5,30 m |
| Area (total) | 1,08 m² |
| Mean chord | 0,20 m |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Mass balance degree | 100% |
| Mass balance method | Distributed |
| Construction | Fabric covered wood. Ribs spaced 30 cm |

**Horizontal tail**

| | |
|---|---|
| Span | 3,00 m |
| Area of elevator and fixed tail (S') | 1,6 m² |
| Area of elevator | 0,8 m² |
| Max. deflection up | 30° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 64010 modified |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,52 m |
| Elevator trimming method | Tension spring on stick |
| Horizontal tail volume coefficient (S' 1'/SC) | 0,429 |
| Construction | Wood. Ply covered tailplane. Fabric covered elevator. Ribs spaced 28 cm |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,98 m² |
| Area of rudder | 0,53 m² |
| Aspect ratio | 2,3 |
| Tail arm | 3,86 m |
| Max. deflection | 30° |
| Aerofoil section | NACA 64010 modified |
| Aerodynamic balance | Unshielded horn (prototype), shielded horn (production) |
| Structure | Wood. Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,16 m |
| Overall length | 6,36 m |
| Max. cross section | 0,43 m² |
| Wetted surface aera | 10 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel. Dive brake. Fixed rubber mounted skid |
| Structure | Ply monocoque. Moulded veneer nose cap. Side opening blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Rotating plates, projecting from upper and lower wing surface |
| Location, % of chord | 42 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 124 kg |
| Fuselage[2] | 67 kg |
| Tailplane and elevator | 7 kg |
| Empty weight[3] | 198 kg |
| Instruments | 3 kg |
| Other equipment (e. g. oxygen, radio) | 17 kg |
| Equipped weight | 218 kg |
| Flying weight | 315 kg |
| Wing loading | 24 kg/m² |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Registro Aeronautico Italiano |
| Date of issue of these requirements | 1942 |
| Certificate of airworthiness. | Yes. Aerobatic category |

**Design flight envelope**

| Manoeuvre loads | V km/h | Proof load factor |
|---|---|---|
| Point A | 126 | 4,5 |
| Point B | 250 | 3,38 |
| Point C | 250 | 0 |
| Point D | 106 | 2,25 |
| Point E | 160 | 2,25 |
| Factor of safety | | 2 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 230 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 90–150 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Inverted manoeuvres not yet allowed |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 30–45 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 190 |

**Straight flight performance**

Calculated
at flying weight of 290 kg

| No flap or brake | V km/h | V sink m/s |
|---|---|---|
| Min. sink condition | 67 | 0,62 |
| Max. L/D condition | 77 | 0.67 |
| | 100 | 1,05 |
| | 117 | 1,49 |
| | 134 | 2,22 |
| Stalling speed | 51 km/h | |
| Max. L/D | 32 | |

# URENDO

Urendo was built as a compact general purpose two-seater. Use in this role is limited due to high wing loading, but it has good soaring performance when flown as a single-seater; type A won the 1959 Italian National Contest and flew the best distance of 297 km.

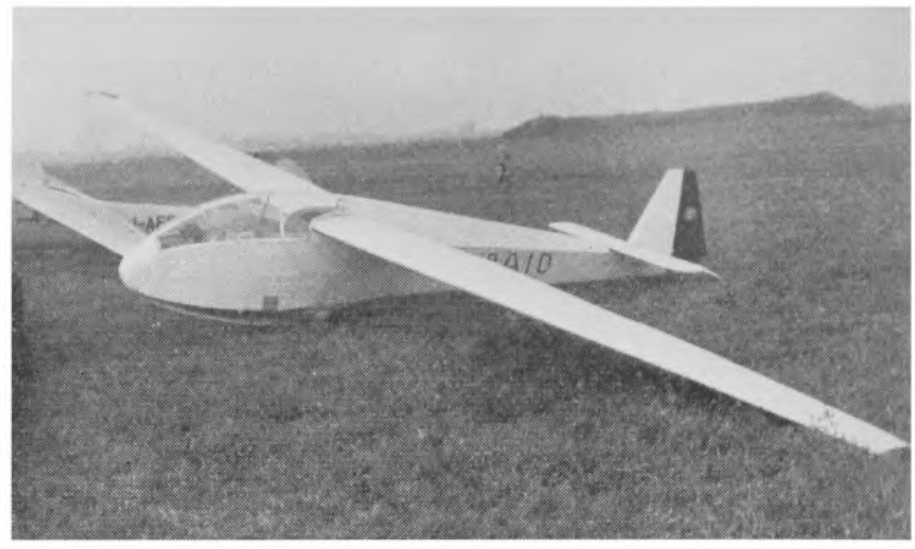
Wing ribs are sawn from 8 mm poplar sheets with the centre cut out and re-inforced with ply strips. This proved simple, gave a good contour and not too great a weight penalty (8 kg). Wing root fittings use three main pins and two drag pins; this involves a rather heavy fuselage structure between the lower main pins. Pins are unhardened but subjected to low bearing stress and have shown no wear in service. Flaps on B and C types have proved useful for take-off and thermalling. Aileron type C was estimated to be some 20% more effective than B, which in turn was better than A.

Der Urendo wurde als Doppelsitzer für alle Zwecke gebaut. Als solcher weist er infolge hoher Flächenbelastung nur beschränkte Möglichkeiten auf, aber er zeigt gute Leistungen, wenn er einsitzig geflogen wird; der Typ A gewann 1959 die italienische Meisterschaft und erreichte eine maximale Strecke von 297 km.

Die Flügelrippen werden aus 8 mm dicken Pappelholzplatten ausgesägt, wobei das Mittelstück herausgeschnitten und durch Sperrholzstreifen verstärkt wird. Dieses Verfahren erwies sich als einfach; es wurde ein guter Umriß ohne zu großes Mehrgewicht (8 kg) erreicht. Die Befestigung an der Flügelwurzel erfolgt durch drei Hauptstifte und zwei Widerstandsstifte; dies bedingt eine eher schwere Rumpfstruktur zwischen den unteren Hauptstiften. Die Stifte sind nicht gehärtet, aber auch nur schwacher Beanspruchung ausgesetzt und zeigten keinerlei Abnutzungserscheinungen. Die Klappen der Typen B und C erwiesen sich als nützlich für Start und Thermikflug. Der Querrudertyp C zeigte schätzungsweise 20% mehr Leistung als B, der seinerseits besser war als A.

L'Urendo a été construit comme biplace pour l'emploi général. Les possibilités comme tel sont limitées à cause de la haute charge alaire, mais il a montré de bonnes performances employé comme monoplace. Le type A a gagné le championnat italien en 1959; la meilleure distance atteinte était de 297 km.

Les nervures alaires sont sciées de planches de 8 mm de bois de peuplier dont le centre est enlevé et renforcé par des bandes de contreplaqué. Le procédé s'est montré simple, donnant à la fois un bon contour sans trop de poids supplémentaire (8 kg). La fixation de l'aile au fuselage se fait par trois goupilles principales et deux goupilles de résistance; il s'ensuit une structure plutôt lourde du fuselage entre les goupilles principales en bas. Les goupilles ne sont pas durcies, mais soumises à des forces seulement faibles; elles n'ont pas montré des signes d'usure. Les volets des types B et C se sont avérés utiles pour le départ et dans les thermiques. L'aileron du type C semble être de 20% plus efficace que celui de B qui, à son tour, est meilleur que celui du type A.



| | |
|---|---|
| Type designation | EC/38/56 A, B, C Urendo |
| Country of design | Italy |
| Designer | Edgardo Ciani |
| Date of first flight of prototype | 22 June 1956 |
| Number produced | A 1 B 1 C 1 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 13,8 m² |
| Aspect ratio ($b^2/s$) | 16,2 |
| Wing root chord ($C_r$) | 1,2 m |
| Wing tip chord ($C_t$) | 0,37 m |
| Mean chord ($C = s/b$) | 0,92 m |
| Wing section, root | NACA $64_3618$ |
| Wing section, mid | NACA $64_3618$ |
| Wing section, tip | NACA 747 A 315 |
| Dihedral | 3° 30′ |
| ¼ chord sweep | —4° 30′ (inner wing)<br>—3° (outer wing) |
| Aero. twist root/tip | 2° (outer wing only) |
| Taper ratio ($C_t/C_r$) | 0,308 |
| Construction | Single spar ply covered wing. Poplar ribs 0,33/0,165 m spacing |

**Ailerons**

| | |
|---|---|
| Type | A Upper surface hinge<br>B Sealed upper surface hinge<br>C Upper surface hinge with small lower surface shroud |
| Span | A 6,0 m<br>B 6,66 m<br>C 6,66 m |
| Area (total) | A 1,47 m²<br>B 1,664 m²<br>C 1,62 m² |
| Mean chord | A 0,245 m<br>B 0,25 m<br>C 0,245 m |
| Max. deflection up | 35° |
| Max. deflection down | 15° |
| Mass balance degree | Nil |
| Construction | Ply covered wood, rib spacing 0,33 m. Nose covered with polyester fibre-glass |

**Horizontal tail**

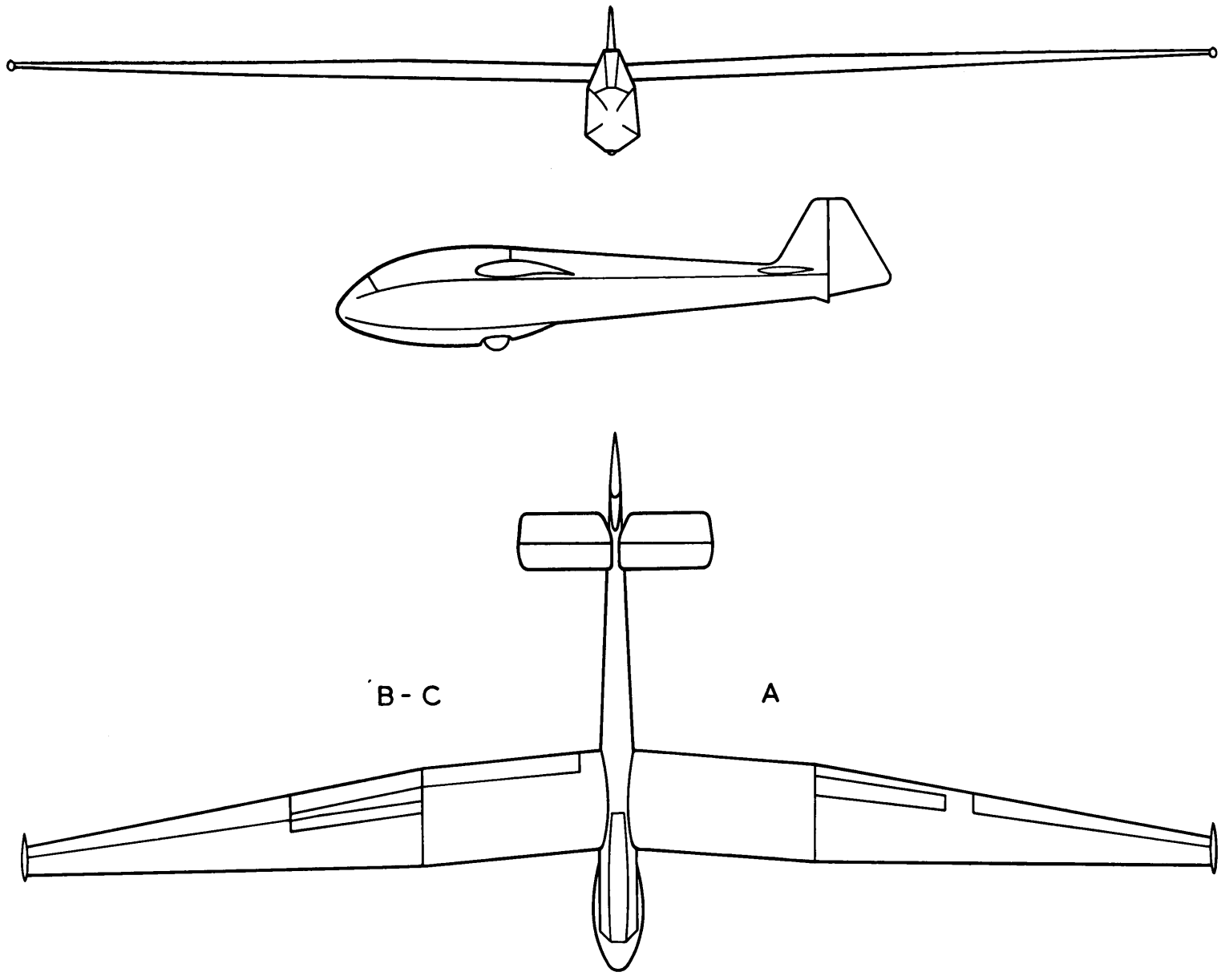
| | |
|---|---|
| Span | 2,5 m |
| Area of elevator and fixed tail (S′) | 1,63 m² |
| Area of elevator | 0,76 m² |
| Max. deflection up | 25° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 0009 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,685 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | A Ground set tab.<br>B and C ditto and spring controlled from cockpit |
| Horizontal tail volume coefficient (S′1′/SC) | 0,47 |
| Construction | Wood. Ply covered fixed tail. Fabric covered elevator |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,136 m² |
| Area of rudder | 0,586 m² |
| Aspect ratio | 1,4 |
| Tail arm | 4,365 m |
| Max. deflection | 20° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Structure | Ply covered wood fin. Fabric covered rudder. Rib spacing 0,3 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,68 m |
| Max. height (at cockpit) | 1,30 m |
| Overall length | 6,92 m |
| Max. cross section | 0,61 m² |
| Wetted surface area | 11,4 m² |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed wheel and rubber mounted skid. Wheel brakes |




| | |
|---|---|
| Structure | Steel tube with wood stringer false work. Fabric covered. Aluminium nose cap. Side opening bent. Plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | A Nil<br>B and C slotted |
| Span (total) | B and C 6,35 m |
| Area (total) | 2,16 m² |
| Max. deflection up | 5° |
| Max. deflection down | 50° |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | A 3,2 m<br>B 3,2 m<br>C 3,2 m |
| Area | A 2,088 m²<br>B 1,992 m²<br>C 1,50 m² |
| Location, % of chord | Upper A 62 B 50 C 49<br>Lower A 70 B 75 C 51 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 140 kg |
| Fuselage[2] | 81 kg |
| Tailplane and elevator | 8 kg |
| Empty weight[3] | 233 kg |
| Instruments | 2 kg |
| Equipped weight | 235 kg |
| Flying weight | 395 kg (2 up) |
| Wing loading | 28,6 kg/m² (2 up) |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | RAI |
| Date of issue of these requirements | 1942 |
| Certificate of airworthiness | Yes—Cat. N |

**Design flight envelope**

*Manoeuvre loads*

| | |
|---|---|
| Ultimate load factor at 395 kg | 9 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 150 km/h |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 33 to 38% |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 160/170 km/h |

**Straight flight performance**

Measured at flying weight of 330 kg (one pilot only)

**No flap or brake**

(Type A after one year's use)

| | V km/h | v m/s |
|---|---|---|
| Min. sink condition | 68 | 0,87 |
| Max. L/D condition | 86 | 0,97 |
| | 100 | 1,30 |
| Stalling speed | 55/60 km/h | 50/52 km/h |
| Flap deflection | 0° | 45° |
| Max. L/D | 24,7 | |

# EC 37/53 SPILLO


The Spillo is based on the CVV7 Pinocchio, but with a higher aspect ratio wing, modified fuselage and redesigned structure. In designing this sailplane, Ciani was aiming primarily at good performance at high flight speeds, an objective which he now considers to have been over emphasised.

Construction took 6 months and 5400 man hours, costing three million lire.

In 1958 flaps were added, the ailerons enlarged and the skid reinforced.

The designer considers the principal faults in the design to be:

1⁰ Air brakes are insufficiently effective in steeping the approach. Best landing technique is with 90° flap and 60 k.p.h. approach speed, but landing distances and approach angle are not suitable for average Italian fields.

2⁰ Horizontal tail surfaces are probably too small.

3⁰ Also recently decided that rudder is probably too small.

Good features are:

1⁰ Excellent glide ratio in the speed range 90/150 k.p.h.

2⁰ Flaps. These are a great help in thermalling; with 10° flaps, 30° banked turns can be flown at 60 k.p.h. and glide ratio seems to be little affected. In landing they enable approach speeds to be reduced from 80 k.p.h. to 55/60 k.p.h. and give a steeper approach.

In 350 hours flying the Spillo has been twice damaged in cross country landings.

Der Spillo beruht auf dem CVV7 Pinocchio, weist jedoch eine größere Streckung, einen abgeänderten Rumpf und eine neue Struktur auf. Bei der Konstruktion suchte Ciani vor allem gute Leistung bei hohen Fluggeschwindigkeiten zu erreichen; er glaubt heute, daß diese Zielsetzung überbewertet wurde.

Die Konstruktion dauerte 6 Monate, benötigte 5400 Arbeitsstunden und kostete drei Millionen Lire.

Im Jahre 1958 wurden Landeklappen angefügt, die Querruder vergrößert und die Kufe verstärkt.

Der Konstrukteur ist der Auffassung, daß folgende konstruktive Hauptfehler begangen wurden:

1⁰ Die Bremsklappen sind bei steilem Anflug zu wenig wirksam. Die beste Landetechnik besteht in Anwendung von 90° Landeklappen bei 60 km/h Anfluggeschwindigkeit, doch eignen sich Landelänge und Anflugwinkel nicht für normale italienische Plätze.

2⁰ Die Oberflächen des Höhenleitwerkes sind vermutlich zu klein.

3⁰ Nach neuesten Erfahrungen ist vermutlich das Seitenruder zu klein.

Als gute Eigenschaften werden bezeichnet:

1⁰ Ausgezeichneter Gleitwinkel im Geschwindigkeitsbereich von 90–150 km/h.

2⁰ Klappen. Diese bilden eine gute Hilfe bei Thermikflug; mit 10° Klappenausschlag können 30°-Kurven mit 60 km/h geflogen werden, wobei der Gleitwinkel wenig beeinflußt wird. Bei der Landung ermöglichen sie eine Verminderung der Landegeschwindigkeit von 80 auf 55–60 km/h und einen steilen Anflug.

In 350 Flugstunden wurde der Spillo zweimal bei Außenlandungen beschädigt.

Le Spillo est basé sur le CVV7 Pinocchio, mais il possède un allongement plus grand, un fuselage modifié et une nouvelle structure. Le but de la construction de Ciani était d'obtenir avant tout une bonne performance lors de grandes vitesses; aujourd'hui le constructeur est d'avis que la réalisation de ce but a été surestimée.

La construction représente un travail de six mois et 5400 heures de travail et s'élève à trois millions de lire.

En 1958 on y a ajouté des volets d'atterrissage; en plus on a agrandi les ailerons et renforcé le patin.

Le constructeur est d'avis qu'on a commis les erreurs de construction principales suivantes:

1⁰ Les volets de freinage ne sont pas assez efficaces lors d'une descente raide. La meilleure technique d'atterrissage requiert 90° des volets d'atterrissage et 60 km/h de vitesse d'approche, mais la longueur d'atterrissage et l'angle d'approche ne se prêtent pas à la moyenne des champs d'atterrissage en Italie.

2⁰ La surface de l'empennage de profondeur est probablement trop petite.

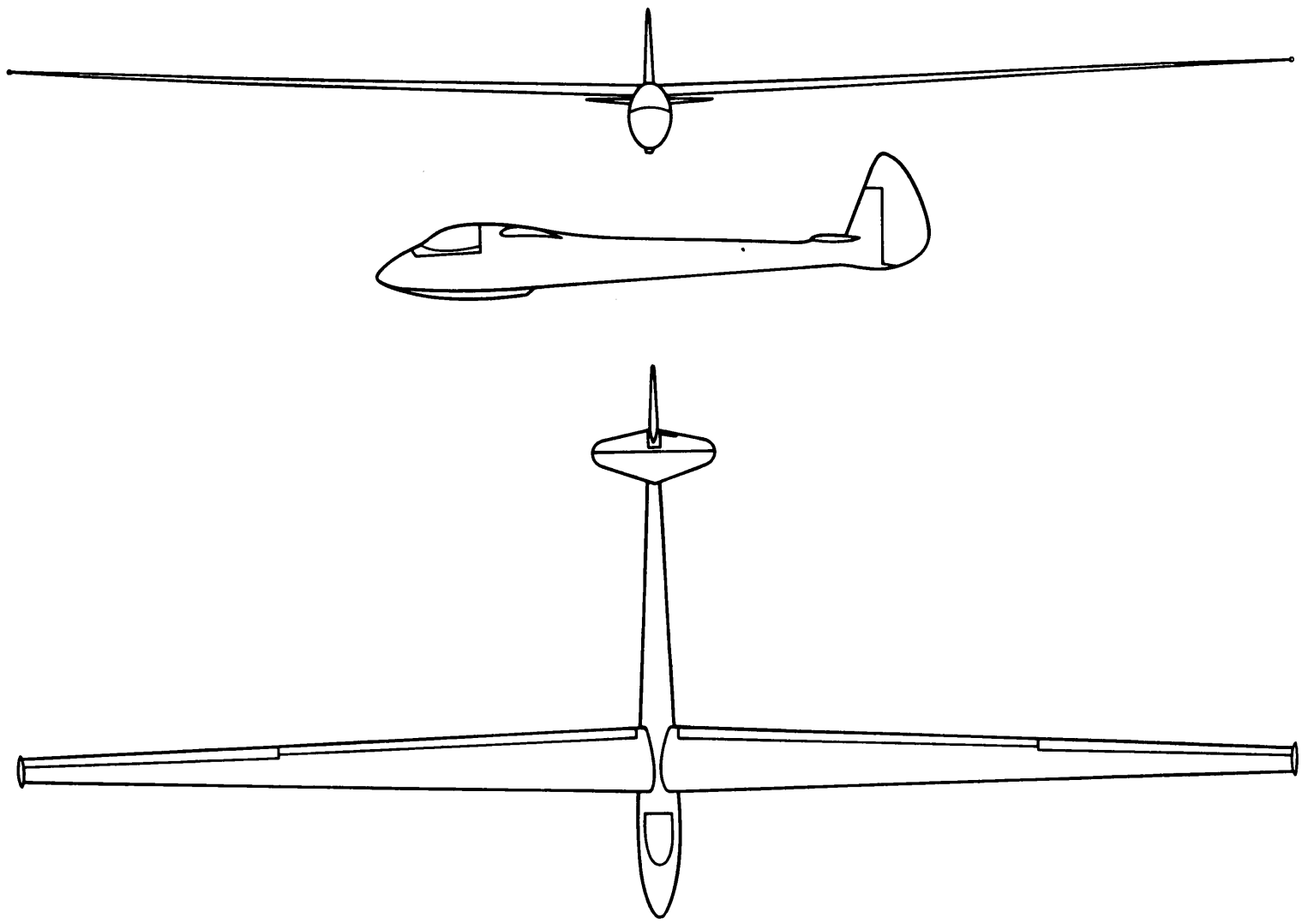
3⁰ D'après de récentes expériences, le gouvernail de direction est probablement trop petit.

Les bonnes caractéristiques sont:

1⁰ Angle de plané excellent entre 90 et 150 km/h.

2⁰ Les volets d'atterrissage sont de grande utilité pour des vols thermiques; des virages de 30° peuvent être effectués avec 10° des volets d'atterrissage, à 60 km/h sans trop influencer l'angle de plané. Pendant l'atterrissage, ils permettent de réduire la vitesse d'approche de 80 à 55–60 km/h et une approche plus raide.

En 350 heures de vol, le Spillo a été endommagé deux fois lors d'atterrissages en campagne.



| | |
|---|---|
| Type designation | EC 37/53 Spillo |
| Country of design | Italy |
| Designer | Ing. E. Ciani |
| Date of first flight of prototype | 1954 |
| Number produced | 1 |

| | Original | 1958 Modifications |
|---|---|---|
| **Wings** | | |
| Span (b) | 18,00 m | |
| Area (s) | 10,97 m² | 11,35 m² |
| Aspect ratio ($b^2/s$) | 29,6 | 28,6 |
| Wing root chord ($C_r$) | 0,938 m | 0,974 m |
| Wing tip chord ($C_t$) | 0,282 m | 0,289 m |
| Mean chord ($C = s/b$) | 0,61 m | 0,631 m |
| Wing section, root | NACA 4415 | |
| Wing section, tip | NACA 2R, 12 | |
| Dihedral | 3,00° | |
| ¼ chord sweep | 0,33° | |
| Aero. twist root/tip | 5,00° | |
| Taper ratio ($C_t/C_r$) | 0,30° | |
| Construction | Single wood spar. Poplar ribs 0,3/0,15 m spacing. Whole wing plywood covered. | |

| | |
|---|---|
| **Ailerons** | |
| Type | Upper surface hinge |
| Span (total) | 6,42 m 7,14 m |
| Area (total) | 0,86 m² 1,08 m² |
| Mean chord | 0,135 m 0,151 m |
| Max. deflection up | 20° |
| Max. deflection down | 8° |
| Mass balance degree | Nil |
| Construction | Wood, ply covered. Rib spacing 0,3 m |
| **Horizontal tail** | |
| Span | 1,8 m |
| Area of elevator and fixed tail (S') | 1,21 m² |
| Area of elevator | 0,63 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 009–005 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,54 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring in cockpit |
| Horizontal tail volume coefficient (S'1' /SC) | 0,77 |
| Construction | Wood. Ply covered fixed tail. Fabric covered elevator. Rib spacing 0,3/0,15 m |
| **Vertical tail** | |
| Area of fin and rudder | 1,0 m² |
| Area of rudder | 0,7 m² |
| Aspect ratio | 2,3 |
| Tail arm | 5,4 m |
| Max. deflection | 30° |
| Aerofoil section | NACA 009–005 |
| Aerodynamic balance | Unshielded horn |
| Structure | Wood. Ply covered fin. Fabric covered elevator. Rib spacing 0,3/0,15 m |
| **Fuselage** | |
| Max. width | 0,62 m |
| Max. height (at cockpit) | 1,1 m |
| Overall length | 7,7 m |
| Max. cross section | 0,42 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Jettisonable wheel. Fixed rubber mounted skid. 2 vertical steel blades under skid to give braking. |
| Structure | Ply monocoque with wood frame and stringers. Blown perspex canopy, side opening. |

| Lift increasing devices | Original | 1958 Modifications |
|---|---|---|
| Type | Nil | Plain trailing edge flaps |
| Span (total) | – | 10,08 m |
| Area (total) | – | 1,46 m² |
| Max. deflection up | – | 5° |
| Max. deflection down | – | 90° |

**Drag producing devices**

| | |
|---|---|
| Type | Lower surface spoilers without gap. Hinged at leading edge |
| Span (total) | 4,32 m |
| Area | 0,71 m² |
| Location, % of chord | 50 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.? | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 170 kg |
| Fuselage [2] | 75 kg |
| Tailplane and elevator | 6 kg |
| Empty weight[3] | 251 kg |
| Instruments | 9 kg |
| Other equipment (e.g. oxygen, radio) | 10 kg |
| Equipped weight | 270 kg |
| Flying weight | 360 kg |
| Wing loading | 31,8 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Registro Aeronautico Italiano |
| Date of issue of these requirements | 1942 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | n (proof load factor) |
|---|---|
| Point A | 3,75 |
| Point D | 1,875 |
| Factor of safety | 2,0 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 150 km/h |
| Winch launching speed | Not established |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 33% to 36% |
| Termial velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Not etablished |

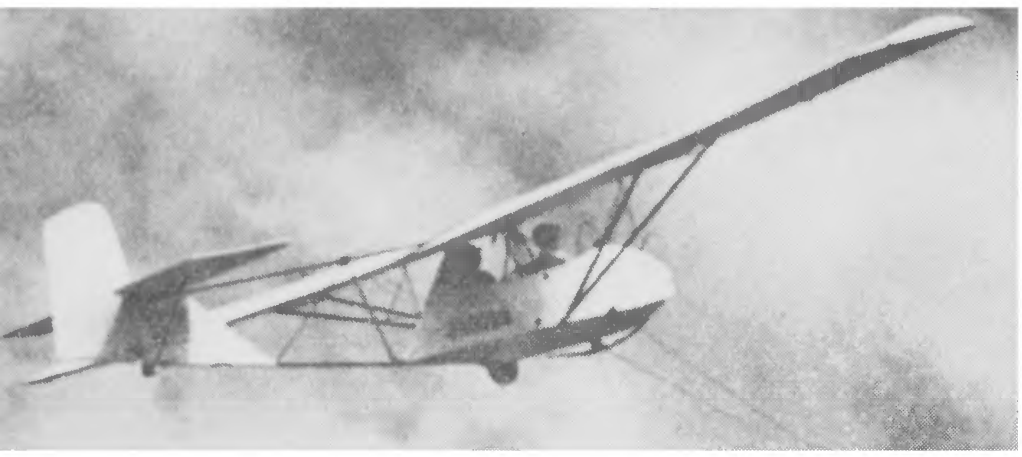
**Straight flight performance**

| | |
|---|---|
| Measured at flying weight of | (before fitting flap) 340 kg |

| No flape or brake | V km/h | v m/s |
|---|---|---|
| Min. sink condition | 83 | 0,72 |
| Max. L/D condition | 101 | 0,78 |
| | 125 | 1,32 |
| Stalling speed | 45/50 km/h | |
| Flap deflection | 90° | |
| Max. L/D | 38 | |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

# Japan



# H-22B-3

A two seater of simple construction for preliminary training.

Zweisitzer einfacher Konstruktion für Anfängerschulung.

Biplace de construction simple pour l'écolage des débutants.

| | |
|---|---|
| Type designation | H-22B-3 |
| Country of design | Japan |
| Designer | D. Horikawa |
| Date of first flight of prototype | August 1953 |
| Number produced | 30 |

**Wings**

| | |
|---|---|
| Span (b) | 12,21 m |
| Area (s) | 16,8 m² |
| Aspect ratio ($b^2/s$) | 8,87 |
| Wing root chord ($C_r$) | 1,4 m |
| Wing tip chord ($C_t$) | 1,4 m |
| Mean chord ($C = s/b$) | 1,4 m |
| Wing section, root | Gö 532 mod. |
| Wing section, mid | Gö 532 mod. |
| Wing section, tip | Gö 532 mod. |
| Dihedral | 1° 20′ |
| ¼ chord sweep | 0 |
| Aero. twist root/tip | 1° 30′ |
| Taper ratio ($C_t/C_r$) | 1 |
| Construction | Strutted, two spar wooden structure. Fabric covered. |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 6,0 m |
| Area (total) | 2,1 m² |
| Mean chord | 0,35 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Construction | Fabric covered, wooden structure |

**Horizontal tail**

| | |
|---|---|
| Span | 3,2 m |
| Area of elevator and fixed tail (S′) | 2,87 m² |
| Area of elevator | 1,00 m² |
| Max. deflection up | 30° |
| Max. deflection down | 25° |
| Aerofoil section | Symm. 7% $t/e$ |
| Mass balance degree | Nil |
| Mass balance method | Nil |
| Tail arm (from ¼ (1′) chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,85 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′1′/SC) | 0,47 |
| Construction | Fabric covered, wooden structure |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,56 all moving |
| Aspect ratio | 2,13 |
| Tail arm | 4,4 m |
| Max. deflection | 25° |
| Aerofoil section | Symm. |
| Aerodynamic balance | Set back hinge |
| Structure | Fabric covered, wooden structure |

**Fuselage**

| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 1,58 m |
| Overall length | 7,0 m |
| Max. cross section | 0,53 m² |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed wheel. No brakes. Rubber mounted skid. |
| Structure | Fabric covered steel tube nacelle. Tail boom. Side opening canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

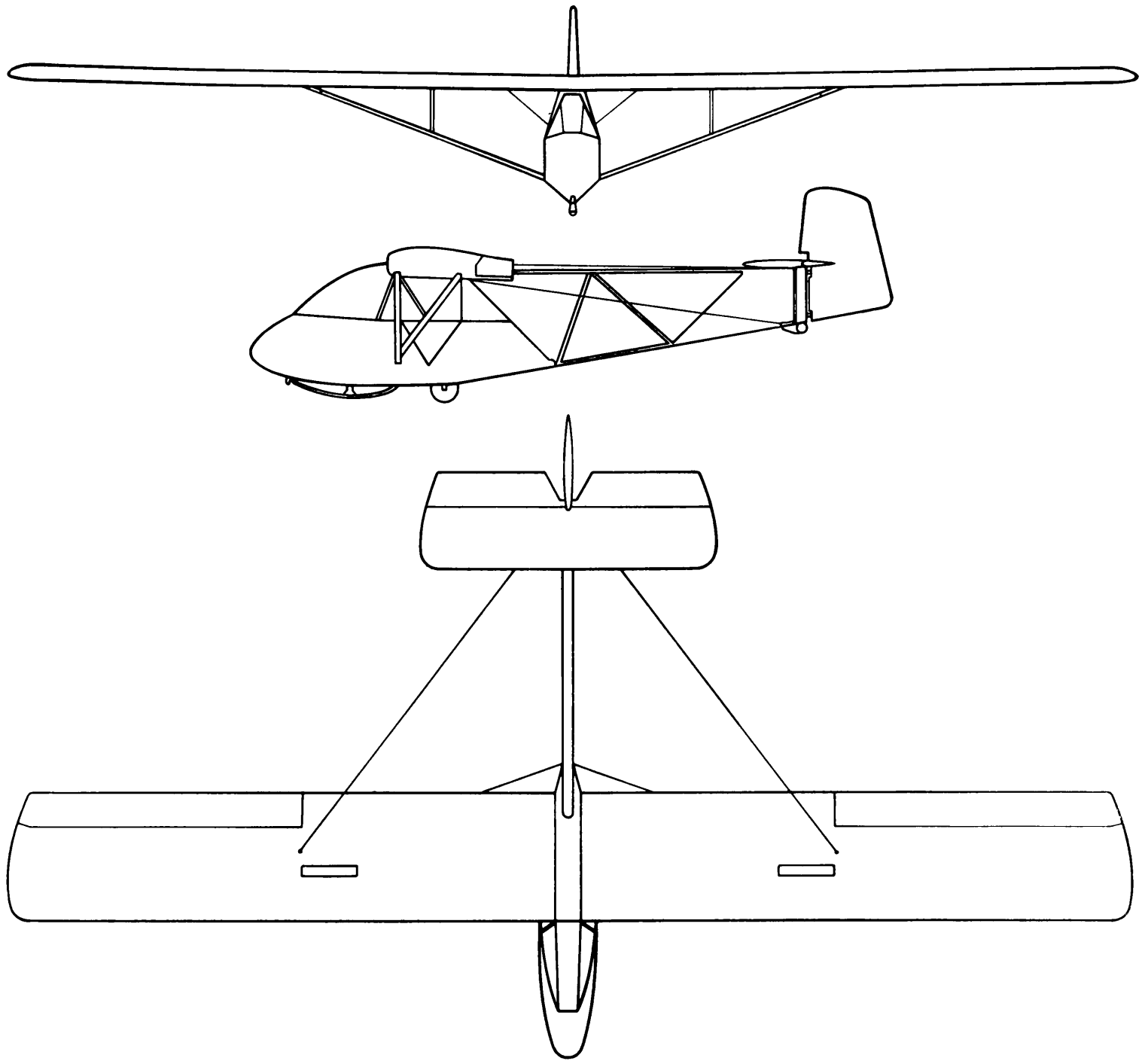
**Drag producing devices**

| | |
|---|---|
| Type | Upper surface spoilers without gap |
| Span (total) | 1,2 m |
| Area | 0,12 m² |
| Location, % of chord | 30 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings[1] | 85 kg |
| Fuselage[2] | 75 kg |
| Tailplane and elevator | 8 kg |
| Empty weight[3] | 168 kg |
| Instruments | 2 kg |
| Equipped weight | 170 kg |
| Flying weight | 300 kg |
| Wing loading | 17,8 kg/m² |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Japanese Civil Air Regulations |
| Date of issue of these requirements | July 1951 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor n |
|---|---|---|
| Point A | 103 | 4 |
| Point B | 154 | 3 |
| Point C | 154 | — 1 |
| Factor of safety | | 1,5 |

| *Gust loads* | V km/h | Gust. vel. m/s |
|---|---|---|
| Point A | 103 | 9 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 120 km/h |
| Placard airspeed gusty conditions | 100 km/h |
| Winch launching speed | 90 km/h |

| | |
|---|---|
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 25–40 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Brakes not terminal velocity limiting |

**Straight flight performance**

Calculated
at flying weight of . . . . . 290 kg

**No flap or brake**

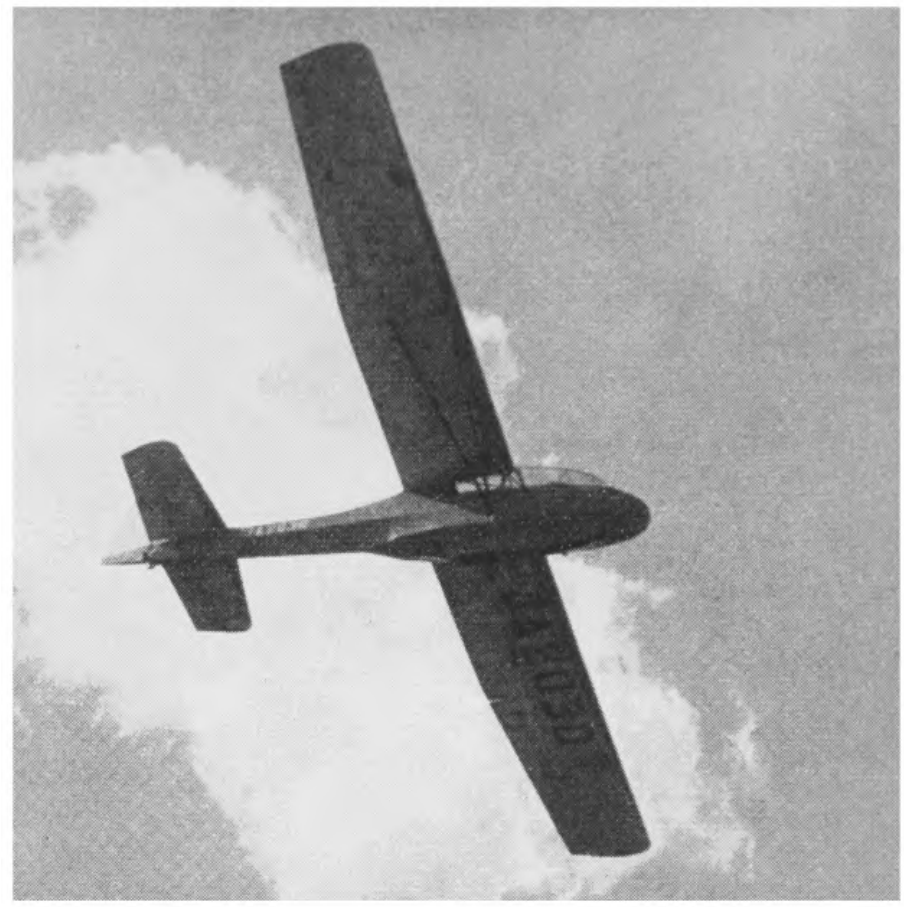
| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 54,4 | 1,16 |
| Max. L/D condition | 66,8 | 1,4 |
| | 73 | 1,65 |
| | 85 | 2,2 |
| | 97 | 3,1 |
| Stalling speed | 48,5 km/h | |
| Max. L/D | 14,2 | |

# H-23B-2

A two seater of better performance than the H-22B-3 suitable for aero-towing and club utility use.

Zweisitzer mit besseren Leistungen als der H-22B-3; kann für Flugzeugschlepp und starke Beanspruchung im Clubbetrieb eingesetzt werden.

Biplace avec de meilleures performances que le H-22B-3; apte pour remorquage par avion et l'emploi quotidien dans les clubs.



| | |
|---|---|
| Type designation | H-23B-2 |
| Country of design | Japan |
| Designer | D. Horikawa |
| Date of first flight of prototype | 10 September 1956 |
| Number produced | 8 |

**Wings**

| | |
|---|---|
| Span (b) | 13,15 m |
| Area (s) | 17,2 m² |
| Aspect ratio ($b^2/s$) | 10 |
| Wing root chord ($C_r$) | 1,4 m |
| Wing tip chord ($C_t$) | 1,1 m |
| Mean chord ($C = s/b$) | 1,3 m |
| Wing section, root | Gö 532 mod. |
| Wing section, mid | Gö 532 mod. |
| Wing section, tip | Gö 676 |
| Dihedral | 1° 20′ |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 3° 50′ |
| Taper ratio ($C_t/C_r$) | 0,78 |
| Construction | Strutted, two spar wooden construction. Fabric covering over rear 35% chord. |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 6,3 m |
| Area (total) | 1,6 m² |
| Mean chord | 0,25 m |
| Max. deflection up | 25° |
| Max. deflection down | 15° |
| Mass balance method | Multiple external weights |
| Construction | Fabric covered, wooden structure. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 1,42 m |
| Overall length | 7,26 m |
| Max. cross section | 0,67 m² |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Sprung wheel. No brakes. Rubber mounted skid. |
| Structure | Fabric covered steel tube fuselage. Side opening bent sheet plexiglass. |

**Horizontal tail**

| | |
|---|---|
| Span | 3,2 m |
| Area of elevator and fixed tail (S′) | 2,73 m² |
| Area of elevator | 1,03 m² |
| Max. deflection up | 25° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 0009 |
| Mass balance degree | Nil |
| Mass balance method | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,7 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′1′/SC) | 0,45 |
| Construction | Fabric covered, wooden structure. |

**Vertical tail**

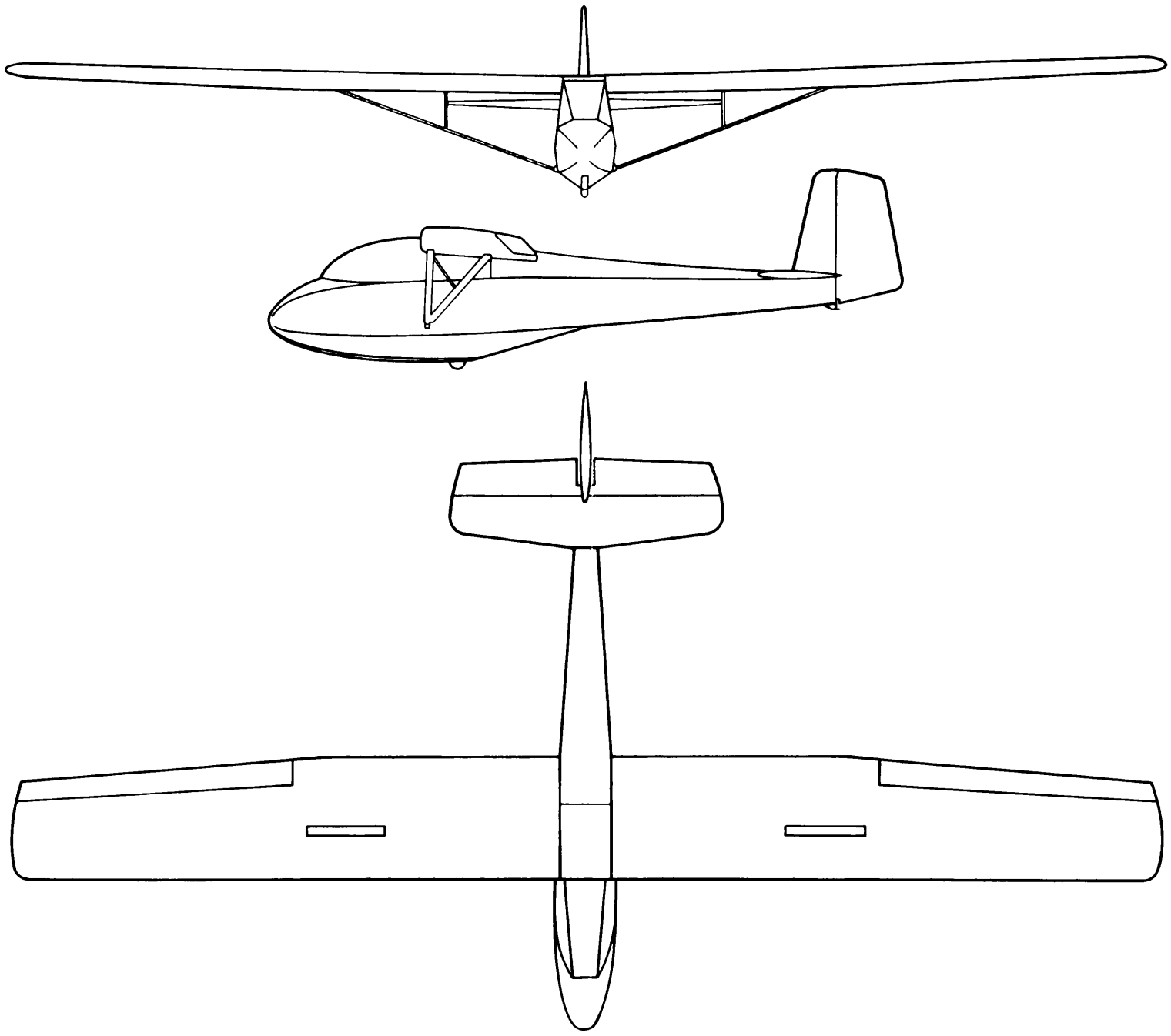
| | |
|---|---|
| Area of fin and rudder | 1,38 m² |
| Area of rudder | 0,9 m² |
| Aspect ratio | 1,63 |
| Tail arm | 4,2 m |
| Max. deflection | 25° |
| Aerofoil section | NACA 0009 |
| Mass balance degree | Nil |
| Mass balance type | Nil |
| Aerodynamic balance | Nil |
| Structure | Fabric covered, wooden structure. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper surface spoilers without gap. |
| Span (total) | 1,8 m |
| Area | 0,18 m² |
| Location, % of chord | 32 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |



**Weights**

| | |
|---|---|
| Wings[1] | 100 kg |
| Fuselage[2] | 98 kg |
| Tailplane and elevator | 10 kg |
| Empty weight[3] | 208 kg |
| Instruments | 2 kg |
| Equipped weight | 210 kg |
| Flying weight | 380 kg |
| Wing loading | 22,1 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Japanese Civil Air Regulations |
| Date of issue of these requirements | July 1951 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor n |
|---|---|---|
| Point A | 127 | 5 |
| Point B | 256 | 4 |
| Point C | 256 | — 1 |
| Point D | 122 | — 2 |
| Factor of safety | 1,5 | |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 114 | ± 9 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 150 km/h |
| Placard airspeed gusty conditions | 110 km/h |
| Aero-towing speed | 110 km/h |
| Winch launching speed | 110 km/h |
| Cloud flying permitted? | No |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 25–40 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | Brakes not terminal velocity limiting |

**Straight flight performance**

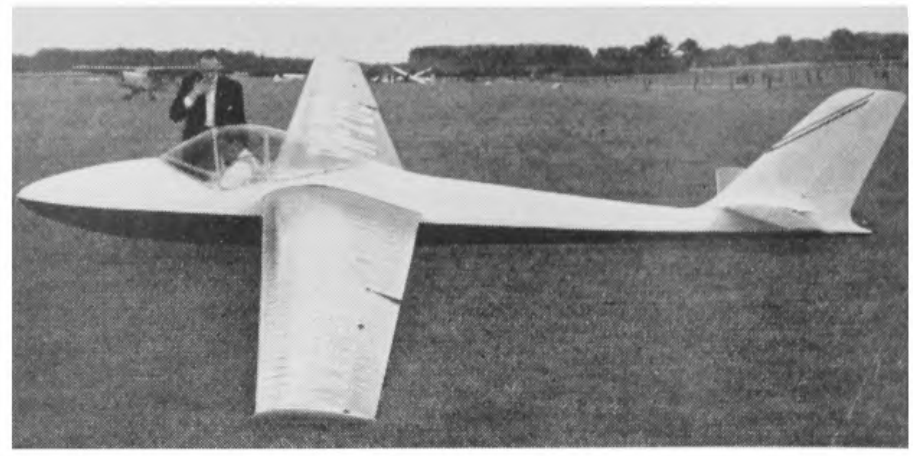
Calculated
at flying weight of 350 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 61,9 | 1,09 |
| Max. L/D condition | 68,5 | 1,23 |
| | 82,5 | 1,4 |
| | 95 | 1,8 |
| | 110 | 2,5 |
| Stalling speed | 55 km/h | |
| Max. L/D | 18 | |

# NETHERLANDS

# SAGITTA



This is the first Dutch Standard Class sailplane, and is a very good-looking example of this class and has an unusually good pilot's view. It is built by N. V. Vliegtuigbouw, and is being developed.

Erstes holländisches Standard-Segelflugzeug. Eine sehr beachtenswerte Konstruktion dieser Klasse mit außergewöhnlich guten Sichtbedingungen für den Piloten. Gebaut von der N. V. Vliegtuigbouw, in Weiterentwicklung.

Premier planeur de la classe Standard construit aux Pays-Bas, remarquable par son aspect et avec une visibilité extraordinaire pour le pilote. Construit par la N. V. Vliegtuigbouw, ce planeur sera développé ultérieurement.

| | |
|---|---|
| Type designation | Sagitta |
| Country of design | Netherlands |
| Designer | P. H. Alsema |
| Date of first flight of prototype | 4 July, 1960 |
| Number produced | 3 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 12 m² |
| Aspect ratio ($b^2/s$) | 18,7 |
| Wing root chord ($C_r$) | 1,2 m |
| Wing tip chord ($C_t$) | 0,5 m |
| Mean chord ($C = s/b$) | 0,8 m |
| Wing section, root | NACA 63 618 |
| Wing section, mid | NACA 63 618 |
| Wing section, tip | NACA 4412 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 1° |
| Taper ratio ($C_t/C_r$) | 0,416 |
| Construction | Single spar wooden cantilever. Leading edge ply torsion box. Fabric covering 25%. Ribs spaced 0,35 m |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 2 × 3 m |
| Area (total) | 2 × 0,468 m² |
| Mean chord | 0,156 m |
| Max. deflection up | 21° |
| Max. deflection down | 14° |
| Mass balance degree | Nil |
| Construction | Wood. Ply covered. Ribs spaced 0,175 m |

**Horizontal tail**

| | |
|---|---|
| Span | 3,0 m |
| Area of elevator and fixed tail (S') | 1,35 m² |
| Area of elevator | 0,548 m² |
| Max. deflection up | 20° |
| Max. deflection down | 15° |
| Aerofoil section | Symm. 14% |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,48 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S'1'/SC) | 0,69 |
| Construction | Wood. Ply covered. Ribs spaced 0,2 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,6 m² |
| Area of rudder | 0,34 m² |
| Aspect ratio | 0,80 |
| Tail arm | 3,45 m |
| Max. deflection | 30° |
| Aerofoil section | Symm. 10% |
| Aerodynamic balance | Nil |
| Construction | Wood. Fin ply covered. Rudder fabric covered. Ribs spaced 0,2 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,55 m |
| Max. height (at cockpit) | 1,10 m |
| Overall length | 6,465 m |
| Max. cross section | 0,44 m² |
| Number of seats/arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel with brakes |
| Construction | Ply with fibre glass nose cap. Sliding moulded perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

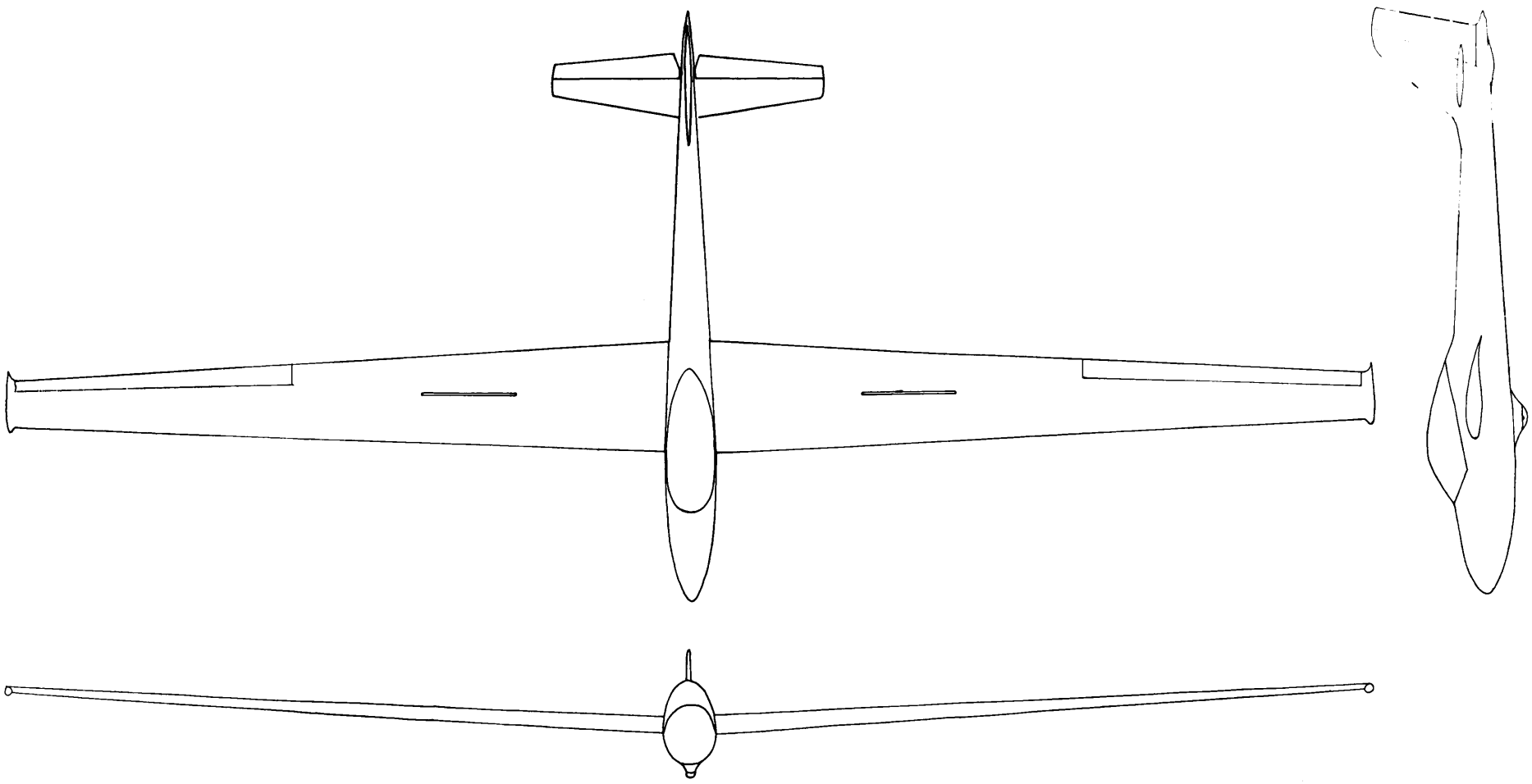
| | |
|---|---|
| Type | Special upper and lower surface spoilers |
| Span (total) | 2 × 1,03 m |
| Area | 2 × 0,30 m² |
| Location, % of chord | 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 132 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 76 kg |
| Tailplane and elevator | 9 kg |
| Empty weight (including any fixed ballast) | 217 kg |
| Instruments | 4 kg |
| Other equipment (e.g. oxygen, radio) | 5 kg |
| Equipped weight | 226 kg |
| Flying weight | 320 kg |
| Wing loading | 26,7 kg/m² |

**Straight flight performance**

| | |
|---|---|
| Measured at flying weight of | 313 kg |



| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 78 | 0,64 |
| Max. L/D condition | 97 | 0,73 |
| | 117 | 0,93 |
| | 136 | 1,30 |
| | 156 | 2,25 |

| | |
|---|---|
| Stalling speed | 66 km/h |
| Max. L/D | 37 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Dutch |
| Date of issue of these requirements | 1953 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 160 | +8 |
| Point B | 270 | +8 |
| Point C | 270 | —5,5 |
| Point D | 226 | —5,5 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point B | 200 | +10 |
| Point C | 200 | —10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 270 km/h |
| Placard airspeed gusty conditions | 200 km/h |
| Aero-towing speed | 140 km/h |
| Winch launching speed | 120 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic and inverted flying |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 31,2–41,2 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 220 km/h |

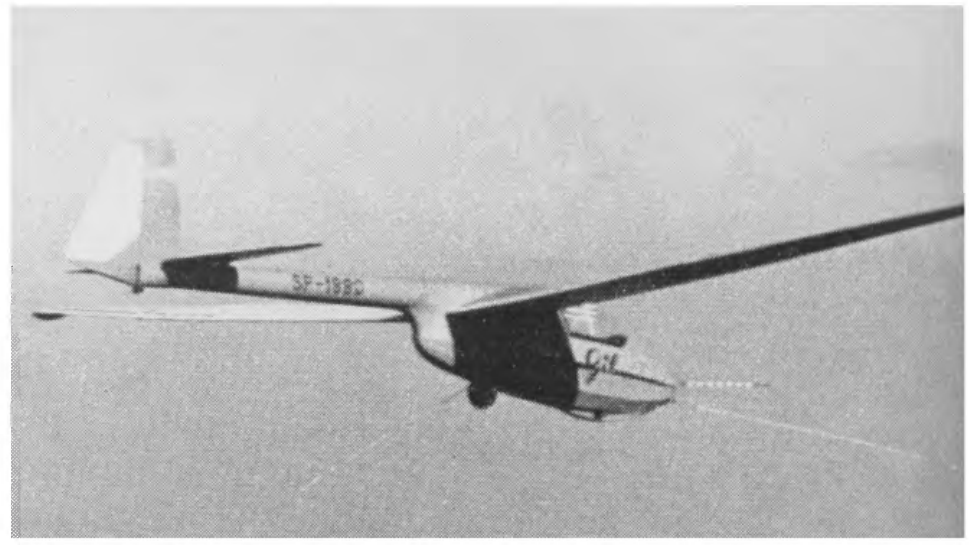
# POLAND

# SZD-16 GIL

This single-seat trainer is a study in mixed construction. The cabin is steel tube with fabric covering. The rear fuselage is a tapered light alloy sheet tube. The wing is wooden. The undercarriage has rubber shock absorbers. A considerable amount of fibreglass laminate is used.

Übungseinsitzer zum Studium der gemischten Bauweise. Kabine als Stahlrohrgerüst mit Stoffbespannung, Rumpfhinterteil als konisches Duralblechrohr, Flügel aus Holz. Das Fahrwerk besitzt Gummiseilfederung. Weitgehende Verwendung von Glasfaserlaminaten.

Ce monoplace d'écolage est une étude dans le domaine de la construction mixte. La cabine est un chassis en tubes d'acier entoilés, la partie arrière du fuselage un tube en tôle d'alliage léger conique. Les ailes sont en bois. Le train d'atterrissage possède un amortisseur de choc en caoutchouc. On a fait un large usage des laminates de fibre de verre.



| | |
|---|---|
| Type designation | SZD-16 Gil |
| Country of design | Poland |
| Designer | Zbigniew Badura |
| Date of first flight of prototype | 20 October 1958 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 13,50 m |
| Area (s) | 14,0 $m^2$ |
| Aspect ratio ($b^2/s$) | 13,0 |
| Wing root chord ($C_r$) | 1,26 m |
| Wing tip chord ($C_t$) | 0,40 m |
| Mean chord ($C = s/b$) | 1,12 m |
| Wing section, root | NACA 43018 mod. |
| Wing section, mid | NACA 43012 A |
| Wing section, tip | NACA 43012 A |
| Dihedral | 4° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 2° |
| Taper ratio ($C_t/C_r$) | 0,318 |
| Construction | Single spar wooden cantilever structure. Leading edge torsion box. 68% fabric covering. |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 6,9 m |
| Area (total) | 1,35 $m^2$ |
| Mean chord | 0,225 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Mass balance degree | 100 |
| Mass balance method | Distributed mass |
| Construction | Fabric covered wooden frame. |

**Horizontal tail**

| | |
|---|---|
| Span | 3,2 m |
| Area of elevator and fixed tail (S′) | 2,0 $m^2$ |
| Area of elevator | 1,1 $m^2$ |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | 009 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,6 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,46 |
| Construction | Fabric covered wooden frame. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,16 $m^2$ |
| Area of rudder | 0,675 $m^2$ |
| Aspect ratio | 1,57 |
| Tail arm | 4,2 m |
| Max. deflection | ± 30° |
| Aerofoil section | 0012 |
| Aerodynamic balance | Nil |
| Structure | Fabric covered wooden frame. |

**Fuselage**

| | |
|---|---|
| Overall length | 6,85 m |
| Max. cross section | 0,55 $m^2$ |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed sprung wheel with brake. Rubber mounted skid. |
| Structure | Fabric covered steel tube frame. Light alloy rear fuselage. Side opening perspex canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

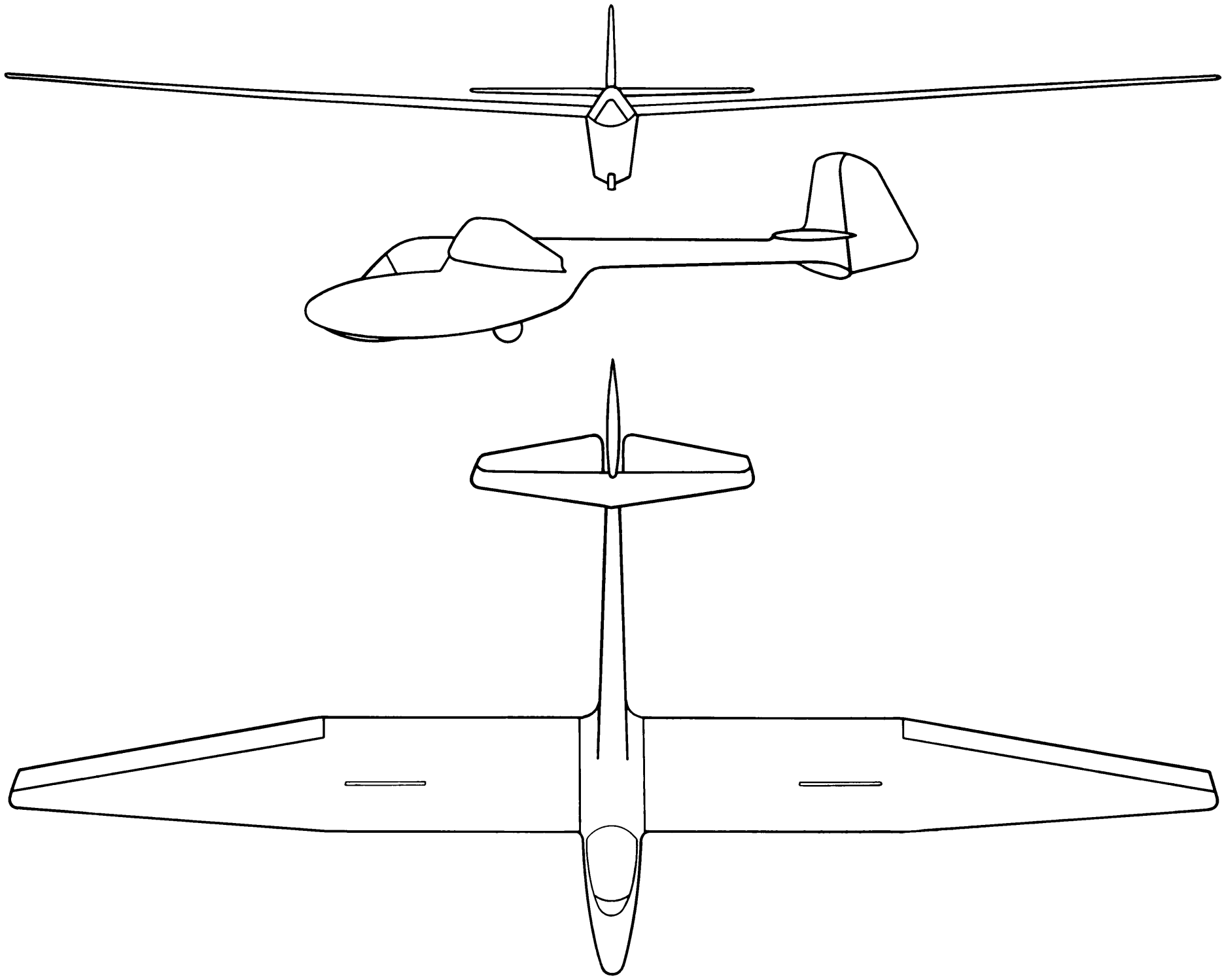
| | |
|---|---|
| Type | Conventional upper and lower surface spoilers with gap. |
| Span (total) | 1,78 m |
| Area | 0,387 $m^2$ |
| Location, % of chord | 35 |

**Weights**

| | |
|---|---|
| Wings[1] | 84 kg |
| Fuselage[2] | 85 kg |

[1] With struts, controls, flaps and brakes

[2] Complete with rudder and fin, less instruments and equipment



| | |
|---|---|
| Tailplane and elevator | 8 kg |
| Empty weight[3] | 177 kg |
| Instruments | 3 kg |
| Other equipment (e.g. oxygen, radio) | 8 kg |
| Equipped weight | 188 kg |
| Flying weight | 298 kg |
| Wing loading | 21,3 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish PBSL |
| Date of issue of these requirements | 1957 |
| Certificate of airworthiness? | Yes, 24 March 1957 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 111 | + 5 |
| Point B | 200 | + 2,5 |
| Point C | 200 | — 1,25 |
| Point D | 111 | — 2,5 |
| Factor of safety | Wood 1,75 | Metal 1,5 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 144 | + 10 |
| Point B | 197 | + 4 |
| Point C | 197 | — 3 |
| Point D | 144 | — 7 |

[3] To include any fixed ballast

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 130 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 23,7–36,9 |

**Straight flight performance**

Measured
at flying weight of 262 kg

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 60 | 0,90 |
| Max. L/D condition | 70 | 0,98 |
| | 90 | 1,46 |
| | 105 | 1,62 |
| | 120 | 2,70 |
| Stalling speed | 52 km/h | |
| Max. L/D | 19,8 | |

# SZD-19-2 ZEFIR 2

This sailplane has been developed from the earlier SZD-19 Zefir 1. By making many improvements not only was the performance improved, but also the construction and handling were improved. Apart from wood, foam sandwich and fibreglass, laminated shells were used. A great deal of attention was paid to the arrangement of the cabin and to the aesthetics of the external appearance. Because of the supine position of the pilot, it was possible to keep the fuselage cross section very small indeed. The wing is equipped with very effective slotted flaps which make it possible to do tight turns in thermals. In addition, the high speed characteristics can be considered as very good, as was shown during the 1960 World Championships. The unusually wide range of usable speeds results in this sailplane being well suited to both strong and weak thermals.

The wing spars become wide at the roots and are bolted together by means of two pairs of steel cheek-pieces, and the wing and fuselage are connected together by four conical pins.

The towing hook is attached to the undercarriage and can be completely retracted with the wheel after the cable is released. For shortening the landing run and for limiting the diving speed, a parachute brake may be used. Early in 1961 series production is being planned.

Das Segelflugzeug wurde aus dem Vormuster SZD-19 Zefir 1 entwickelt. Durch Einführung vieler Verbesserungen wurden sowohl die Leistungen als auch der Bau und die Handhabung vereinfacht. In der Konstruktion wurden neben Holz auch Schaumstoff-Sandwiches und Glasfaser-Laminat-Schalen verwendet. Viel Aufmerksamkeit wurde der Kabinengestaltung und der äußeren Eleganz gewidmet. Dank der liegenden Stellung des Piloten konnte der Rumpfquerschnitt sehr klein gehalten werden. Der Flügel ist mit wirkungsvollen Spaltklappen ausgestattet, die ein sehr enges Thermikkreisen ermöglichen. Auch die Schnellflugeigenschaften können, wie es die WM 1960 bewiesen haben, als sehr gut anerkannt werden. Der außerordentlich weite Nutzgeschwindigkeits-Bereich macht es möglich, daß das Flugzeug für starke wie auch für ganz schwache Thermik sehr gut geeignet ist.

Die Flügelholme gehen in breite Holmenden über, die mittels zweier Paare von Stahlbacken zusammen verschraubt werden; dabei wird der Rumpf mit vier Konuszapfen mit dem Flügel verbunden.

Die Schleppkupplung befindet sich am Fahrwerk und kann nach dem Auslösen des Schleppseiles mit dem Rad voll eingezogen werden. Für kurze Landungen sowie zur Begrenzung der Sturzfluggeschwindigkeit kann ein wirksamer Bremsschirm verwendet werden. Anfang 1961 wurde die serienmäßige Produktion des Segelflugzeuges vorbereitet.

Développé du modèle de base SZD-19 Zefir 1. Par l'introduction de nombreuses améliorations, on a obtenu des performances meilleures et simplifié la construction et le maniement. A part du bois, on a employé du sandwich en matière de mousse et des coquilles en laminates de fibre de verre. Une importance particulière a été attribuée à l'arrangement de la cabine et à l'élégance extérieure. Grâce à la position couchée du pilote, la section du fuselage est très petite. L'aile est équipée de flaps à fente efficaces qui permettent des virages très étroits dans les thermiques. Les caractéristiques pour le vol de vitesse peuvent être considérées comme bonnes, ce qui a été prouvé lors des Championnats du monde 1960. Le rayon très grand des vitesses utilisables en fait un planeur qui s'adapte aussi bien aux thermiques forts que faibles.

Les longerons des ailes finissent en des bouts de longeron larges qui sont vissées ensemble par deux paires de joues en acier; le fuselage est rallié à l'aile par quatre tourillons coniques. L'accouplement de remorquage se trouve au train d'atterrissage et peut être rétracté entièrement avec la roue après le déclenchement de la corde de remorquage. Un parachute de freinage peut être employé pour des atterrissages courts et pour réduire la vitesse en piqué. La production en série du planeur a été préparée au début de 1961.

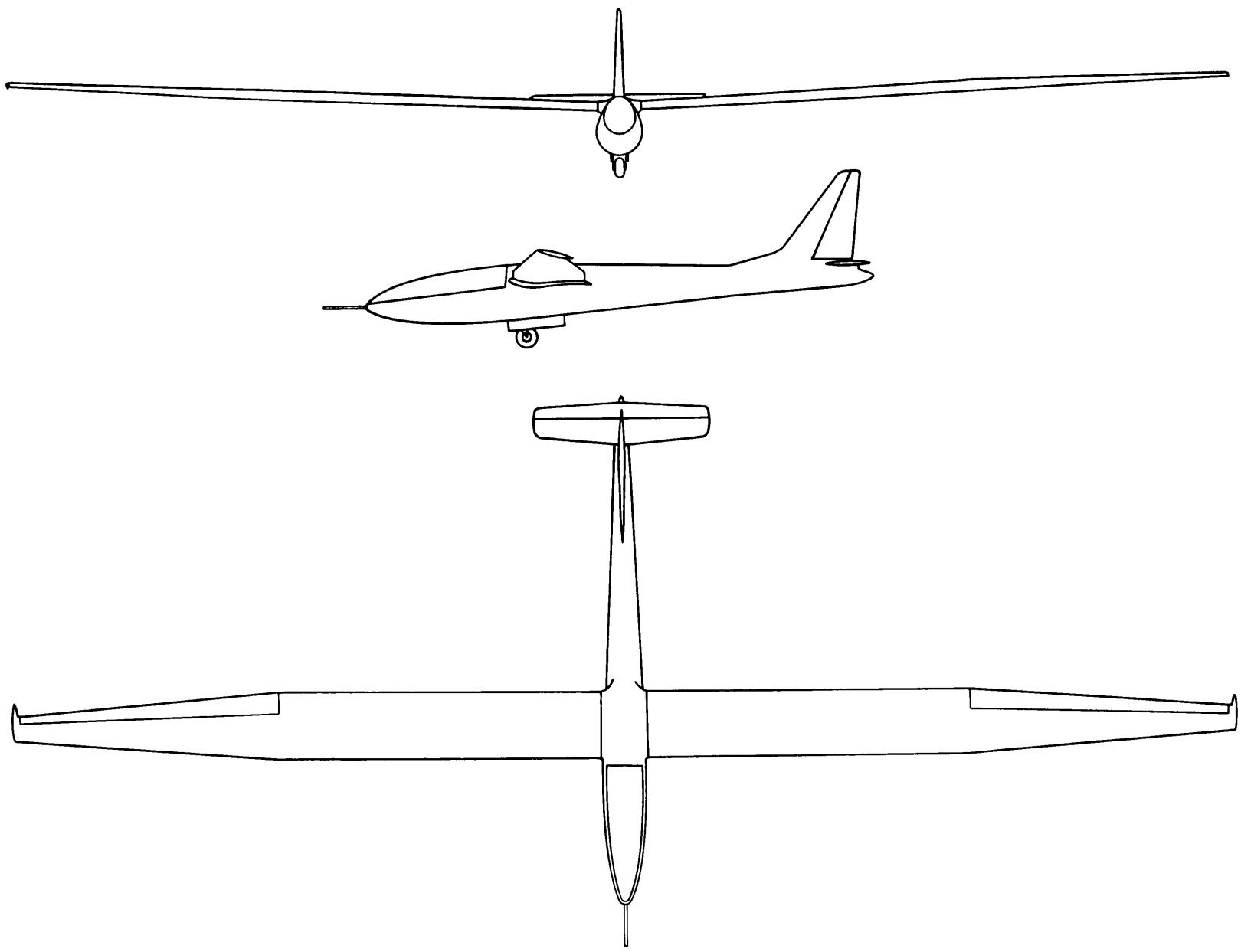
| | |
|---|---|
| Type designation | SZD-19-2 Zefir 2 |
| Country of design | Poland |
| Designer | Bogumil Szuba |
| Date of first flight of prototype | 11 March 1960 |
| Number produced | 2 |

**Wings**

| | |
|---|---|
| Span (b) | 17,0 m |
| Area (s) | 14,0 $m^2$ |
| Aspect ratio ($b^2/s$) | 20,6 |
| Wing root chord ($C_r$) | 0,960 m |
| Wing tip chord ($C_t$) | 0,343 m |
| Mean chord ($C = s/b$) | 0,873 m |
| Wing section, root | NACA $65_2$515 mod. |
| Wing section, mid | NACA $65_2$515 mod. |
| Wing section, tip | NACA $65_2$515 mod. |
| Dihedral | 2° 30′ |
| ¼ chord sweep | 0 |
| Aero. twist root/tip | 0 |
| Taper ratio ($C_t/C_r$) | 0,357 |
| Construction | Single spar wooden cantilever structure. Leading edge ply/plastic sandwich, central torsion box. No fabric |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 7,14 m |
| Area (total) | 1,212 $m^2$ |
| Mean chord | 0,17 m |



| | |
|---|---|
| Max. deflection up | 30° |
| Max. deflection down | 12° |
| Mass balance degree | 100° |
| Mass balance method | Distributed mass. |
| Construction | Fabric covered wood frame |

**Horizontal tail**

| | |
|---|---|
| Span | 2,4 m |
| Area of elevator and fixed tail (S′) | 1,28 m² |
| Area of elevator | 0,56 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 65₁012 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,45 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,436 |
| Construction | Ply sandwich tailplane. Fabric covered wooden frame elevator |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,992 m² |
| Area of rudder | 0,44 m² |
| Aspect ratio | 1,81 |
| Tail arm | 4,1 m |
| Max. deflection | ± 30° |
| Aerofoil section | NACA 65₁012 |
| Aerodynamic balance | Nil |
| Structure | Ply sandwich. Fabric covered rudder. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 0,76 m |
| Overall length | 7,07 m |
| Max. cross section | 0,33 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Retractable sprung wheel. No skid. Brakes. |
| Structure | Ply monocoque and fibre glass. Rear opening moulded perspex canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Slotted VZLU 35% |
| Span (total) | 9,0 m |
| Area (total) | 3,0 m² |
| Max. deflection up | 0 |
| Max. deflection down | 10° |

**Drag producing devices**

| | |
|---|---|
| Type | Tail parachute |
| Area | 1,13 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings [1] | 185 kg |
| Fuselage [2] | 99 kg |
| Tailplane and elevator | 7 kg |
| Instruments | 4 kg |
| Equipped weight | 295 kg |
| Flying weight | 405 kg |
| Wing loading | 28,9 kg/m² |

[1] With struts, controls, flaps and brakes

[2] Complete with rudder and fin, less instruments and equipment

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish PBSL |
| Date of issue of these requirements | 1959 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 152,5 | +5,5 |
| Point B | 220 | +4,0 |
| Point C | 220 | —2,0 |
| Point D | 180 | —3,5 |
| Factor of safety | Wood 1,75 | Metal 1,50 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 125 | +30 |
| Point B | 220 | +4 |
| Point C | 220 | —4 |
| Point D | 125 | —30 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 220 km/h |
| Placard airspeed gusty conditions | 130 km/h |
| Aero-towing speed | 130 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 28 to 41,5 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 190 km/h |

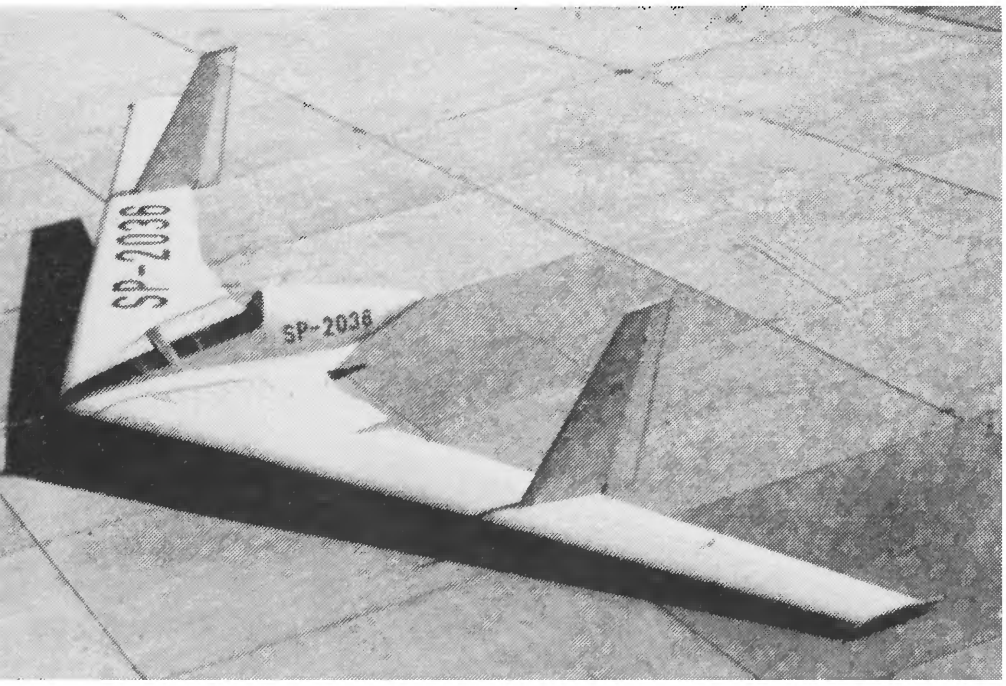
**Straight flight performance**

Measured at flying weight of 382 kg

| **No flap or brake** | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 87 | 0,72 |
| Max. L/D condition | 95 | 0,75 |
| | 130,5 | 1,43 |
| | 152,5 | 2,04 |
| | 174 | 2,78 |

| | |
|---|---|
| Stalling speed | 62 km/h |
| Flap deflection | 10° |
| Max. L/D | 35 |

# SZD-20X WAMPIR




This is an experimental sailplane designed for investigation of the flying characteristics of tailless types. In order to achieve a good basis of comparison with normal types, a span of 15 m and wing area of 15 m² were chosen. Special arrangements in the control mechanisms made it possible to investigate various control schemes.

Versuchssegelflugzeug, entworfen zwecks Untersuchung der Flugeigenschaften der Nurflügelbauart. Um einen besseren Vergleich mit der normalen Art zu erzielen, wurde es mit 15 m Spannweite und 15 m² Tragfläche ausgelegt. Eine spezielle Ausführung der Steuerungsantriebe macht es möglich, verschiedene Steuervarianten im Fluge zu untersuchen.

Planeur d'essais construit pour des recherches dans le domaine des ailes volantes. Une envergure de 15 m et une surface portante de 15 m² ont été choisies pour mieux permettre des comparaisons avec des planeurs normaux. Une construction spéciale du mécanisme de contrôle permet des recherches sur les différentes possibilités du contrôle en vol.

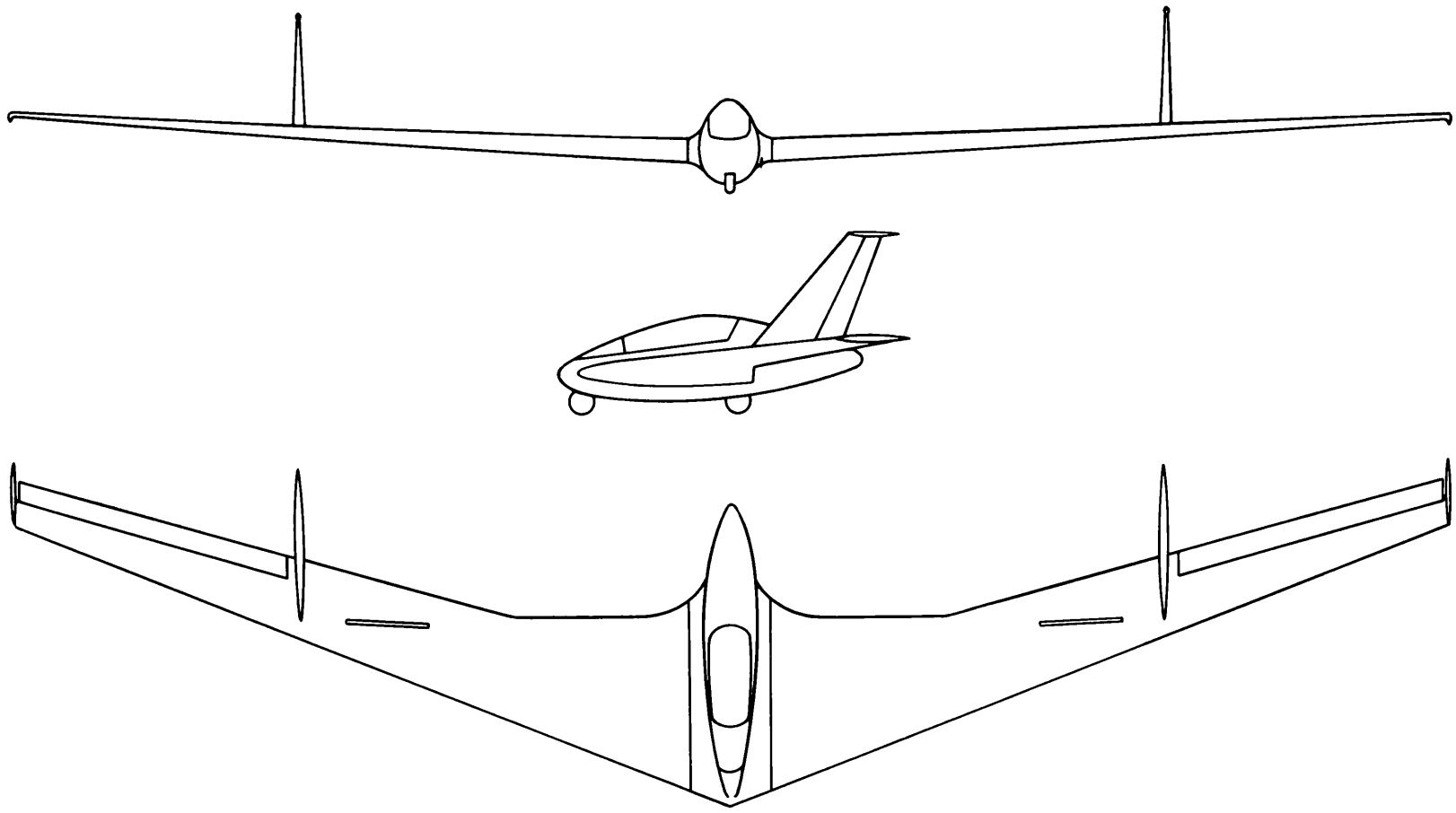
| | |
|---|---|
| Type designation | SZD-20 X Wampir |
| Country of design | Poland |
| Designer | Jan Dyrex |
| Date of first flight of prototype | 9 Sept. 1959 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 15 m² |
| Aspect ratio ($b^2/s$) | 15 |
| Wing root chord ($C_r$) | 1,850 m |
| Wing tip chord ($C_t$) | 0,50 m |
| Mean chord ($C = {}^{s}/_{b}$) | 1,055 m |
| Wing section, root | NACA 23112 |
| Wing section, mid | NACA 23112 |
| Wing section, tip | NACA 23112 |
| Dihedral | 2° |
| ¼ chord sweep | 18,28° |
| Aero. twist root/tip | 4° |
| Taper ratio ($C_t/C_r$) | 0,33 |
| Construction | Single spar wooden cantilever structure. Leading edge torsion box. No fabric |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 5,6 m |
| Area (total) | 1,46 m² |
| Mean chord | 0,26 m |



| | |
|---|---|
| Max. deflection up | 28° |
| Max. deflection down | 28° (± 16 as elevator) |
| Construction | Fabric covered wood frame |

**Horizontal tail**

| | |
|---|---|
| Span | No tailplane<br>Elevator span 3,69 |
| Area of elevator and fixed tail (S′) | No tailplane |
| Area of elevator | 1,494 m² |
| Max. deflection up | 17° |
| Max. deflection down | 23° |
| Aerofoil section | Extension of wing section |
| Mass balance degree | Nil |
| Elevator trimming method | Tab |
| Construction | Fabric covered wood frame |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,61 m² |
| Area of rudder | 0,53 m² |
| Aspect ratio | 2,15 |
| Tail arm | 1,61 m |
| Max. deflection | ± 25° |
| Aerofoil section | NACA 0009/0006 |
| Aerodynamic balance | Nil |
| Structure | Ply covered fin.<br>Fabric covered elevator |

**Fuselage**

| | |
|---|---|
| Max. width | 0,6 m |
| Max. height (at cockpit) | 0,9 m |
| Overall length | 3,9 m |
| Max. cross section | 0,416 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | 2 wheels in tandem. Fixed, unsprung, no skid. Wheel brakes |
| Structure | Ply monocoque. Fibre glass nose. Side opening perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Drooping ailerons |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |

**Weights**

| | |
|---|---|
| Equipped weight | 171 kg |
| Flying weight | 268 kg |
| Wing loading | 17,8 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish PBSL |
| Date of issue of these requirements | 1958 |
| Certificate of airworthiness | Experimental |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 106 | +4,5 |
| Point B | 200 | +3,5 |
| Point C | 200 | —1 |
| Point D | 91 | —2 |
| Factor of safety | Wood 1,75 | Metal 1,5 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 125 | +10 |
| Point B | 200 | +4 |
| Point C | 200 | —4 |
| Point D | 125 | —10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Aero-towing speed | 120 km/h |

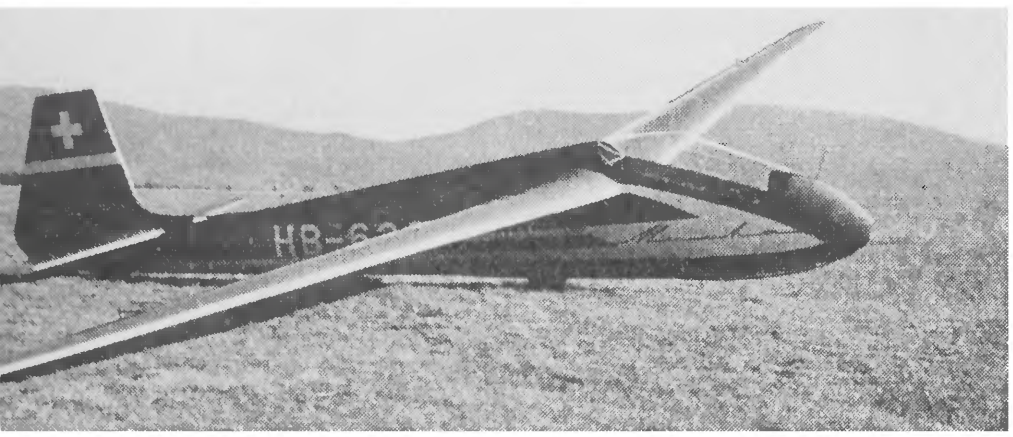
**Straight flight performance**

Calculated
at flying weight of 268 kg

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 72 | 0,84 |
| Max. L/D condition | 82 | 0,96 |
| | 108 | 1,66 |
| | 126 | 2,36 |
| | 144 | 3,22 |
| Stalling speed | 50 km/h | |
| Max. L/D | 24,4 | |

# SZD-22 MUCHA STANDARD



This sailplane was designed for the 1958 World Championships, where it took first place in the Standard Class. Since then it has been in production in three variants: SZD-22A, B and C. Apart from minor improvements, these variants differ because of the addition of water ballast (B and C) and wing fabric covering (C). Because any change in weight during flight is not allowed by the FAI Standard Class rules, the tanks can only be emptied when the sailplane is on the ground. The ballast installation consists of two rubber tanks inside the wing leading edge. Thanks to good flying qualities and low price, this sailplane is now (1961) in mass production and is used in club flying and competitions.

Dieses Segelflugzeug wurde für die Weltmeisterschaften 1958 entworfen, wo es in der Standard-Klasse den ersten Platz errang. Seit dieser Zeit wurde es serienmäßig in drei Varianten als SZD-22A, SZD-22B und SZD-22C gebaut. Neben kleinen Verbesserungen unterscheiden sich die einzelnen Ausführungen durch Einbau des Wasserballastes (B und C) sowie durch die Stoffbespannung des Flügels (C). Da eine Änderung des Fluggewichtes während des Fluges von den FAI-Regeln für die Standard-Klasse nicht erlaubt wird, können die Behälter nur auf dem Boden entleert werden. Die Ballastanlage besteht aus zwei Gummibehältern, die in die Flügelnasen eingeschoben werden können. Dank guten Flugeigenschaften und niedrigem Preis steht das Segelflugzeug gegenwärtig (1961) in Serienproduktion und wird für Klubbetrieb und Wettbewerbe eingesetzt.

Construit pour les Championnats du monde 1958 où il obtint le premier prix dans la classe standard. Depuis ce temps il est construit en série, en trois variations: SZD-22A, B et C. A part des petites améliorations, les variations se distinguent par l'addition de lest d'eau (B et C) et l'entoilage de l'aile (C). Un changement du poids en vol n'étant pas admis par les règles FAI de la classe standard, les réservoirs ne peuvent être vidés qu'au sol. L'installation du lest consiste en deux réservoirs en caoutchouc qui peuvent être introduits dans la partie avant des ailes. Grâce aux bonnes performances et au prix bas, ce planeur se trouve actuellement (1961) en production en série; il est employé dans les clubs et pour des vols de performance.

| | |
|---|---|
| Type designation | SZD-22A Mucha Standard |
| Country of design | Poland |
| Designers | Nowakowski, Grzywacz, Zatwarnicki |
| Date of first flight of prototype | 10 February 1958 |
| Number produced | Approx. 120 |

**Wings**

| | |
|---|---|
| Span (b) | 14,98 m |
| Area (s) | 12,75 m² |
| Aspect ratio ($b^2/s$) | 17,65 |
| Wing root chord ($C_r$) | 1,45 m |
| Wing tip chord ($C_t$) | 0,43 m |
| Mean chord ($C = s/b$) | 0,95 m |
| Wing section, root | Gö 549 |
| Wing section, tip | M 12 |
| Dihedral | 4° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,297 |
| Construction | Single spar wooden cantilever structure. Leading edge torsion box. Fabric covering: SZD-22B nil, SZD-22C 67%. |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 7,0 m |
| Area (total) | 1,4 m² |
| Mean chord | 0,2 m |
| Max. deflection up | 26° |
| Max. deflection down | 13° |
| Mass balance degree | 100 |
| Mass balance method | Distributed mass |
| Construction | Fabric covered wooden frame. |

**Horizontal tail**

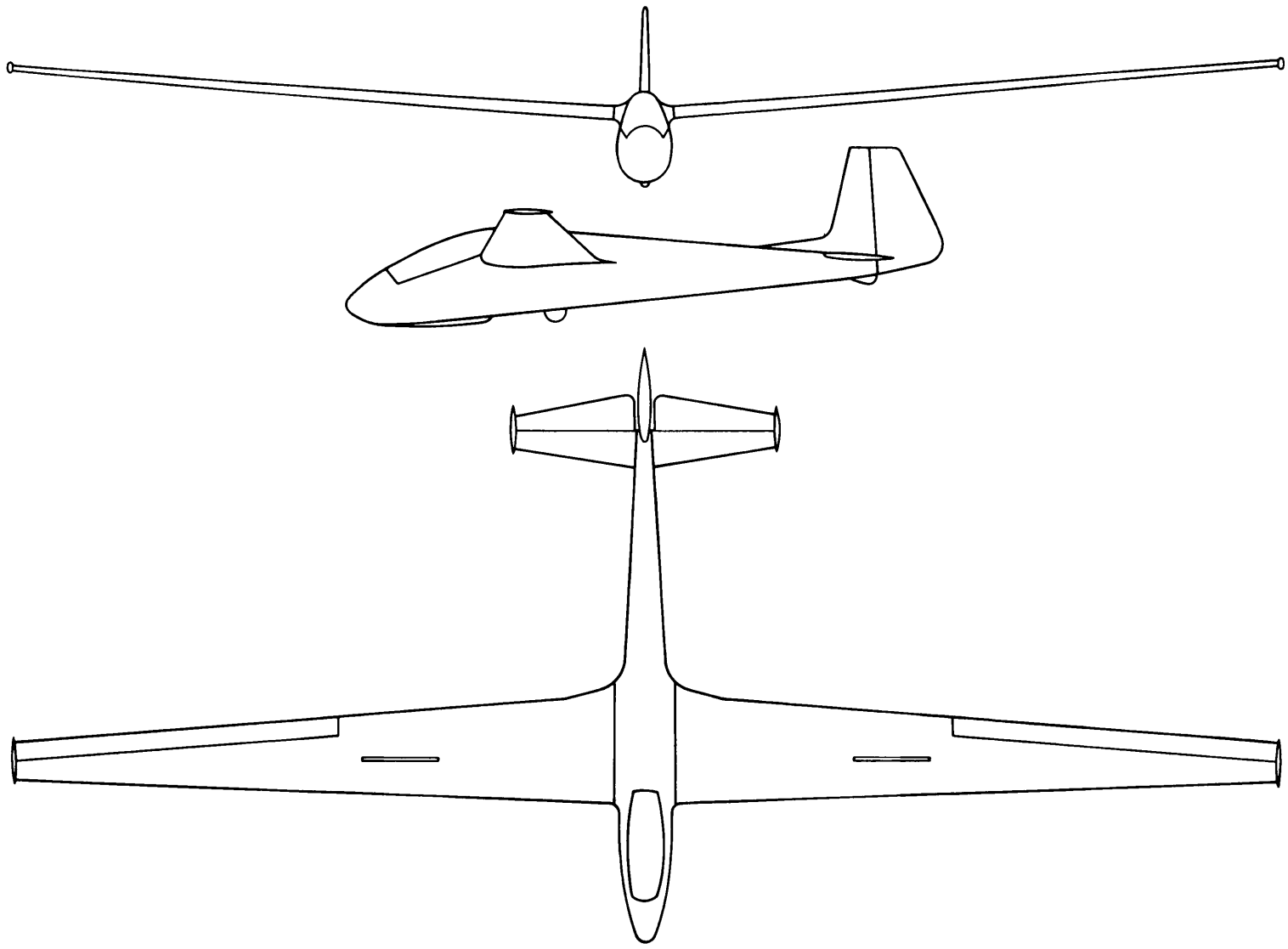
| | |
|---|---|
| Span | 3,15 m |
| Area of elevator and fixed tail (S′) | 1,88 m² |
| Area of elevator | 0,79 m² |
| Max. deflection up | 22° |
| Max. deflection down | 20° |
| Aerofoil section | 0012 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,9 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,605 |
| Construction | Fabric covered wooden frame. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,20 m² |
| Area of rudder | 0,77 m² |
| Max. deflection | ± 30° |
| Aerofoil section | 0012 |
| Aerodynamic balance | Nil |
| Structure | Fabric covered wooden frame. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,565 m |
| Max. height (at cockpit) | 1,06 m |
| Overall length | 7,00 m |
| Max. cross section | 0,475 m² |



| | |
|---|---|
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel with brakes. Rubber mounted skid. |
| Structure | Ply monocoque. Light alloy nose cap. Front opening perspex canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Conventional upper and lower surface spoilers without gap. |
| Span (total) | 2,0 m |
| Area | 0,38 m² |
| Location, % of chord | 36 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.? | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 112 kg |
| Fuselage[2] | 96 kg |
| Tailplane and elevator | 11 kg |
| Empty weight[3] | 219 kg |
| Instruments | 4 kg |
| Other equipment (e.g. oxygen, radio) | 15 kg |
| Equipped weight | 240 kg |
| Flying weight | 350/383 kg |
| Wing loading | 27,4/30,0 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish PBSL |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

| | |
|---|---|
| Date of issue of these requirements | 1957 |
| Certificate of airworthiness | Yes, 25 May 1960 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 144 | + 6 |
| Point B | 250 | + 4 |
| Point C | 250 | — 2 |
| Point D | 144 | — 3 |
| Factor of safety | Wood 1,75 | Metal 1,5 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 148 | + 30 |
| Point B | 250 | + 4 |
| Point C | 250 | — 4 |
| Point D | 148 | — 5 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 250 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 150 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres? | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 22,5–42,1 |

**Straight flight performance**

| | |
|---|---|
| Measured at flying weight of | 296 kg |

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 71 | 0,73 |
| Max. L/D condition | 75 | 0,75 |
| | 106 | 1,42 |
| | 124 | 2,03 |
| | 142 | 2,80 |
| Stalling speed | 59 km/h | |
| Max. L/D | 27,8 | |

# SZD-24 FOKA


This is a high performance single-seater designed according to the FAI Standard Class Requirements, for taking part in World Championships. In the design great emphasis was laid on relatively low cost in production and very good performance. The foam plastic sandwich wing shells were formed by a simple vacuum method. If damaged, it is possible to replace individual shell panels.

Thanks to the semi-reclining pilot's position and laterally located elevator and aileron control runs, it was possible to reduce the fuselage cross-section considerably. The cabin is very comfortable.

Since the 1960 World Championships, the sailplane has been continously developed, and the variants SZD-24 A and B have been built. At present (1961) a long production run of SZD-24 C has commenced. Apart from many improvements, the variants do not involve any major changes.

Hochleistungseinsitzer, entworfen entsprechend den FAI-Regeln der Standard-Klasse für die Teilnahme an Weltmeisterschaften. Bei der Konstruktion wurde großer Wert auf sehr gute Leistungen und verhältnismäßig niedrige Kosten im Serienbau gelegt. Die Schaumstoffsandwich-Flügelschalen werden in einem einfachen Unterdruckverfahren gefertigt. Im Falle einer Beschädigung besteht die Möglichkeit, einzelne Felder der Schale zu ersetzen.

Dank der halbliegenden Anordnung des Piloten sowie einer seitlichen Führung der Höhen- und Querruderantriebe konnte der Rumpfquerschnitt wesentlich herabgesetzt werden. Die Bequemlichkeit der Kabine blieb dabei sehr gut.

Seit den Weltmeisterschaften 1960 wird die Maschine laufend entwickelt, wobei die Varianten SZD-24 A und SZD-24 B gebaut wurden. Gegenwärtig (1961) wird die Groß-Serienproduktion der SZD-24 C angefangen. Die einzelnen Varianten weisen neben vielen Verbesserungen keine grundsätzlichen Änderungen auf.

Monoplace de performance construit selon les prescriptions de la FAI pour les planeurs standard, pour les championnats du monde. On a tenu à obtenir des performances excellentes et un prix relativement bas pour la construction en série. Les coquilles des ailes en sandwich en matière de mousse sont formées par une méthode de vacuum très simple. En cas d'endommagement, des parties de la coquille peuvent être remplacées.

Grâce à la position semi-couchée du pilote et l'arrangement latéral du guidage du gouvernail de profondeur et des ailerons, la section du fuselage a pu être réduite considérablement. La cabine est restée très confortable.

Depuis les Championnats du monde 1960, le planeur a été développé continuellement, et on a construit les versions SZD-24 A et SZD-24 B. Actuellement (1961) on commence la production en série du SZD-24 C. Les versions différentes sont caractérisées par de nombreuses améliorations, mais ne diffèrent pas en principe.

| | |
|---|---|
| Type designation | SZD-24 B Foka |
| Country of design | Poland |
| Designers | Okarmus and Mynarski |
| Date of first flight of prototype | 2 May 1960 |
| Number produced | 5 |

**Wings**

| | |
|---|---|
| Span (b) | 15,0 m |
| Area (s) | 12,16 m² |
| Aspect ratio ($b^2/s$) | 18,5 |
| Wing root chord ($C_r$) | 1,28 m |
| Wing tip chord ($C_t$) | 0,375 m |
| Mean chord ($C = s/b$) | 0,89 m |
| Wing section, root | NACA $63_3618$ |
| Wing section, mid | NACA $63_3618$ mod. |
| Wing section, tip | NACA 4415 mod. |
| Dihedral | 2° |
| ¼ chord sweep | —1,6° |
| Aero. twist root/tip | 0 |
| Taper radio ($C_t/C_r$) | 0,308 |
| Construction | Single spar wooden cantilever structure. Ply/plastic sandwich. No fabric |

**Ailerons**

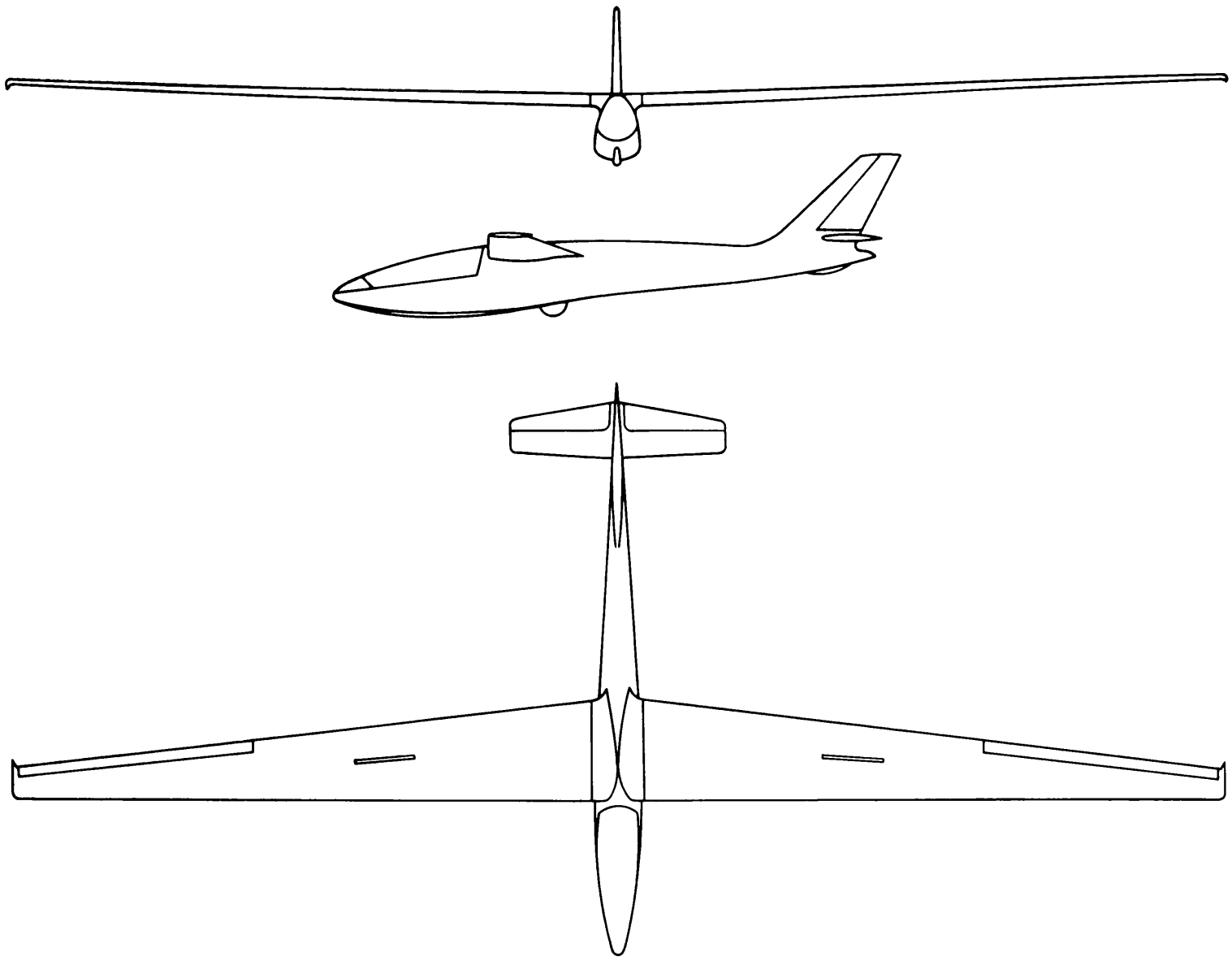
| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 6,0 m |
| Area (total) | 0,90 m² |
| Mean chord | 0,150 m |
| Max. deflection up | 34° |
| Max. deflection down | 16° |
| Mass balance degree | 100° |
| Mass balance method | Distributed mass |
| Construction | Ply covered wood frame |

**Horizontal tail**

| | |
|---|---|
| Span | 2,7 m |
| Area of elevator and fixed tail (S′) | 1,40 m² |
| Area of elevator | 0,56 m² |
| Max. deflection up | 24° |
| Max. deflection down | 18° |
| Aerofoil section | NACA $63_1012/009$ |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,0 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,518 |
| Construction | Ply sandwich tailplane. Fabric covered wooden frame elevator |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,98 m² |
| Area of rudder | 0,44 m² |
| Aspect ratio | 1,5 |
| Tail arm | 3,8 m |
| Max. deflection | ± 35° |
| Aerofoil section | NACA $63_1012/009$ |
| Aerodynamic balance | Nil |
| Structure | Ply sandwich. Fabric covered rudder |



**Fuselage**

| | |
|---|---|
| Max. width | 0,58 m |
| Max. height (at cockpit) | 0,86 m |
| Overall length | 7,0 m |
| Max. cross section | 0,38 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel. Fixed skid, rubber mounted. Wheel brakes |
| Structure | Ply monocoque and fibre glass. Forward opening moulded perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Special upper and lower surface spoilers. |
| Span (total) | 2,20 m |
| Area | 0,78 m² |
| Location, % of chord | 60 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings [1] | 128 kg |
| Fuselage [2] | 89 kg |
| Tailplane and elevator | 8 kg |
| Instruments | 3 kg |
| Equipped weight | 228 kg |
| Flying weight | 312 kg |
| Wing loading | 25,7 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish PBSL |
| Date of issue of these requirements | 1959 |
| Certificate of airworthiness | 17 February 1961 |

[1] With struts, controls, flaps and brakes

[2] Complete with rudder and fin, less instruments and equipment

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 149 | +6 |
| Boint B | 260 | +4 |
| Point C | 260 | —2 |
| Point D | 146 | —3 |
| Factor of safety | Wood 1,75 | Metal 1,50 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 131 | +30 |
| Point B | 140 | +4 |
| Point C | 240 | —4 |
| Point D | 140 | —10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 260 km/h |
| Placard airspeed gusty conditions | 160 km/h |
| Aero-towing speed | 140 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 22,4 to 39,5 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 255 km/h |

**Straight flight performance**

Measured at flying weight of 304 kg

**No flap or brake**

| V km/h | v/m sec |
|---|---|
| 75 | 0,66 |
| 86 | 0,70 |
| 112 | 1,26 |
| 131 | 0,87 |
| 150 | 2,60 |

| | |
|---|---|
| Stalling speed | 62 km/h |
| Max. L/D | 34 |

# SZD-25 LIS

This sailplane was developed from the Mucha Standard by SZD. In designing the new sailplane, an effort was made to retain the proven performance and characteristics so well shown at the World Championships in 1958. The wing was altered only in twist, but a new metal fuselage was used. This improved the safety conditions for the pilot, gave a greater life and reduced the cost of production.

The Lis (Fox) is suitable for training and performance flying. Thanks to a special undercarriage design with proper shock absorbers, it can be used by inexperienced pilots.

The forward fuselage consists of a steel tube framework mainly with fabric covering, but partly covered with fibreglass laminates. The rear fuselage is formed by a tapered light alloy sheet tube. All fairings are made of fibreglass laminates.

Aus der Weltmeistermaschine Mucha Standard entwickelte das SZD den Leistungseinsitzer Lis (Fuchs). Beim Entwurf des neuen Segelflugzeuges wurden die Flugleistungen und Eigenschaften der bei den WM 1958 bewährten Maschine angestrebt. An den Tragflächen wurde nur die Schränkung geändert; dagegen kam ein neuer Metallrumpf zur Anwendung. Diese Lösung erhöht die Sicherheit des Piloten, gewährleistet eine längere Lebensdauer des Segelflugzeuges und setzt seine Anschaffungskosten herab.

Das Segelflugzeug Lis ist für Übungs- und Leistungsflüge bestimmt. Dank einer speziellen Fahrwerkausführung mit wirksamen Stoßdämpfern kann es auch für unerfahrene Piloten eingesetzt werden.

Der Rumpfvorderteil besteht aus einem Stahlrohrgerüst mit Stoffbespannung, teilweise mit Glasfaserlaminaten verkleidet. Der Hinterteil ist als ein konisches Duralblechrohr gestaltet. Alle Profilübergangsstellen sind ebenso aus Glasfaserlaminaten formgemäß gebildet.

Développé du Mucha Standard, champion du monde 1958, par le SZD, le monoplace de performance Lis (Renard) devait garder les caractéristiques et performances de son prédécesseur. Aux ailes, seul l'angle de décalage aérodynamique fut changé, mais on employa un nouveau fuselage en métal. Cette solution augmente la sécurité pour le pilote, assure une vie prolongée du planeur et réduit le coût de production.

Le Lis est destiné à l'écolage et aux vols de performance. Grâce à une construction spéciale du train d'atterrissage avec des amortisseurs de choc efficaces, il peut être employé par des pilotes inexpérimentés.

La partie avant du fuselage consiste en un chassis de tubes d'acier entoilé et partiellement couvert de laminates de fibre de verre. La partie arrière est formée en tube de tôle d'alliage léger conique. Tous les revêtements sont faits de laminates de fibre de verre.

| | |
|---|---|
| Type designation | SZD-25 Lis |
| Country of design | Poland |
| Designers | Z. Badura, R. Zatwarnicki |
| Date of first flight of prototype | 5 March 1960 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 14,98 m |
| Area (s) | 12,75 m² |
| Aspect ratio ($b^2/s$) | 17,65 |
| Wing root chord ($C_r$) | 1,45 m |
| Wing tip chord ($C_t$) | 0,43 m |
| Mean chord ($C = {}^s/_b$) | 0,95 m |
| Wing section, root | Gö 549 |
| Wing section, tip | M 12 |
| Dihedral | 4° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 4,5° |
| Taper ratio ($C_t/C_r$) | 0,297 |
| Construction | Single spar wooden cantilever structure. Leading edge torsion box. |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 7,0 m |
| Area (total) | 1,4 m² |
| Mean chord | 0,2 m |
| Max. deflection up | 26° |
| Max. deflection down | 13° |
| Mass balance degree | 100 |
| Mass balance method | Distributed mass |
| Construction | Fabric covered wooden frame. |

**Horizontal tail**

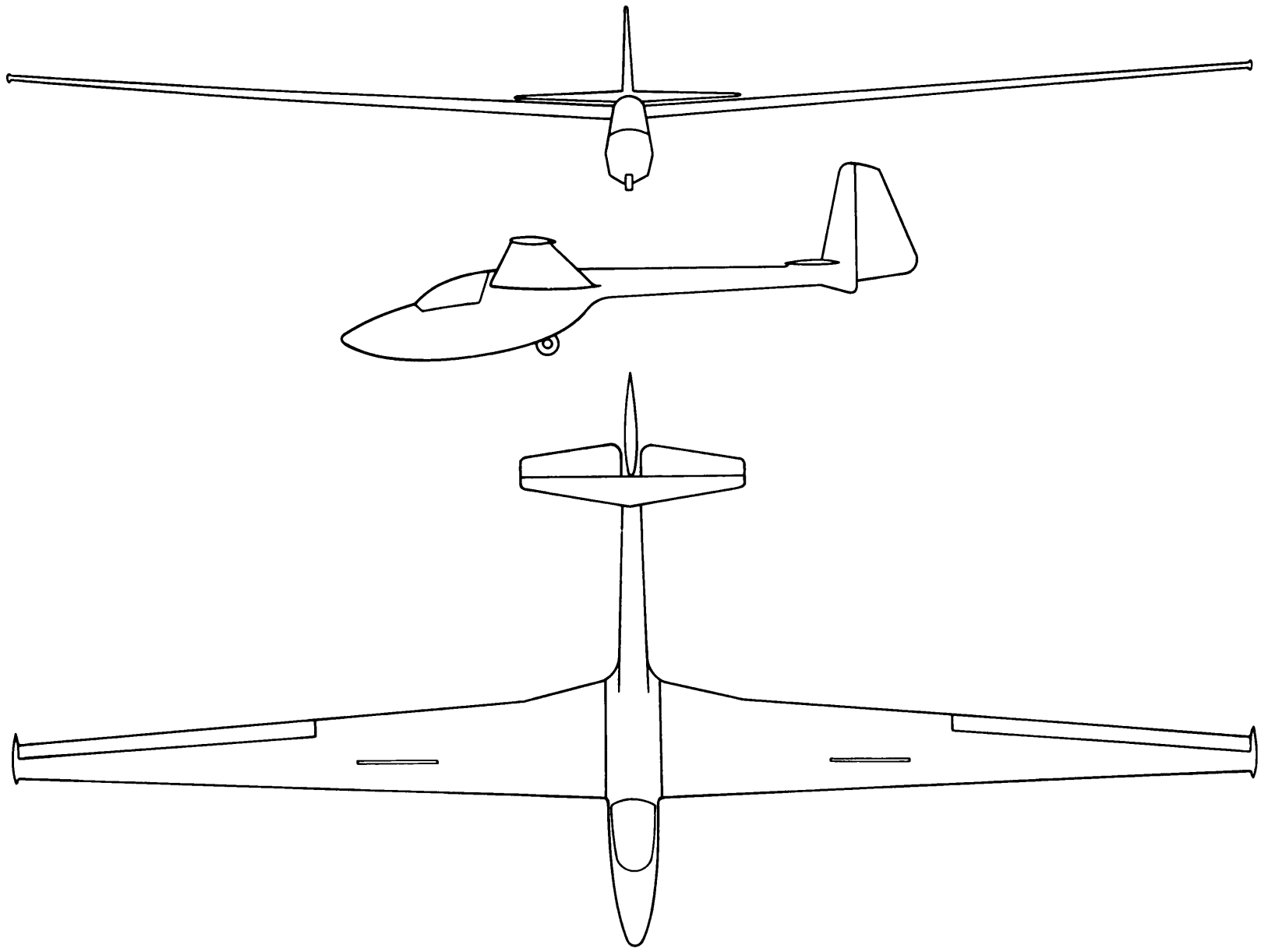
| | |
|---|---|
| Span | 2,75 m |
| Area of elevator and fixed tail (S′) | 1,55 m² |
| Area of elevator | 0,73 m² |
| Max. deflection up | 26° |
| Max. deflection down | 15° |
| Aerofoil section | 0012 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,65 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,603 |
| Construction | Fabric covered wooden frame. |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,04 m² |
| Area of rudder | 0,75 m² |
| Aspect ratio | 1,625 |
| Tail arm | 4,0 m |
| Max. deflection | ± 30° |
| Aerofoil section | 0012 |
| Aerodynamic balance | Nil |
| Structure | Fabric covered wooden frame. |

**Fuselage**

| | |
|---|---|
| Max. width | 0,57 m |
| Max. height (at cockpit) | 0,96 m |
| Overall length | 7,0 m |



| | |
|---|---|
| Max. cross section | 0,433 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Semi retractable sprung wheel. Rubber mounted skid. Wheel brakes. |
| Structure | Fabric covered steel tube frame. Light alloy rear fuselage and nose cap. Side opening blown perspex canopy. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Conventional upper and lower surface spoilers with gap. |
| Span (total) | 2,0 m |
| Area | 0,38 m² |
| Location, % of chord | 36 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.? | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 110 kg |
| Fuselage[2] | 90 kg |
| Tailplane and elevator | 8 kg |
| Empty weight[3] | 208 kg |
| Instruments | 3 kg |
| Equipped weight | 211 kg |
| Flying weight | 315 kg |
| Wing loading | 24,7 kg/m² |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish PBSL |
| Date of issue of these requirements | 1959 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 141,5 | + 6 |
| Point B | 230 | + 4 |
| Point C | 230 | — 2 |
| Point D | 141,5 | — 3 |
| Factor of safety | Wood 1,75 | Metal 1,5 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 133 | + 30 |
| Point B | 230 | + 4 |
| Point C | 230 | + 4 |
| Point D | 137 | — 10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 230 km/h |
| Placard airspeed gusty conditions | 130 km/h |
| Aero-towing speed | 130 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |

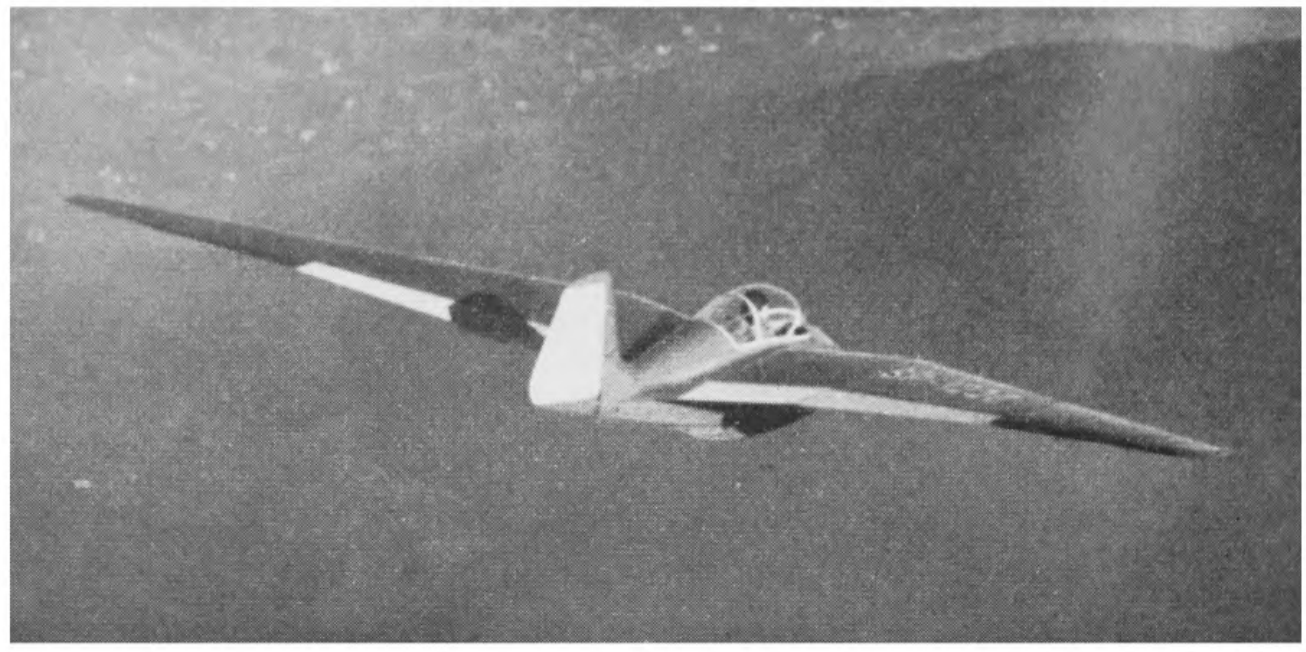
**Straight flight performance**

Calculated at flying weight of 295 kg

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 69,1 | 0,76 |
| Max. L/D condition | 75,2 | 0,77 |
| | 103 | 1,45 |
| | 121 | 2,25 |
| | 138 | 3,30 |
| Stalling speed | 57,6 km/h | |
| Max. L/D | 27,0 | |

# SZD-6X NIETOPERZ



Experimental all-wing aircraft. It was flown with 3 variants of aerodynamic controls.

1. Directional control by normal rudder, split ailerons used only as airbrakes.
2. Directional control by split ailerons, fixed normal rudder.
3. Directional control by split ailerons, normal rudder removed.

In variants 2 and 3 the split ailerons could be used separately as ailerons or together as airbrakes.

Versuchs-Segelflugzeug in Nurflügelbauart. Wurde in drei Steuerungsvarianten geflogen:

1. Seitensteuerung mittels Seitenruder. Spreizquerruder nur als Luftbremse.
2. Seitensteuerung mittels Spreizquerruder. Seitenruder fest.
3. Seitensteuerung mittels Spreizquerruder. Seitenruder abgenommen.

Bei den Varianten 2 und 3 konnten die Spreizquerruder einzeln oder gleichzeitig (als Luftbremse) betätigt werden.

Aile volante d'essais en vol avec trois variations des commandes:

1. Contrôle de la direction par le gouvernail de direction, ailerons à fente employés comme freins.
2. Contrôle de direction par les ailerons à fente, gouvernail fixe.
3. Contrôle de direction par les ailerons à fente, sans gouvernail de direction.

Dans les cas 2) et 3), les ailerons à fente pouvaient être employés seuls, ou ensemble comme freins.

| | |
|---|---|
| Type designation | SZD-6X Nietoperz |
| Country of design | Poland |
| Designers | W. Nowakowski, J. Sandauer |
| Date of first flight of prototype | 4 January, 1951 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 12,0 m |
| Area (s) | 14,4 m² |
| Aspect ratio ($b^2/s$) | 10 |
| Wing root chord ($C_r$) | 1,7 m |
| Wing tip chord ($C_t$) | 0,425 m |
| Mean chord ($C = {}^s/_b$) | 1,2 m |
| Wing section, root | NACA 23012 |
| Wing section, mid | NACA 23012 |
| Wing section, tip | NACA 23012 |
| Aero. twist root/tip | + 5,2° |
| Taper ratio ($C_t/C_r$) | 0,25 |
| Construction | Two spar wooden cantilever with leading edge torsion box. Ply covered |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | Inner 2 × 2,10 m<br>Outer 2 × 2,2 m |
| Max. deflection up | Inner 5° Outer 11° |
| Max. deflection down | Inner 5° Outer 11° |
| Mass balance degree | Nil |
| Construction | Outer ailerons split as air brake. Ailerons also deflect symmetrically as elevators |

**Horizontal tail**

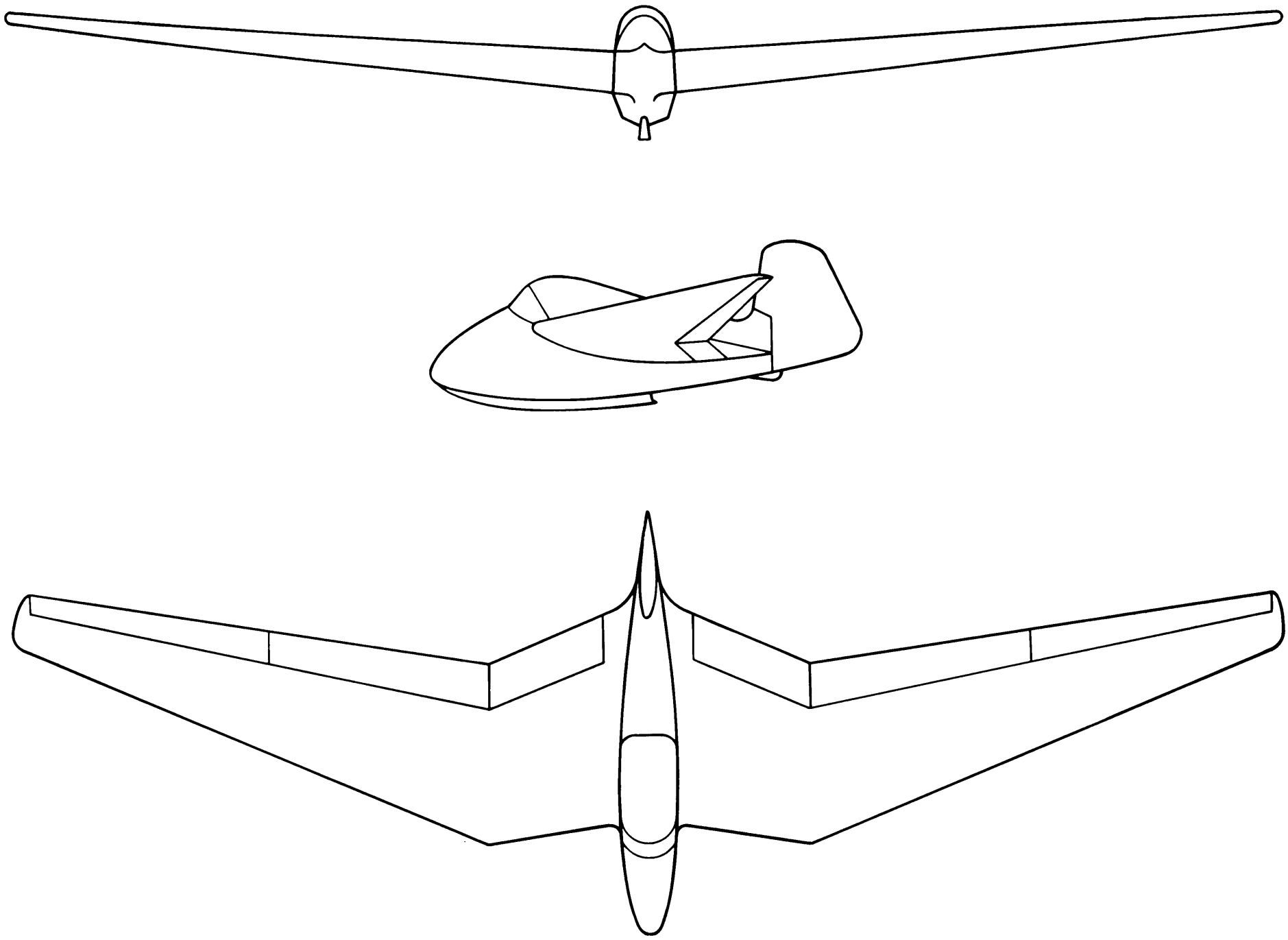
| | |
|---|---|
| Span | Tailless |
| Max. deflection up | Inner 8° Outer 16° |
| Max. deflection down | Inner 7° Outer 14° (aileron deflection as elevator) |
| Construction | Centre section flap deflects as trimming flap, ± 10° |

**Vertical tail**

| | |
|---|---|
| Max. deflection | ± 30° |
| Construction | Wood. Fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,55 m |
| Max. height (at cockpit) | 1,30 m |
| Overall length | 4,05 m |
| Max. cross section | 0,5 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed rubber mounted skid |
| Construction | Ply monocoque. Removable moulded perspex canopy |



**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Split outer ailerons deflected ± 38° |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Equipped weight | 194 kg |
| Flying weight | 270 kg |
| Wing loading | 18,7 kg/m² |

**Straight flight performance**

Measured at flying weight of . . . . . 269 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 80 | 1,35 |
| Max. L/D condition | 90 | 1,44 |
| | 120 | 2,48 |
| Stalling speed | 65 km/h | |
| Max. L/D | 17,5 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish Preliminary Draft |
| Certificate of airworthiness | Experimental |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 138 | 6,5 |
| Point B | 300 | 4,5 |
| Point C | 210 | —2 |
| Point D | 138 | —3 |
| Factor of safety | | 1,75 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 195 | +10 |
| Point B | 300 | +4 |
| Point C | 210 | —3 |
| Point D | 195 | —7 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 300 km/h |
| Placard airspeed gusty conditions | 195 km/h |
| Aero-towing speed | 170 km/h |
| Winch launching speed | 120 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | No |

# IS-4 JASTRZAB

This is an aerobatic single-seater with an ultimate load factor of 12.2. All aerobatic manoeuvres are permitted, and terminal velocity dives may be made without using airbrakes. Production machines were made in 1952 and 1953.

Vollkunstflugtaugliches Segelflugzeug in Holzbauweise. Zugelassen für alle Kunstflugfiguren im Normal- und Rükkenflug. Sturzflug mit Endgeschwindigkeit ohne Bremsen zugelassen. Das Segelflugzeug wurde in Serie in den Jahren 1952 und 1953 gebaut.

Planeur pour toutes les manœuvres acrobatiques, construit en bois. Vol en piqué avec vitesse finale sans freins permis. Cet avion fut construit en série, en 1952 et 1953.

| | |
|---|---|
| Type designation | IS-4 Jastrzab |
| Country of design | Poland |
| Designer | J. Niespal |
| Date of first flight of prototype | 21 December, 1949 |
| Number produced | 42 |

**Wings**

| | |
|---|---|
| Span (b) | 12 m |
| Area (s) | 12 m² |
| Aspect ratio ($b^2/s$) | 12 |
| Wing root chord ($C_r$) | 1,385 m |
| Wing tip chord ($C_t$) | 0,50 m |
| Mean chord ($C = s/b$) | 1,00 m |
| Wing section, root | NACA 2418 |
| Wing section, mid | NACA 2412 |
| Wing section, tip | NACA 0012 |
| Dihedral | 1° |
| ¼ chord sweep | —3,2° |
| Taper ratio ($C_t/C_r$) | 0,363 |
| Construction | Single spar wooden cantilever. Central and leading edge torsion box |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 3,3 m |
| Area (total) | 2 × 0,84 m² |
| Mean chord | 0,255 m |
| Max. deflection up | Inner 20° Outer 15° |
| Max. deflection down | Inner 15° Outer 8° |
| Mass balance degree | 100 |
| Mass balance method | Distributed |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 2,5 m |
| Area of elevator and fixed tail (S′) | 1,84 m² |
| Area of elevator | 0,84 m² |
| Max. deflection up | 25° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 0009 |
| Mass balance degree | Nil |
| Mass balance method | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,2 m |
| Elevator aerodynamic balance method | Setback hinge |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,48 |
| Construction | Wood. Fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,0 m² |
| Area of rudder | 0,65 m² |
| Aspect ratio | 3,82 |
| Tail arm | 3,52 m |
| Max. deflection | ± 30° |
| Aerofoil section | NACA 0012 |
| Aerodynamic balance | Setback hinge |
| Construction | Wood. Fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,62 m |
| Max. height (at cockpit) | 1,30 m |
| Overall length | 6,25 m |
| Max. cross section | 0,54 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel with brakes. Fixed rubber mounted skid |
| Construction | Ply monocoque with moulded veneer nose. Detachable canopy. Moulded and bent perspex canopy |

**Lift increasing devices**

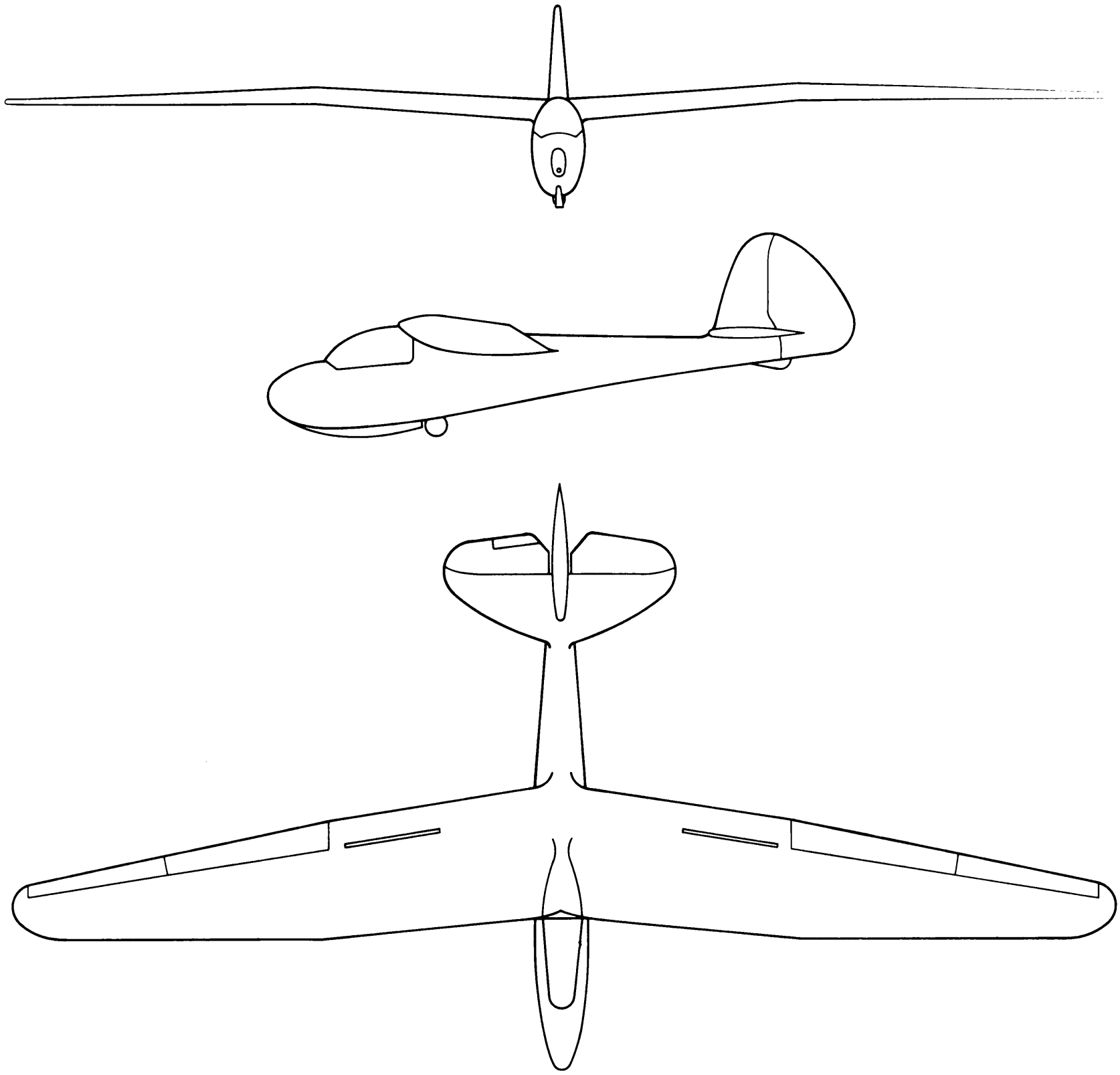
| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Schempp-Hirth airbrakes |
| Span (total) | 2 × 1,12 m |
| Area | 2 × 0,335 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 130 kg |



| | |
|---|---|
| Fuselage (with fin and rudder, less instruments and equipment) | 100 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 240 kg |
| Flying weight | 357 kg |
| Wing loading | 29,7 kg/m² |

**Straight flight performance**

Measured at flying weight of 320 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 70 | 1,04 |
| Max. L/D condition | 87 | 1,21 |
| | 105 | 1,65 |
| | 122 | 2,23 |
| | 140 | 3,04 |
| Stalling speed | 67 km/h | |
| Max. L/D | 20,2 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish Preliminary Draft |
| Certificate of airworthiness | Ful aerobatic |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 164 | +7 |
| Point B | 500 | +7 |
| Point C | 500 | —4 |
| Point D | 133 | —4 |
| Factor of safety | | 1,75 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 238 | +10 |
| Point B | 500 | +4 |
| Point C | 500 | —3 |
| Point D | 222 | —7 |

**Limiting flight conditions**

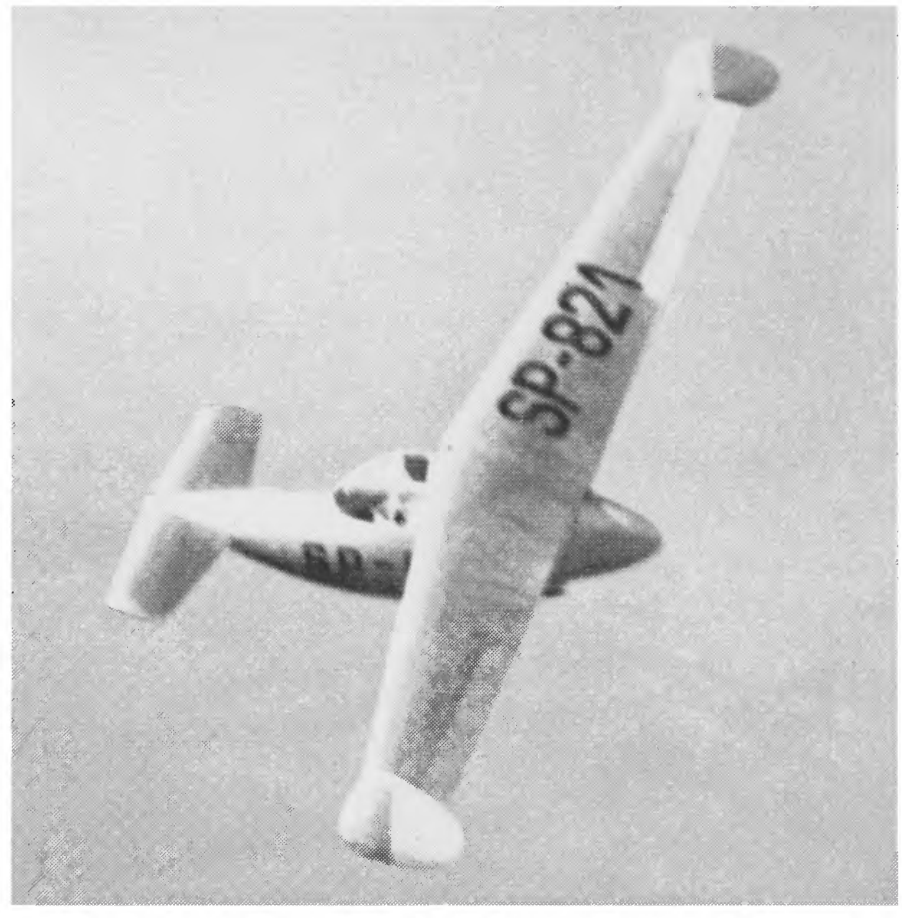
| | |
|---|---|
| Placard airspeed smooth conditions | 450 km/h |
| Placard airspeed gusty conditions | 230 km/h |
| Aero-towing speed | 200 km/h |
| Winch launching speed | 150 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Fully aerobatic |
| Spinning permitted? | Normal and inverted |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 27–36 |

# IS-5 KACZKA

Experimental tail-first sailplane. Spreading tail used as air brakes. Additional braking provided by opening both wing-tip rudders. A movable lead weight was provided so that the centre of gravity could be changed in flight.

Versuchs-Segelflugzeug in Entenbauart. Spreizbares Rumpfende als Luftbremse. Weitere Bremswirkung mittels gleichzeitigem Ausschlag beider Seitenruder. Verschiebbares Bleigewicht zur Änderung der Schwerpunktlage im Fluge.

Planeur expérimental en construction de canard. Arrière du fuselage à fente, employé comme frein. Freinage additionnel par l'ouverture simultanée des deux gouvernails de direction. Poids en plomb mobile pour changer le centre de gravité pendant le vol.




| | |
|---|---|
| Type designation | IS-5 Kaczka |
| Country of design | Poland |
| Designers | I. Kaniewska, T. Kostia |
| Date of first flight of prototype | 29 March, 1949 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 11,56 m |
| Area (s) | 10,0 $m^2$ |
| Aspect ratio ($b^2/s$) | 13 |
| Wing root chord ($C_r$) | 1,18 m |
| Wing tip chord ($C_t$) | 0,58 m |
| Mean chord ($C = s/b$) | 0,92 m |
| Wing section, root | Peyret 2 |
| Wing section, mid | Peyret 2 |
| Wing section, tip | Peyret 2 |
| Construction | Single spar wooden cantilever with leading edge torsion box |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 2,95 m |
| Area (total) | 2 × 0,88 $m^2$ |
| Mean chord | 0,30 m |
| Max. deflection up | 28° |
| Max. deflection down | 6° |
| Mass balance degree | Nil |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,10 m |
| Area of elevator and fixed tail (S′) | 1,67 $m^2$ |
| Area of elevator | 0,67 $m^2$ |
| Max. deflection up | 28° |
| Max. deflection down | 23° |
| Aerofoil section | Gö 549 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 2,40 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Construction | Wood. Fabric covered (Note: Tail first configuration) |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 2 × 1,32 $m^2$ |
| Area of rudder | 2 × 0,54 $m^2$ |
| Aspect ratio | 1,25 |
| Max. deflection | 47° outwards |
| Aerofoil section | Gö 723 |
| Construction | Wood. Fabric covered (Note: Rudders at wing tips operate independently) |

**Fuselage**

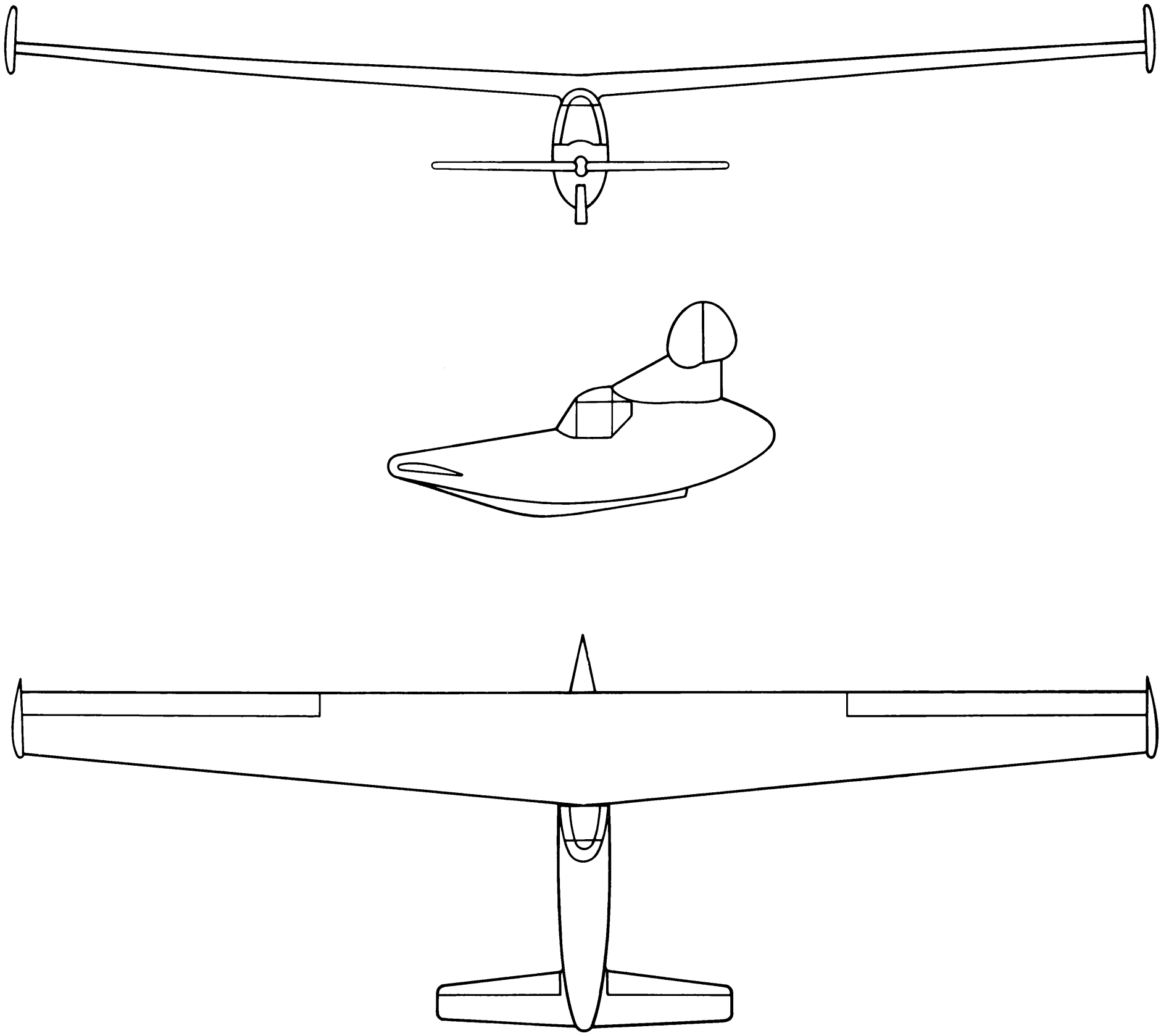
| | |
|---|---|
| Overall length | 4,00 m |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed rubber mounted skid |
| Construction | Ply monocoque. Removable perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Fuselage air brakes |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |



**Weights**

| | |
|---|---|
| Equipped weight | 159 kg |
| Flying weight | 257 kg |
| Wing loading | 25,7 kg/m² |

**Straight flight performance**

Measured at flying weight of . . . . . 257 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 76 | 1,26 |
| Max. L/D condition | 81 | 1,30 |
| | 103 | 2,10 |
| | 114 | 2,70 |
| Stalling speed | 63 km/h | |
| Max. L/D | 17,3 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Polish Preliminary Draft |
| Certificate of airworthiness | Experimental |

**Design flight envelope**

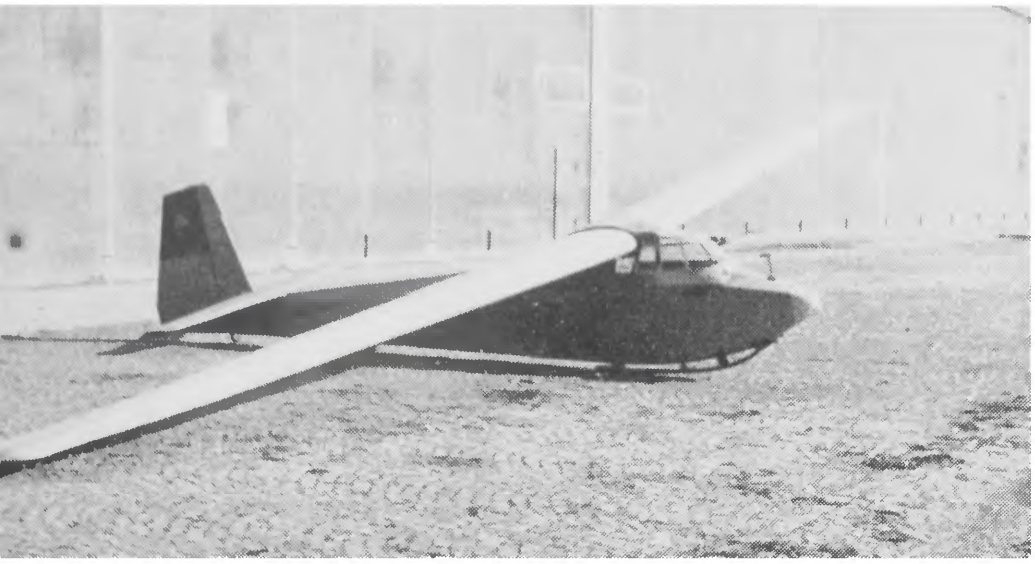
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 125 | 6 |
| Point B | 250 | 4 |
| Point C | 250 | —2 |
| Point D | 125 | —3 |
| Factor of safety | | 1,75 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 136 | +10 |
| Point B | 250 | +4 |
| Point C | 250 | —3 |
| Point D | 136 | —7 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 250 km/h |
| Placard airspeed gusty conditions | 136 km/h |
| Aero-towing speed | 130 km/h |
| Winch launching speed | 95 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | —25,4 to —17,2 |

# RUMANIA



# IS-2

The various Rumanian designs by Josif Silimon, built between 1950 and 1960, indicate an enormous technical effort by the designer and his associates, and cover a wide range from trainers and aerobatic types to boom-tail gliders with auxiliary engines to standard class types.

Die verschiedenen rumänischen Konstruktionen von Josif Silimon, die zwischen 1950 und 1960 gebaut wurden, legen Zeugnis ab von den enormen Anstrengungen des Konstrukteurs und seiner Mitarbeiter; sie erstrecken sich von Schulflugzeugen und kunstflugtauglichen Maschinen bis zum Segelflugzeug mit Hilfsmotor und Standardklasse-Typen.

Les différentes constructions roumaines de Josef Silimon, datant de 1950 à 1960, témoignent de l'effort énorme du constructeur et de ses collaborateurs. Elles comprennent des planeurs d'écolage, des machines d'acrobatie, des planeurs avec moteur auxiliaire et des types de la classe Standard.

| | |
|---|---|
| Type designation | IS-2 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 14 August, 1950 |

**Wings**

| | |
|---|---|
| Span (b) | 12,3 m |
| Area (s) | 14,7 m² |
| Aspect ratio ($b^2/s$) | 10,3 |
| Wing root chord ($C_r$) | 1,5 m |
| Wing tip chord ($C_t$) | 0,885 m |
| Mean chord ($C = s/b$) | 1,2 m |
| Wing section, root | Gö 535 |
| Wing section, mid | Gö 535 |
| Wing section, tip | Gö 676 |
| Dihedral | 2° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,59 |
| Construction | Single spar wooden cantilever. Leading edge torsion box. 60% fabric covering. Ribs spaced 0,4 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 3,55 m |
| Area (total) | 2 × 1,14 m² |
| Mean chord | 0,32 m |
| Max. deflection up | 28° |
| Max. deflection down | 17° |
| Mass balance degree | Nil |
| Construction | Wood. Ply and fabric covering. Ribs spaced 0,4 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 2,10 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,8 m |
| Elevator aerodynamic balance method | Nil |
| Horizontal tail volume coefficient (S′1′/SC) | 0,45 |
| Construction | Wood. Ply and fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1 m² |
| Area of rudder | 0,75 m² |
| Tail arm | 4,15 m |
| Max. deflection | ±30° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Unshielded horn |
| Construction | Wood. Ply covered fin, fabric covered elevator |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,05 m |
| Overall length | 6,54 m |
| Max. cross section | 0,58 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Rubber mounted fixed skid |
| Construction | Frame and stringer. Moulded veneer nose cap. Rear opening plexiglass canopy |

**Lift increasing devices**

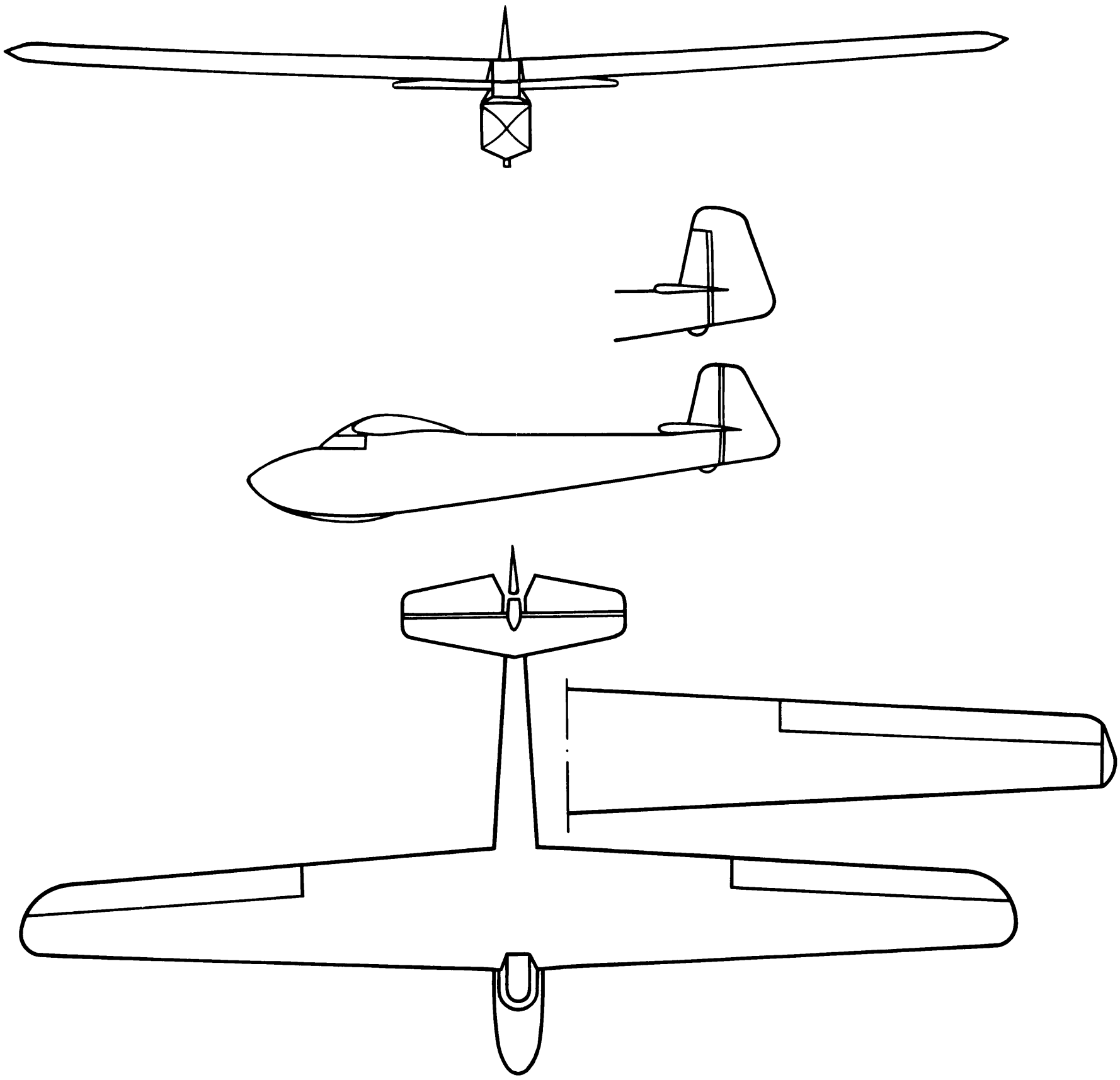
| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 0,81 m |
| Area | 2 × 0,21 m² |
| Location, % of chord | 40 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 82 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 62 kg |
| Tailplane and elevator | 8 kg |
| Empty weight (including any fixed ballast) | 152 kg |
| Instruments | 8 kg |
| Equipped weight | 160 kg |
| Flying weight | 250 kg |
| Wing loading | 17 kg/m² |



**Straight flight performance**

Measured
at flying weight of . . . . . 245 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition . . . . . | 53 | 0,77 |
| Max. L/D condition . . . . . | 69 | 0,97 |
| | 80 | 1,45 |
| | 93 | 2,15 |
| | 106 | 3,60 |

Stalling speed . . . . . 42 km/h
Max. L/D . . . . . 20

**Design standards**

Airworthiness requirements to which aircraft has been built . . . . . Rumanian
Date of issue of these requirements . . . 1936

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A . . . . . | 96 | 4 |
| Point B . . . . . | 185 | 4 |
| Point C . . . . . | 185 | —2,2 |
| Point D . . . . . | 92 | —2,2 |

Factor of safety . . . . . 1,8

**Limiting flight conditions**

Placard airspeed smooth conditions . . . 180 km/h
Placard airspeed gusty conditions . . . . 130 km/h
Aero-towing speed . . . . . 110 km/h
Winch launching speed . . . . . 80 km/h
Cloud flying permitted? . . . . . No
Permitted aerobatic manoeuvres . . . . . None
Spinning permitted? . . . . . Yes
Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) . . 28–33
Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) . . . . . 180 km/h

# IS-3

| | |
|---|---|
| Type designation | IS-3 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 19 August, 1953 |

**Wings**

| | |
|---|---|
| Span (b) | 16 m |
| Area (s) | 16 m² |
| Aspect ratio ($b^2/s$) | 16 |
| Wing root chord ($C_r$) | 1,5 m |
| Wing tip chord ($C_t$) | 0,5 m |
| Mean chord ($C = s/b$) | 1,0 m |
| Wing section, root | NACA 23015 |
| Wing section, mid | NACA 23012 |
| Wing section, tip | NACA 23012 |
| Dihedral | 2,5° |
| ¼ chord sweep | +3° |
| Aero. twist root/tip | 4°50′ |
| Taper ratio ($C_t/C_r$) | 0,33 |
| Construction | Single spar wooden cantilever. Leading edge torsion box. Ribs spacing 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 4,5 m |
| Area (total) | 2 × 1,26 m² |
| Mean chord | 0,28 m |
| Max. deflection up | 30° |
| Max. deflection down | 13° |
| Mass balance degree | Nil |
| Construction | Wood. Ply and fabric covering. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 1,68 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,4 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,354 |
| Construction | Wood. Ply and fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,186 m² |
| Area of rudder | 0,90 m² |
| Tail arm | 3,725 m |
| Max. deflection | ±25° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin, fabric covered elevator |

**Fuselage**

| | |
|---|---|
| Max. width | 0,576 m |
| Max. height (at cockpit) | 1,05 m |
| Overall length | 6,46 m |
| Max. cross section | 0,44 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel and fixed rubber mounted skid. Wheel brake |
| Construction | Ply and metal monocoque. Side opening moulded plexiglass canopy |

**Lift increasing devices**

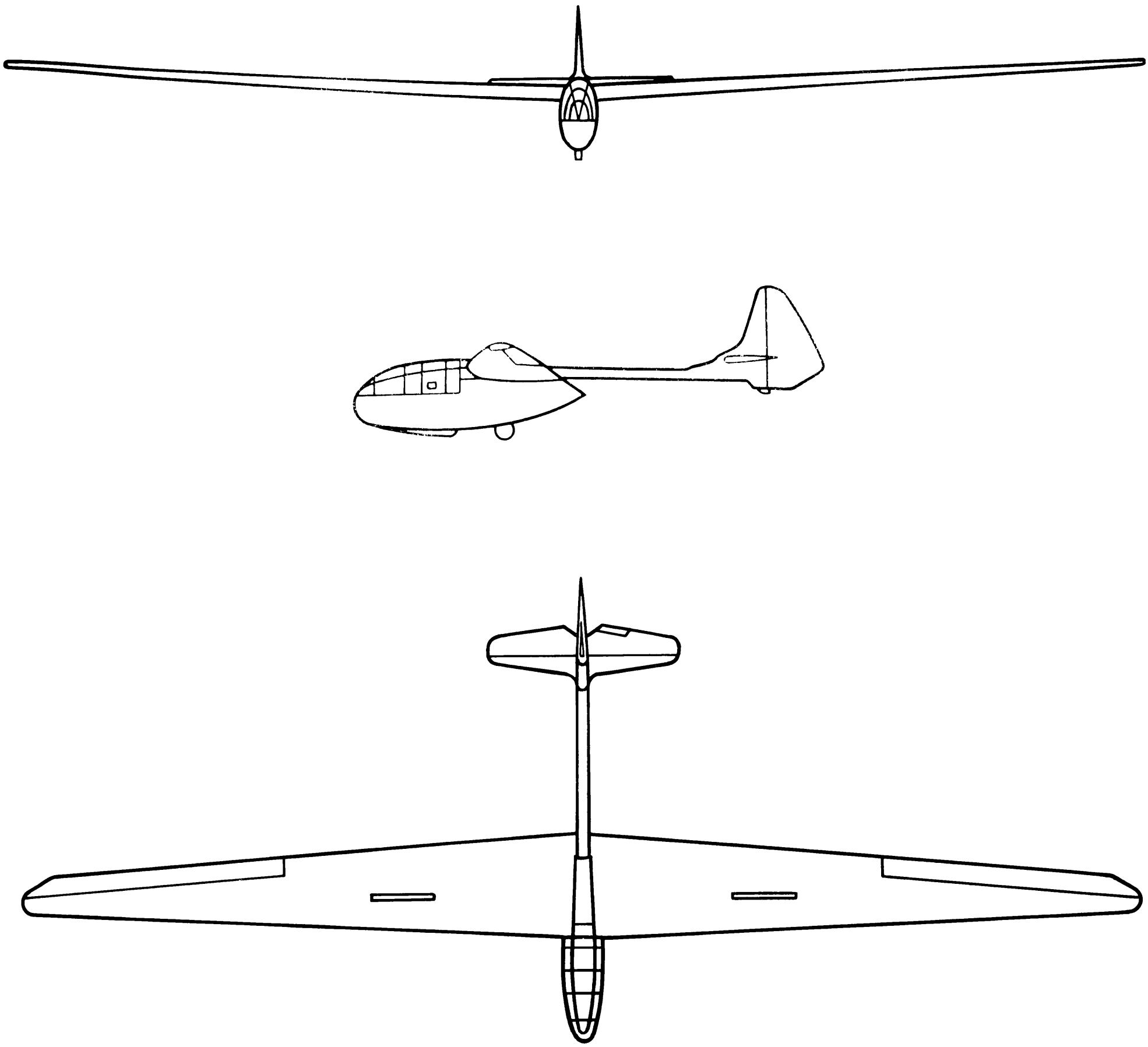
| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 0,71 m |
| Area | 2 × 0,295 m² |
| Location, % of chord | 40 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 120 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 76 kg |
| Tailplane and elevator | 9 kg |
| Empty weight (including any fixed ballast) | 205 kg |
| Instruments | 10 kg |
| Equipped weight | 215 kg |
| Flying weight | 305 kg |
| Wing loading | 19,1 kg/m² |



**Straight flight performance**

| | |
|---|---|
| Measured at flying weight of | 305 kg |

| No flap or brake | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 68 | 0,68 |
| Max. L/D condition | 81 | 0,76 |
| | 102 | 1,20 |
| | 119 | 1,95 |
| | 136 | 2,60 |

| | |
|---|---|
| Stalling speed | 50 km/h |
| Max. L/D | 29,5 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 115 | 4 |
| Point B | 205 | 4 |
| Point C | 205 | —2,2 |
| Point D | 115 | —2,2 |
| Factor of safety | | 1,8 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 180 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 115 km/h |
| Winch launching speed | 85 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 29,3–35,1 |

# IS-3A

| | |
|---|---|
| Type designation | IS-3a |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 16 May, 1955 |

**Wings**

| | |
|---|---|
| Span (b) | 16 m |
| Area (s) | 16 m² |
| Aspect ratio ($b^2/s$) | 16 |
| Wing root chord ($C_r$) | 1,5 m |
| Wing tip chord ($C_t$) | 0,5 m |
| Mean chord ($C = s/b$) | 1,0 m |
| Wing section, root | NACA 23015 |
| Wing section, mid | NACA 23012 |
| Wing section, tip | NACA 23012 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 4°50′ |
| Taper ratio ($C_t/C_r$) | 0,33 |
| Construction | Single spar wooden cantilever. Leading edge torsion box. Ribs spacing 0,3 m. 65% fabric covering |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 4,5 m |
| Area (total) | 2 × 1,26 m² |
| Mean chord | 0,28 m |
| Max. deflection up | 30° |
| Max. deflection down | 13° |
| Mass balance degree | Nil |
| Construction | Wood. Ply and fabric covering. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 1,68 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,28 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,344 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,150 m² |
| Area of rudder | 0,85 m² |
| Tail arm | 3,6 m |
| Max. deflection | ±28° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin, fabric covered elevator. Ribs spaced 0,25 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,59 m |
| Max. height (at cockpit) | 1,145 m |
| Overall length | 6,60 m |
| Max. cross section | 0,50 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed skid, rubber mounted. Fixed unsprung wheel without brake |
| Construction | Ply and metal monocoque. Side opening moulded plexiglass canopy |

**Lift increasing devices**

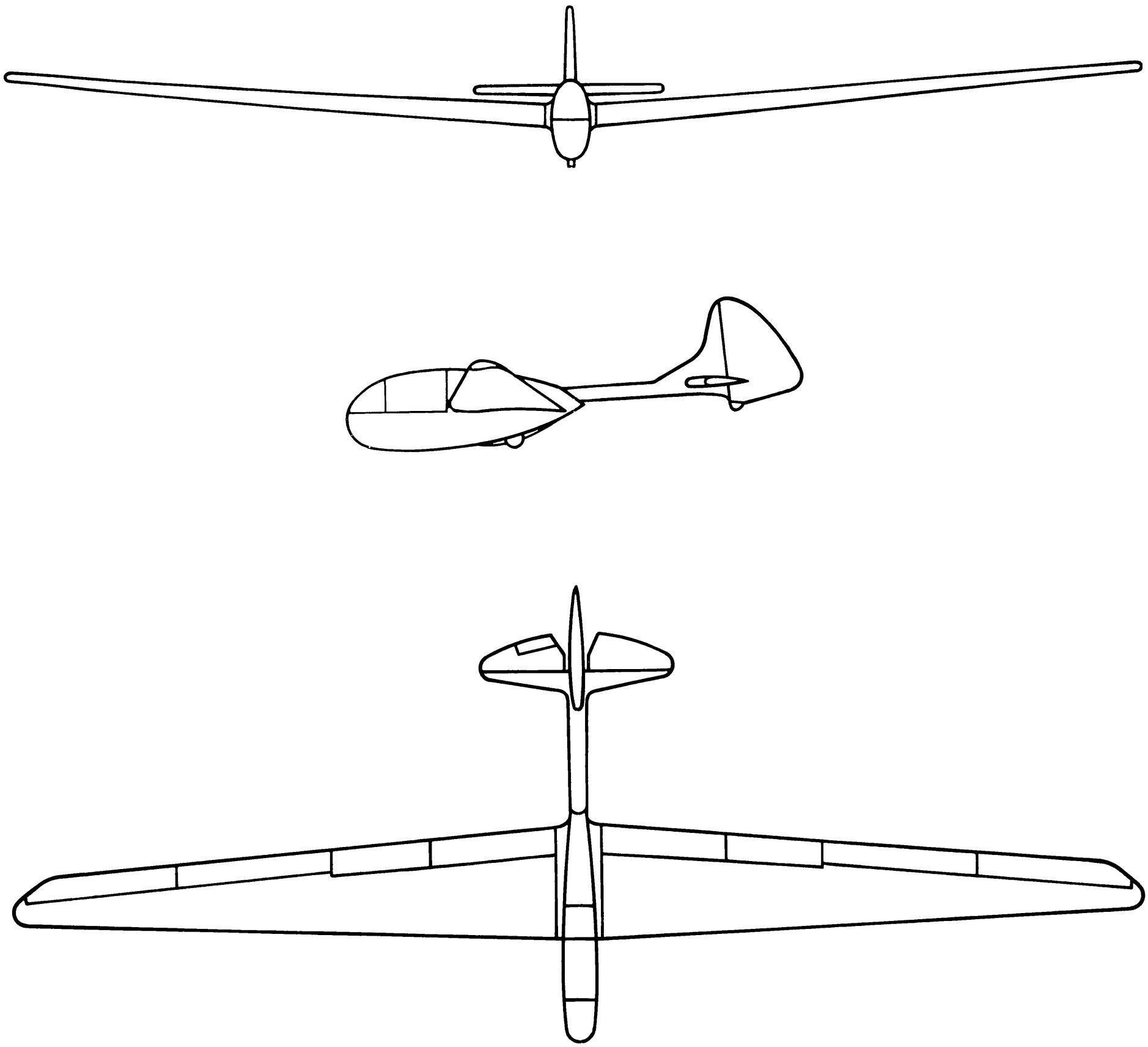
| | |
|---|---|
| Type | Slotted flaps |
| Span (total) | 2 × 3,12 m |
| Area (total) | 2 × 0,935 m² |
| Max. deflection up | Nil |
| Max. deflection down | 4,5° |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 0,88 m |
| Area | 2 × 0,225 m² |
| Location, % of chord | 40 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 115 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 110 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 235 kg |
| Instruments | 10 kg |
| Equipped weight | 245 kg |
| Flying weight | 335 kg |
| Wing loading | 21 kg/m² |



**Straight flight performance**

Calculated
at flying weight of . . . . . 335 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition . . . . . | 68 | 0,70 |
| Max. L/D condition . . . . . | 81 | 0,79 |
| | 102 | 1,25 |
| | 119 | 1,90 |
| | 136 | 2,50 |

Stalling speed . . . . . 50 km/h
Flap deflection . . . . . 4,5°
Max. L/D . . . . . 28,5

**Design standards**

Airworthiness requirements to which aircraft has been built . . . . . Rumanian
Date of issue of these requirements . . . 1936

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A . . . . . | 130 | 4 |
| Point B . . . . . | 235 | 4 |
| Point C . . . . . | 235 | —2,2 |
| Point D . . . . . | 130 | —2,2 |

Factor of safety . . . . . 1,8

**Limiting flight conditions**

Placard airspeed smooth conditions . . . 180 km/h
Placard airspeed gusty conditions . . . . 140 km/h
Aero-towing speed . . . . . 115 km/h
Winch launching speed . . . . . 85 km/h
Cloud flying permitted? . . . . . No
Permitted aerobatic manoeuvres . . . . . None
Spinning permitted? . . . . . Yes
Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) . . 31–36

# IS-3B

| | |
|---|---|
| Type designation | IS-3b |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 19 June, 1955 |

**Wings**

| | |
|---|---|
| Span (b) | 16 m |
| Area (s) | 16 m² |
| Aspect ratio ($b^2/s$) | 16 |
| Wing root chord ($C_r$) | 1,5 m |
| Wing tip chord ($C_t$) | 0,5 m |
| Mean chord ($C = {}^{s}/_{b}$) | 1,0 m |
| Wing section, root | NACA 23015 |
| Wing section, mid | NACA 23012 |
| Wing section, tip | NACA 23012 |
| Dihedral | 3° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 4°50′ |
| Taper ratio ($C_t/C_r$) | 0,33 |
| Construction | Single spar wooden cantilever leading edge torsion box. Ply covering. Ribs spaced 0,15 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2×4,5 m |
| Area (total) | 2×1,26 m² |
| Mean chord | 0,28 m |
| Max. deflection up | 30° |
| Max. deflection down | 13° |
| Mass balance degree | Nil |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,8 m |
| Area of elevator and fixed tail (S′) | 1,68 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,28 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,344 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,150 m² |
| Area of rudder | 0,85 m² |
| Tail arm | 3,6 m |
| Max. deflection | ±28° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin. Fabric covered elevator. Ribs spaced 0,25 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,59 m |
| Max. height (at cockpit) | 1,08 m |
| Overall length | 6,60 m |
| Max. cross section | 0,49 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Rubber mounted skid and fixed unsprung wheel without brake |
| Construction | Ply and metal monocoque. Side opening moulded plexiglass canopy |

**Lift increasing devices**

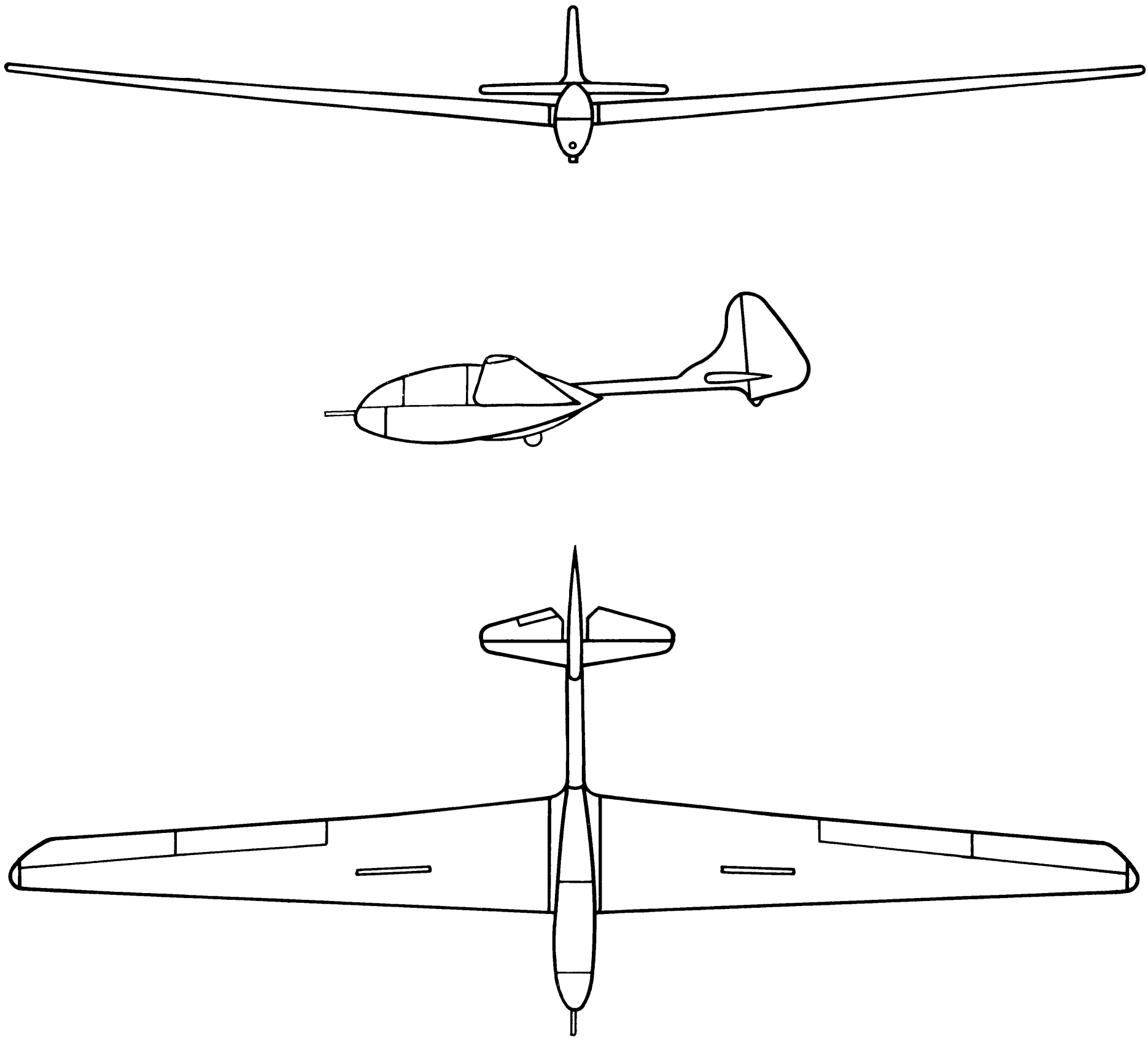
| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2×0,88 m |
| Area | 2×0,225 m² |
| Location, % of chord | 40 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 110 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 110 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 230 kg |
| Instruments | 10 kg |
| Equipped weight | 240 kg |
| Flying weight | 330 kg |
| Wing loading | 20,6 kg/m² |



**Straight flight performance**

| | |
|---|---|
| Measured at flying weight of | 330 kg |

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 69 | 0,71 |
| Max. L/D condition | 83 | 0,80 |
| | 103 | 1,30 |
| | 121 | 1,90 |
| | 138 | 2,55 |
| Stalling speed | 58 km/h | |
| Max. L/D | 29 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 130 | 4 |
| Point B | 235 | 4 |
| Point C | 235 | —2,2 |
| Point D | 130 | —2,2 |
| Factor of safety | 1,8 | |

**Limiting flight conditions**

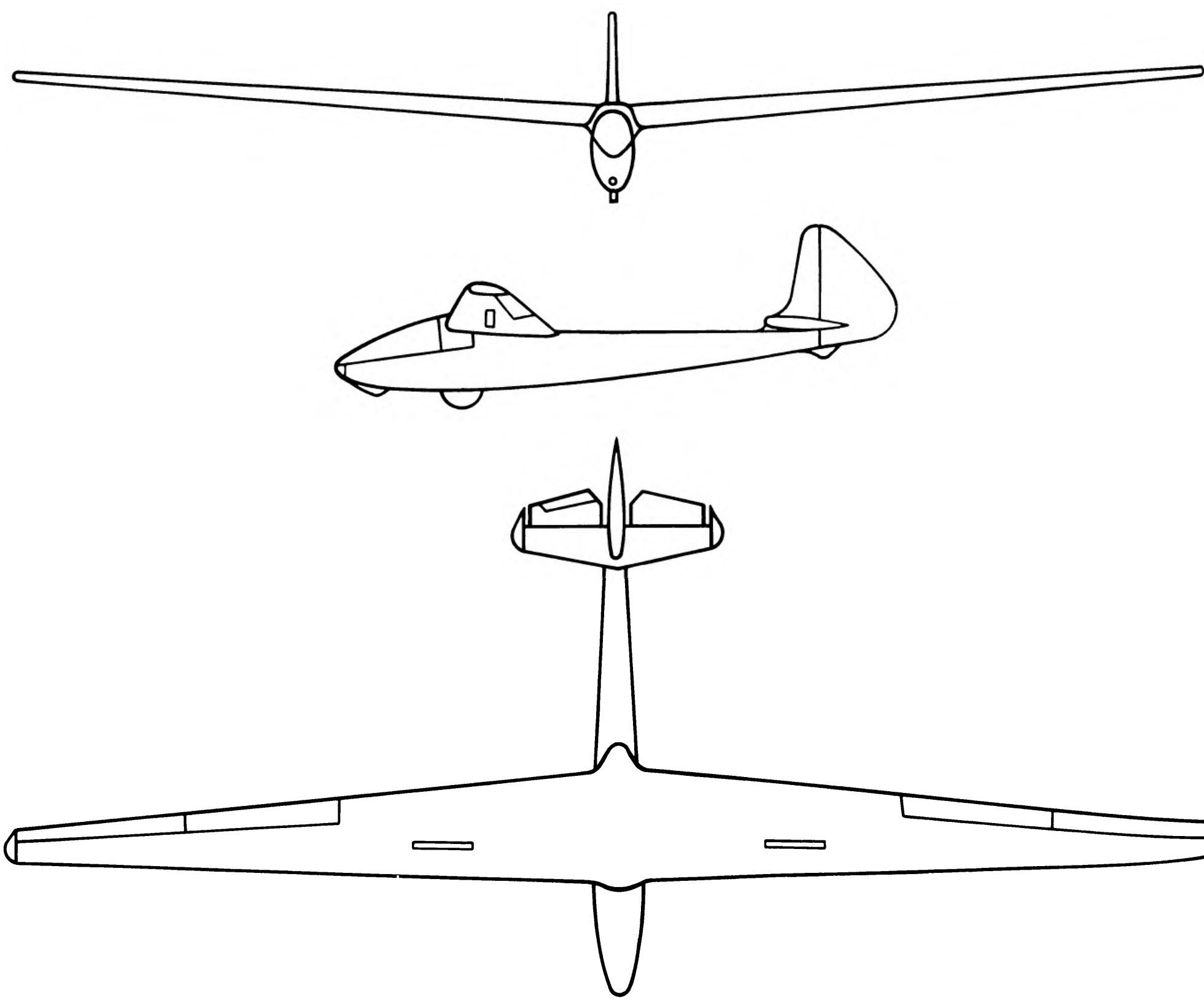
| | |
|---|---|
| Placard airspeed smooth conditions | 180 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 31–36 |

# IS-3C


| | |
|---|---|
| Type designation | IS-3c |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 4 October, 1957 |

**Wings**

| | |
|---|---|
| Span (b) | 17 m |
| Area (s) | 16 m² |
| Aspect ratio ($b^2/s$) | 18 |
| Wing root chord ($C_r$) | 1,47 m |
| Wing tip chord ($C_t$) | 0,41 m |
| Mean chord ($C = s/b$) | 0,94 m |
| Wing section, root | NACA 23015 |
| Wing section, mid | NACA 23012 |
| Wing section, tip | NACA 23012 |
| Dihedral | 2°30′ |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 4°50′ |
| Taper ratio ($C_t/C_r$) | 0,28 |
| Construction | Single spar wooden cantilever leading edge torsion box. Ply covering. Ribs spaced 0,15 m |



**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2×4,5 m |
| Area (total) | 2×0,91 m² |
| Mean chord | 0,20 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Mass balance degree | 80% |
| Mass balance method | Distributed |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m. Ailerons droop 10° to increase $C_L$ max. |

**Horizontal tail**

| | |
|---|---|
| Span | 3,15 m |
| Area of elevator and fixed tail (S′) | 2,185 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,0 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,58 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,186 m² |
| Area of rudder | 0,9 m² |
| Tail arm | 4,25 m |
| Max. deflection | ±25° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin. Fabric covered elevator. Ribs spaced 0,25 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,055 m |
| Overall length | 7,26 m |
| Max. cross section | 0,49 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Rubber mounted skid and fixed unsprung wheel with brake |
| Construction | Ply monocoque. Side opening moulded plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Split flaps |
| Span (total) | 2×3,715 m |
| Area (total) | 2×0,96 m² |
| Max. deflection down | 45° |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2×0,90 m |
| Area | 2×0,35 m² |
| Location, % of chord | 40 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 170 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 80 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 260 kg |
| Instruments | 10 kg |
| Equipped weight | 270 kg |
| Flying weight | 360 kg |
| Wing loading | 22,5 kg/m² |

**Straight flight performance**

Measured at flying weight of . . . . . 360 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 65 | 0,70 |
| Max. L/D condition | 79 | 0,77 |
| | 98 | 1,30 |
| | 114 | 1,85 |
| | 130 | 2,80 |
| Stalling speed | 52 km/h | |
| Flap deflection | 45° | |
| Max. L/D | 28,5 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

**Design flight envelope**

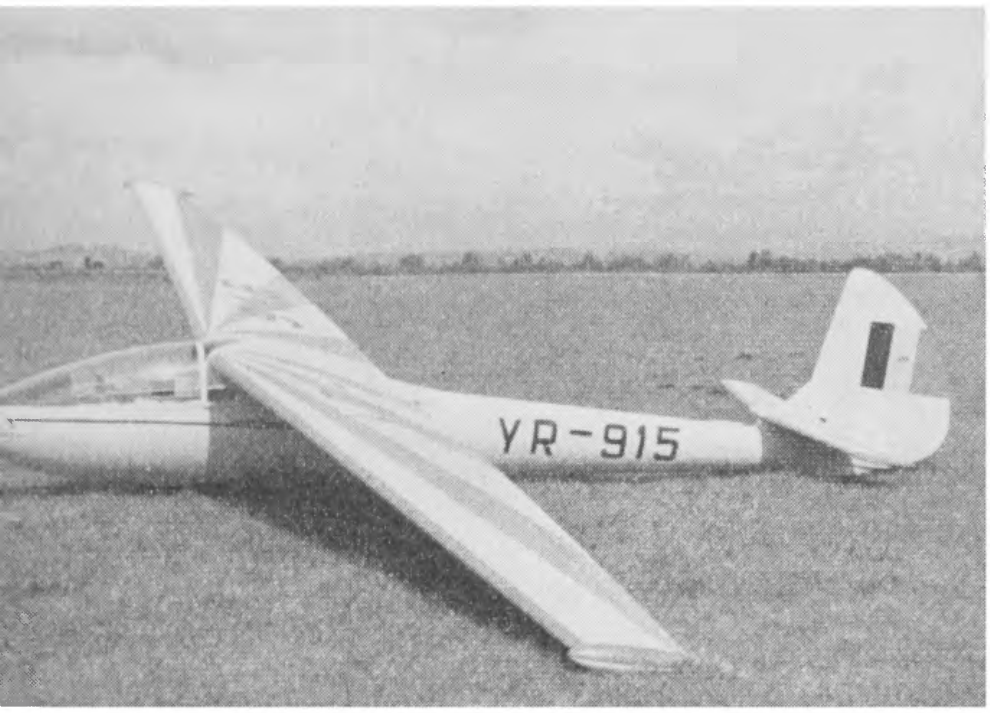
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 135 | 4,5 |
| Point B | 250 | 4,5 |
| Point C | 250 | —2,2 |
| Point D | 135 | —2,2 |
| Factor of safety | 1,8 | |

| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A | 100 | 15 |
| Point B | 200 | 7,5 |
| Point C | 200 | —7,5 |
| Point D | 100 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 150 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 31–39 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 200 km/h |

# IS-3D




| | |
|---|---|
| Type designation | IS-3d |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 18 September, 1956 |

**Wings**

| | |
|---|---|
| Span (b) | 15,3 m |
| Area (s) | 15,3 m² |
| Aspect ratio ($b^2/s$) | 15,3 |
| Wing root chord ($C_r$) | 1,474 m |
| Wing tip chord ($C_t$) | 0,518 m |
| Mean chord ($C = s/b$) | 1 m |
| Wing section, root | NACA 23015 |
| Wing section, mid | NACA 23012 |
| Wing section, tip | NACA 23012 |
| Dihedral | 2°30′ |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 4°10′ |
| Taper ratio ($C_t/C_r$) | 0,352 |
| Construction | Single spar wooden cantilever leading edge torsion box. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2×3,9 m |
| Area (total) | 2×0,845 m² |
| Mean chord | 0,217 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Mass balance degree | 100% |
| Mass balance method | Distributed |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 2,08 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,0 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′l′/SC) | 0,545 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,186 m² |
| Area of rudder | 0,9 m² |
| Tail arm | 4,25 m |
| Max. deflection | ±28° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin. Fabric covered elevator. Ribs spaced 0,25 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,045 m |
| Overall length | 7,26 m |
| Max. cross section | 0,48 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Rubber mounted skid and fixed unsprung wheel with brake |
| Construction | Ply monocoque. Side opening moulded plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2×0,90 m |
| Area | 2×0,35 m² |
| Location, % of chord | 43 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

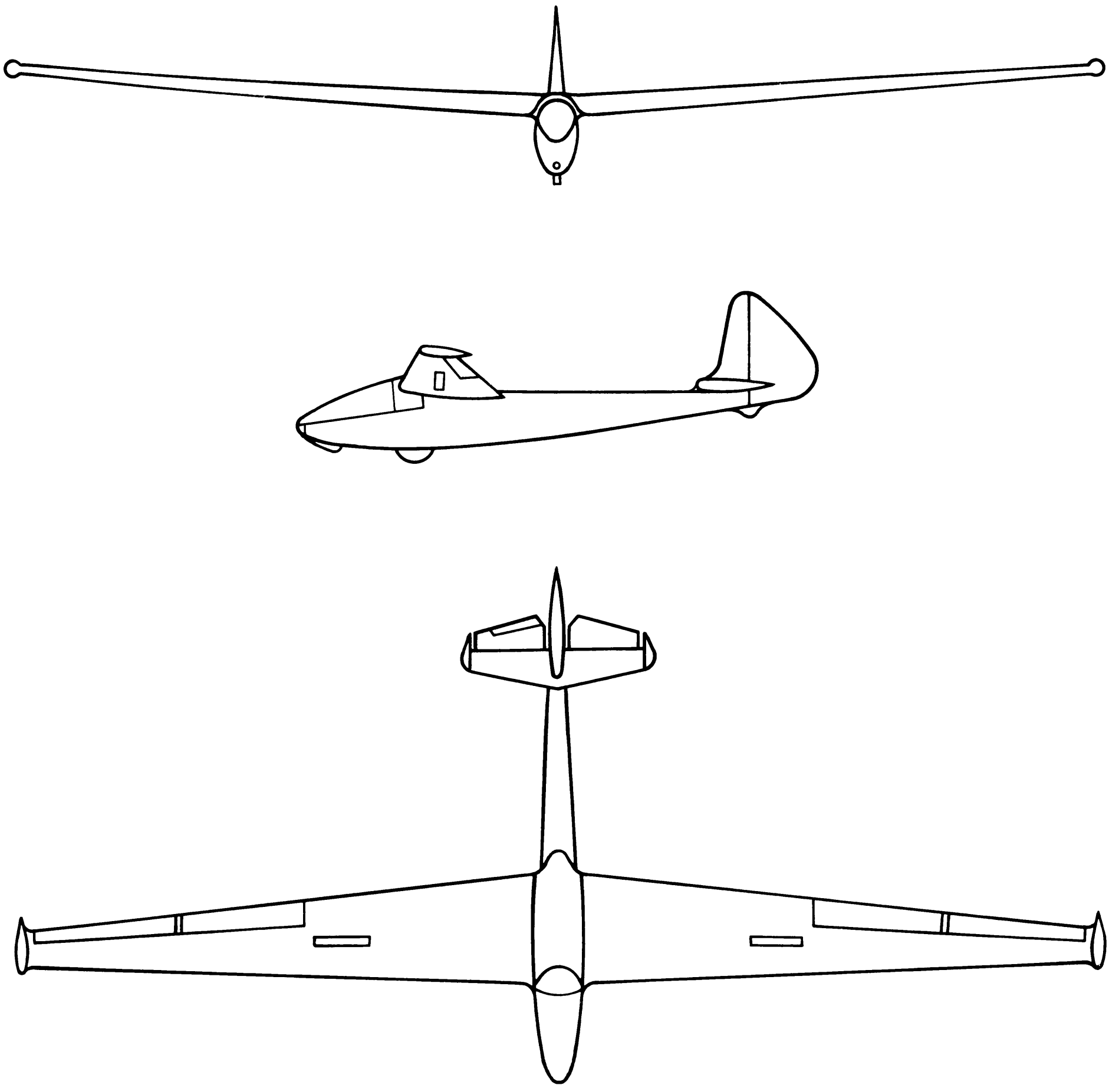
| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 130 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 80 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 220 kg |
| Instruments | 10 kg |
| Equipped weight | 230 kg |
| Flying weight | 342 kg |
| Wing loading | 22,4 kg/m² |

**Straight flight performance**

Measured at flying weight of 330 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 63 | 0,68 |
| Max. L/D condition | 75 | 0,76 |
| | 95 | 1,24 |
| | 110 | 1,78 |
| | 126 | 2,65 |
| Stalling speed | 56 km/h | |
| Max. L/D | 28 | |



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

**Design flight envelope**

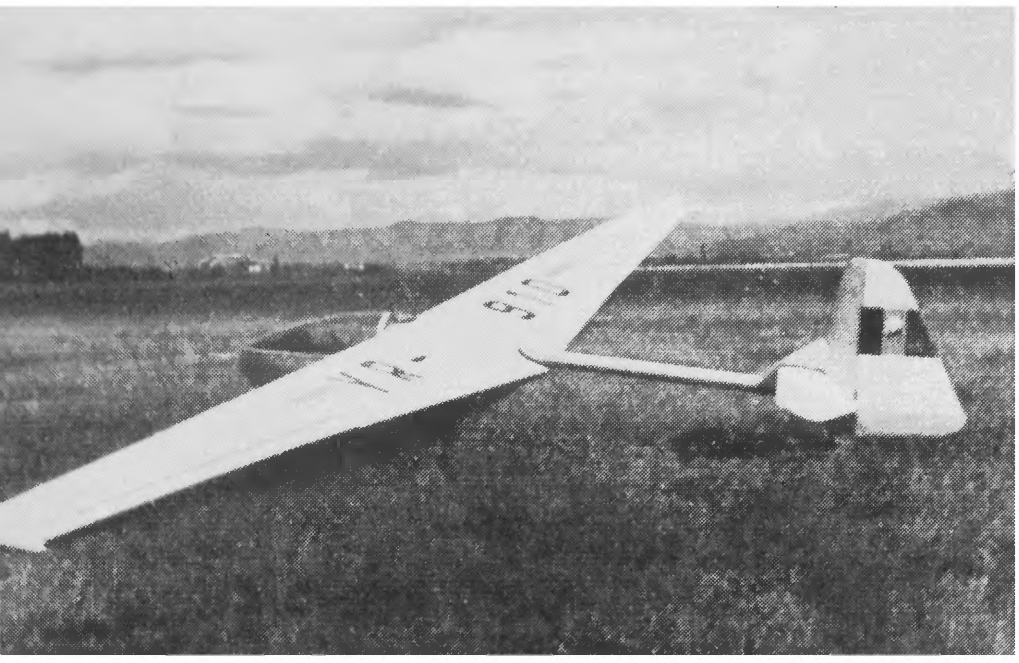
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 120 | 5 |
| Point B | 250 | 5 |
| Point C | 250 | —3 |
| Point D | 120 | —3 |
| Factor of safety | 2,0 | |

| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A | 120 | 15 |
| Point B | 240 | 7,5 |
| Point C | 240 | —7,5 |
| Point D | 120 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 150 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 30,15—42,1 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 185 km/h |

# IS-3F



| | |
|---|---|
| Type designation | IS-3f |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 22 May, 1958 |

**Wings**

| | |
|---|---|
| Span (b) | 15,3 m |
| Area (s) | 15,3 $m^2$ |
| Aspect ratio ($b^2/s$) | 15,3 |
| Wing root chord ($C_r$) | 1,474 m |
| Wing tip chord ($C_t$) | 0,518 m |
| Mean chord ($C = s/b$) | 1,0 m |
| Wing section, root | NACA 23015 |
| Wing section, mid | NACA 23012 |
| Wing section, tip | NACA 23012 |
| Dihedral | 2°30′ |
| ¼ chord sweep | +2° |
| Aero. twist root/tip | 4°10′ |
| Taper ratio ($C_t/C_r$) | 0,35 |
| Construction | Single spar wooden cantilever leading edge torsion box. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2×3,9 m |
| Area (total) | 2×0,845 $m^2$ |
| Mean chord | 0,217 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Mass balance degree | 100% |
| Mass balance method | Distributed |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 1,68 $m^2$ |
| Area of elevator | 1,05 $m^2$ |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,45 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,38 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,20 $m^2$ |
| Area of rudder | 0,93 $m^2$ |
| Tail arm | 3,85 m |
| Max. deflection | ±25° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Ply covered fin. Fabric covered rudder. Ribs spaced 0,25 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,58 m |
| Max. height (at cockpit) | 0,945 m |
| Overall length | 7,00 m |
| Max. cross section | 0,436 $m^2$ |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed rubber mounted skid. Retractable unsprung wheel with brake |
| Construction | Ply and metal monocoque. Side opening moulded plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2×0,90 m |
| Area | 2×0,35 $m^2$ |
| Location, % of chord | 43 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

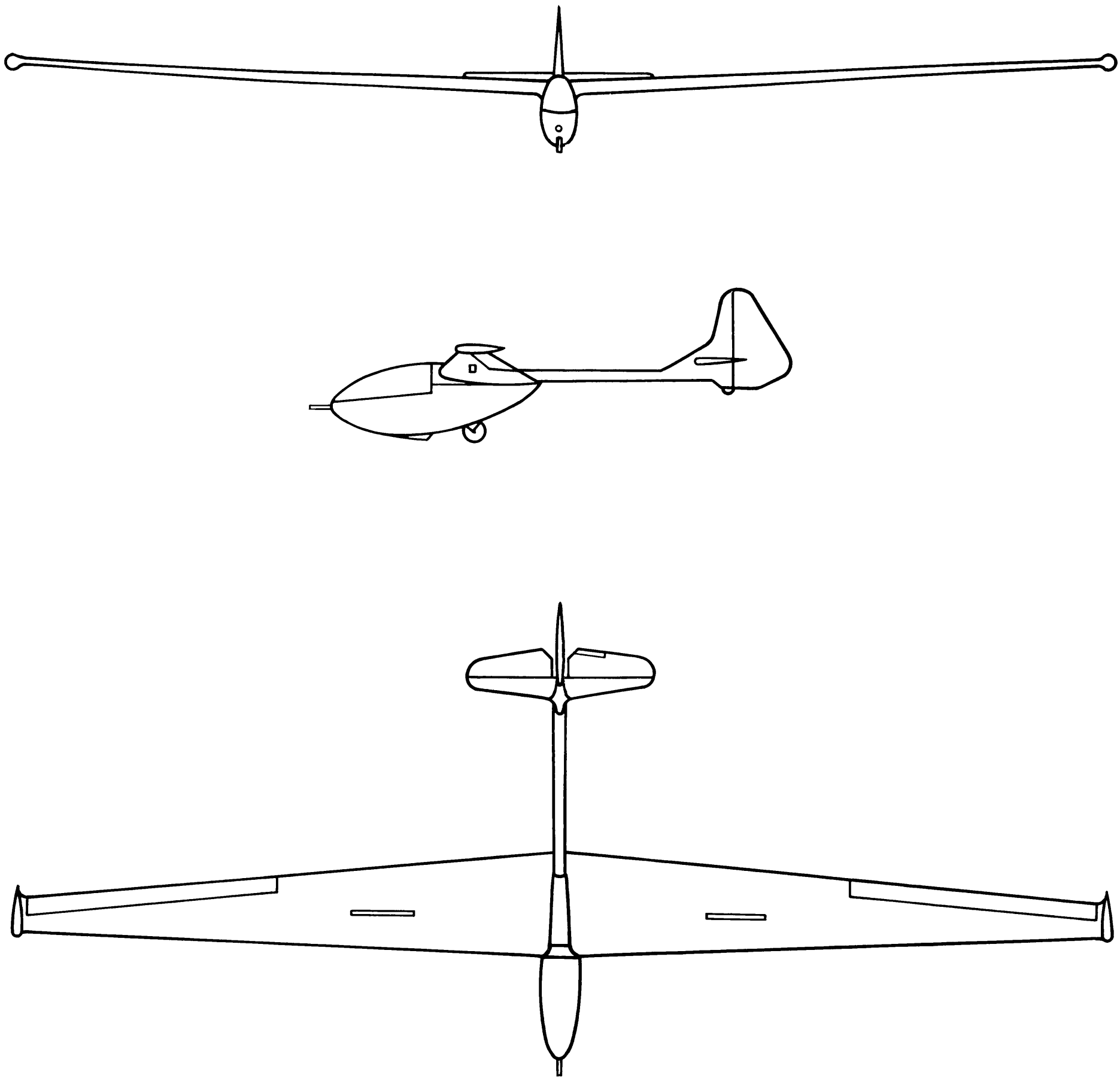
**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 130 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 80 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 220 kg |
| Instruments | 10 kg |
| Equipped weight | 230 kg |
| Flying weight | 320 kg |
| Wing loading | 21 kg/$m^2$ |

**Straight flight performance**

Measured at flying weight of 320 kg

| No flap or brake | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 67 | 0,70 |
| Max. L/D condition | 82 | 0,77 |



| | V km/h | v sink m/s |
|---|---|---|
| Max. L/D condition | 100 | 1,20 |
| | 117 | 2,00 |
| | 134 | 2,80 |
| Stalling speed . . . . . | 59 km/h | |
| Max. L/D . . . . . | 29,6 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built . . . . . | Rumanian |
| Date of issue of these requirements . . . | 1936 |

**Design flight envelope**

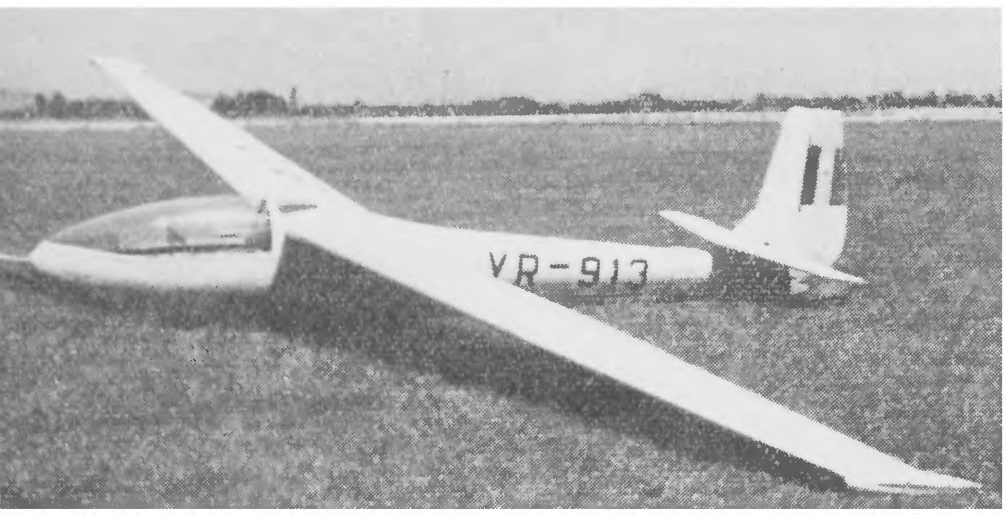
| | V km/h | Proof load factor |
|---|---|---|
| *Manoeuvre loads* | | |
| Point A . . . . . | 120 | 5 |
| Point B . . . . . | 250 | 5 |
| Point C . . . . . | 250 | —3 |
| Point D . . . . . | 120 | —3 |
| Factor of safety . . . . . | 2 | |

| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A . . . . . | 110 | 15 |
| Point B . . . . . | 220 | 7,5 |
| Point C . . . . . | 220 | —7,5 |
| Point D . . . . . | 110 | —15 |

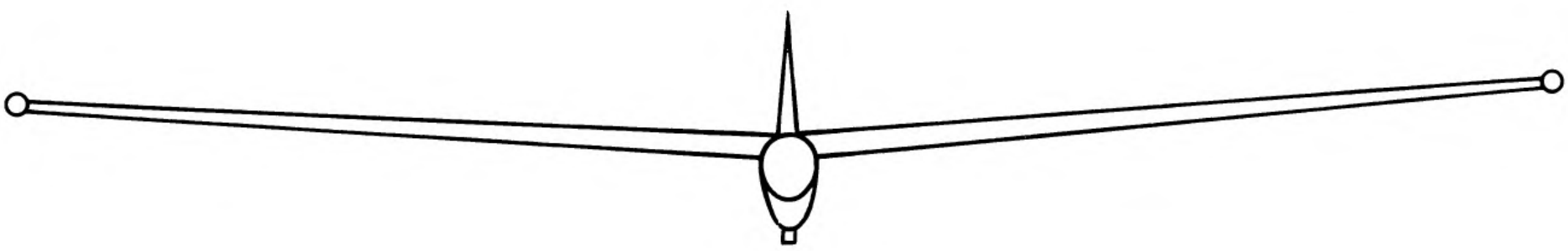
**Limiting flight conditions**

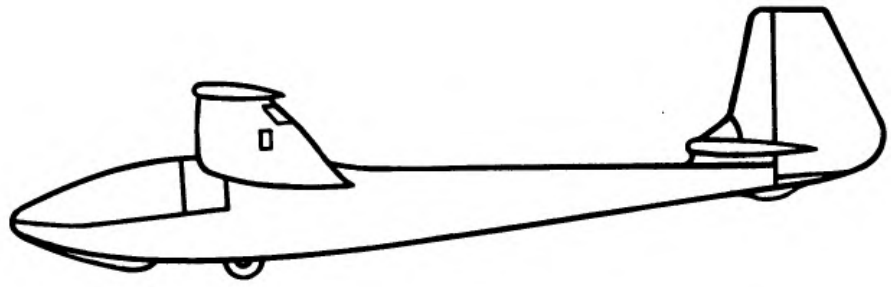
| | |
|---|---|
| Placard airspeed smooth conditions . . . | 200 km/h |
| Placard airspeed gusty conditions . . . . | 150 km/h |
| Aero-towing speed . . . . . | 120 km/h |
| Winch launching speed . . . . . | 90 km/h |
| Cloud flying permitted? . . . . . | Yes |
| Permitted aerobatic manoeuvres. . . . . | None |
| Spinning permitted? . . . . . | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) . . | 29,1—39 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) . . . . . | 180 km/h |

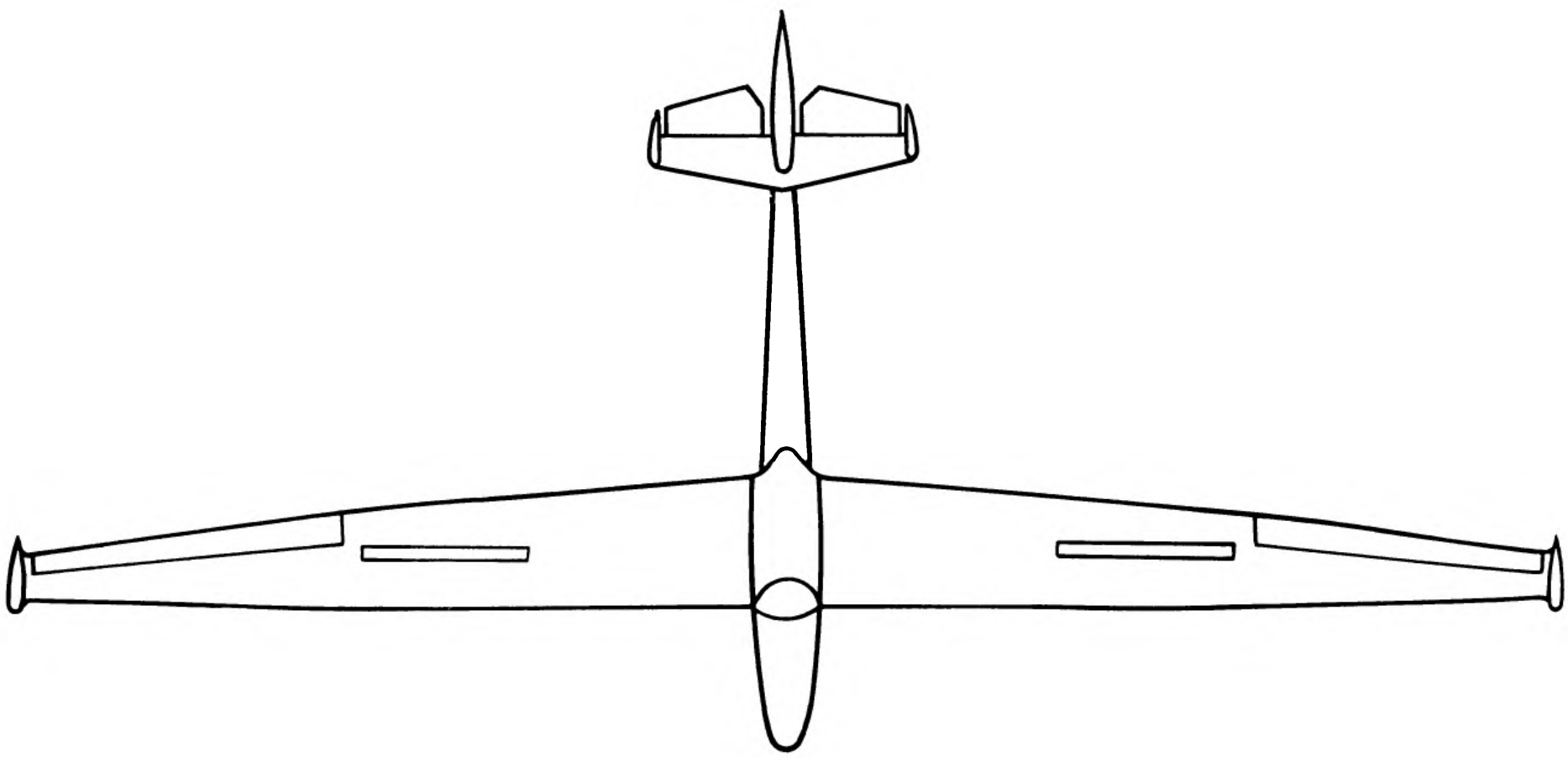
# IS-4




| | |
|---|---|
| Type designation | IS-4 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 5 June, 1959 |







## Wings

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 14 m² |
| Aspect ratio ($b^2/s$) | 16 |
| Wing root chord ($C_r$) | 1,275 m |
| Wing tip chord ($C_t$) | 0,50 m |
| Mean chord ($C = s/b$) | 0,935 m |
| Wing section, root | Gö 549 |
| Wing section, mid | Gö 549 |
| Wing section, tip | Gö 693 |
| Dihedral | 2°30′ |
| ¼ chord sweep | —3° |
| Taper ratio ($C_t/C_r$) | 0,39 |
| Construction | Single spar wooden cantilever with leading edge torsion box. Ribs spaced 0,3 m |

## Ailerons

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2×3,0 m |
| Area (total) | 2×0,735 m² |
| Mean chord | 0,245 m |
| Max. deflection up | 35° |
| Max. deflection down | 15° |
| Mass balance degree | 100% |
| Mass balance method | Distributed |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

## Horizontal tail

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 2,185 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,55 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,517 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

## Vertical tail

| | |
|---|---|
| Area of fin and rudder | 1,277 m² |
| Area of rudder | 0,837 m² |
| Tail arm | 3,95 m |
| Max. deflection | ±30° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin. Fabric covered rudder |

## Fuselage

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 0,90 m |
| Overall length | 7,10 m |
| Max. cross section | 0,430 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed rubber mounted skid. Fixed unsprung wheel with brake |
| Construction | Ply monocoque. Side opening moulded plexiglass canopy |

## Lift increasing devices

| | |
|---|---|
| Type | Nil |

## Drag producing devices

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2×1,166 m |
| Area | 2×0,225 m² |
| Location, % of chord | 48 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

## Weights

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 126 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 75 kg |
| Tailplane and elevator | 9 kg |
| Empty weight (including any fixed ballast) | 210 kg |
| Instruments | 10 kg |
| Equipped weight | 220 kg |
| Flying weight | 320 kg |
| Wing loading | 22,9 kg/m² |

## Straight flight performance

Measured at flying weight of . . . . . 320 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 67 | 0,64 |
| Max. L/D condition | 80 | 0,75 |
| | 100 | 1,15 |
| | 117 | 1,95 |
| | 134 | 2,70 |
| Stalling speed | 60 km/h | |
| Max. L/D | 30 | |

## Design standards

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

## Design flight envelope

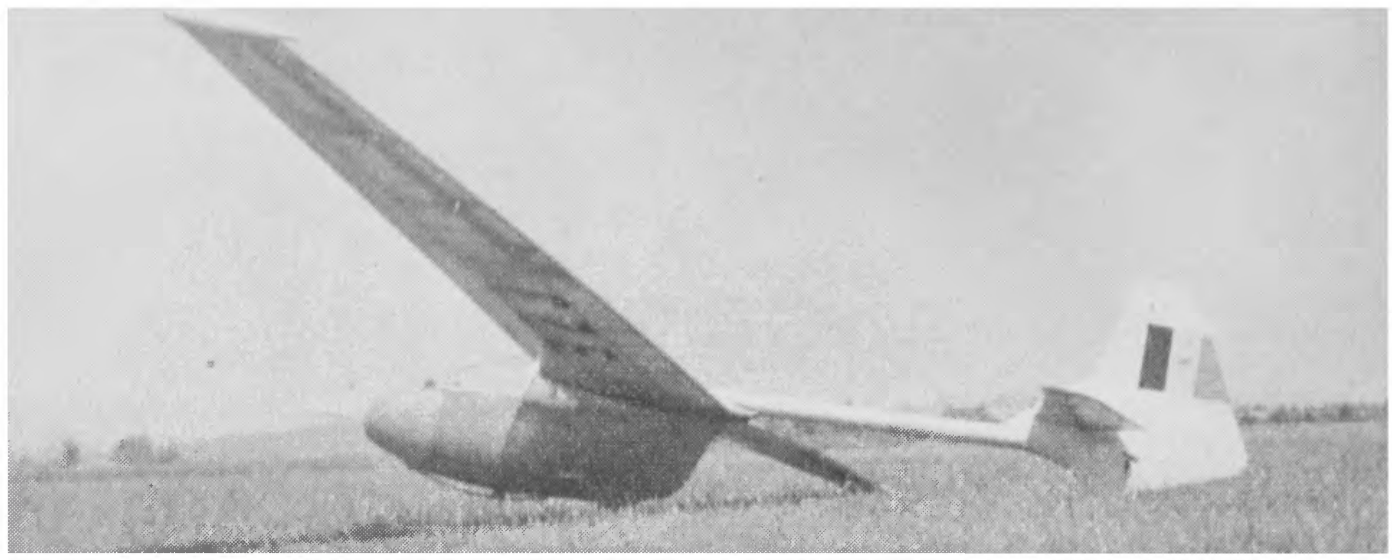
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 135 | 5 |
| Point B | 250 | 5 |
| Point C | 250 | —3 |
| Point D | 135 | —3 |
| Factor of safety | 1,8 | |

| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A | 120 | 15 |
| Point B | 235 | 7,5 |
| Point C | 235 | —7,5 |
| Point D | 120 | —15 |

## Limiting flight conditions

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 150 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 38–44 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 185 km/h |

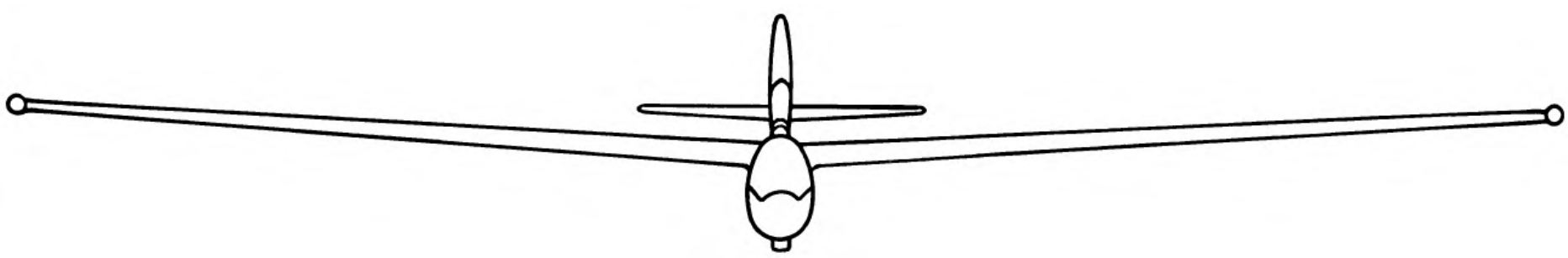
# IS-5

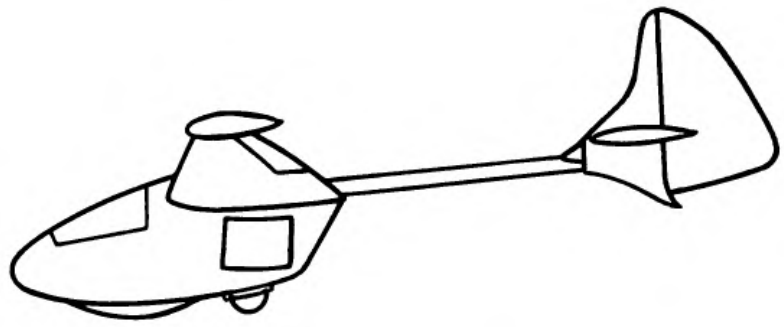


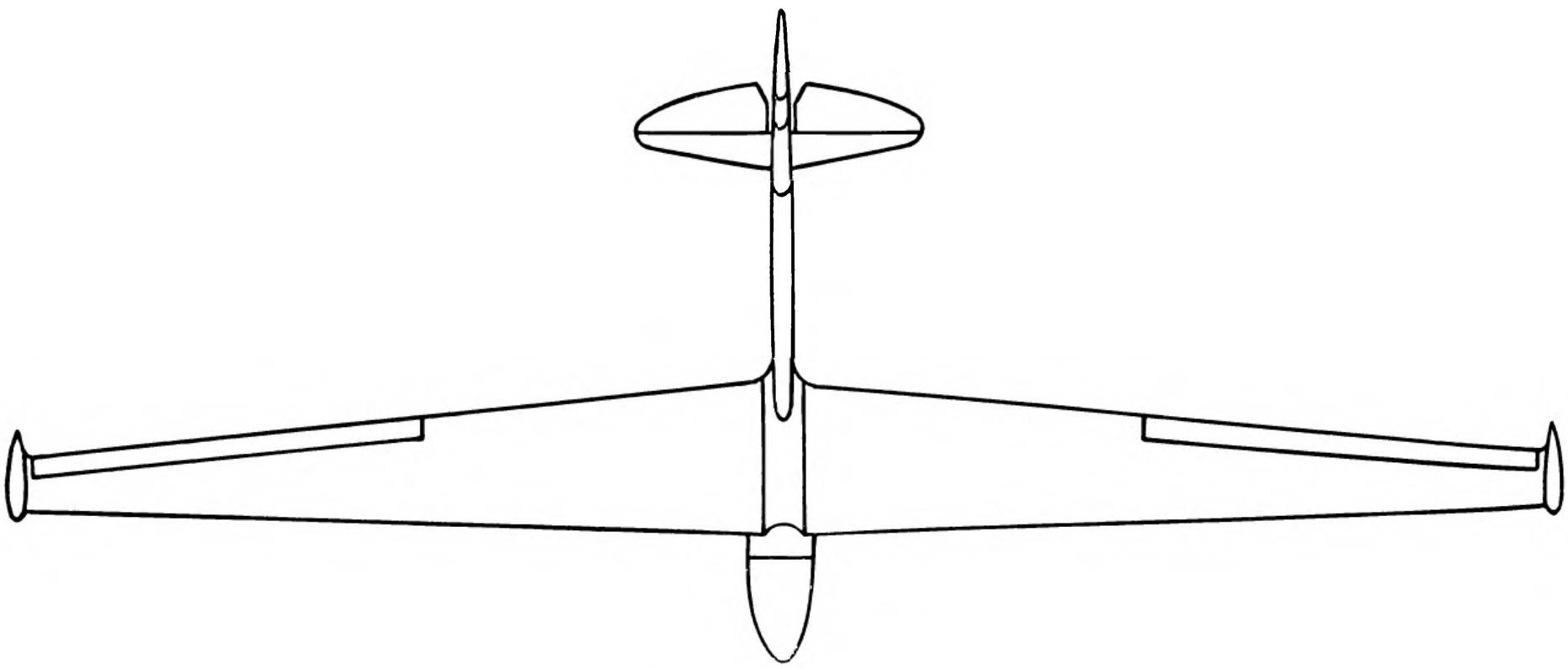
| | |
|---|---|
| Type designation | IS-5 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 14 June, 1960 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 15 m² |
| Aspect ratio ($b^2/s$) | 15 |







| | |
|---|---|
| Wing root chord ($C_r$) | 1,47 m |
| Wing tip chord ($C_t$) | 0,53 m |
| Mean chord ($C = {}^{s}/_{b}$) | 1,0 m |
| Wing section, root | NACA 23015 |
| Wing section, mid | NACA 23012 |
| Wing section, tip | NACA 23012 |
| Dihedral | 3° |
| ¼ chord sweep | +3° |
| Aero. twist root/tip | 4° |
| Taper ratio ($C_t/C_r$) | 0,36 |
| Construction | Single spar wooden cantilever with leading edge torsion box. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2×3,75 m |
| Area (total) | 2×0,82 m² |
| Mean chord | 0,219 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Mass balance degree | 100% |
| Mass balance method | Distributed |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 1,68 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,34 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′1′/SC) | 0,368 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,186 m² |
| Area of rudder | 0,9 m² |
| Aspect ratio | 2,30 |
| Tail arm | 3,725 m |
| Max. deflection | ±25° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin. Fabric covered rudder. Ribs spaced 0,25 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,61 m |
| Max. height (at cockpit) | 1,125 m |
| Overall length | 6,36 m |
| Max. cross section | 0,516 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed rubber mounted skid. Fixed unsprung wheel with brake |
| Construction | Metal monocoque fuselage. Moulded veneer nosecap. Side opening moulded plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Special air brakes opening from side of fuselage |
| Span (total) | 0,67 m long |
| Area | 2×0,325 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 130 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 71 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 211 kg |
| Instruments | 9 kg |
| Equipped weight | 220 kg |
| Flying weight | 310 kg |
| Wing loading | 20,9 kg/m² |

**Straight flight performance**

Measured at flying weight of . . . . . 310 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 64 | 0,74 |
| Max. L/D condition | 78 | 0,79 |
| | 96 | 1,01 |
| | 112 | 1,35 |
| | 128 | 1,85 |
| Stalling speed | 55 km/h | |
| Max. L/D | 28 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

| **Design flight envelope** | V km/h | Proof load factor |
|---|---|---|
| *Manoeuvre loads* | | |
| Point A | 130 | 5 |
| Point B | 240 | 5 |
| Point C | 240 | —3 |
| Point D | 130 | —3 |
| Factor of safety | 1,8 | |
| *Gust loads* | V km/h | Gust vel. V m/s |
| Point A | 110 | 15 |
| Point B | 220 | 7,5 |
| Point C | 220 | —7,5 |
| Point D | 110 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 180 km/h |
| Placard airspeed gusty conditions | 150 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 29–39 |

# IS-7

| | |
|---|---|
| Type designation | IS-7 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 7 May, 1959 |

**Wings**

| | |
|---|---|
| Span (b) | 15,9 m |
| Area (s) | 19,7 m² |
| Aspect ratio ($b^2/s$) | 12,85 |
| Wing root chord ($C_r$) | 1,88 m |
| Wing tip chord ($C_t$) | 0,59 m |
| Mean chord ($C = s/b$) | 1,24 m |
| Wing section, root | NACA 43015 |
| Wing section, mid | NACA 43015 |
| Wing section, tip | NACA 43012 A |
| Dihedral | 3°30′ |
| ¼ chord sweep | —6° |
| Aero. twist root/tip | 5°21′ |
| Taper ratio ($C_t/C_r$) | 0,313 |
| Construction | Single spar wooden cantilever with leading edge torsion box. 70% fabric covered. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2×4,35 m |
| Area (total) | 2×1,316 m² |
| Mean chord | 0,30 m |
| Max. deflection up | 34° |
| Max. deflection down | 17° |
| Mass balance degree | 100% |
| Mass balance method | Distributed weight |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

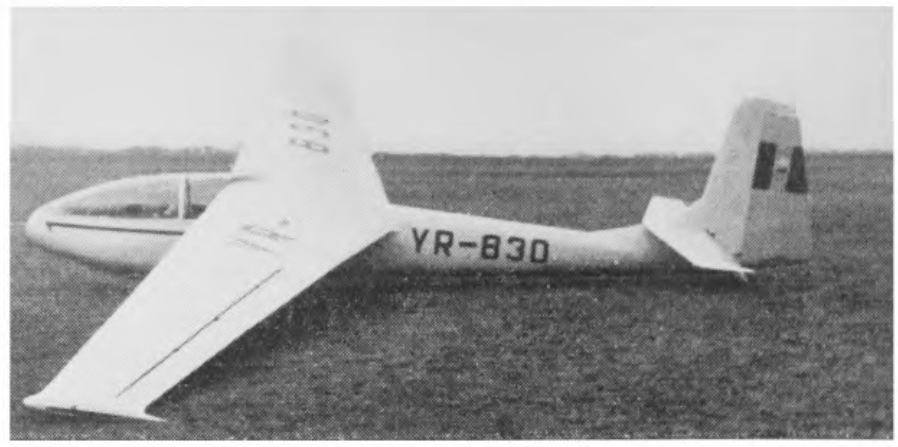
| | |
|---|---|
| Span | 2,76 m |
| Area of elevator and fixed tail (S′) | 2,58 m² |
| Area of elevator | 1,14 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,4 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,465 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,21 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 2,00 m² |
| Area of rudder | 1,230 m² |
| Aspect ratio | 2 |
| Max. deflection | ±30° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,76 m |
| Max. height (at cockpit) | 1,153 m |
| Overall length | 8,65 m |
| Max. cross section | 0,636 m² |




| | |
|---|---|
| Number of seats and arrangement | 2 tandem |
| Undercarriage type | Fixed rubber mounted skid and fixed unsprung wheel with brake |
| Construction | Ply monocoque. Side and rear opening moulded plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2×1,24 m |
| Location, % of chord | 39 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 176 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 120 kg |
| Tailplane and elevator | 12 kg |
| Empty weight (including any fixed ballast) | 308 kg |
| Instruments | 10 kg |
| Equipped weight | 318 kg |
| Flying weight | 500 kg |
| Wing loading | 25,5 kg/m² |

**Straight flight performance**

Measured at flying weight of 500 kg

**No flap or brake**

| V km/h | v sink m/s |
|---|---|
| 70 | 0,85 |
| 80 | 0,9 |
| 105 | 1,5 |
| 123 | 2,1 |
| 140 | 2,8 |

| | |
|---|---|
| Stalling speed | 56 km/h |
| Max. L/D | 24,5 |

**Design standards**

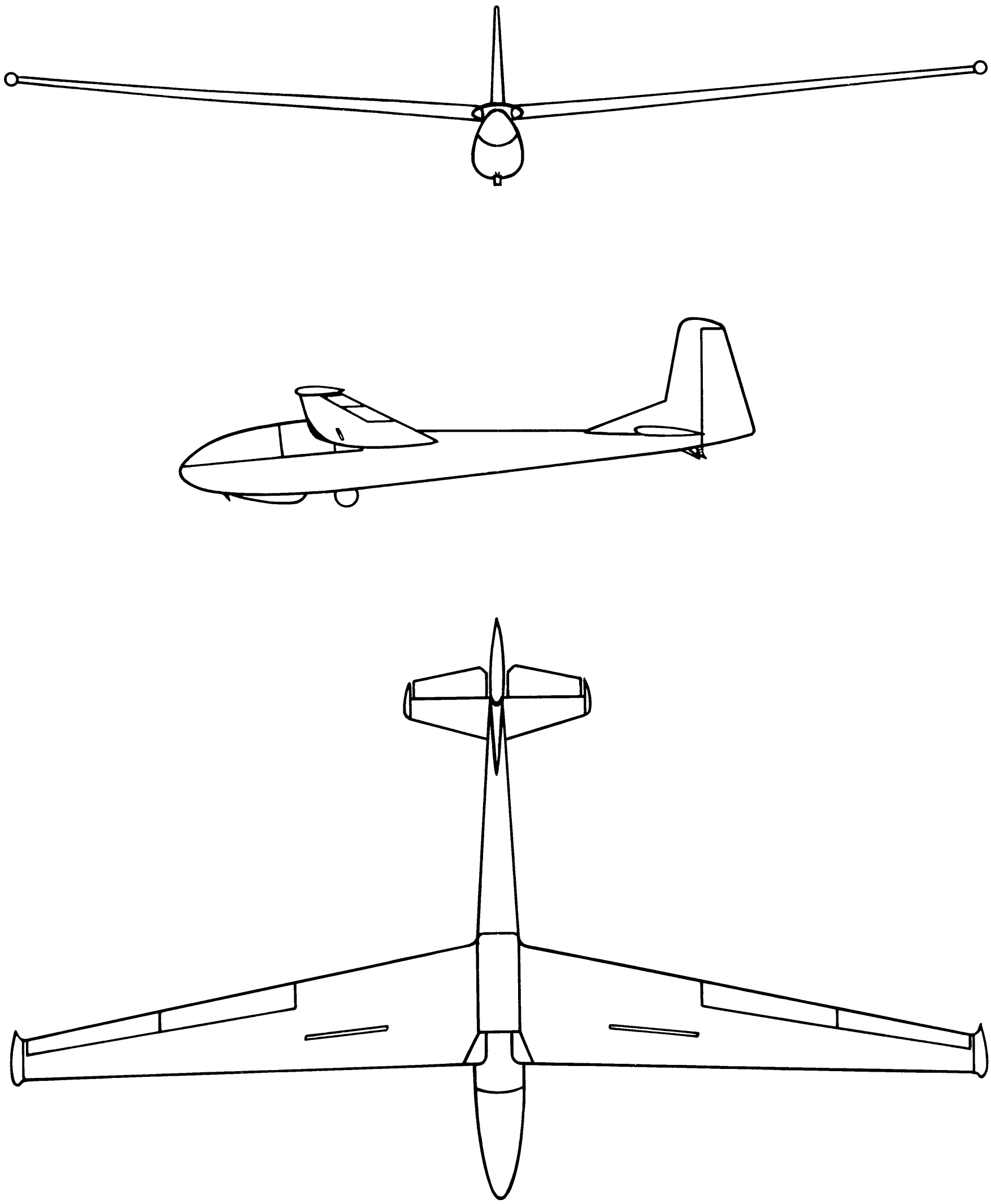
| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

**Design flight envelope**

*Manoeuvre loads*

| | V km/h | Proof load factor |
|---|---|---|
| Point A | 125 | 5 |
| Point B | 260 | 5 |
| Point C | 260 | —3 |
| Point D | 130 | —3 |

Factor of safety 1,8



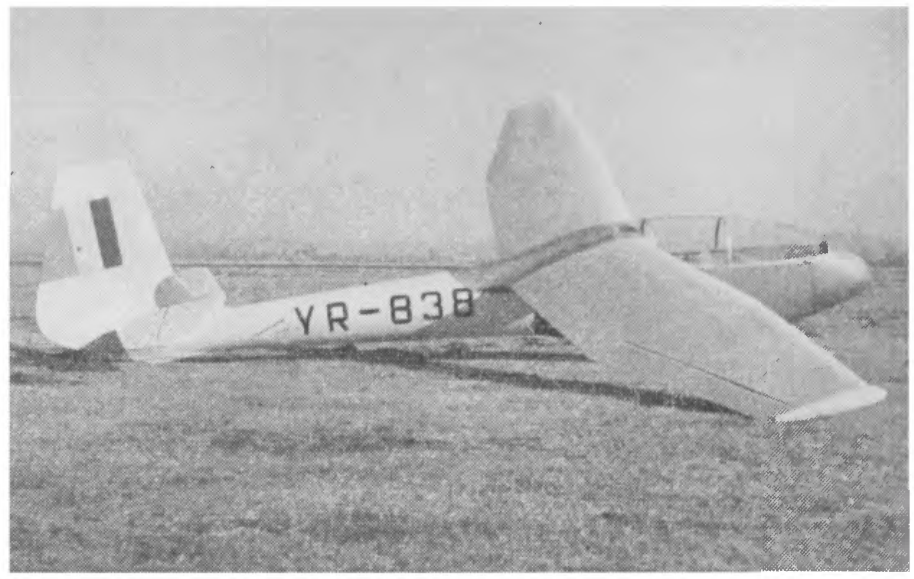
| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A | 135 | 15 |
| Point B | 265 | 7,5 |
| Point C | 265 | —7,5 |
| Point D | 135 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 230 km/h |
| Placard airspeed gusty conditions | 180 km/h |

| | |
|---|---|
| Aero-towing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Semi aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 31–39 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 190 km/h |

# IS-8




| | |
|---|---|
| Type designation | IS-8 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 14 September, 1960 |

**Wings**

| | |
|---|---|
| Span (b) | 13,35 m |
| Area (s) | 15,45 m² |
| Aspect ratio ($b^2/s$) | 11,50 |
| Wing root chord ($C_r$) | 1,30 m |
| Wing tip chord ($C_t$) | 0,68 m |
| Mean chord ($C = s/b$) | 1,15 m |
| Wing section, root | NACA 43015 |
| Wing section, mid | NACA 43012A |
| Wing section, tip | NACA 43012A |
| Dihedral | 2°30′ |
| ¼ chord sweep | —7° |
| Aero. twist root/tip | 1° 50′ |
| Taper ratio ($C_t/C_r$) | 0,522 |
| Construction | Single spar wooden cantilever with leading edge torsion box. 70% fabric covered. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2×2,85 m |
| Area (total) | 2×0,84 m² |
| Mean chord | 0,296 m |
| Max. deflection up | 34° |
| Max. deflection down | 17° |
| Mass balance degree | 100% |
| Mass balance method | Distributed weight |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 2,185 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,7 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,334 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,51 m² |
| Area of rudder | 1,04 m² |
| Tail arm | 4,22 m |
| Max. deflection | ±28° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,125 m |
| Overall length | 7,35 m |
| Max. cross section | 0,51 m² |
| Number of seats and arrangement | 2 tandem |
| Undercarriage type | Fixed rubber mounted skid. Fixed unsprung wheel without brake |
| Construction | Metal and ply monocoque. Side and rear opening canopy of moulded plexiglass |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Special brake flaps on side of fuselage |
| Span (total) | 0,64 m long |
| Area | 2×0,37 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

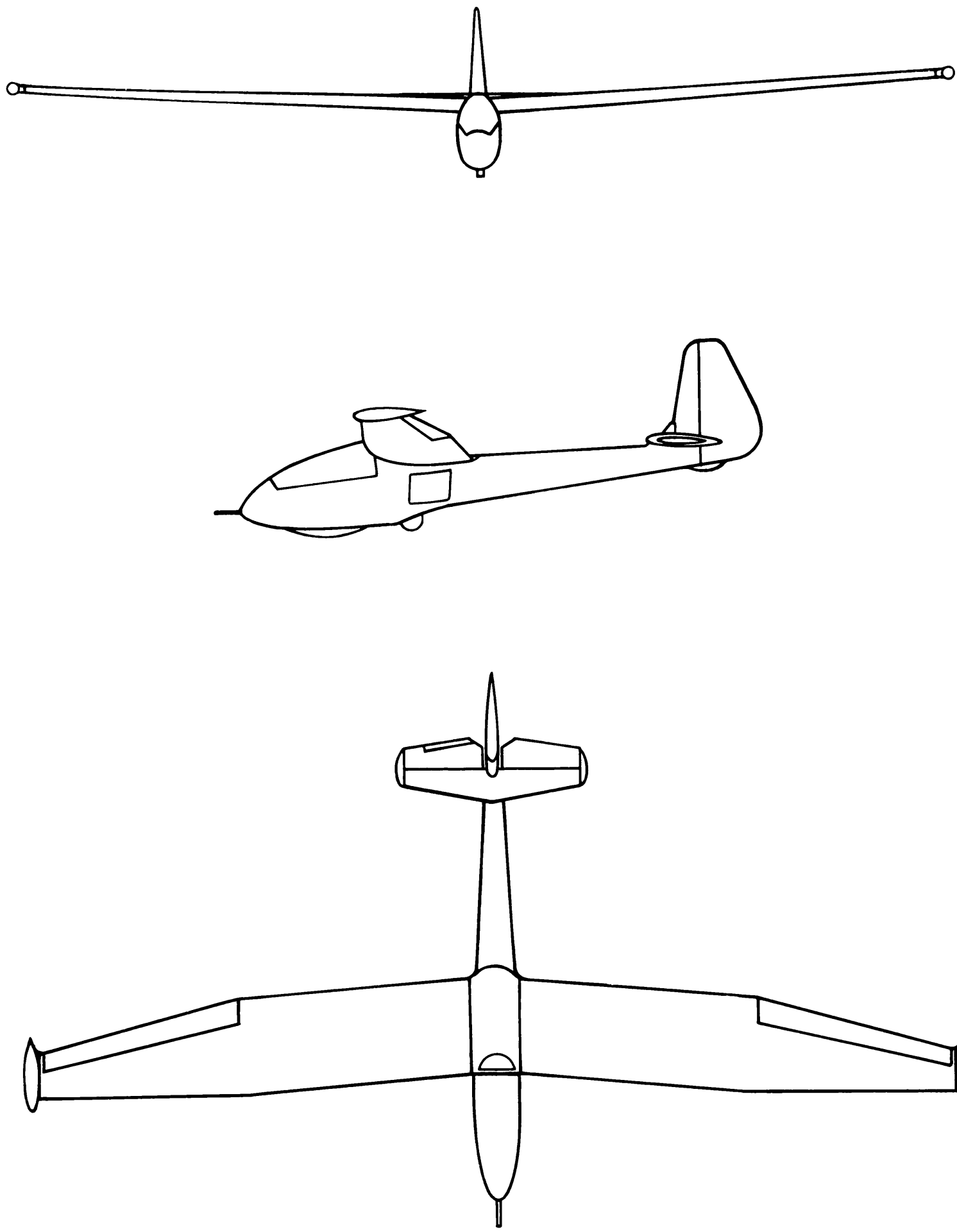
**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 120 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 80 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 210 kg |
| Instruments | 10 kg |
| Equipped weight | 220 kg |
| Flying weight | 400 kg |
| Wing loading | 25,8 kg/m² |

**Straight flight performance**

Calculated at flying weight of 380 kg

| No flap or brake | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 70 | 0,98 |
| Max. L/D condition | 85 | 1,04 |
| | 105 | 1,35 |
| | 122 | 1,80 |
| | 140 | 2,60 |
| Stalling speed | 62 km/h | |
| Max. L/D | 23 | |



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

**Design flight envelope**

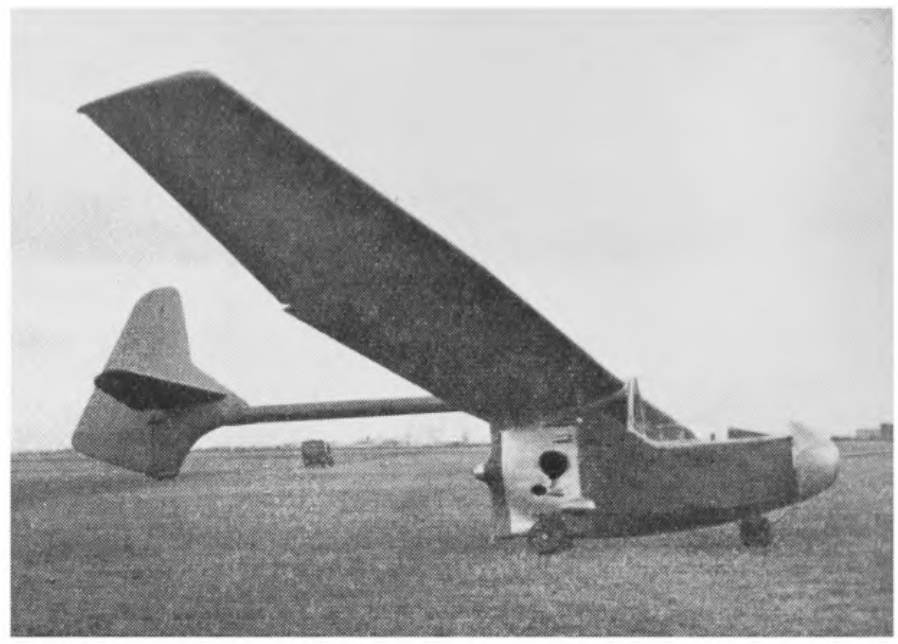
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 120 | 4 |
| Point B | 250 | 4 |
| Point C | 250 | —2,2 |
| Point D | 120 | —2,2 |
| Factor of safety | | 1,8 |

| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A | 105 | 15 |
| Point B | 210 | 7,5 |
| Point C | 210 | —7,5 |
| Point D | 105 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 180 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 85 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 26–37 |

# IS-8



| | |
|---|---|
| Type designation | IS-9 (Powered sailplane) |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 2 July, 1958 |

**Wings**

| | |
|---|---|
| Span (b) | 13 m |
| Area (s) | 15 m² |
| Aspect ratio ($b^2/s$) | 11,3 |
| Wing root chord ($C_r$) | 1,30 m |
| Wing tip chord ($C_t$) | 0,68 m |
| Mean chord ($C = s/b$) | 1,15 m |
| Wing section, root | NACA 43015 |
| Wing section, mid | NACA 43012A |
| Wing section, tip | NACA 43012A |
| Dihedral | 2°30′ |
| ¼ chord sweep | 1°30′ |
| Aero. twist root/tip | 1°50′ |
| Taper ratio ($C_t/C_r$) | 0,52 |
| Construction | Single spar wooden cantilever with leading edge torsion box. 70% fabric covered. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2×2,85 m |
| Area (total) | 2×0,84 m² |
| Mean chord | 0,296 m |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Mass balance degree | 100% |
| Mass balance method | Distributed weight |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 1,68 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to chord ¼ m.a.c. tail) | 3,43 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,334 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,186 m² |
| Area of rudder | 0,9 m² |
| Tail arm | 3,725 m |
| Max. deflection | ±25° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,28 m |
| Overall length | 6,64 m |
| Max. cross section | 0,58 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed tricycle undercarriage, unsprung, no brake |
| Construction | Sheet metal monocoque and steel tube. Side opening moulded plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Special brake flaps on side of fuselage |
| Span (total) | 0,64 m long |
| Area | 2×0,45 m² |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 120 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 90 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 220 kg |
| Instruments | 10 kg |
| Equipped weight | 230 kg |
| Flying weight | 360 kg |
| Wing loading | 24,0 kg/m² |

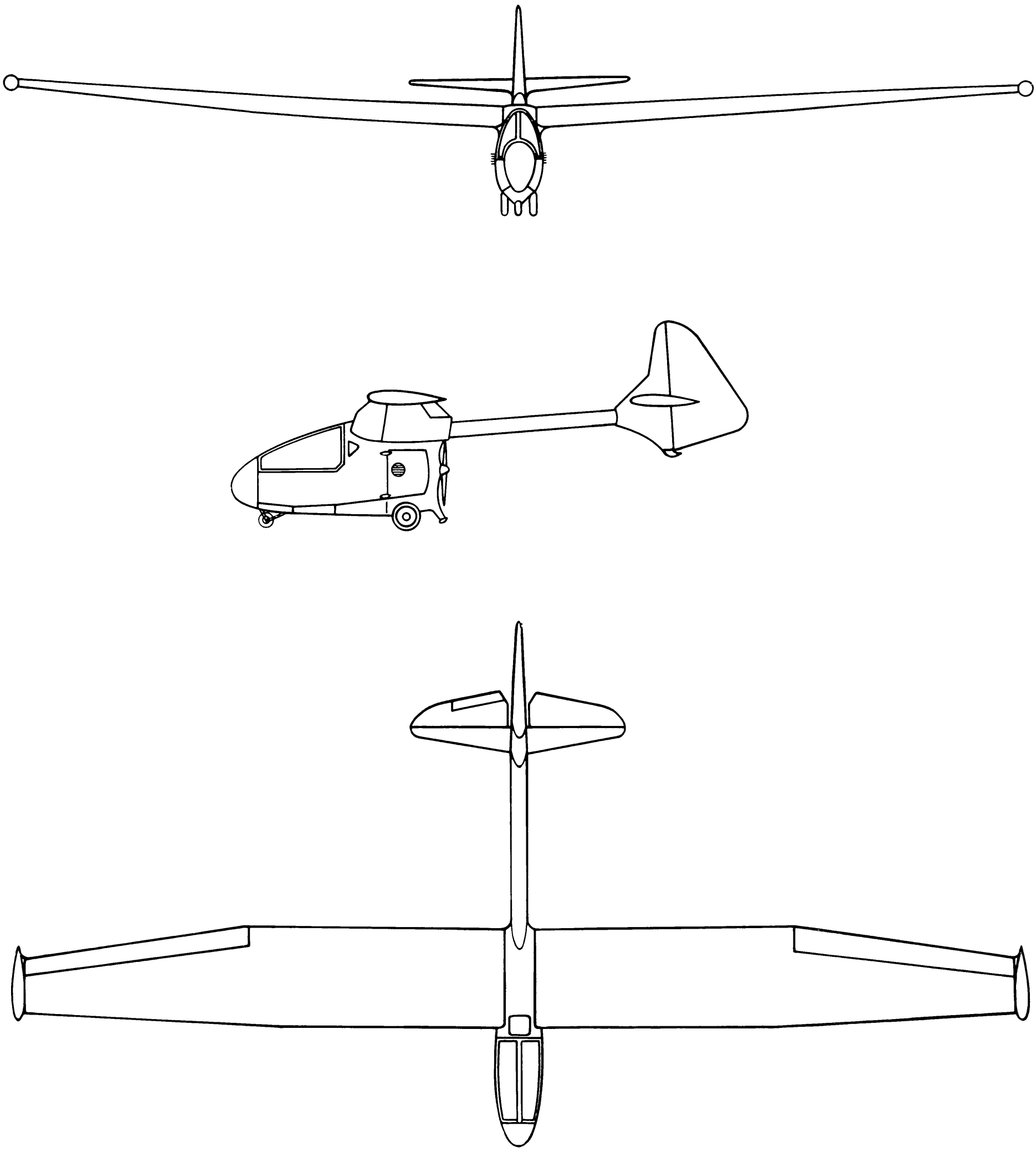
**Straight flight performance**
Calculated

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 65 | 0,85 |
| Max. L/D condition | 80 | 0,95 |
| | 98 | 1,40 |
| | 114 | 2,10 |
| | 130 | 2,90 |
| Stalling speed | 52 km/h | |
| Max. L/D | 23,5 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |



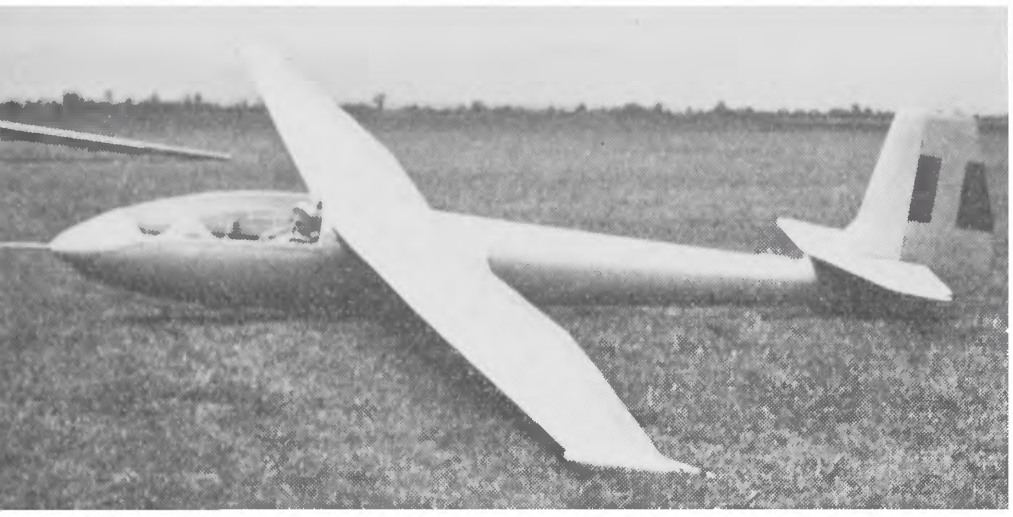
**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 105 | 4 |
| Point B | 215 | 4 |
| Point C | 215 | —2,3 |
| Point D | 105 | —2,3 |
| Factor of safety | 1,8 | |

| *Gust loads* | V km/h | Gust vel. V m/s |
|---|---|---|
| Point A | 100 | 15 |
| Point B | 200 | 7,5 |
| Point C | 200 | —7,5 |
| Point D | 100 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 180 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towing speed | 120 km/h |
| Cloud flying permitted? | No |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 30,2–42,1 |



# IS-10

| | |
|---|---|
| Type designation | IS-10 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 6 April, 1960 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 13,2 m² |
| Aspect ratio ($b^2/s$) | 17 |
| Wing root chord ($C_r$) | 1,2 m |
| Wing tip chord ($C_t$) | 0,43 m |
| Mean chord ($C = s/b$) | 0,88 m |
| Wing section, root | 63–4–621 |
| Wing section, mid | 63–3–618 |
| Wing section, tip | 63–3–618 |
| Dihedral | 2°30′ |
| ¼ chord sweep | —3° |
| Aero. twist root/tip | 1°40′ |
| Taper ratio ($C_t/C_r$) | 0,26 |
| Construction | Single spar wooden cantilever with leading edge torsion box. 40% fabric covered. Ribs spaced 0,1 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 2,4 m |
| Area (total) | 2 × 0,586 m² |
| Mean chord | 0,244 m |
| Max. deflection up | 35° |
| Max. deflection down | 15° |
| Mass balance degree | 100% |
| Mass balance method | Distributed weight |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,2 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 2,185 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,63 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,68 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,277 m² |
| Area of rudder | 0,837 m² |
| Tail arm | 4,15 m |
| Max. deflection | ± 25° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,59 m |
| Max. height (at cockpit) | 0,82 m |
| Overall length | 7,44 m |
| Max. cross section | 0,38 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed rubber mounted skid. Fixed unsprung wheel with brake |
| Construction | Ply monocoque with side opening moulded plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,166 m |
| Area | 2 × 0,215 m² |
| Location, % of chord | 50 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

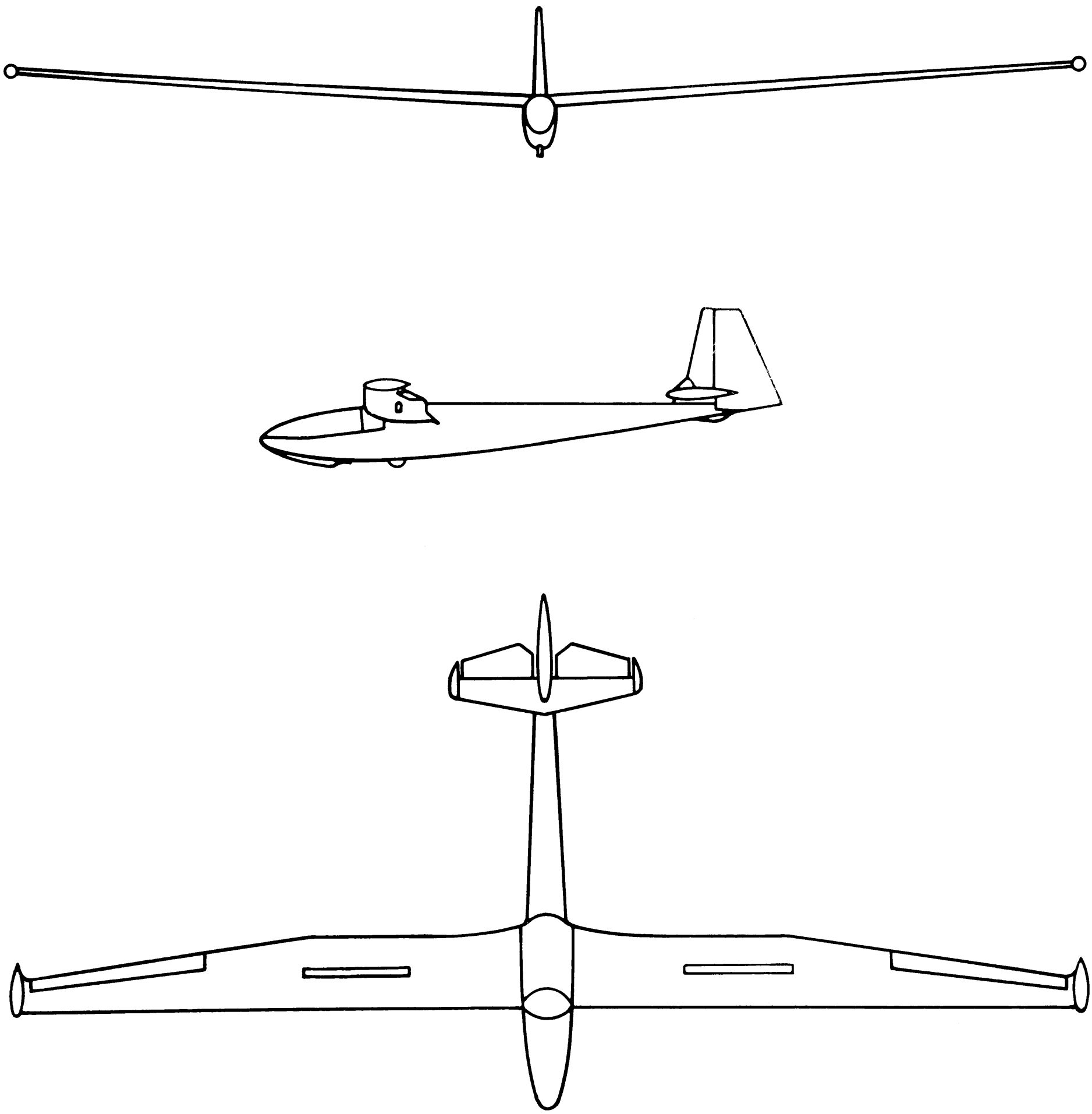
**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 146 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 75 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 231 kg |
| Instruments | 9 kg |
| Equipped weight | 240 kg |
| Flying weight | 340 kg |
| Wing loading | 25,7 kg/m² |

**Straight flight performance**

Measured at flying weight of 320 kg

| No flap or brake | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 72 | 0,67 |
| Max. L/D condition | 85 | 0,72 |
| | 108 | 1,30 |
| | 126 | 1,95 |
| | 144 | 3,00 |
| Stalling speed | 62 km/h | |
| Max. L/D | 32,7 | |



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 155 | 5 |
| Point B | 270 | 5 |
| Point C | 270 | —3 |
| Point D | 155 | —3 |
| Factor of safety | | 1,8 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 145 | 15 |
| Point B | 265 | 7,5 |
| Point C | 265 | —7,5 |
| Point D | 145 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 220 km/h |
| Placard airspeed gusty conditions | 150 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 27 to 33 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 195 km/h |


# IS-11

| | |
|---|---|
| Type designation | IS-11 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 16 December, 1959 |

**Wings**

| | |
|---|---|
| Span (b) | 14,1 m |
| Area (s) | 14,5 m² |
| Aspect ratio ($b^2/s$) | 13,75 |
| Wing root chord ($C_r$) | 1,45 m |
| Wing tip chord ($C_t$) | 0,61 m |
| Mean chord ($C = s/b$) | 1,03 m |
| Wing section, root | NACA 23015 |
| Wing section, mid | NACA 23012 |
| Wing section, tip | NACA 23012 |
| Dihedral | 2°30′ |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 4° |
| Taper ratio ($C_t/C_r$) | 0,42 |
| Construction | Single spar wooden cantilever with leading edge torsion box. Ply covering. Ribs spaced 0,15 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 3,30 m |
| Area (total) | 2 × 0,43 m² |
| Mean chord | 0,26 m |
| Max. deflection up | 32° |
| Max. deflection down | 15° |
| Mass balance degree | 100% |
| Mass balance method | Distributed weight |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,80 m |
| Area of elevator and fixed tail (S′) | 2,18 m² |
| Area of elevator | 1,05 m² |
| Max. deflection up | 30° |
| Max. deflection down | 30° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,95 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,585 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,28 m² |
| Area of rudder | 0,89 m² |
| Tail arm | 4,36 m |
| Max. deflection | ± 25° |
| Aerofoil section | NACA 0009 |
| Construction | Wood. Ply covered. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,60 m |
| Max. height (at cockpit) | 1,00 m |
| Overall length | 6,86 m |
| Max. cross section | 0,48 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Fixed rubber mounted skid. Fixed unsprung wheel with brake |
| Construction | Ply monocoque with side opening moulded plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 0,90 m |
| Area | 2 × 0,35 m² |
| Location, % of chord | 43 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

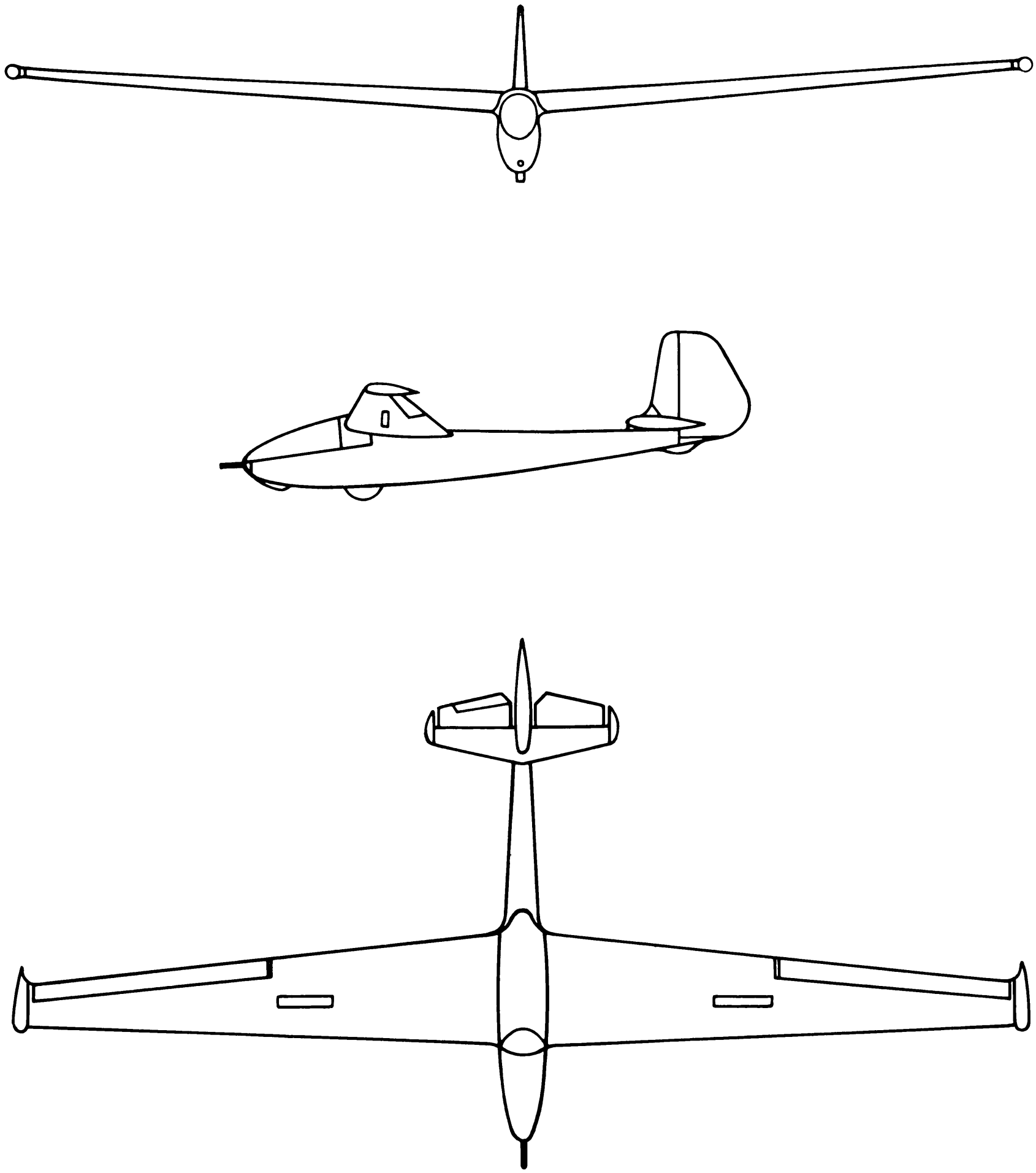
**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 130 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 90 kg |
| Tailplane and elevator | 10 kg |
| Empty weight (including any fixed ballast) | 230 kg |
| Instruments | 10 kg |
| Equipped weight | 240 kg |
| Flying weight | 330 kg |
| Wing loading | 23,8 kg/m² |

**Straight flight performance**

Measured at flying weight of . . . . . 330 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 68 | 0,82 |
| Max. L/D condition | 80 | 0,95 |
| | 102 | 1,50 |
| | 119 | 2,30 |
| | 136 | 2,70 |
| Stalling speed | 60 km/h | |
| Max. L/D | 24 | |



**Design standards**

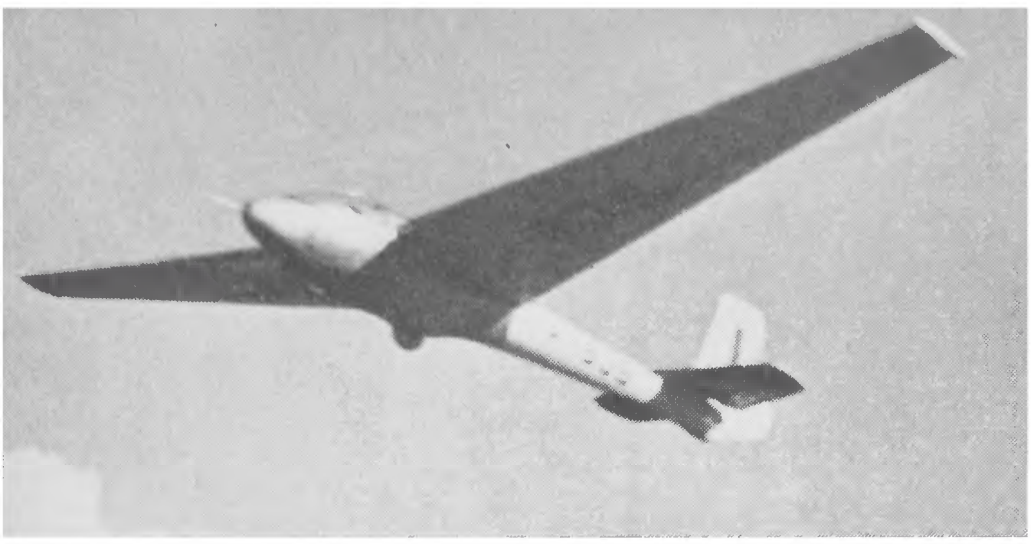
| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1936 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 150 | 6 |
| Point B | 275 | 6 |
| Point C | 275 | —4 |
| Point D | 150 | —4 |
| Factor of safety | | 2 |
| *Gust loads* | V km/h | Gust velocity V m/s |
| Point A | 160 | 15 |
| Point B | 320 | 7,5 |
| Point C | 320 | —7,5 |
| Point D | 160 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 275 km/h |
| Placard airspeed gusty conditions | 160 km/h |
| Aero-towing speed | 150 km/h |
| Winch launching speed | 100 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 33 to 39 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 210 km/h |



# IS-12

| | |
|---|---|
| Type designation | IS-12 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 23 December, 1960 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 18 m² |
| Aspect ratio ($b^2/s$) | 12,5 |
| Wing root chord ($C_r$) | 1,80 m |
| Wing tip chord ($C_t$) | 0,575 m |
| Mean chord ($C = s/b$) | 1,20 m |
| Wing section, root | NACA 43015 |
| Wing section, mid | NACA 43015 |
| Wing section, tip | NACA 43012 A |
| Dihedral | 3°30′ |
| ¼ chord sweep | —6° |
| Aero. twist root/tip | 5° |
| Taper ratio ($C_t/C_r$) | 0,32 |
| Construction | Single spar wooden cantilever with leading edge torsion box. 60% fabric covered. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Span (total) | 2 × 4,35 m |
| Area (total) | 2 × 1,31 m² |
| Mean chord | 0,30 m |
| Max. deflection up | 34° |
| Max. deflection down | 17° |
| Mass balance degree | 100% |
| Mass balance method | Distributed weight |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,76 m |
| Area of elevator and fixed tail (S′) | 2,58 m² |
| Area of elevator | 1,14 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,05 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′l′/SC) | 0,517 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,51 m² |
| Area of rudder | 1,04 m² |
| Tail arm | 4,4 m |
| Max. deflection | ± 28° |
| Aerofoil section | NACA 0009 |
| Construction | Wood. Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,62 m |
| Max. height (at cockpit) | 1,11 m |
| Overall length | 7,60 m |
| Max. cross section | 0,53 m² |
| Number of seats and arrangement | 2 tandem |
| Undercarriage type | Fixed rubber mounted skid and fixed unsprung wheel with brake |
| Construction | Metal monocoque and steel tube. Rear and side opening moulded plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,1 m |
| Area | 2 × 0,33 m² |
| Location, % of chord | 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

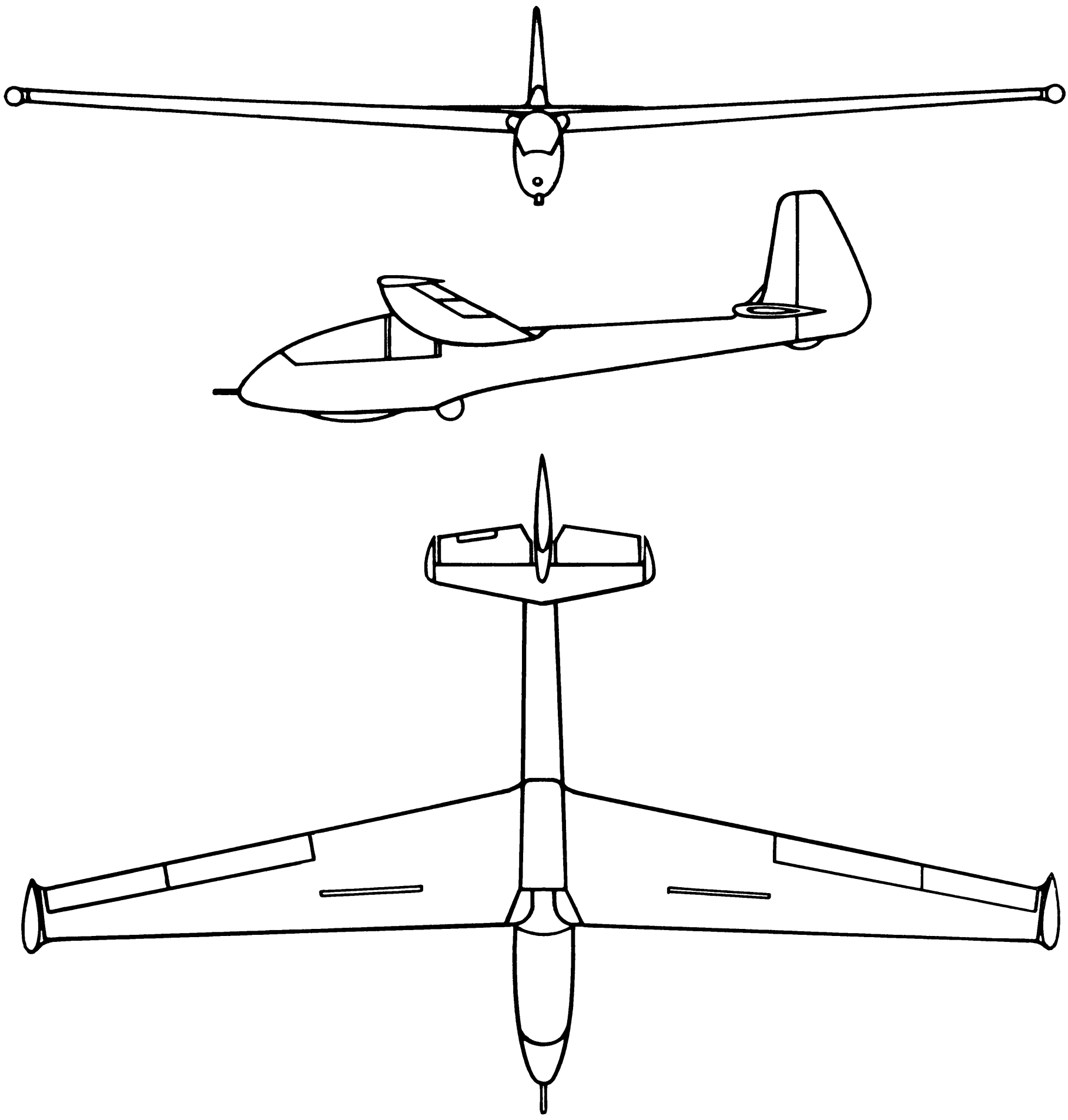
**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 168 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 100 kg |
| Tailplane and elevator | 12 kg |
| Empty weight (including any fixed ballast) | 280 kg |
| Instruments | 10 kg |
| Equipped weight | 290 kg |
| Flying weight | 480 kg |
| Wing loading | 26,6 kg/m² |

**Straight flight performance**

Measured at flying weight of 470 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 65 | 0,92 |
| Max. L/D condition | 81 | 0,98 |
| | 98 | 1,45 |
| | 114 | 1,85 |
| | 130 | 2,3 |
| Stalling speed | 58 km/h | |
| Max. L/D | 24 | |



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been cuilt | Rumanian |
| Date of issue of these requirements | 1959 |

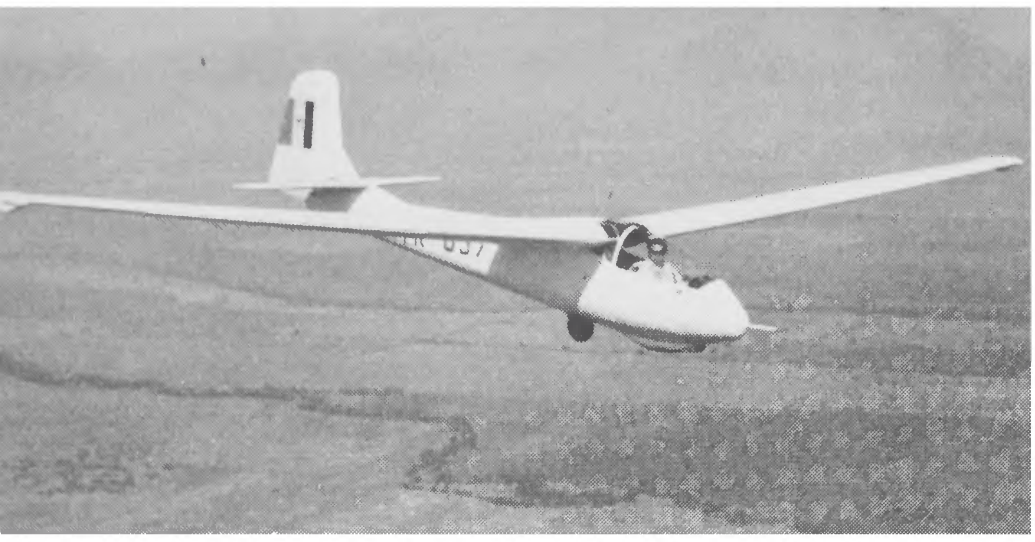
**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 130 | 5 |
| Point B | 265 | 5 |
| Point C | 265 | —3 |
| Point D | 130 | —3 |
| Factor of safety | | 1,8 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 140 | 15 |
| Point B | 280 | 7,5 |
| Point C | 280 | —7,5 |
| Point D | 140 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 150 km/h |
| Aero-towing speed | 130 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 30 to 40 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 185 km/h |



# IS-13

| | |
|---|---|
| Type designation | IS-13 |
| Country of design | Rumania |
| Designer | Ing. Josif Silimon |
| Date of first flight of prototype | 27 December, 1960 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 18 m² |
| Aspect ratio ($b^2/s$) | 12,5 |
| Wing root chord ($C_r$) | 1,80 m |
| Wing tip chord ($C_t$) | 0,575 m |
| Mean chord ($C = s/b$) | 1,20 m |
| Wing section, root | NACA 43015 |
| Wing section, mid | NACA 43015 |
| Wing section, tip | NACA 43012 A |
| Dihedral | 2°30′ |
| ¼ chord sweep | —2° |
| Aero. twist root/tip | 5° |
| Taper ratio ($C_t/C_r$) | 0,32 |
| Construction | Single spar wooden cantilever with leading edge torsion box. 60% fabric covered. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted |
| Max. deflection up | 34° |
| Max. deflection down | 17° |
| Mass balance degree | 100% |
| Mass balance method | Distributed weight |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,3 m |

**Horizontal tail**

| | |
|---|---|
| Span | 2,76 m |
| Area of elevator and fixed tail (S′) | 2,58 m² |
| Area of elevator | 1,14 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,18 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,534 |
| Construction | Wood. Ply and fabric covered. Ribs spaced 0,27 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 2,00 m² |
| Area of rudder | 1,23 m² |
| Tail arm | 4,60 m |
| Max. deflection | ± 28° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Nil |
| Construction | Ply covered fin. Fabric covered rudder. Ribs spaced 0,25 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,76 m |
| Max. height (at cockpit) | 1,125 m |
| Overall length | 8,0 m |
| Max. cross section | 0,64 m² |
| Number of seats and arrangement | 2 tandem |
| Undercarriage type | Fixed rubber mounted skid. Fixed unsprung wheel with brake |
| Construction | Ply monocoque. Moulded plexiglass canopy, side and rear opening |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,1 m |
| Area | 2 × 0,33 m² |
| Location, % of chord | 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

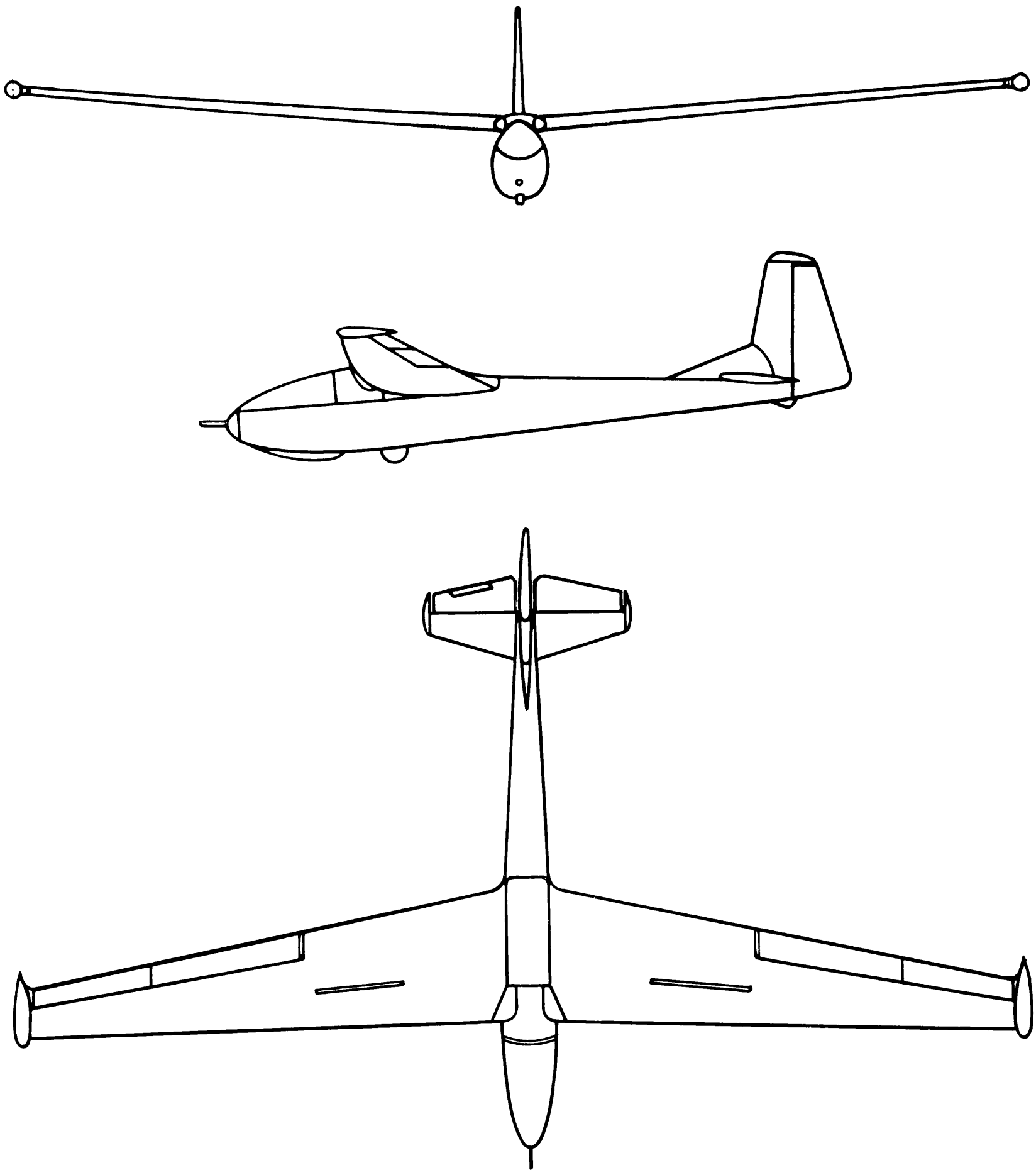
**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 168 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 105 kg |
| Tailplane and elevator | 12 kg |
| Empty weight (including any fixed ballast) | 285 kg |
| Instruments | 10 kg |
| Equipped weight | 295 kg |
| Flying weight | 485 kg |
| Wing loading | 26,8 kg/m² |

**Straight flight performance**

Measured at flying weight of 200 kg

| No flap or brake | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 68 | 0,90 |
| Max. L/D condition | 81 | 0,96 |
| | 102 | 1,45 |
| | 119 | 2,0 |
| | 136 | 2,4 |
| Stalling speed | 58 km/h | |
| Max. L/D | 24 | |



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Rumanian |
| Date of issue of these requirements | 1959 |

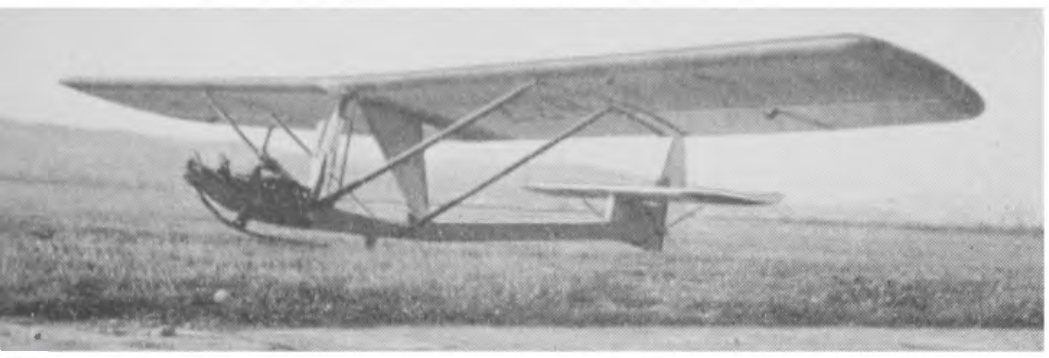
**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 130 | 5 |
| Point B | 265 | 5 |
| Point C | 265 | —3 |
| Point D | 130 | —3 |
| Factor of safety | | 1,8 |

| *Gust loads* | V km/h | Gust velocity v m/s |
|---|---|---|
| Point A | 145 | 15 |
| Point B | 285 | 7,5 |
| Point C | 285 | —7,5 |
| Point D | 145 | —15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 150 km/h |
| Aero-towing speed | 130 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 32,8 to 40,3 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 200 km/h |



# RG-4 PIONIER

These 3 following designs by Reghin, a primary trainer, a near-standard class and a two-seater, although first flown some years ago, are not widely known outside Rumania.

Die drei folgenden Konstruktionen von Reghin, ein Flugzeug für Grundschulung, eines mit nahezu Standardklasse-Bedingungen und ein Doppelsitzer, sind außerhalb Rumäniens fast unbekannt, trotzdem ihre Erstflüge bereits einige Jahre zurückliegen.

Les trois constructions suivantes de Reghin, un planeur d'écolage, un autre s'approchant aux conditions de la classe Standard, et un biplace, sont presque inconnus en dehors de la Roumanie, malgré que leurs premiers vols datent déjà d'il y a quelques années.

| | |
|---|---|
| Type designation | RG-4 Pionier |
| Country of design | Rumania |
| Designer | Vladimir Novitchi |
| Constructor | C.I.L. Reghin |
| Date of first flight of prototype | 1 May, 1954 |
| Number produced | 50 |

**Wings**

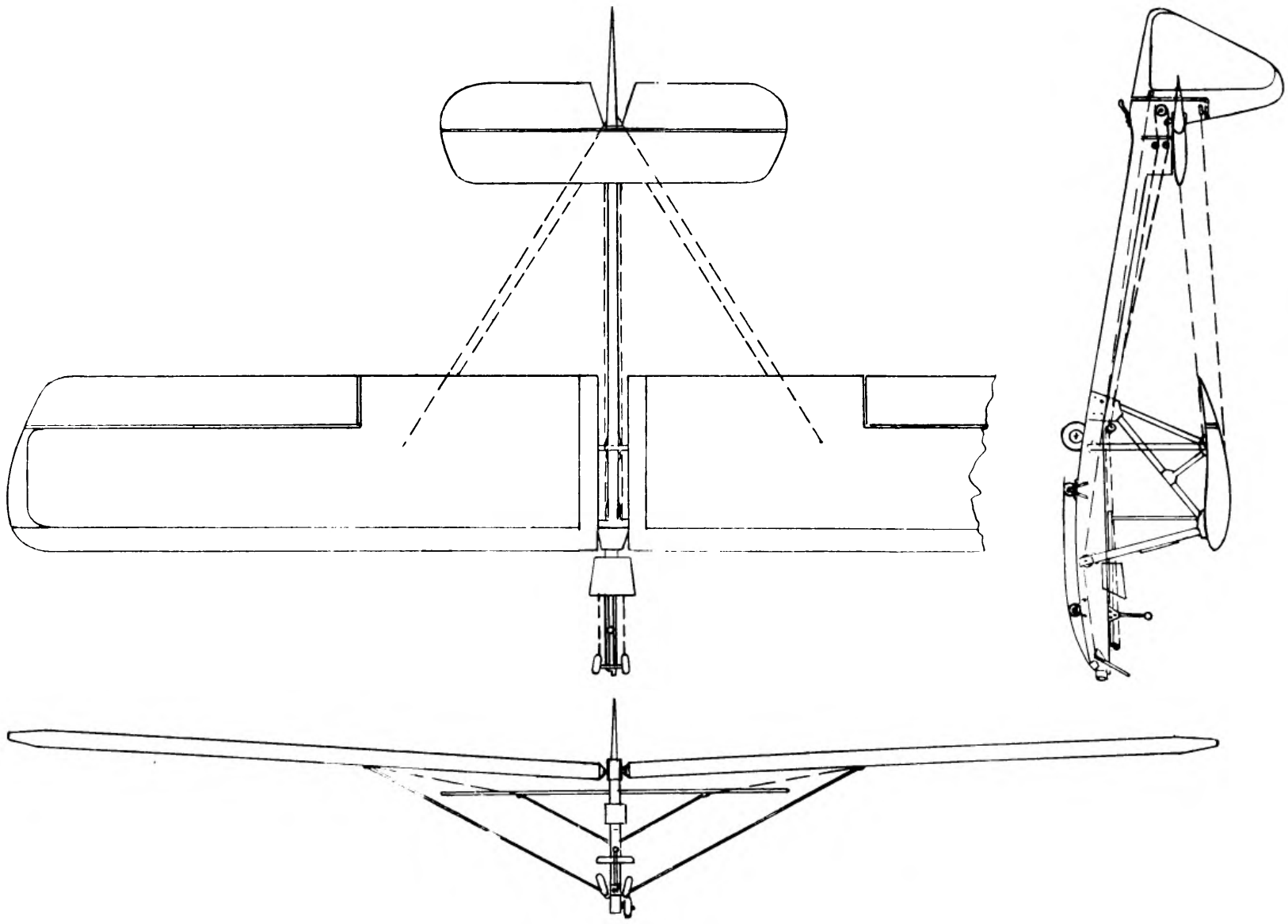
| | |
|---|---|
| Span (b) | 10,450 m |
| Area (s) | 14,80 m² |
| Aspect ratio ($b^2/s$) | 7 |
| Wing root chord ($C_r$) | 1,480 m |
| Wing tip chord ($C_t$) | 1,480 m |
| Mean chord ($C = s/b$) | 1,480 m |
| Wing section, root | NACA 60 modified |
| Dihedral | +2,8° |
| Taper ratio ($C_t/C_r$) | 1,0 |
| Construction | High wing double strut braced, wooden structure |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2,94 m |
| Area (total) | 2,46 m² |
| Mean chord | 0,418 m |
| Max. deflection up | 25° |
| Max. deflection down | 15° |
| Construction | Fabric covered wood frame |

**Horizontal tail**

| | |
|---|---|
| Span | 3,0 m |
| Area of elevator and fixed tail (S′) | 2,260 m² |
| Area of elevator | 1,070 m² |
| Max. deflection up | 25° |
| Max. deflection down | 15° |
| Construction | Wooden structure |



**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,001 m² |
| Area of rudder | 0,300 m² |
| Aspect ratio | 2,2 |
| Max. deflection | ± 30° |
| Construction | Wooden structure |

**Fuselage**

| | |
|---|---|
| Max. height (at cockpit) | 1,200 m |
| Overall length | 5,750 m |
| Number of seats/arrangement | 1 |
| Undercarriage type | Fixed wheel 290/110 and skid |
| Construction | Open, tail boom wooden structure covered with ply |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 36 kg |
| Tailplane and elevator | 8 kg |
| Equipped weight | 100 kg |
| Flying weight | 188 kg |
| Wing loading | 12,7 kg/m² |

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 52 | 0,90 |
| Max. L/D condition | 58 | |
| Stalling speed | 40 km/h | |
| Max. L/D | 14,5 | |

**Limiting flight conditions**

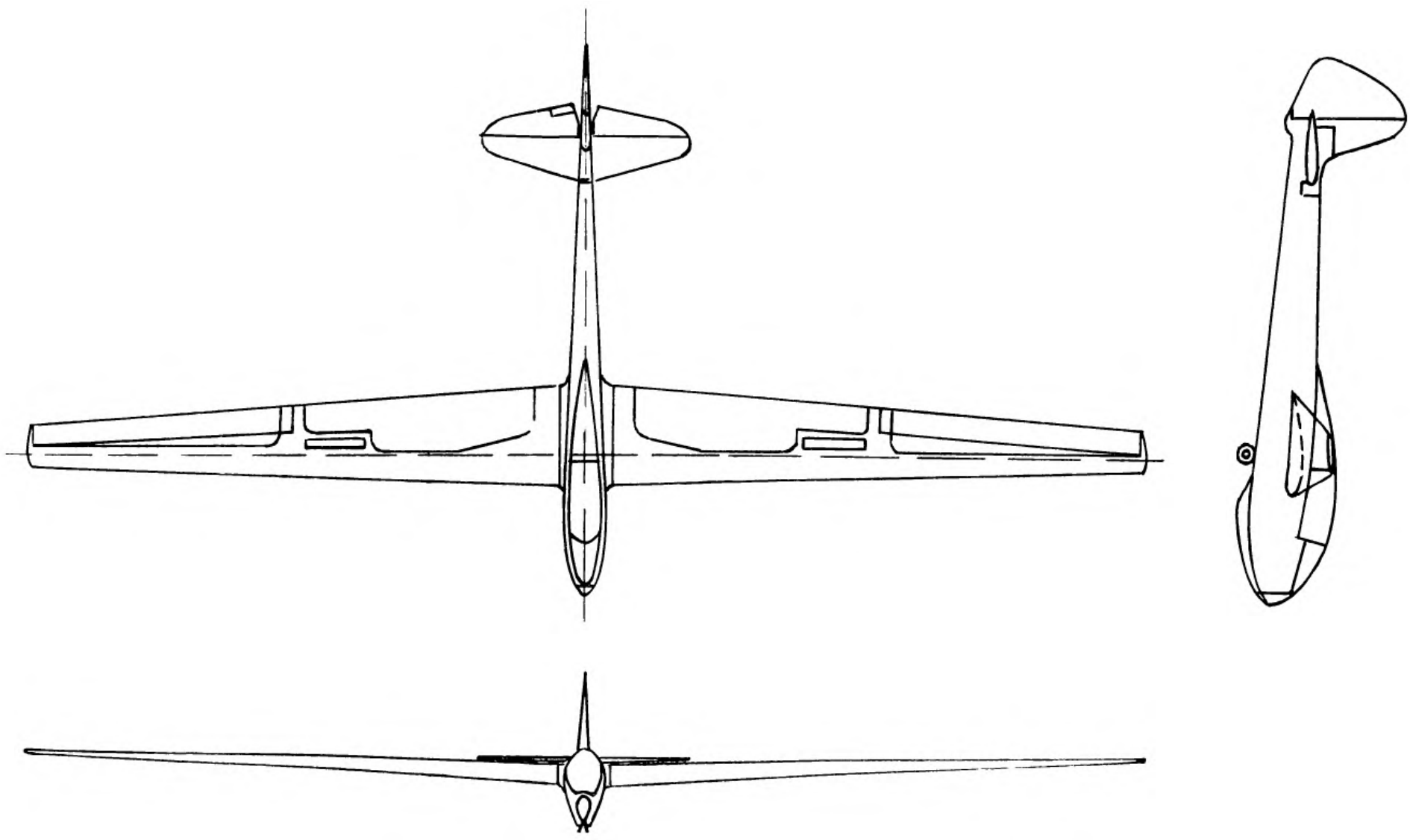
| | |
|---|---|
| Placard airspeed smooth conditions | 165 km/h |
| Placard airspeed gusty conditions | 100 km/h |
| Winch launching speed | 90 km/h |
| Permitted aerobatic manoeuvres | None |

# RG-5 PESCĂRUS

| | |
|---|---|
| Type designation | RG-5 Pescărus |
| Country of design | Rumania |
| Designer | Vladimir Novitchi |
| Constructor | C.I.L. Reghin |
| Date of first flight of prototype | 8 September, 1957 |
| Number produced | 26 |


**Wings**

| | |
|---|---|
| Span (b) | 15,10 m |
| Area (s) | 15,40 m² |
| Aspect ratio ($b^2/s$) | 14,60 |
| Wing root chord ($C_r$) | 1,44 m |
| Wing tip chord ($C_t$) | 0,605 m |
| Mean chord ($C = s/b$) | 1,02 m |



| | |
|---|---|
| Wing section, root | Gö-549, modified |
| Dihedral | + 1,66° |
| Taper ratio ($C_t/C_r$) | 0,42 |
| Construction | Single spar wooden mid wing cantilever structure. Ply leading edge torsion box |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 3,50 m |
| Area (total) | 2,20 m² |
| Mean chord | 0,315 m |
| Max. deflection up | 20° |
| Max. deflection down | 12° |
| Construction | Fabric covered wood frame |

**Horizontal tail**

| | |
|---|---|
| Span | 2,0 m |
| Area of elevator and fixed tail (S') | 1,446 m² |
| Area of elevator | 0,781 m² |
| Max. deflection up | 30° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0006 |
| Construction | Wooden structure |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,100 m² |
| Area of rudder | 0,300 m² |
| Max. deflection | ± 30° |
| Construction | Wooden structure |

**Fuselage**

| | |
|---|---|
| Max. width | 0,600 m |
| Max. height (at cockpit) | 1,000 m |
| Overall length | 7,380 m |
| Max. cross section | 0,500 m² |
| Number of seats/arrangement | 1 |
| Undercarriage type | Fixed wheel 290/110 and front skid |
| Construction | Ply monocoque. Side opening perspex canopy |

**Drag producing devices**

| | |
|---|---|
| Span (total) | 0,900 m |
| Area | 0,432 m² |

**Weights**

| | |
|---|---|
| Tailplane and elevator | 10 kg |
| Instruments | 4 kg |
| Equipped weight | 210 kg |
| Flying weight | 300 kg |
| Wing loading | 19,5 kg/m² |

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 60 | 0,76 |
| Max. L/D condition | 76 | |
| Stalling speed | 50 km/h | |
| Max. L/D | 27 | |

**Limiting flight conditions**

| | |
|---|---|
| Aero-towing speed | 120 km/h |
| Permitted aerobatic manoeuvres | None |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 180 km/h |

# RG-9 ALBATROS

| | |
|---|---|
| Type designation | RG-9 Albatros |
| Country of design | Rumania |
| Designer | Vladimir Novitchi |
| Constructor | C.I.L. Reghin |
| Date of first flight of prototype | 1 June, 1958 |
| Number produced | 25 |

**Wings**

| | |
|---|---|
| Span (b) | 16,450 m |
| Area (s) | 20 m² |
| Aspect ratio ($b^2/s$) | 13,50 |
| Wing root chord ($C_r$) | 1,600 m |
| Wing tip chord ($C_t$) | 0,660 m |
| Mean chord ($C^s/b$) | 1,215 m |
| Wing section, root | Gö-535/539 |
| Dihedral | + 1,5° |
| Taper ratio ($C_t/C_r$) | 0,412 |
| Construction | Mid wing cantilever wooden structure. Ply leading edge torsion box |

**Ailerons**

| | |
|---|---|
| Area (total) | 3,77 m² |
| Max. deflection up | 25° |
| Max. deflection down | 15° |
| Construction | Fabric covered wood frame |

**Horizontal tail**

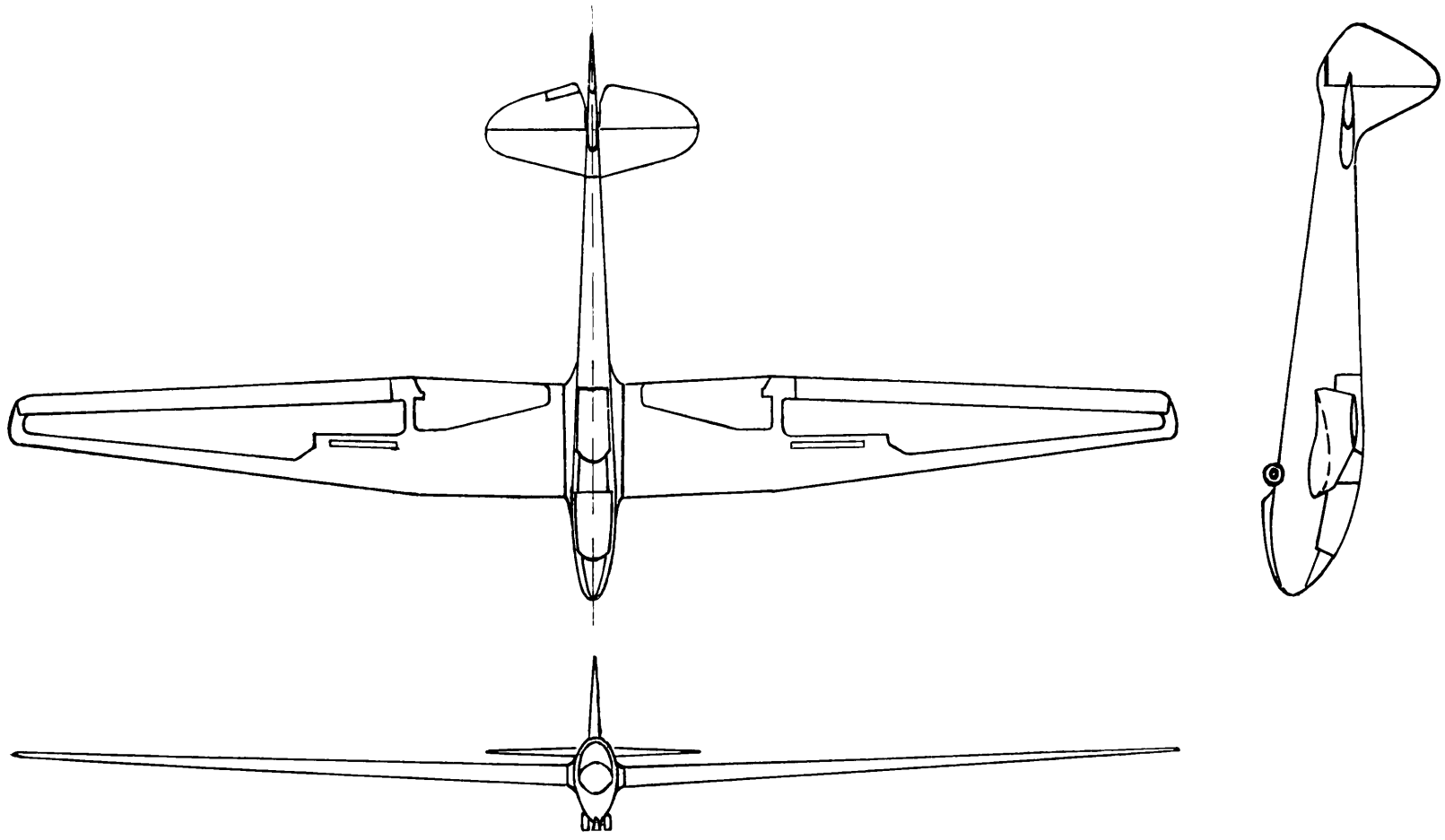
| | |
|---|---|
| Span | 3,0 m |
| Area of elevator and fixed tail (S') | 2,160 m² |
| Area of elevator | 0,981 m² |
| Max. deflection up | 30° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 0006 |
| Construction | Wooden structure |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,360 m² |
| Area of rudder | 0,930 m² |
| Max. deflection | ± 35° |
| Construction | Wooden structure |

**Fuselage**

| | |
|---|---|
| Max. width | 0,600 m |
| Max. height (at cockpit) | 1,290 m |



| | |
|---|---|
| Overall length | 7,975 m |
| Max. cross section | 0,60 m² |
| Number of seats/arrangement | 2 (tandem) |
| Undercarriage type | Two wheels 420/150 and front skid |
| Construction | Ply monocoque. Two side opening perspex canopies |

**Drag producing devices**

| | |
|---|---|
| Span (total) | 1,200 m |
| Area | 0,720 m² |

**Weights**

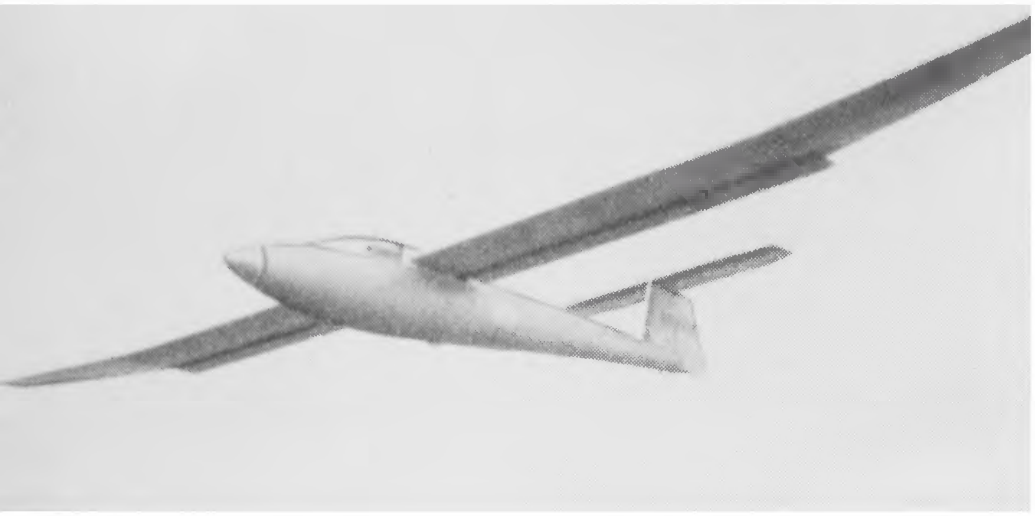
| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 170 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 100 kg |
| Tailplane and elevator | 12 kg |
| Instruments | 8 kg |
| Equipped weight | 290 kg |
| Flying weight | 470 kg |
| Wing loading | 23,5 kg/m² |

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 62 | 0,85 |
| Max. L/D condition | 79 | |
| Stalling speed | 55 km/h | |
| Max. L/D | 25 | |

**Limiting flight conditions**

| | |
|---|---|
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 180 km/h |

# South Africa



# BJ2 ASSEGAI

The BJ2 was designed to take advantage of the performance potentialities of an area increasing camber changing flap on a sailplane having comparitively high wing loading.

The Fowler type flap is built in two sections per half span and is supported at 1,1 meter intervals by two streamlined arms, one of which controls movement of the flap leading edge, while the other controls the movement of the flap 25% chord point. Arms operate chordwise in rails which transmit the loads to the main spar and leading edge torsion box. Operation is by spanwise torque tube and rack and pinion at each operating point. The flap movement is so arranged that the first 80% of travel gives only an increase in area and the last 20% changes the flap angle to a maximum of 30°. By means of a special fairing flap the recess in the underside of the wing is smoothly faired to form a basic aerofoil section which is highly undercambered when the flap is out.

The machine is of all wood construction, and good wing profile accuracy has been achieved by the use of thick (4.5 millimeter) premoulded spruce multiply over fully machined ribs spaced at 7.6 centimeters. Flaps, ailerons, and elevators are covered with diagonal 1.5 millimeter spruce ply on closely spaced ribs (3.8 centimeters on flap leading edge).

The undercarriage consists of a sprung retractable wheel and skid unit combined, the wheel being positioned well aft of the CG.

The petal type fuselage glide control brakes have proved inadequate for this purpose, even with 30° flap deflection and the machine is being modified to incorporate two tail parachutes. It will be possible to deploy and jettison each parachute individually.

Der BJ2 wurde konstruiert zur Ausnutzung der Leistungssteigerung durch eine flächenvergrößernde, die Wölbung verändernde Klappe an einem Segelflugzeug mit relativ hoher Flächenbelastung.

Die Klappe vom Fowler-Typ ist in zwei Teilen für jede Hälfte der Spannweite gebaut und wird in Abständen von 1,1 m durch zwei stromlinienförmige Arme gestützt, von denen einer die Bewegung der Vorderkante der Klappe kontrolliert, der zweite die Bewegung des Punktes von 25% Tiefe der Klappe. Die Arme arbeiten in Richtung der Tiefe auf Schienen, welche die Belastung auf den Hauptholm und den Torsionskasten an der Vorderkante übertragen. Die Betätigung erfolgt über die ganze Spannweite durch ein Rohr mit Drehmoment sowie Zahnstange und Zahnrad an jedem betätigten Punkt. Die Bewegung der Klappe ist so gestaltet, daß die ersten 80% des Weges nur eine Flächenvergrößerung ergeben; die letzten 20% ändern den Winkel der Klappe bis zu einem Maximum von 30°. Durch eine besondere Verkleidungsklappe wird die Aussparung auf der Flügelunterseite langsam zugedeckt und bildet einen Tragflügel-Querschnitt, der bei ausgefahrener Klappe stark unterwölbt ist.

Das Flugzeug ist vollständig in Holz gebaut; gute Genauigkeit des Flügelprofils wurde erzielt durch die Verwendung von 4,5 mm dickem, vorgeformtem Rottannen-Sperrholz über voll bearbeiteten Rippen, die im Abstand von 7,6 cm angeordnet sind. Klappen, Querruder und Höhenruder sind mit diagonalem Rottannen-Sperrholz von 1,5 mm bedeckt; die Rippen folgen sich in kleinen Abständen (3,8 cm an der Vorderkante der Klappe).

Das Fahrgestell besteht aus einem gefederten, einziehbaren Rad und Kufe kombiniert, wobei sich das Rad deutlich hinter dem Schwerpunkt befindet.

Die blütenblattförmigen, am Rumpf befindlichen Luftbremsen haben sich in dieser Form als unzweckmäßig erwiesen, sogar mit 30° Klappenausschlag; das Flugzeug wird nun abgeändert und erhält zwei Heckfallschirme. Jeder Fallschirm soll gesondert entfaltet und abgeworfen werden können.

Le BJ2 a été construit pour exploiter les possibilités d'un volet agrandissant la superficie et changeant la courbure, le planeur ayant une charge alaire relativement élevée.

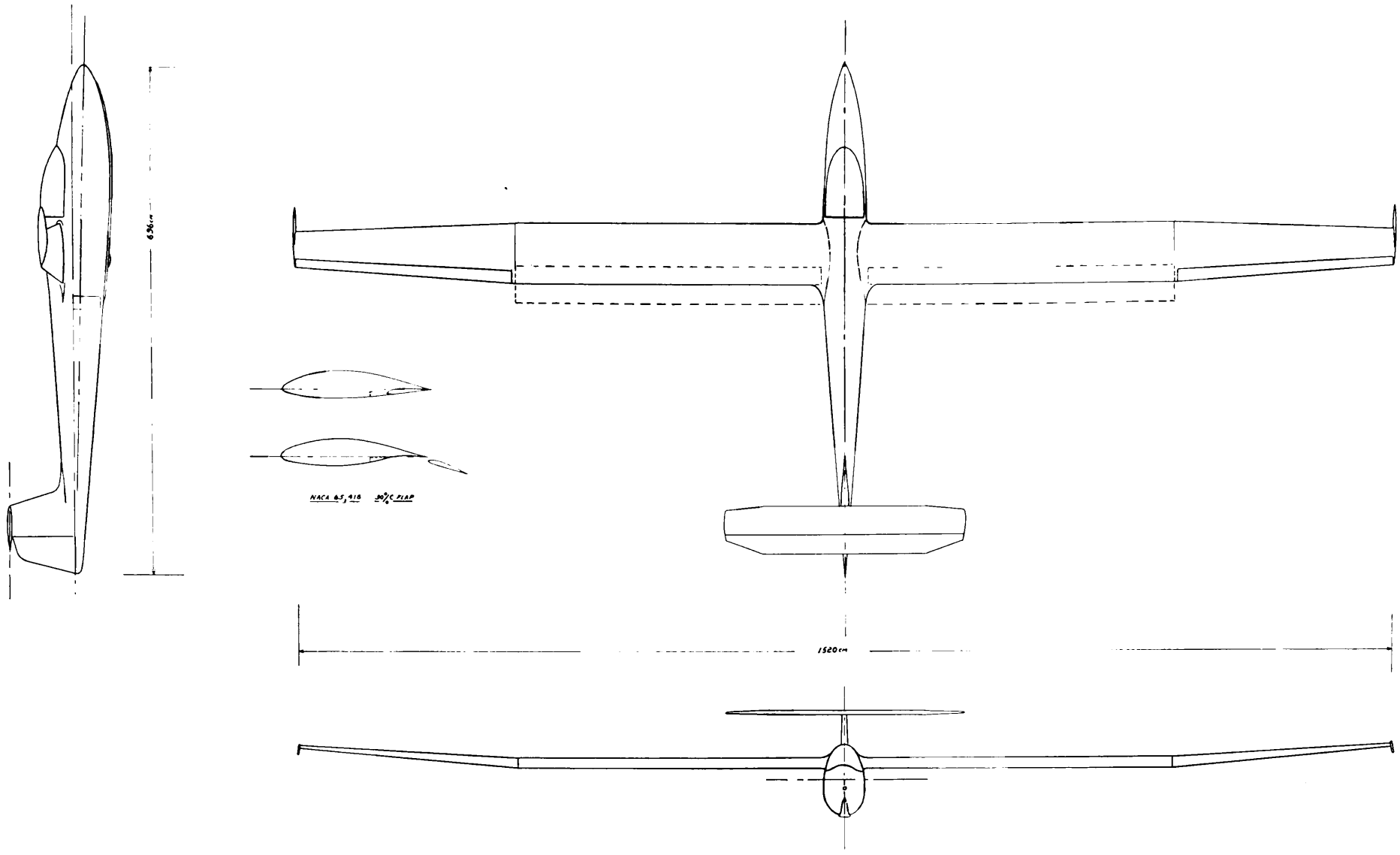
Le volet du type Fowler est construit en deux sections par moitié de l'envergure; il est supporté, à des distances de 1,1 m, par deux bras en forme aérodynamique, dont le premier contrôle le mouvement du bord d'attaque du volet, le second le mouvement du point 25% en profondeur du volet. Les bras travaillent en profondeur sur des rails qui transmettent les charges au longeron principal et au caisson de torsion, au bord d'attaque. Ils sont actionnés en direction de l'envergure par un tube de torsion, ainsi qu'un système de crémaillère à chaque point actionné. Le mouvement du volet est arrangé de sorte que les premiers 80% du chemin fournissent seulement un changement de la superficie; les derniers 20% changent l'angle du volet jusqu'à 30° au maximum. Un volet spécial revêtit un creux dans la superficie inférieure de l'aile et forme un profil considérablement courbé quand le volet est sorti.

Le planeur est entièrement construit en bois; l'exactitude du profil de l'aile a été obtenue par l'emploi de contreplaqué épais (4,5 mm) préformé de sapin, sur des nervures arêtières distantes de 7,6 cm. Les volets, les ailerons et les gouvernails de profondeur sont couverts de contreplaqué de sapin de 1,5 mm; les nervures arêtières se suivent en petites distances (3,8 cm au bord d'attaque du volet).

Le train d'atterrissage consiste en une roue éclipsable et un patin combinés, la roue se trouvant derrière le centre de gravité.

Les freins d'atterrissage au fuselage, en forme de pétales, se sont avérés inefficaces à cet effet, même avec un braquage de 30°, et le planeur sera modifié dans le sens qu'il sera équipé de deux parachutes d'atterrissage dont on pourra déployer et larguer chacun séparément.

| | |
|---|---|
| Type designation | BJ2 Assegai |
| Country of design | South Africa |




| | |
|---|---|
| Designers | P.J.Beatty, W.A.T.Johl |
| Date of first flight of prototype | 31 December, 1960 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 15,24 m |
| Area (s) | 11,75 m² |
| Aspect ratio ($b^2/s$) | 19,7 |
| Wing root chord ($C_r$) | 0,838 m |
| Wing tip chord ($C_t$) | 0,506 m |
| Mean chord ($C = s/b$) | 0,645 m |
| Wing section, root | NACA 65.3418 a = 0,5 |
| Wing section, mid | NACA 65.3418 a = 0,5 |
| Wing section, tip | NACA 2412 |
| Dihedral | 0° centre section<br>5° tip |
| ¼ chord sweep | Nil |
| Aero. twist root/tip | —1° |
| Taper ratio ($C_t/C_r$) | Nil centre section<br>0,606 tip |
| Construction | Single spar cantilever wood. Leading edge ply torsion box. 4,5 mm moulded spruce ply covering. Ribs at 7,6 cm spacing |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 2 × 2,95 m |
| Area (total) | 2 × 0,486 m² |
| Mean chord | 0,165 m |
| Max. deflection up | 25° |
| Max. deflection down | 17,5° |
| Mass balance degree | Nil |
| Construction | Wood. Covered with 1,5 mm spruce ply. Ribs spaced 15,2 cm |

**Horizontal tail**

| | |
|---|---|
| Span | 3,29 m |
| Area of elevator and fixed tail (S′) | 2,06 m² |
| Area of elevator | 0,753 m² |
| Max. deflection up | 30° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 64.012 |
| Mass balance degree | 50% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,86 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′1′/SC) | 1,05 |
| Construction | T-configuration. Wood structure, ply covered. Ribs spaced 12,7 cm |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,87 m² |
| Area of rudder | 0,40 m² |
| Aspect ratio | 0,96 |
| Tail arm | 3,86 m |
| Max. deflection | 30° |
| Aerofoil section | NACA 65.012 |
| Aerodynamic balance | Nil |
| Construction | Wood. Ply covered fin, fabric covered rudder. Ribs spaced 15,2 cm |

**Fuselage**

| | |
|---|---|
| Max. width | 0,605 m |
| Max. height (at cockpit) | 0,96 m |
| Overall length | 7,03 m |
| Max. cross section | 0,452 m² |
| Wetted surface area | 10 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Retractable, rubber. Sprung wheel and skid. Wheel brake |

| | |
|---|---|
| Construction | Ply monocoque. Fibre glass nose cap. Blown plexiglass side opening canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Fowler flaps |
| Span (total) | 9,1 m |
| Area (total) | 2,32 m² |
| Max. deflection up | Nil |
| Max. deflection down | 30° |

**Drag producing devices**

| | |
|---|---|
| Type | Fuselage petal brakes and 2 cruciform parachutes (tail) |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 187,5 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 90,8 kg |
| Tailplane and elevator | 13,6 kg |
| Empty weight (including any fixed ballast) | 292 kg |
| Instruments | 4 kg |
| Other equipment (e.g. oxygen, radio) | 4 kg |
| Equipped weight | 300 kg |
| Flying weight | 400 kg |
| Wing loading | 34 kg/m² |

**Straight flight performance**

Calculated (with optimum flap) at flying weight of . . . . . 380 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 82 | 0,7 |
| Max. L/D condition | 110 | 0,85 |
| | 122 | 0,97 |
| | 144 | 1,34 |
| | 164 | 1,86 |

| | | |
|---|---|---|
| Stalling speed | 66 61 | 57 53 |
| Flap deflection | 0° 10° | 20° 30° |
| Max. L/D | 36 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BCAR 1948 |
| Date of issue of these requirements | March 1948 |
| Certificate of airworthiness | No |

**Design flight envelope**

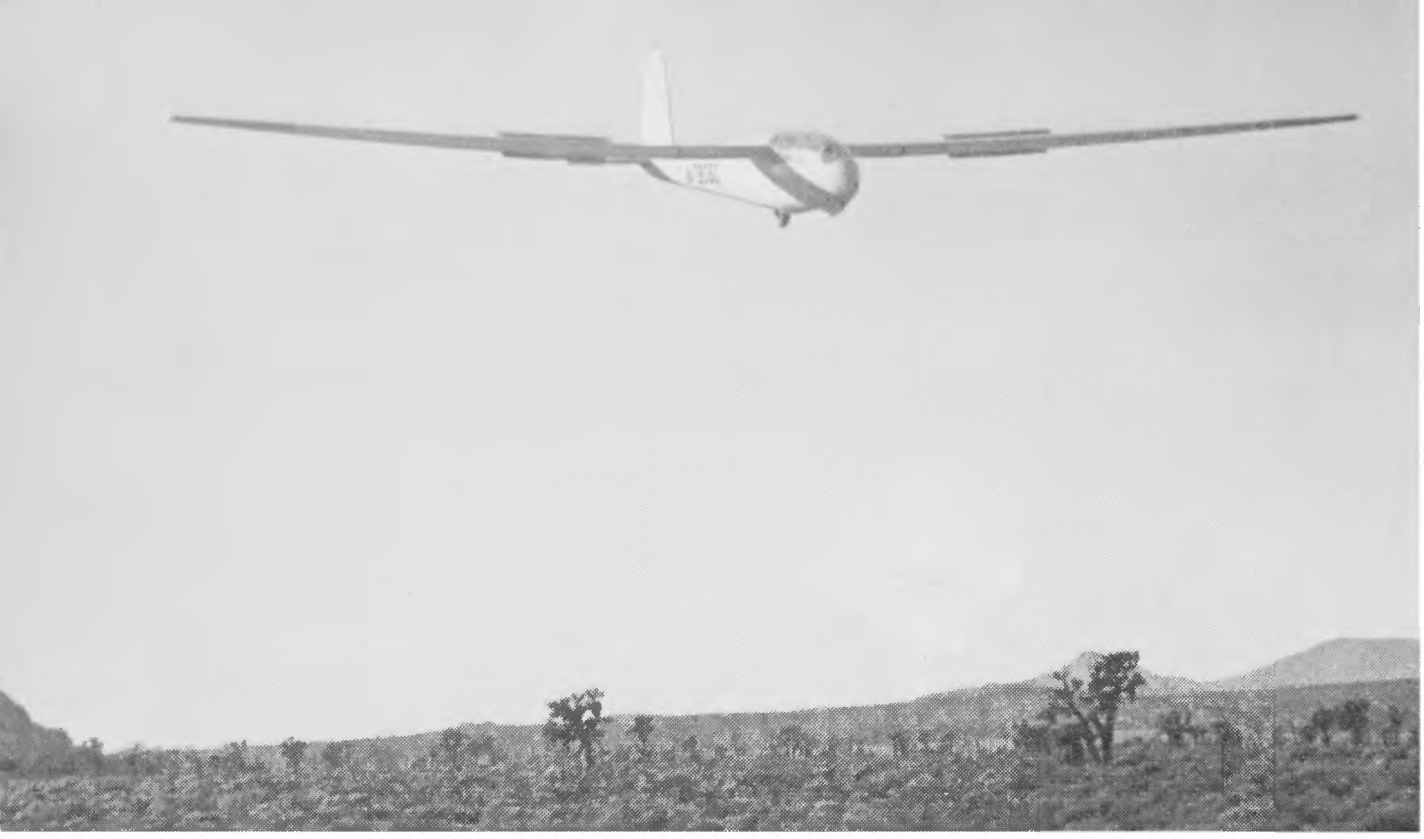
| | V km/h Flap 0° | Flap 30° | Proof load factor |
|---|---|---|---|
| *Manoeuvre loads* | | | |
| Point A | 158 | 106 | 4 |
| Point B | 236 | 161 | 3 |
| Point C | 236 | 161 | 0 |
| Point D | 114 | 128 | —2 |
| Factor of safety | | | 1,5 |

| | V km/h Flap 0° | Flap ( 30°) | Gust vel. m/s | |
|---|---|---|---|---|
| *Gust loads* | | | | |
| Point A | 158 | (106) | 20 | (18,6) |
| Point B | 236 | (161) | 6 | ( 7,7) |

**Limiting flight conditions**

| | | |
|---|---|---|
| Placard airspeed smooth conditions | Flap 30° | 158 km/h |
| | 0° | 236 km/h |
| Placard airspeed gusty conditions | Flap 30° | 107 km/h |
| | 0° | 158 km/h |
| Aero-towing speed | Flap 5° | 100 km/h |
| Cloud flying permitted? | Yes | |
| Permitted aerobatic manoeuvres | Nil | |
| Spinning permitted? | No | |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | | 30–40 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | | Not known |

U.S.A.



# PRUE TWO

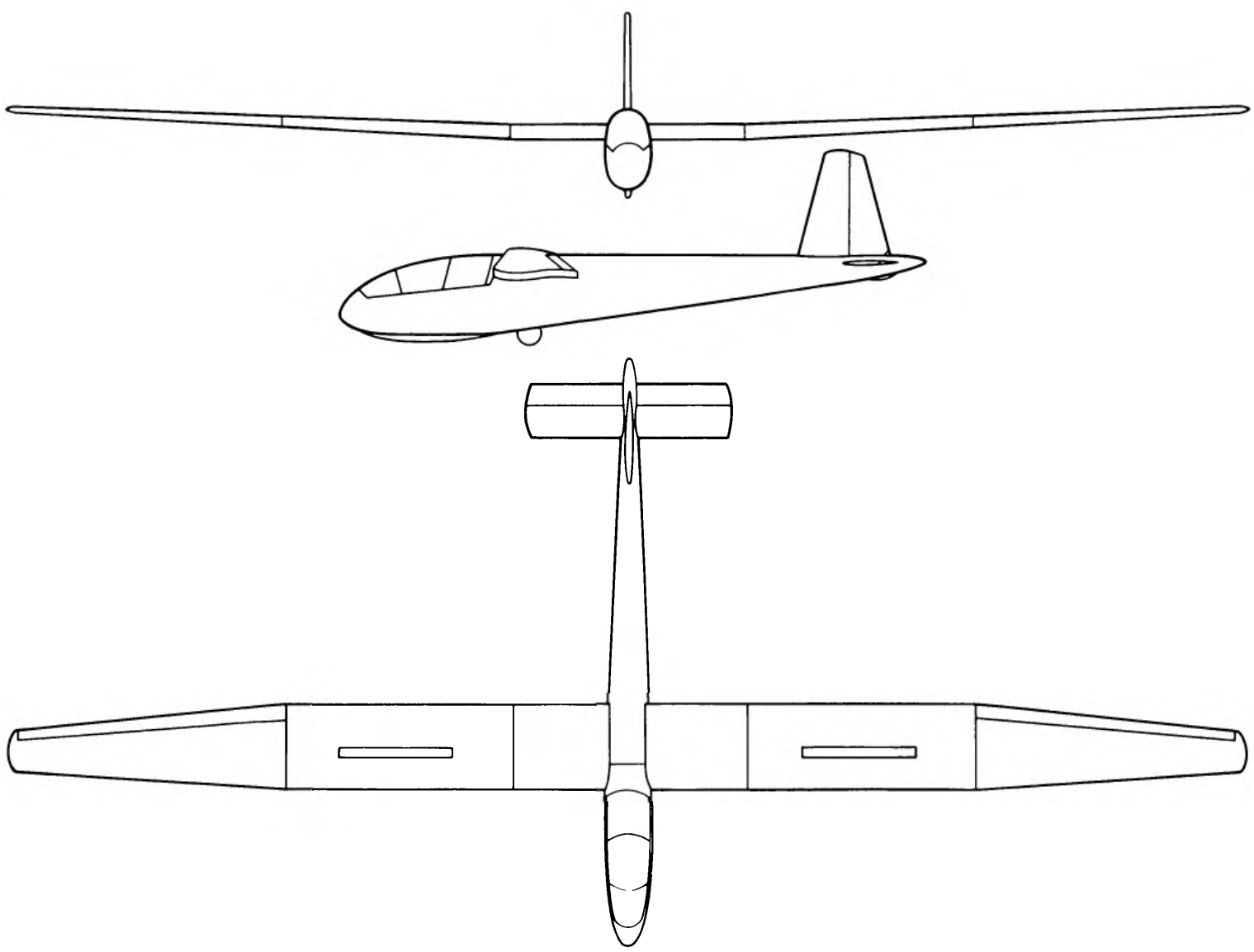
The Prue Two was built of sheet aluminium and fibre glass to give maintenance free operation and resistance to minor damage so that it could be kept out of doors on the flight line ready to fly during competitions.

Provision for fluid ballast is made in two integral tanks in the tip of each wing. These are intended for use in wave conditions for long distance high speed flight, using non freezing liquids. Ballast capacity is 182 kg.

Aus Aluminiumblech und Fiberglas gebaut, um die Wartung zu erleichtern und kleinere Beschädigungen zu verhindern, somit geeignet, um im Freien für Wettkämpfe bereitgehalten zu werden. Die Mitführung von flüssigem Ballast in zwei eingebauten Tanks in den Flügelenden ist vorgesehen. Damit werden Geschwindigkeitsflüge auf großen Strecken in Wellenlagen bei Benutzung nicht gefrierender Flüssigkeiten ermöglicht. Es können 182 kg Ballast mitgeführt werden.

Construit en tôle d'aluminium et en fibre de verre afin de faciliter l'entretien et d'éviter des endommagements mineurs; capable d'être stationné en plein air, prêt pour les compétitions.

Dans chaque extrémité de l'aile on a prévu un réservoir pour lest liquide. Ceux-ci permettent des vols d'onde de grandes distances à vitesse maximum en utilisant des liquides insensibles au gel. La capacité de lest s'élève à 182 kg.



| | |
|---|---|
| Type designation | Prue Two |
| Country of design | U.S.A. |
| Designer | Irving O. Prue |
| Date of first flight of prototype | March 1959 |
| Number produced | 1 prototype<br>2 under construction |

**Wings**

| | |
|---|---|
| Span (b) | 19,65 m |
| Area (s) | 21,30 $m^2$ |
| Aspect ratio ($b^2/s$) | 18,25 |
| Wing root chord ($C_r$) | 1,46 m |
| Wing tip chord ($C_t$) | 0,73 m |

| | |
|---|---|
| Mean chord ($C = {}^{s}/_{b}$) | 1,07 m |
| Wing section, root | NACA $63_3$618 a = 1 |
| Wing section, mid | NACA $63_3$618 a = 1 |
| Wing section, tip | NACA $63_3$618 a = 1 |
| Dihedral | 2° outer 8 m |
| ¼ chord sweep | + 1,47° outer 4 m |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,5 |
| Construction | Two span stressed skin, all metal (aluminium alloy) construction. Ribs 36 cm spacing. |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 8,54 m |
| Area (total) | 3,13 m² |
| Mean chord | 0,183 m |
| Max. deflection up | 25° |
| Max. deflection down | 10° |
| Mass balance degree | Nil |
| Construction | Aluminium alloy skin on ribs (36 cm spacing) |

**Horizontal tail**

| | |
|---|---|
| Span | 3,54 m |
| Area of elevator and fixed tail (S′) | 2,49 m² |
| Area of elevator | 1,00 m² |
| Max. deflection up | 25° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 5,9 m |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′1′/SC) | 0,64 |
| Construction | Aluminium alloy skin and ribs (36 cm spacing) |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,68 m² |
| Area of rudder | 0,84 m² |
| Aspect ratio | 1,39 |
| Tail arm | 4,90 m |
| Max. deflection | 25° |
| Aerofoil section | NACA 0009 to 0006 |
| Aerodynamic balance | Nil |
| Structure | Aluminium alloy skin and ribs (36 cm spacing) |

**Fuselage**

| | |
|---|---|
| Max. width | 0,71 m |
| Max. height (at cockpit) | 1,22 m |
| Overall length | 9,3 m |
| Max. cross section | 0,75 m² |
| Wetted surface area | 15,5 m² |
| Number seats and arrangement | Tandem 2 |
| Undercarriage type | Retractable wheel with brakes. Fixed skid, rubber mounted. |
| Structure | Metal monocoque with fibre glass nose cap. Bent perspex sheet canopy, side opening. |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Forward opening upper. Backward opening lower. Spoilers without gap. |
| Span (total) | 3,66 m |
| Area | 1,31 m² |
| Location, % of chord | 40 to 54 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings[1] | 314 kg |
| Fuselage[2] | 160 kg |
| Tailplane and elevator | 14 kg |
| Empty weight[3] | 488 kg |
| Instruments | 3 kg |
| Other equipment (e.g. oxygen, radio) | 6 kg |
| Equipped weight | 497 kg |
| Flying weight | 728 kg |
| Wing loading | 34,2 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR 05 and 03, normal category, appendix A |
| Date of issue of these requirements | March 1959 |
| Certificate of airworthiness | Experimental, amateur built |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 140 | 3,8 |
| Point B | 231 | 3,8 |
| Point C | 231 | 1,9 |
| Point D | 100 | 1,9 |
| Factor of safety | | 1,55 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point A | 140 | 9,14 |
| Point B | 165 | 4,57 |
| Point C | 165 | 4,57 |
| Point D | 140 | 9,14 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 231 km/h |
| Placard airspeed gusty conditions | 165 km/h |
| Aero-towing speed | 165 km/h |
| Winch launching speed | 140 km/h |
| Cloud flying permitted | No |
| Permitted aerobatic manoeuvres | None |
| Spinning permitted | No |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 25 to 38 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 192 km/h |

**Straight flight performance**

Calculated at flying weight of 728 kg

| **No flap or brake** | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 81,4 | 0,67 |
| Max. L/D condition | 100 | 0,69 |
| | 122,1 | 1,10 |
| | 142,4 | 1,55 |
| | 173,0 | 2,19 |
| Stalling speed | 72 km/h | |
| Flap deflection | Nil | |
| Max. L/D | 37,2 | |

[1] With struts, controls, flaps and brakes

[2] Complete with rudder and fin, less instruments and equipment

[3] To include any fixed ballast

# HP-8


This is an all-metal high performance sailplane with a laminar wing.

Hochleistungssegelflugzeug in Ganzmetallausführung mit Laminarflügel.

Planeur de performance entièrement en métal, avec aile laminaire.

| | |
|---|---|
| Type designation | HP-8 |
| Country of design | USA |
| Designer | R.E.Schreder |
| Date of first flight of prototype | July 24, 1958 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 15,65 m |
| Area (s) | 10,25 $m^2$ |
| Aspect ratio ($b^2/s$) | 23,8 |
| Wing root chord ($C_r$) | 0,76 m |
| Wing tip chord ($C_t$) | 0,38 m |
| Mean chord ($C = s/b$) | 0,655 m |
| Wing section, root | NACA $65_3$ 618 |
| Wing section, mid | NACA $65_3$ 618 |
| Wing section, tip | NACA $65_3$ 618 |
| Dihedral | 0° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | (taper 0,5 on outer panels only) |
| Construction | Single spar metal cantilever construction, metal covered |

**Ailerons**

| | |
|---|---|
| Type | Plain. Upper surface hinge |
| Span (total) | 4,92 m |
| Area (total) | 0,565 $m^2$ |
| Mean chord | 0,114 m |
| Max. deflection up | 36° |
| Max. deflection down | 12° |
| Mass balance degree | Nil |
| Construction | Metal structure |

**Horizontal tail**

| | |
|---|---|
| Span | (Vee tail, 40 °) 2,42 m (projected) |
| Area of elevator and fixed tail (S′) | 1,24 $m^2$ (projected) |
| Area of elevator | 0,472 $m^2$ |
| Max. deflection up | 20° |
| Max. deflection down | 15° |
| Aerofoil section | NACA 65 009 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,61 m |
| Elevator trimming method | None |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,665 |
| Construction | Metal structure and covering |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,04 $m^2$ (projected) |
| Area of rudder | 0,396 $m^2$ (projected) |
| Tail arm | 3,61 m |
| Max. deflection | 15° |
| Structure | (See horizontal tail) |

**Fuselage**

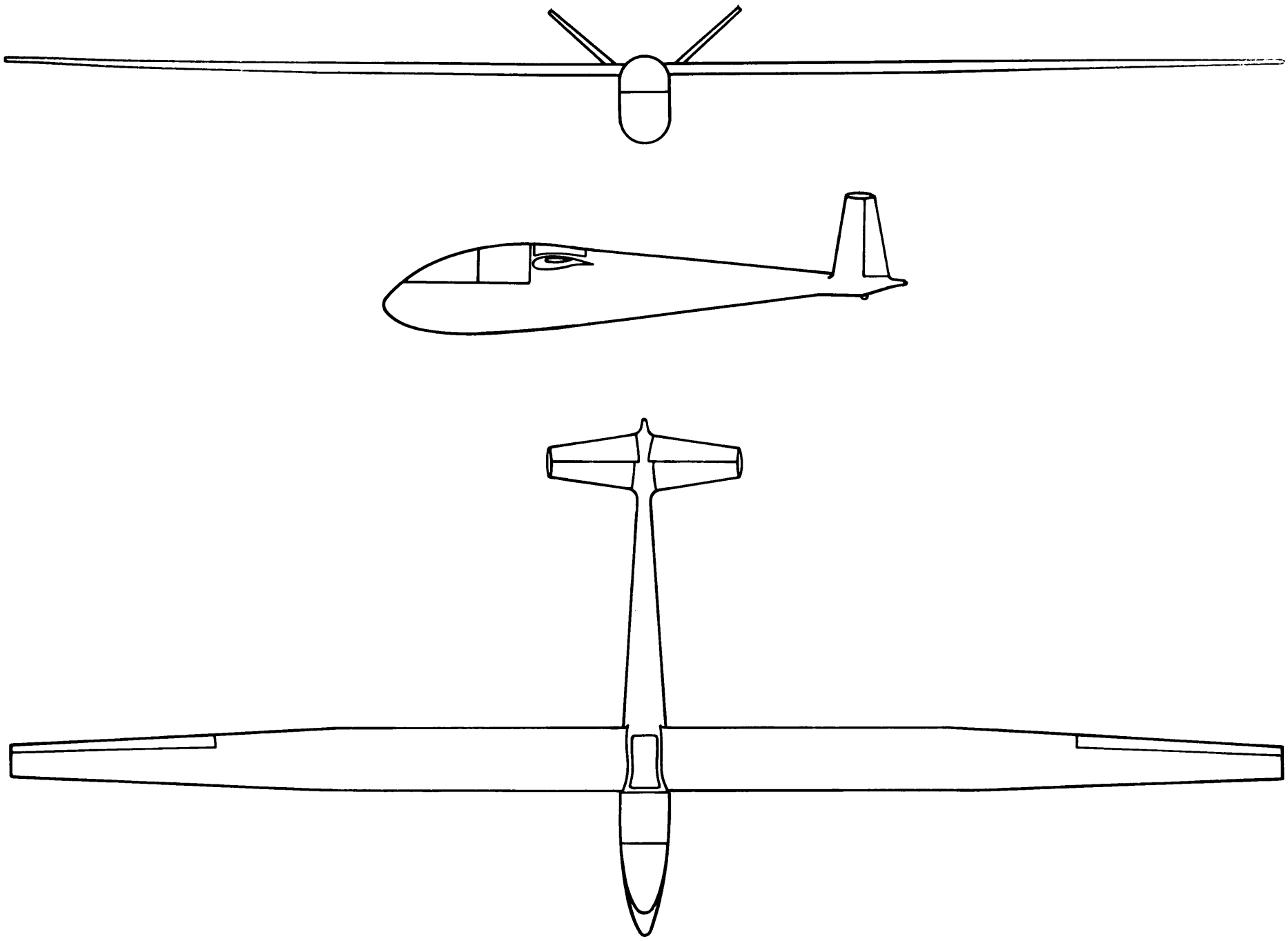
| | |
|---|---|
| Max. width | 0,596 m |
| Max. height (at cockpit) | 1,07 m |
| Overall length | 6,36 m |
| Max. cross section | 0,55 $m^2$ |
| Wetted surface area | 8,65 $m^2$ |
| Number seats and arrangement | 1 |
| Undercarriage type | Sprung retractable wheel with hydraulic shock strut and brake |
| Structure | Metal monocoque with side opening blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Plain trailing edge flaps |
| Span (total) | 10,4 m |
| Area (total) | 1,56 $m^2$ |
| Max. deflection up | 10° |
| Max. deflection down | 45° |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers without gap |
| Span (total) | 2,04 m |
| Area | 0,515 $m^2$ |
| Location, % of chord | 40 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.? | Yes |



**Weights**

| | |
|---|---|
| Wings [1] | 159 kg |
| Fuselage [2] + Tailplane and elevator | 100 kg |
| Empty weight [3] | 259 kg |
| Instruments | 4,5 kg |
| Other equipment (e.g. oxygen, radio) | 27,2 kg |
| Equipped weight | 290,7 kg |
| Flying weight | 386 kg |
| Wing loading | 37,6 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR 05 |
| Date of issue of these requirements | 1942 |
| Certificate of airworthiness | Experimental |

**Design flight envelope**

*Manoeuvre loads*

| | |
|---|---|
| Point A | Ultimate load factor 12 |
| Point B | Ultimate load factor 12 |
| Point C | Ultimate load factor 12 |
| Point D | Ultimate load factor 12 |
| Factor of safety | 1,5 |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 218 km/h |
| Placard airspeed gusty conditions | 194 km/h |
| Aero-towing speed | 194 km/h |
| Winch launching speed | 121 km/h |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 25 to 40 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 202 km/h |

**Straight flight performance**

Calculated at flying weight of 368 kg

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 80,5 | 0,64 |
| Max. L/D condition | 88,6 | 0,68 |
| | 121 | 0,99 |
| | 142 | 1,31 |
| | 161 | 1,79 |

| | |
|---|---|
| Stalling speed | 64,5 km/h |
| Flap deflection | 45° |
| Max. L/D | 36 |

# SISU 1

This is a prototype for testing the structural and aerodynamic ideas which are to be further developed in Sisu 1 A. Camber changing flaps will be replaced by slotted flaps, and ailerons drooped 10° in combination on the prospected 1 A. A plate/stringer wing structure will be used to save weight compared with the monocoque wing on the Sisu 1, but the smooth non-buckling surface will be retained. The cockpit will be enlarged. Larger spoilers, capable of acting as dive brakes, will be fitted, and elevator area enlarged to handle the more powerful flaps. It is also proposed to increase dihedral 1° and to increase the positive and negative load factors to 6,15 and −4,8 respectively.

Prototyp zur Prüfung der strukturellen und aerodynamischen Eigenschaften, welche beim Sisu 1 A weiterentwickelt werden sollen. Die wölbungsverändernden Klappen sollen durch Spaltklappen ersetzt und gleichzeitig die Querruder um 10° gesenkt werden. Zur Gewichtsverminderung soll beim 1 A die Beplankung des Flügels tragend gestaltet werden, während beim Sisu 1 die Schalenbauweise in Anwendung kam; die glatte, sich nicht verwerfende Oberfläche soll jedoch beibehalten werden. Der Pilotenraum wird erweitert. Es sollen breitere Störklappen angebracht werden, die als Sturzflugbremsen dienen können, und die vergrößerte Höhenruderfläche soll die Bedienung der stärkeren Landeklappen erleichtern. Es ist ferner vorgesehen, die V-Stellung der Flügel um 1° zu vergrößern und das positive und negative Lastvielfache auf 6,15 bzw. −4,8 zu erhöhen.

Prototype pour l'étude des qualités structurelles et aérodynamiques à développer dans le Sisu 1 A. Les volets changeant la courbure de l'aile seront remplacés par des volets à fente, et les ailerons seront écartés de 10°. Pour réduire le poids, le revêtement de l'aile du 1 A sera portant, pendant que l'aile du Sisu 1 avait une construction monocoque; la superficie lisse évitant des ondulations sera cependant maintenue. Le cockpit sera élargi. Des volets de freinage élargis pourront servir de freins de piqué, et le gouvernail de profondeur agrandi facilitera l'emploi des volets plus forts. Il est en outre prévu d'agrandir le dièdre de 1° et de porter les facteurs de charge positif et négatif à 6,15 et −4,8 respectivement.

| | |
|---|---|
| Type designation | Sisu 1 |
| Country of design | USA |
| Designer | Leonard A. Niemi |
| Date of first flight of prototype | December 20, 1958 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 15,25 m |
| Area (s) | 10,08 m² |
| Aspect ratio ($b^2/s$) | 23,1 |
| Wing root chord ($C_r$) | 1,017 m |
| Wing tip chord ($C_t$) | 0,305 m |
| Mean chord ($C = s/b$) | 0,661 m |
| Wing section, root | NACA $65_3$-418, a = 0,5 |
| Wing section, mid | NACA $65_3$-418, a = 0,5 |
| Wing section, tip | NACA $65_3$-418, a = 0,5 |
| Dihedral | 1,0° |
| ¼ chord sweep | −2,80° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,30 |
| Construction | Two spar metal cantilever structure |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 4,268 m |
| Area (total) | 0,462 m² |
| Mean chord | 0,1082 m |
| Max. deflection up | 27° |
| Max. deflection down | 20° |
| Mass balance degree | Nil |
| Aerodynamic balance method | Nil |
| Construction | Metal structure and covering |

**Horizontal tail**

| | |
|---|---|
| Span | (45° Vee tail) 1,81 m (projected) |
| Area of elevator and fixed tail (S′) | 0,997 m² (projected) |
| Area of elevator | 0,432 m² (projected) |
| Max. deflection up | 20° |
| Max. deflection down | 15° |
| Aerofoil section | NACA 0009 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,93 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,587 |
| Construction | Metal structure and covering |

**Vertical tail**

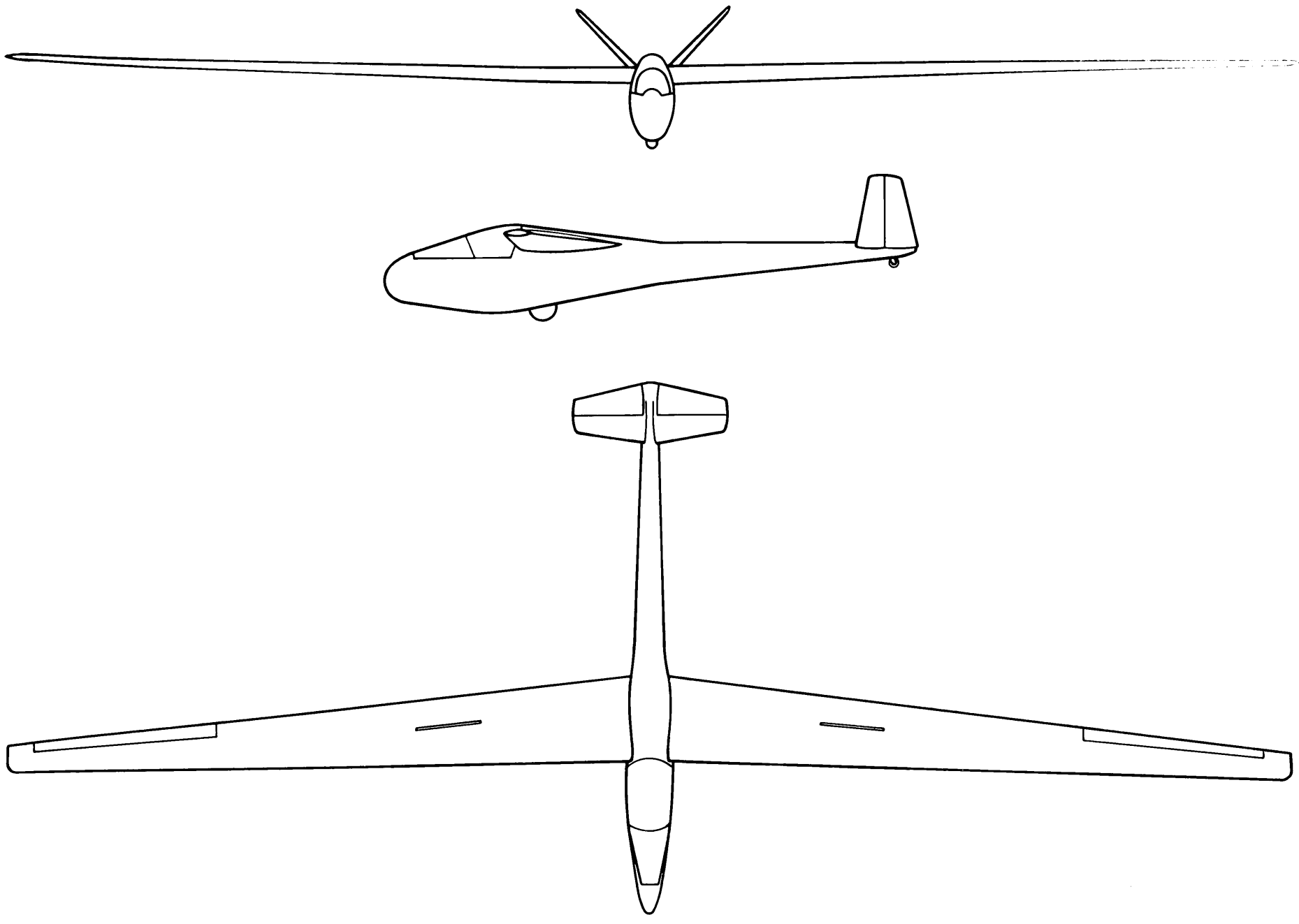
| | |
|---|---|
| Structure | 45° Vee tail, data as for horizontal tail |

**Fuselage**

| | |
|---|---|
| Max. width | 0,56 m |
| Max. height (at cockpit) | 1,04 m |
| Overall length | 6,35 m |
| Max. cross section | 0,452 m² |
| Wetted surface area | 8,77 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Retractable unsprung wheel. Rubber mounted skid. Wheel brakes. |
| Structure | Ply monocoque body with metal monocoque tail boom. Fibreglass nose cap. Side opening blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Camber changing plain flap |
| Area (total) | 1,91 m² |
| Max. deflection down | 25° |



**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 1,696 m |
| Area | 0,337 m² |
| Location, % of chord | 61 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.? | No |

**Weights**

| | |
|---|---|
| Wings [1] | 138,5 kg |
| Fuselage [2] | 76,2 kg |
| Tailplane and elevator | 8,8 kg |
| Empty weight [3] | 223,5 kg |
| Instruments | 3,6 kg |
| Other equipment (e.g. oxygen, radio) | 8,9 kg |
| Equipped weight | 236 kg |
| Flying weight | 323 kg |
| Wing loading | 32,05 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR 05 |
| Date of issue of these requirements | June 1940 |
| Certificate of airworthiness | Experimental |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 190 | 6,0 |
| Point B | 218 | 6,0 |
| Point C | 218 | — 4,0 |
| Point D | 176 | — 4,0 |
| Factor of safety | 1,5 | |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast

*Gust loads*

| | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 190 | 10,5 |
| Point B | 218 | 9,15 |
| Point C | 218 | — 9,15 |
| Point D | 176 | —11,3 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 190 km/h |
| Placard airspeed gusty conditions | 218 km/h |
| Aero-towing speed | 190 km/h |
| Winch launching speed | 129 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Unrestricted |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 32,4 to 40,2 |

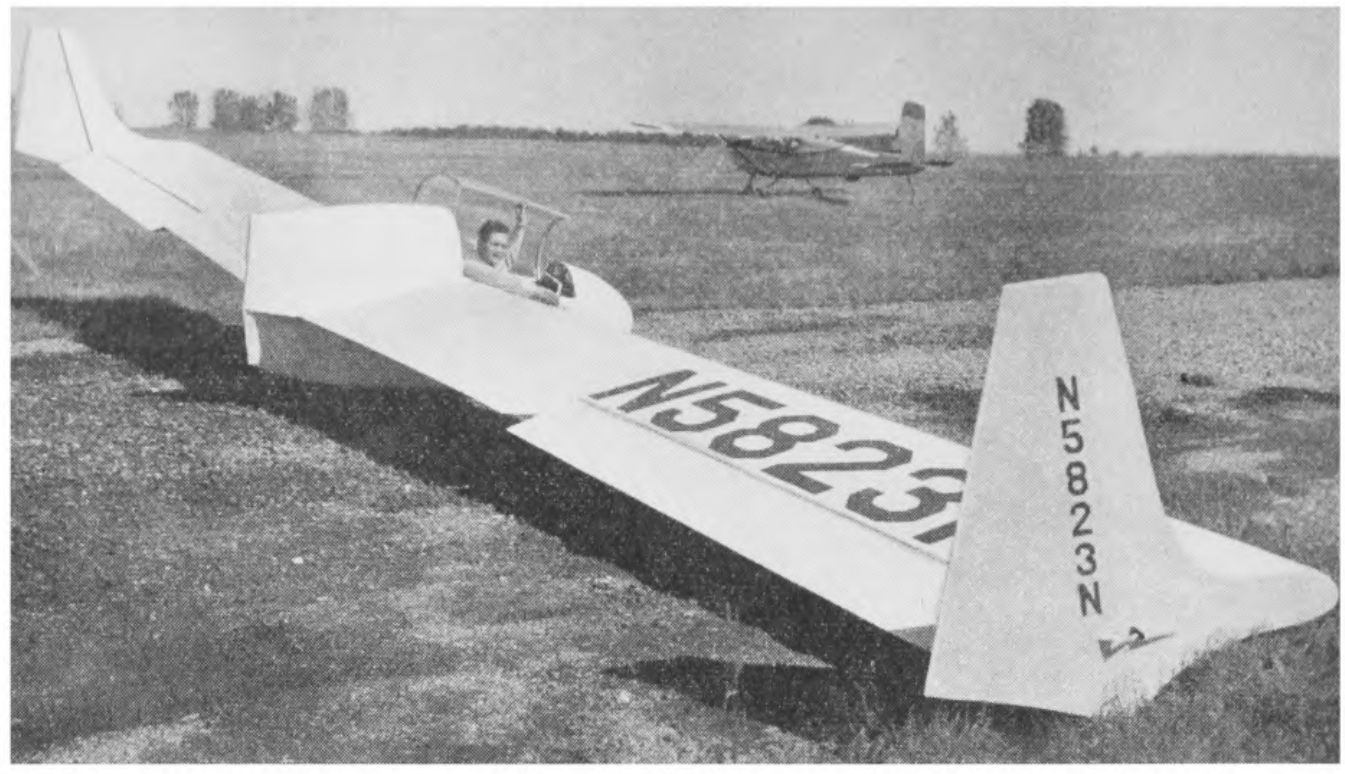
**Straight flight performance**

Measured
at flying weight of 300 kg

**No flap or brake**

| | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 88,4 | 0,625 |
| Max. L/D condition | 100 | 0,671 |
| | 133 | 1,16 |
| | 155 | 1,68 |
| | 177,5 | 2,30 |
| Stalling speed | 66,2 | 77,2 |
| Flap deflection | 25° | 0° |
| Max. L/D | 41,4 | |

# XM-1-B




The XM-1-B is a single-place medium performance sailplane. It was designed to test the practicability of the tailless sailplane as a small, simple sailplane with moderate performance. The aircraft can be broken down in the usual manner for trailering or storage.

Construction of the fuselage is of tubular steel frame fitted into a moulded fibreglass skin. The wing is of standard wood construction except for the fibreglass covered leading edge.

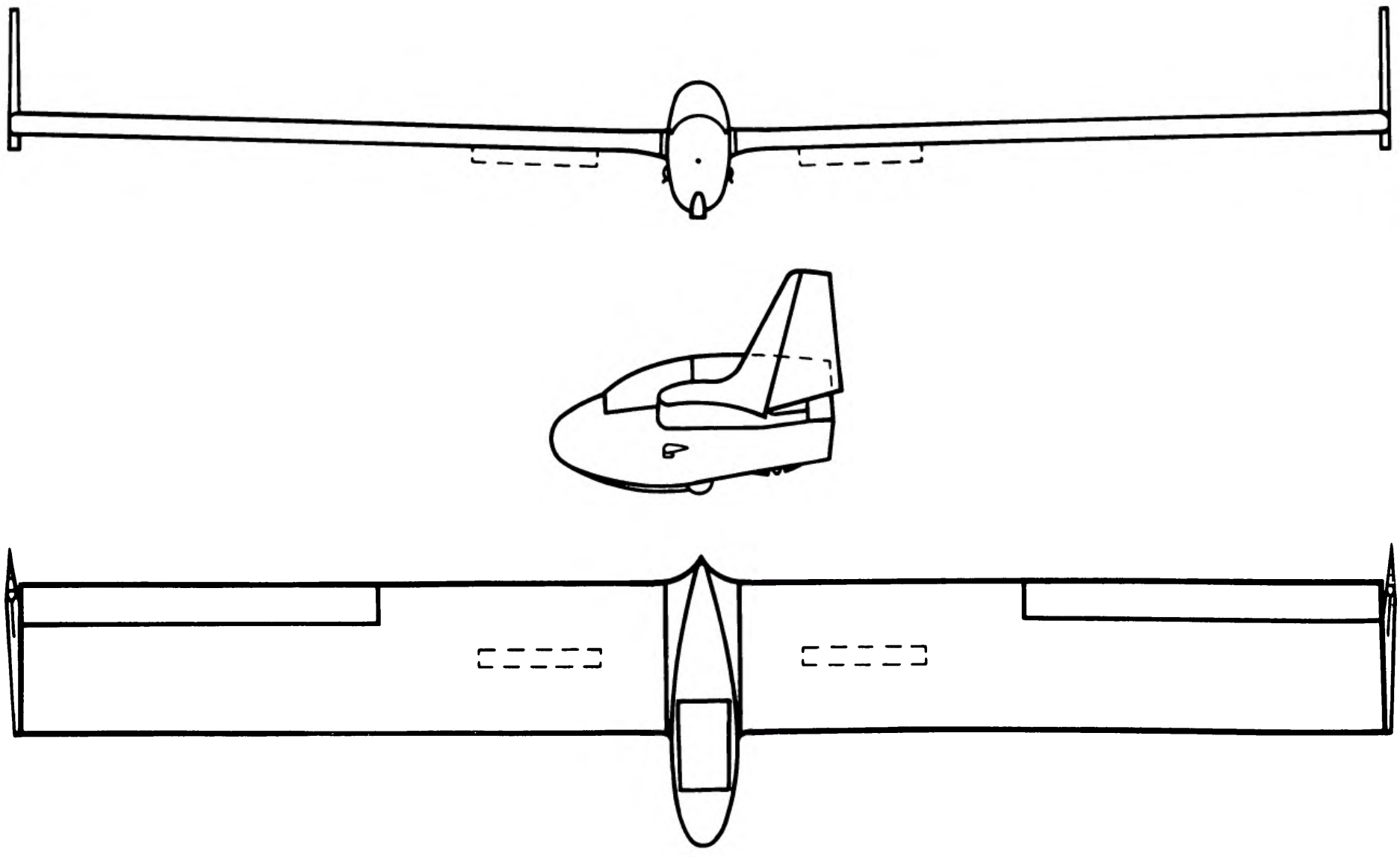
The design has now been modified by replacing the tip fins by a central fin (type now designated XM-1-C).

Einsitziges Leistungsflugzeug für Versuche, mit einer schwanzlosen Konstruktion ein kleines, einfaches Segelflugzeug mittlerer Leistung zu bauen. Es kann in üblicher Weise für Transport und Hangarierung zerlegt werden. Rumpf als Stahlrohrgerippe mit einer Oberfläche aus geformtem Fiberglas. Flügel in üblicher Holzbauweise; nur die Flügeleintrittskante ist mit Fiberglas bedeckt.

Die Konstruktion wurde jetzt dahingehend abgeändert, daß die Seitenflossen an den Flügelenden durch eine zentrale Seitenflosse ersetzt wurden (neue Typenbezeichnung XM-1-C).

Planeur de performance monoplace, construit pour des essais d'obtenir une aile volante petite et simple de performance moyenne. Il peut être démonté de façon habituelle pour le transport et le stationnement.

La construction du fuselage est en tubes d'acier couverts d'une superficie en fibre de verre. L'aile est une construction



en bois normale, le bord d'attaque ayant une superficie en fibre de verre.

Le XM-1-B a été modifié récemment; les plans de dérive aux pointes des ailes ont été remplacés par un plan de dérive central (ce nouveau type portant la désignation XM-1-C).

| | |
|---|---|
| Type designation | XM-1-B |
| Country of design | USA |
| Designer | James Marske |
| Date of first flight of prototype | 12 October, 1957 |
| Number produced | 1 (XM-1-C is modified version with central fin in place of tip fins) |

**Wings**

| | |
|---|---|
| Span (b) | 11,6 m |
| Area (s) | 15,0 $m^2$ |
| Aspect ratio ($b^2/s$) | 9 |
| Wing root chord ($C_r$) | 1,4 m |
| Wing tip chord ($C_t$) | 1,4 m |
| Mean chord ($C = s/b$) | 1,4 m |
| Wing section, root | Fauvel 17% |
| Wing section, mid | Fauvel 14% |
| Wing section, tip | Fauvel 14% |
| Dihedral | 1,5° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 1 |
| Construction | Two spar wooden construction. Plastic sandwich leading edge torsion box. Fabric covered aft of front spar |

**Ailerons**

| | |
|---|---|
| Type | Plain (elevon) |
| Span (total) | 6,1 m |
| Area (total) | 2,08 $m^2$ |
| Mean chord | 0,34 m |
| Max. deflection up | 18° |
| Max. deflection down | 18° |
| Mass balance degree | Nil |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | Tailless |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 0,71 m × 2 |
| Area of rudder | 0,47 m × 2 |
| Aspect ratio | 2,6 |
| Max. deflection | 40° out, 5° in |
| Aerofoil section | Symmetrical |
| Aerodynamic balance | Nil |
| Construction | Wood. Fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,61 m |
| Max. height (at cockpit) | 1,16 m |
| Overall length | 2,48 m |
| Max. cross section | 0,53 $m^2$ |
| Wetted surface area | 5,9 $m^2$ |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed unsprung unbraked wheel. Rubber mounted skid |
| Construction | Steel tube fuselage with moulded fibre glass skin. Blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Lower surface hinged spoilers without gap |
| Span (total) | 2,2 m |
| Area | 0,348 $m^2$ |
| Location, % of chord | 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 91 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 50 kg |
| Empty weight (including any fixed ballast) | 141 kg |
| Instruments | 3 kg |
| Equipped weight | 144 kg |
| Flying weight | 250 kg |
| Wing loading | 16,7 kg/$m^2$ |

**Straight flight performance**

Measured at flying weight of 230 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 64 | 0,89 |
| Max. L/D condition | 82 | 0,984 |
| Stalling speed | 50 km/h | 56 km/h |
| Flap deflection | 90° | 0° |
| Max. L/D | 24 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR Parts 3 and 5 |
| Date of issue of these requirements | 1956 |
| Certificate of airworthiness | Experimental |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 74 | 4 |
| Point B | 147 | 4 |
| Point C | 147 | —3 |
| Point D | 80 | —3 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 74 | 8 |
| Point B | 147 | 8 |
| Point C | 147 | —7,2 |
| Point D | 80 | —7,2 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 226 km/h |
| Aero-towing speed | 168 km/h |
| Winch launching speed | 105 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Loops |
| Spinning permitted? | Yes |

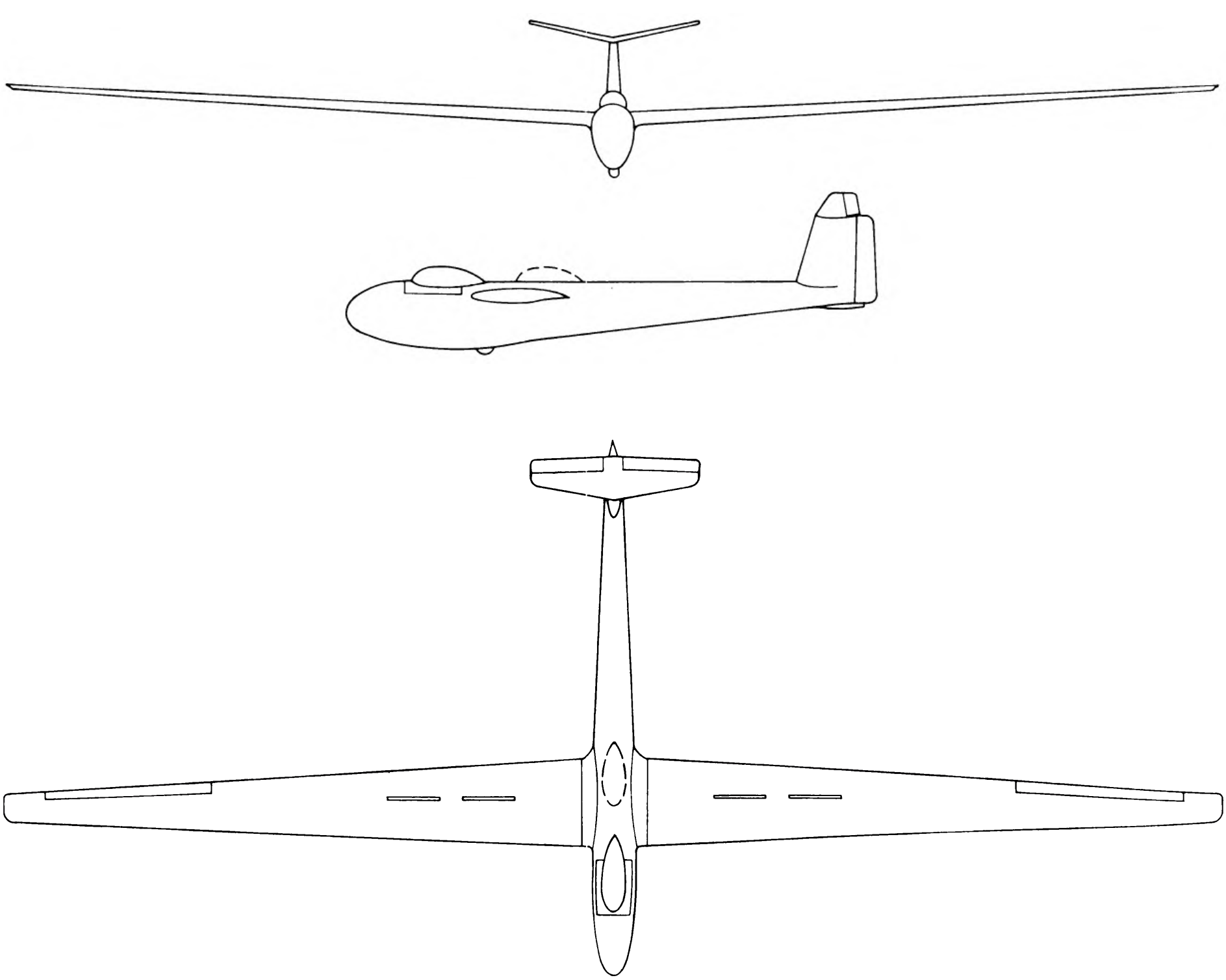
# RHJ-6 ADASTRA I


A high performance two-seater. Placed 15th in the 1960 World Championships at Butzweiler. Since this time, Johnston has redesigned the tail on more conventional lines, making it much lighter.

Hochleistungs-Doppelsitzer, im 15. Rang der Weltmeisterschaft 1960 klassiert. Seitdem hat Johnston das Leitwerk in konventionellerer Weise neukonstruiert und dabei beträchtliches Gewicht eingespart.

Biplace de haute performance, placé 15e aux championnats du monde 1960. Depuis ce temps, Johnston a reconstruit l'empennage d'une manière plus conventionnelle. Il en résulta un gain de poids considérable.

| | |
|---|---|
| Type designation | RHJ-6 Adastra I |
| Country of design | USA |
| Designer | R.H.Johnson |
| Date of first flight of prototype | 3 April, 1960 |



### Wings

| | |
|---|---|
| Span (b) | 17,65 m |
| Area (s) | 15,25 m² |
| Aspect ratio ($b^2/s$) | 20,5 |
| Wing root chord ($C_r$) | 1,57 m |
| Wing tip chord ($C_t$) | 0,49 m |
| Mean chord ($C = s/b$) | 0,864 m |
| Wing section, root | Eppler 503 16% |
| Wing section, tip | Eppler 146 14,5% |
| Dihedral | 2,5° |
| ¼ chord sweep | —1,0° |
| Aero. twist root/tip | —3,0° |
| Taper ratio ($C_t/C_r$) | 0,31 |
| Construction | Single spar wooden construction with leading edge torsion box. Ply covered. Ribs at 0,15 m |

### Ailerons

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 4,36 m |
| Area (total) | 0,648 m² |
| Mean chord | 0,148 m |
| Max. deflection up | 25° |
| Max. deflection down | 12,5° |
| Mass balance degree | Nil |
| Construction | Wood. Rib spacing 0,15 m |

### Horizontal tail

| | |
|---|---|
| Span | 2,55 m |
| Area of elevator and fixed tail (S') | 1,39 m² |
| Area of elevator | 0,412 m² |
| Max. deflection up | 30° |
| Max. deflection down | 15° |
| Aerofoil section | NACA 65015 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,9 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S'1'/SC) | 0,412 |
| Construction | Wood. Ply covered fixed tail. Rib spacing 0,15 m |

### Vertical tail

| | |
|---|---|
| Area of fin and rudder | 1,41 m² |
| Area of rudder | 0,357 m² |
| Aspect ratio | 1,11 |
| Tail arm | 3,86 m |
| Max. deflection | ± 30° |
| Aerofoil section | NACA 65018 |
| Aerodynamic balance | Nil |
| Construction | Wood. Part ply covered. Rib spacing 0,15 m |

### Fuselage

| | |
|---|---|
| Max. width | 0,612 m |
| Max. height (at cockpit) | 1,12 m |
| Overall length | 7,57 m |
| Max. cross section | 0,44 m² |
| Wetted surface area | 11,9 m² |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed unsprung wheel with brake. Rubber mounted skid |
| Construction | Ply fuselage with balsa nose cap. Side opening blown perspex canopy |

### Lift increasing devices

| | |
|---|---|
| Type | Nil |

### Drag producing devices

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 3,06 m |
| Area | 1,86 m² |
| Location, % of chord | 55 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

### Weights

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 202 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 102 kg |
| Tailplane and elevator | 10,4 kg |
| Empty weight (including any fixed ballast) | 340 kg |
| Instruments | 4 kg |
| Other equipment (e.g. oxygen, radio) | 3 kg |
| Equipped weight | 347 kg |
| Flying weight | 529 kg Twoseater<br>433 kg Solo |
| Wing loading | 34 kg/m² Twoseater<br>28,5 kg/m² Solo |

### Straight flight performance

Calculated
at flying weight of . . . . . 440 kg

### No flap or brake

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 92 | 0,61 |
| Max. L/D condition | 98 | 0,64 |
| | 138 | 1,10 |
| | 162 | 1,55 |
| | 184 | 2,50 |
| Stalling speed | 58 km/h | |
| Flap deflection | 0° | |
| Max. L/D | 42,5 | |

### Design standards

| | |
|---|---|
| Certificate of airworthiness | Experimental |

### Design flight envelope

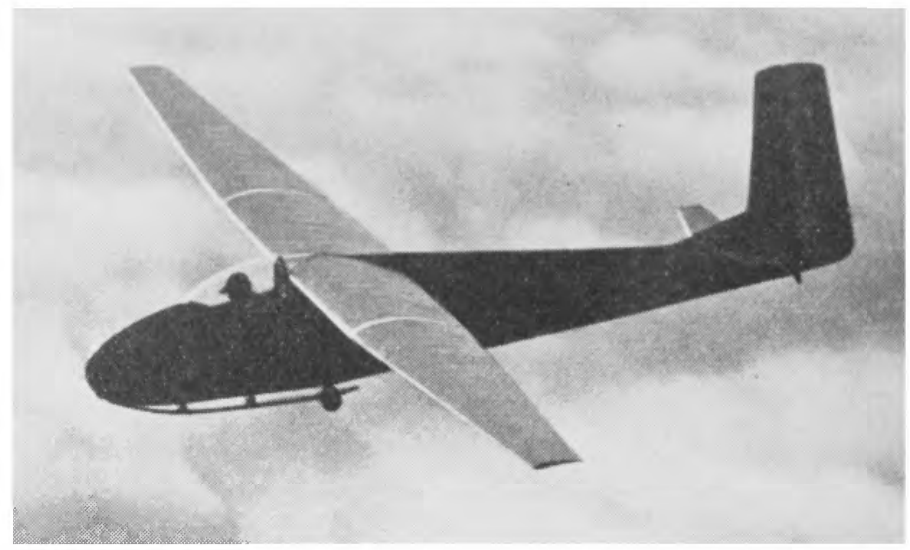
| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | | 6 |
| Point B | 225 | 6 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 161 | 12,2 |
| Point B | 241 | 9,1 |
| Point C | 241 | — 6,7 |
| Point D | 161 | —12,2 |

### Limiting flight conditions

| | |
|---|---|
| Placard airspeed smooth conditions | 225 km/h |
| Placard airspeed gusty conditions | 194 km/h |
| Aero-towing speed | 194 km/h |
| Winch launching speed | 129 km/h |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. position for which compliance with regulations has been shown or is intended (% m.a.c.) | 20–45 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 225 km/h |

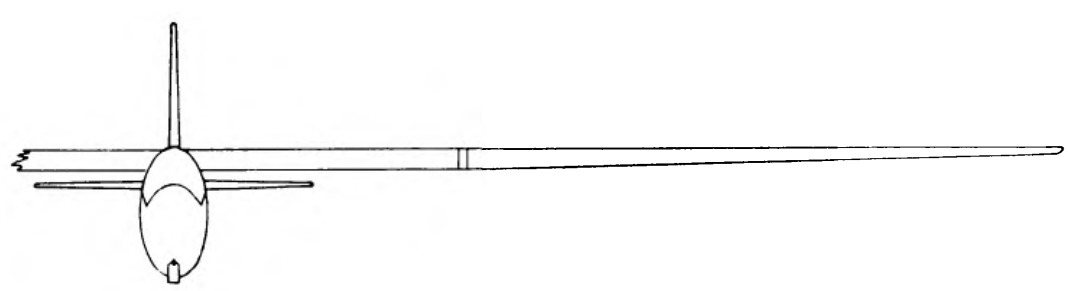
# M-1

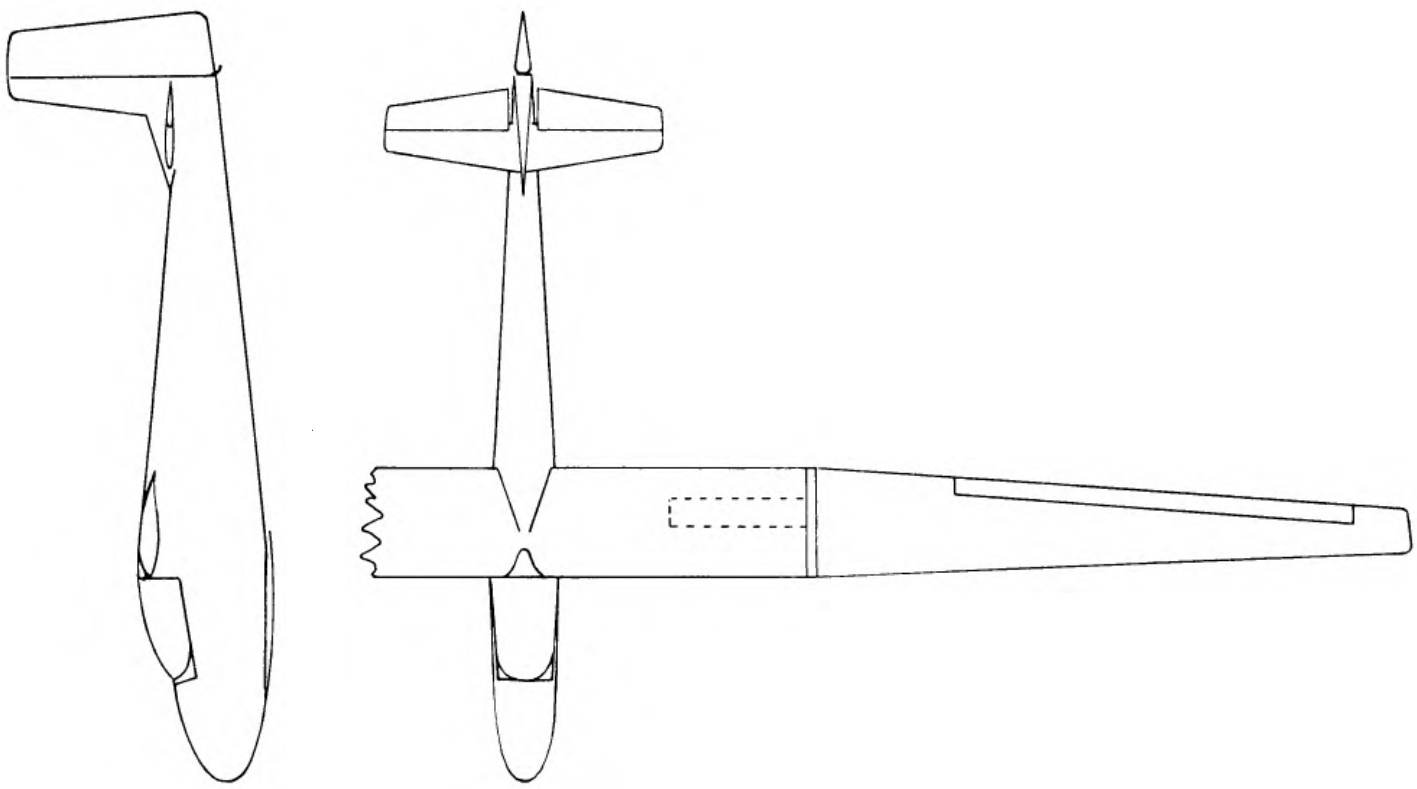


The principal designer, Frederick Matteson, designed this aircraft whilst living in Germany and the conversion to German standards and the completion of the detail was by A. Vogt. The majority of the construction was done in Germany but it was completed and flown in the USA. The wing spar construction, using D-nosed spar filled with foamed Polystyrene to stabilize the skin and give a true contour, is of particular interest. Ailerons are likewise of stressed plywood, stabilized by foam filling and have no ribs.

Der Hauptkonstrukteur, Frederick Matteson, konstruierte dieses Segelflugzeug während seines Aufenthaltes in Deutschland; die Anpassung an die deutschen Anforderungen und die Vervollständigung der Einzelheiten besorgte Alfred Vogt. Der Hauptteil der Konstruktion erfolgte in Deutschland, doch wurden die Endarbeiten und Flugerprobung in den USA durchgeführt. Von besonderem Interesse ist die Flügelholmkonstruktion, welche D-förmige Holmvorderseiten verwendet; diese sind mit schaumartigem Polystyren gefüllt, um die Oberfläche zu stabilisieren und ihr die richtige Form zu geben. Die Querruder bestehen entsprechend aus verstärktem Sperrholz, das durch Schaumfüllung gefestigt wurde, und weisen keine Rippen auf.

Le constructeur principal, Frederick Matteson, a construit ce planeur pendant son séjour en Allemagne; l'adaptation aux besoins allemands et la perfection des détails fut arrangée par A. Vogt. Une grande partie des travaux de construction fut achevée en Allemagne; par contre, les travaux finals et les vols d'essai eurent lieu aux Etats-Unis. La construction des longerons d'aile pour lesquels on a utilisé une partie avant en forme de D, mérite une attention particulière; ils sont remplis avec du Polystyrène mousseux pour stabiliser la superficie et assurer ses formes. Les ailerons sont faits en contreplaqué fortifié et stabilisés par de la mousse à l'intérieur; ils sont construits sans nervures arêtières.





| | | | |
|---|---|---|---|
| Type designation | M-1 | Aspect ratio ($b^2/s$) | 20,2 |
| Designers | Frederick Matteson and Alfred Vogt | Wing root chord ($C_r$) | 0,91 m |
| | | Wing tip chord ($C_t$) | 0,39 m |
| Country of design | USA / Germany | Mean chord ($C = {}^s/_b$) | 0,77 m |
| Date of first flight of prototype | February 1959 | Wing section, root | NACA 63518 |
| Number produced | 1 | Wing section, tip | NACA 4412 |
| | | Dihedral | 0,48° |
| **Wings** | | ¼ chord sweep | 0,43° |
| Span (b) | 15,6 m | Aero. twist root/tip | 1,7° |
| Area (s) | 12,1 m² | Taper ratio ($C_t/C_r$) | 0,40 |

| | |
|---|---|
| Construction | Wood, D-nosed spar filled with foamed polystyrene. Ribs 30 cm. Fabric covering over rear 65% chord |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 7,02 m |
| Area (total) | 1,158 m² |
| Mean chord | 0,165 m |
| Max. deflection up | 25° |
| Max. deflection down | 15° |
| Mass balance degree | Nil |
| Construction | Ribless ply filled with foamed polystyrene |

**Horizontal tail**

| | |
|---|---|
| Span | 2,44 m |
| Area of elevator and fixed tail | 1,39 m² |
| Area of elevator | 0,69 m² |
| Max. deflection up | 20° |
| Max. deflection down | 10° |
| Aerofoil section | NACA 0009 |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,53 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S' 1'/SC) | 0,526 |
| Construction | Stressed ply skin. Ribs at 30 cm spacing. Fabric covered elevator |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,26 m² |
| Area of rudder | 0,74 m² |
| Aspect ratio | 2,44 |
| Tail arm | 4,06 m |
| Max. deflection | 15° |
| Aerofoil section | NACA 0009 |
| Mass balance degree | Nil |
| Aerodynamic balance | Nil |
| Structure | Stressed ply skin. Ribs at 38 cm spacing. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,61 m |
| Max. height (at cockpit) | 1,22 m |
| Overall length | 6,79 m |
| Max. cross section | 0,562 m² |
| Wetted surface area | 10,3 m² |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed rubber mounted skid |
| Structure | Ply semi-monocoque. Blown plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Lower surface spoilers without gap. |

| | |
|---|---|
| Span (total) | 2,44 m |
| Area | 0,56 m² |
| Location, % of chord | 43 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings[1] | 147 kg |
| Fuselage[2] | 78,5 kg |
| Tailplane and elevator | 8,9 kg |
| Empty weight [3] | 234 kg |
| Instruments | (Incl. in fuselage) |
| Flying weight | 332 kg |
| Wing loading | 27,5 kg/m² |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR 05 |
| Date of issue of these requirements | 1942 |
| Certificate of airworthiness | Experimental |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 125,5 | 5,86 |
| Point B | 226,0 | 5,86 |
| Point C | 226,0 | —3,86 |
| Point D | 144,0 | —3,86 |
| Factor of safety | | 1,5 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 207 km/h |
| Placard airspeed gusty conditions | 207 km/h |
| Aero-towing speed | 207 km/h |
| Winch launching speed | 116 km/h |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended in % m.a.c. | 16 to 35 |

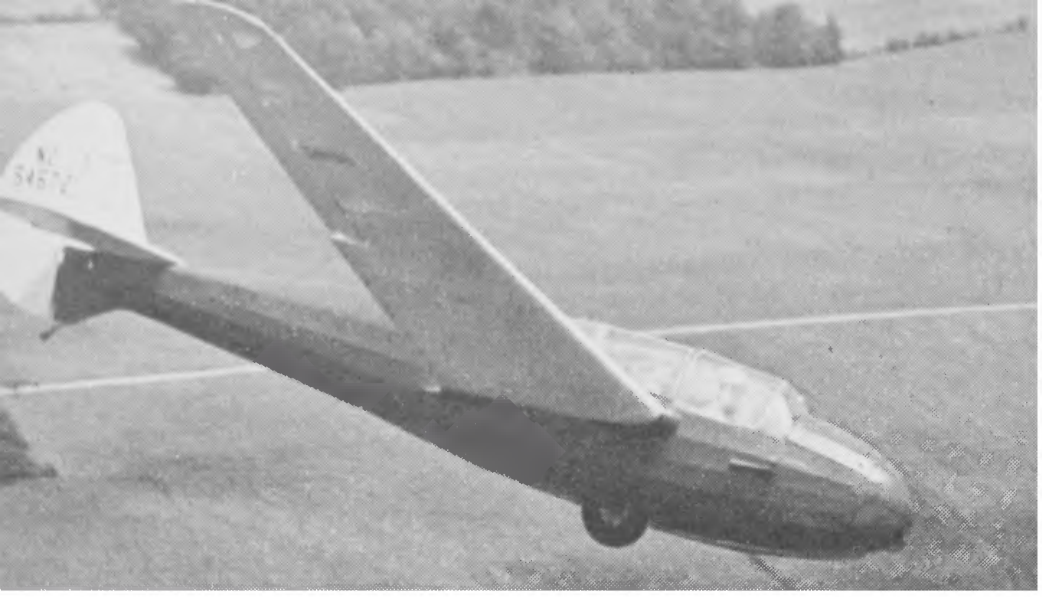
**Straight flight performance**

Measured
at flying weight of 332 kg

**No flap or brake**

| | V km/h | V sink m/s |
|---|---|---|
| Min. sink condition | 72 | 0,66 |
| Max. L/D condition | 76 | 0,68 |
| | 109 | 1,22 |
| | 127 | 1,68 |
| | 145 | 2,24 |
| Stalling speed | 68 km/h | |
| Max. L/D | 31,5[4] | |

[1] With struts, controls, flaps and brakes
[2] Complete with rudder and fin, less instruments and equipment
[3] To include any fixed ballast
[4] With fixed dolly undercarriage wheels and some fuselage fairings not fitted. Final L/D expected to be 34



# LAISTER KAUFFMANN LK-10

The LK-10 (military designation TG-4A) designed by Jack Laister is certainly the best known American 2-seater. It was developed from a single-seat design called the Yankee Doodle which had the same general lines and used the same materials but was 15% smaller than the LK-10.

The LK-10 was built very quickly to fit the United States requirements for 2-seat training glider during World War II. After the war a large proportion of the total production of 156 was thrown on the market and they have been widely used ever since. Refinements referred to as «flat tops» and other variants have been produced privately to improve the performance, but the information given here refers only to the production aircraft.

Der LK-10 (militärische Bezeichnung TG-4A), konstruiert von Jack Laister, ist bestimmt der bekannteste amerikanische Doppelsitzer. Er wurde aus einem Yankee Doodle genannten Einsitzer entwickelt, der denselben Gesamtaufbau und dasselbe Material aufwies, aber ungefähr 15% kleiner war als der LK-10.

Der LK-10 wurde sehr schnell gebaut, um den Bedarf der USA für Doppelsitzer-Schulungsflugzeuge während des Zweiten Weltkrieges zu decken. Nach dem Krieg wurde ein Großteil der 156 Flugzeuge auf den Markt gebracht und seither intensiv eingesetzt. Inzwischen wurden Verbesserungen wie die sogenannten «flat tops» und andere Varianten auf privater Grundlage konstruiert; die nachstehenden Angaben beziehen sich nur auf die Serienausführung.

Le LK-10 (désignation militaire TG-4A), construit par Jack Laister, est le biplace le mieux connu des Etats-Unis. Il fut développé du monoplace Yankee Doodle qui avait à peu près la même apparence et le même matériel, mais était de 15% plus petit.

Le LK-10 fut construit très vite pour couvrir les besoins des Etats-Unis pour un biplace d'entraînement pendant la dernière guerre. Plus tard un grand nombre des 156 exemplaires fut vendu et employé partout. Des améliorations comme les «flat tops» et d'autres variations furent construites sur base privée; les informations suivantes se réfèrent au planeur de série.

| | |
|---|---|
| Type designation | Laister-Kauffmann LK-10 |
| Country of design | USA |
| Designer | Jack W. Laister |
| Date of first flight of prototype | February, 1942 |
| Number produced | 156 |

**Wings**

| | |
|---|---|
| Span (b) | 15,24 m |
| Area (s) | 15,2 m² |
| Aspect ratio ($b^2/s$) | 15,1 |
| Wing root chord ($C_r$) | 1,425 m |
| Wing tip chord ($C_t$) | 0,559 m |
| Mean chord ($C = s/b$) | 0,995 m |
| Wing section, root | NACA 4418 |
| Wing section, tip | NACA 4409 |
| Dihedral | 4¼° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 4° |
| Taper ratio ($C_t/C_r$) | 0,392 |
| Construction | Single spar wooden cantilever with leading edge ply torsion box. Ribs spaced 0,305 m |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 4,1 m |
| Area (total) | 2 × 0,97 m² |
| Mean chord | 0,24 m |
| Max. deflection up | 24° |
| Max. deflection down | 12° |
| Mass balance degree | 90% |
| Mass balance method | Multiple internal weight |
| Construction | Wood. Fabric covered. Ribs spaced 0,305 m |

**Horizontal tail**

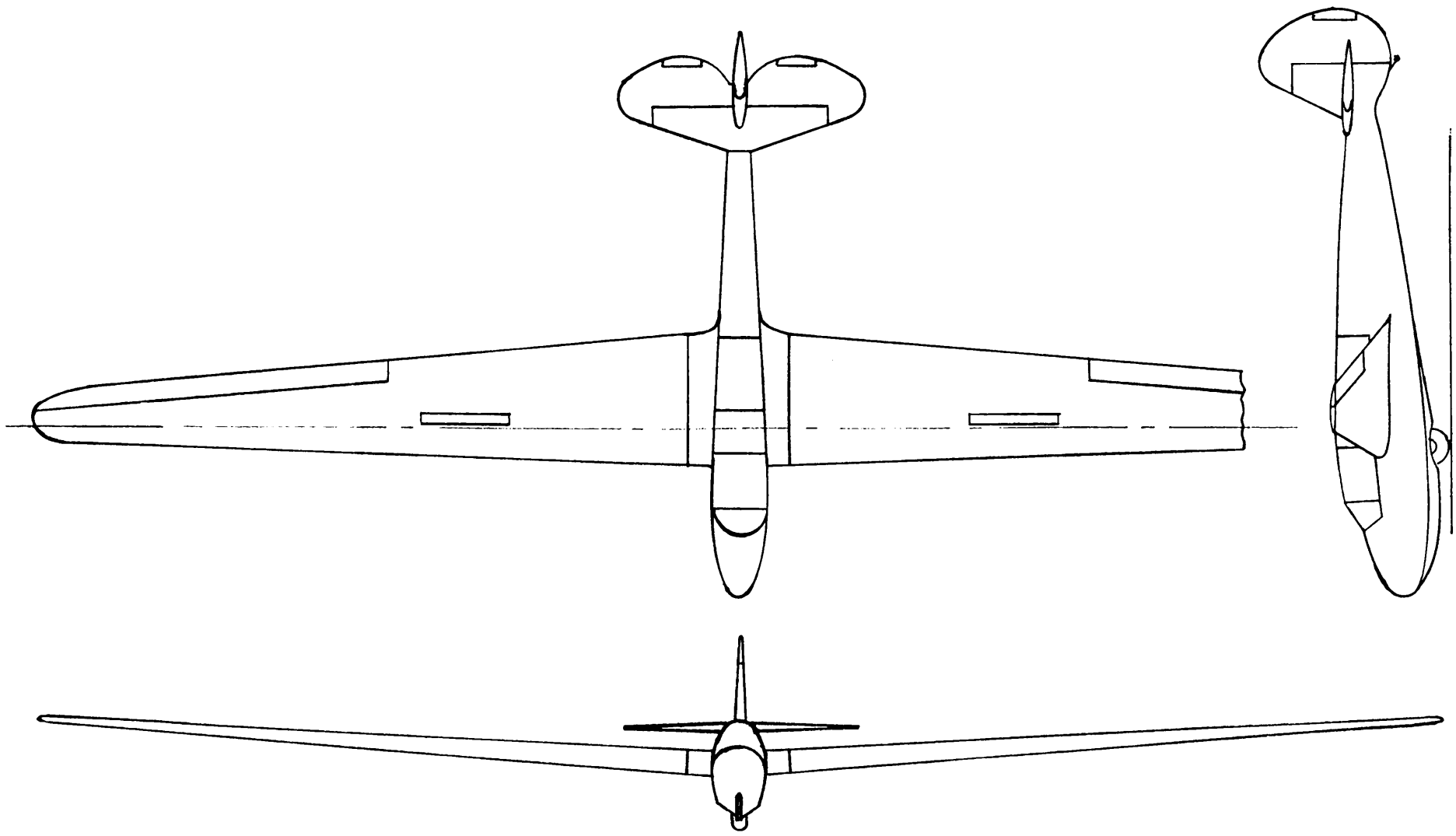
| | |
|---|---|
| Span | 2,79 m |
| Area of elevator and fixed tail (S') | 1,98 m² |
| Area of elevator | 1,32 m² |
| Max. deflection up | 15° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0009 |
| Mass balance degree | 90% |
| Mass balance method | External bob weight |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,46 m |
| Elevator aerodynamic balance method | Unshielded horn |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S'1'/SC) | 0,455 |
| Construction | Wood. Fabric covered. Ribs spaced 0,3 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,23 m² |
| Area of rudder | 0,76 m² |
| Aspect ratio | 1,52 |
| Tail arm | 3,86 m |
| Max. deflection | ± 27° |
| Aerofoil section | NACA 0009 |
| Aerodynamic balance | Unshielded horn |
| Construction | Wood. Fabric covered. Ribs spaced 0,3 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,635 m |
| Max. height (at cockpit) | 1,115 m |
| Overall length | 6,5 m |
| Max. cross section | 0,482 m² |



| | |
|---|---|
| Wetted surface area | 10,5 m² |
| Number of seats and arrangement | 2 tandem |
| Undercarriage type | Fixed unsprung wheel. Fixed rubber mounted skid. Wheel brakes |
| Construction | Steel tube with wood stringer falsework. Fabric covered. Side opening bent sheet perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers hinged at leading edge. No gap |
| Span (total) | 2 × 0,962 m |
| Area | 2 × 0,195 m² |
| Location, % of chord | 30 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 100 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 91 kg |
| Tailplane and elevator | 12 kg |
| Empty weight (including any fixed ballast) | 206 kg |
| Instruments | 8 kg |
| Other equipment (e.g. oxygen, radio) | 4 kg |
| Equipped weight | 215 kg |
| Flying weight | 397 kg |
| Wing loading | 26,5 kg/m² |

**Straight flight performance**
Calculated

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 73 | 0,97 |
| Max. L/D condition | 80 | 1,00 |
| Stalling speed | 61 km/h | |
| Max. L/D | 22 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR Pt. 5 |
| Date of issue of these requirements | June, 1940 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point B | 225 | 6 |
| Point C | 225 | —3 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point B | 225 | 9,15 |
| Point C | 225 | —9,15 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 203 km/h |
| Placard airspeed gusty conditions | 203 km/h |
| Aero-towing speed | 203 km/h |
| Winch launching speed | 130 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Fully aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 17 to 33 |

# SCHWEIZER 1-23-H

The Schweizer 1-23-H is the latest development of the original 1-23 machine of 13,4 m span which first flew in 1948. Although the new version has a great deal in common with the earlier machine, it has been refined in many ways and the span is now slightly over 16 m.

The Schweizer 1-23-H-15 is a Standard Class version of this aircraft. In fact the only difference between the two aircraft is in the extension to the wing tip.

The 3-view drawing and photograph shown depict the 1-23-H-15. This is deemed sufficient to cover both versions.

Der Schweizer 1-23-H ist die neueste Entwicklung des ursprünglichen 1-23 mit 13,4 m Spannweite, der erstmals 1948 flog. Trotzdem die neue Ausführung vieles mit der früheren gemeinsam hat, ist sie in mancher Beziehung verfeinert, und die Spannweite beträgt nun etwas über 16 m.

Der Schweizer 1-23-H-15 ist die Standardklasse-Ausführung des 1-23-H. Der einzige Unterschied besteht in der Spannweite.

Dreiseitenansicht und Photo stellen den 1-23-H-15 dar, was für beide Typen genügen sollte.

Le Schweizer 1-23-H est le plus récent développement du 1-23 original qui avait une envergure de 13,4 m et faisait son premier vol en 1948. La nouvelle version a beaucoup de ressemblance avec la première, mais elle est plus raffinée, et l'envergure a été portée à plus de 16 m.

Le Schweizer 1-23-H-15 est la version Standard de cette machine. La seule différence entre les deux types se rapporte à l'envergure.

Le dessin et la photo montrent le 1-23-H-15, ce qui a été jugé suffisant pour les deux versions.

| | |
|---|---|
| Type designation | Schweizer SGS 1-23-H |
| Country of design | USA |
| Designer | E. Schweizer |
| Date of first flight of prototype | August, 1959 |
| Number produced | 7 |

**Wings**

| | |
|---|---|
| Span (b) | 16,052 m |
| Area (s) | 15,323 m² |
| Aspect ratio ($b^2/s$) | 16,90 |
| Wing root chord ($C_r$) | 1,22 m |
| Wing tip chord ($C_t$) | 0,353 m |
| Mean chord ($C = {}^{s}/_{b}$) | 0,955 m |
| Wing section, root | NACA 43 012 A |
| Wing section, mid | NACA 43 012 A |
| Wing section, tip | NACA 23 009 |
| Dihedral | 3½° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 2½° |
| Taper ratio ($C_t/C_r$) | 0,29 |
| Construction | Metal cantilever single spar. All metal covering |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 2 × 3,66 m |
| Area (total) | 2 × 0,843 m² |
| Mean chord | 0,229 m |
| Max. deflection up | 36° |
| Max. deflection down | 18° |
| Mass balance degree | 100% |
| Mass balance method | Internal and external weights |
| Construction | All metal |

**Horizontal tail**

| | |
|---|---|
| Span | 2,13 m |
| Area of elevator and fixed tail (S′) | 1,41 m² |
| Area of elevator | 0,62 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,79 m |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′l′/SC) | 0,365 |
| Construction | All metal |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,213 m² |
| Area of rudder | 0,66 m² |
| Aspect ratio | 1,55 |
| Tail arm | 3,44 m |
| Max. deflection | 28° |
| Aerodynamic balance | Nil |
| Construction | All metal |

**Fuselage**

| | |
|---|---|
| Max. width | 0,584 m |
| Max. height (at cockpit) | 1,085 m |
| Overall length | 6,232 m |
| Max. cross section | 0,52 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel and skid. Wheel brake |
| Construction | Metal monocoque. Side opening blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Conventional upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,152 m |
| Area | 2 × 0,161 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 130 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 81 kg |
| Tailplane and elevator | 7 kg |
| Empty weight (including any fixed ballast) | 218 kg |
| Instruments, Other equipment (e.g. oxygen, radio) | 36 kg |
| Equipped weight | 254 kg |
| Flying weight | 340 kg |
| Wing loading | 22,2 kg/m² |

**Straight flight performance**

| | |
|---|---|
| Calculated at flying weight of | 340 kg |

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 60 | 0,625 |
| Max. L/D condition | 81 | 0,72 |
| | 89 | 0,83 |
| | 104 | 1,07 |
| | 119 | 1,36 |
| Max. L/D | 30,8 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR 05 |
| Certificate of airworthiness | ATC 1G1 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 118 | 6,00 |
| Point B | 232 | 6,00 |
| Point C | 136 | —4,00 |
| Point D | 232 | —4,00 |
| Factor of safety | 1,5 | |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 225 km/h |
| Placard airspeed gusty conditions | 225 km/h |
| Aero-towing speed | 177 km/h |
| Winch launching speed | 109 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Fully aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 26—36 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 225 km/h |

# SCHWEIZER 1-23-H-15


| | |
|---|---|
| Type designation | Schweizer SGS 1-23-H-15 |
| Country of design | USA |
| Designer | E. Schweizer |
| Date of first flight of prototype | June, 1959 |
| Number produced | 10 |

**Wings**

| | |
|---|---|
| Span (b) | 14,98 m |
| Area (s) | 14,81 m² |
| Aspect ratio ($b^2/s$) | 15,2 |
| Wing root chord ($C_r$) | 1,22 m |
| Wing tip chord ($C_t$) | 0,446 m |
| Mean chord ($C = s/b$) | 0,988 m |
| Wing section, root | NACA 43 012 A |
| Wing section, mid | NACA 43 012 A |
| Wing section, tip | NACA 23 009 |
| Dihedral | 3½° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 2½° |
| Taper ratio ($C_t/C_r$) | 0,366 |
| Construction | Metal cantilever single spar. All metal covering |

**Ailerons**

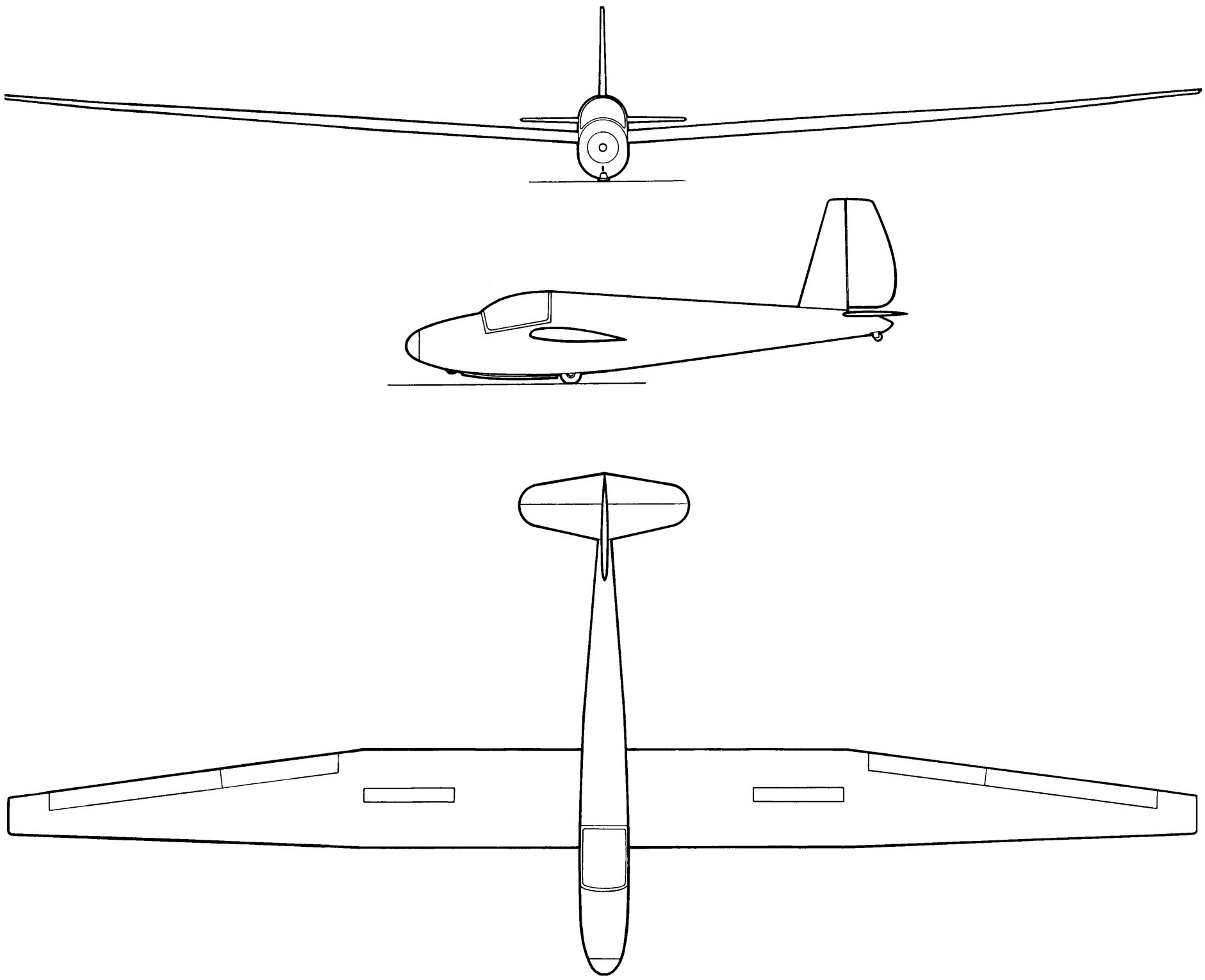
| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 2 × 3,66 m |
| Area (total) | 2 × 0,843 m² |
| Mean chord | 0,229 m |
| Max. deflection up | 36° |
| Max. deflection down | 18° |
| Mass balance degree | 100% |
| Mass balance method | Internal and external weights |
| Construction | All metal |

**Horizontal tail**

| | |
|---|---|
| Span | 2,13 m |
| Area of elevator and fixed tail (S′) | 1,41 m² |
| Area of elevator | 0,62 m² |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,79 m |
| Elevator trimming method | Spring |
| Horizontal tail volume coefficient (S′l′/SC) | 0,365 |
| Construction | All metal |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,213 m² |
| Area of rudder | 0,66 m² |
| Aspect ratio | 1,55 |



| | |
|---|---|
| Tail arm | 3,44 m |
| Max. deflection | 28° |
| Aerodynamic balance | Nil |
| Construction | All metal |

**Fuselage**

| | |
|---|---|
| Max. width | 0,584 m |
| Max. height (at cockpit) | 1,085 m |
| Overall length | 6,232 m |
| Max. cross section | 0,52 m² |
| Number seats/arrangement | 1 |
| Undercarriage type | Fixed unsprung wheel and skid. Wheel brake |
| Construction | Metal monocoque. Side opening blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Conventional upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,152 m |
| Area | 2 × 0,161 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 127 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 81 kg |
| Tailplane and elevator | 7 kg |
| Empty weight (including any fixed ballast) | 215 kg |
| Instruments, Other equipment (e.g. oxygen, radio) | 39 kg |
| Equipped weight | 254 kg |
| Flying weight | 340 kg |
| Wing loading | 22,9 kg/m² |

**Straight flight performance**

Calculated
at flying weight of . . . . . 340 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 61 | 0,67 |
| Max. L/D condition | 81 | 0,77 |
| | 92 | 0,89 |
| | 107 | 1,15 |
| | 122 | 1,46 |
| Max. L/D | 29,2 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR 05 |
| Certificate of airworthiness | ATC 1G1 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 118 | 6,00 |
| Point B | 232 | 6,00 |
| Point C | 136 | —4,00 |
| Point D | 232 | —4,00 |
| Factor of safety | 1,5 | |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 225 km/h |
| Placard airspeed gusty conditions | 225 km/h |
| Aero-towing speed | 177 km/h |
| Winch launching speed | 109 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Fully aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 26—36 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 225 km/h |

# SCHWEIZER 2-32

The Schweizer 2-32 is the latest two-seater which is quite a new design, although it must in some ways be based on the experience obtained by the Schweizer Brothers on their 2-25 first flown in 1954. The new machine has somewhat less span and considerably less wing area and a higher aspect ratio. It is notable that the wing loading of the new machine is 29.3 kg per sq. metre against the much lower value of 24.9 kg of the earlier 2-25.

All these Schweizer machines are all-metal, but in the case of the 2-32, the control surfaces are fabric-covered.

Der Schweizer 2-32 ist der letzte Doppelsitzer, eine völlig neue Konstruktion, trotzdem er bis zu einem gewissen Grade auf den Erfahrungen der Gebrüder Schweizer mit ihrem 2-25 beruht, der erstmals 1954 flog. Die neue Maschine hat eine etwas geringere Spannweite, bedeutend kleinere Flügeloberfläche und größere Flügelstreckung. Bemerkenswert ist, daß die Flächenbelastung der 2-32 mit 29,3 kg/m² bedeutend höher liegt als die 24,9 kg/m² der 2-25.

Alle diese Maschinen von Schweizer sind Ganzmetallkonstruktionen; im Falle des 2-32 sind die Steuerflächen tuchbespannt.

Le Schweizer 2-32 est le biplace le plus récent, une construction tout à fait nouvelle malgré qu'il se base jusqu'à un certain degré sur les expériences faites par les frères Schweizer avec leur 2-25 qui vola la première fois en 1954. La nouvelle version a une envergure un peu réduite, une surface des ailes plus petite et un rapport d'allongement plus grand. A remarquer que la charge alaire du 2-32 est considérablement plus élevée avec 29,3 kg/m², comparée à celle du 2-25 avec 24,9 kg/m².

Toutes ces constructions de Schweizer sont entièrement en métal, à l'exception des surfaces des gouvernails du 2-32 qui sont entoilés.

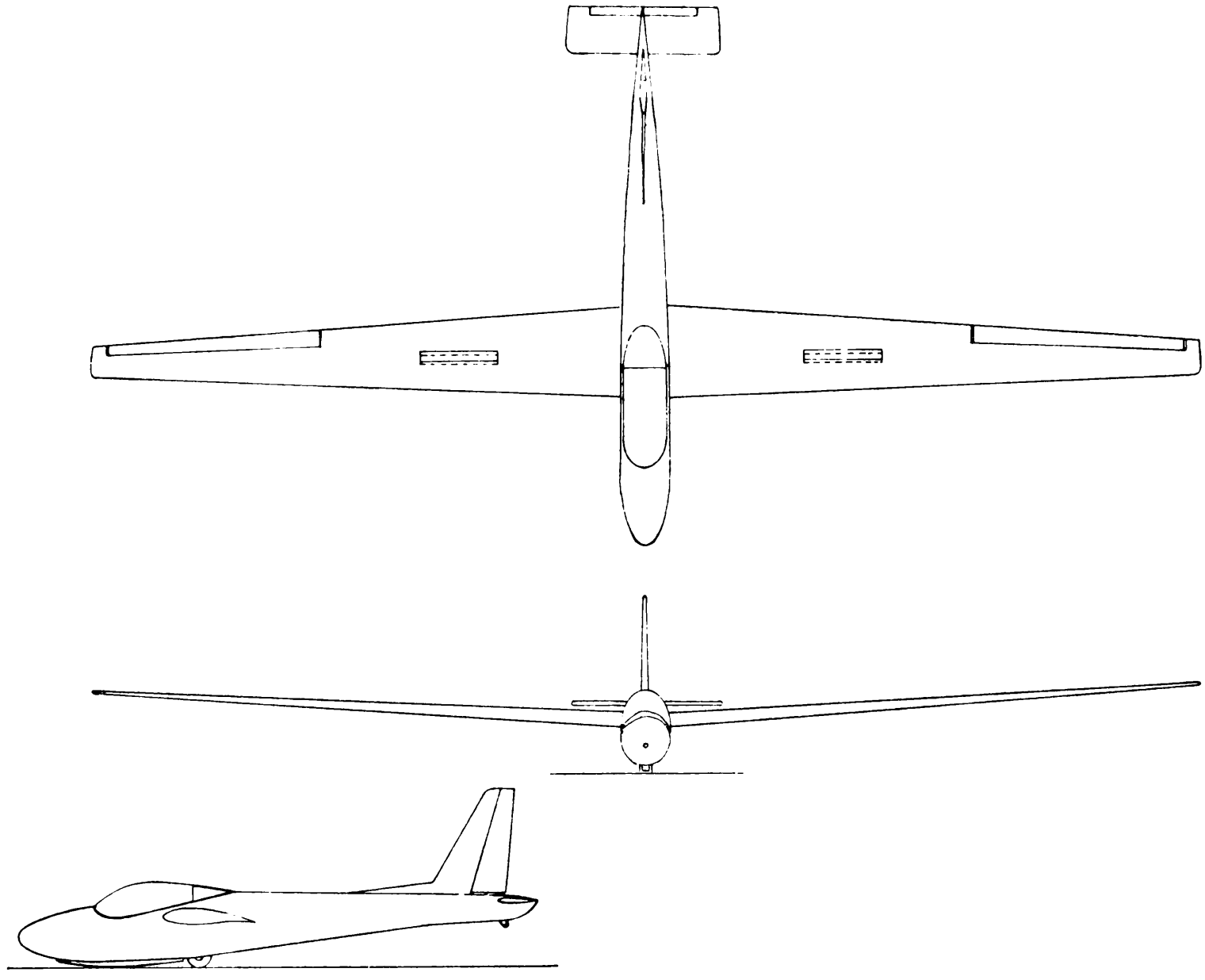
| | |
|---|---|
| Type designation | Schweizer SGS 2-32 |
| Country of design | USA |
| Designer | E. Schweizer |
| Date of first flight of prototype | 3 July, 1962 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 17,40 m |
| Area (s) | 16,70 m² |
| Aspect ratio ($b^2/s$) | 18,05 |
| Wing root chord ($C_r$) | 1,45 m |
| Wing tip chord ($C_t$) | 0,48 m |
| Mean chord ($C = s/b$) | 0,960 m |
| Wing section, root | NACA $63_3$-618 |
| Wing section, mid | NACA $63_3$-618 |
| Wing section, tip | NACA 43 012A |
| Dihedral | 3½° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 2° |
| Taper ratio ($C_t/C_r$) | 0,333 |
| Construction | Metal cantilever single spar. Metal covered. |

**Ailerons**

| | |
|---|---|
| Type | Plain |
| Span (total) | 2 × 3,28 m |
| Area (total) | 2 × 0,685 m² |
| Mean chord | 0,208 m |
| Max. deflection up | 30° |
| Max. deflection down | 12° |
| Mass balance degree | 100% |
| Mass balance method | Internal weight |
| Construction | Metal. Fabric covered |



**Horizontal tail**

| | |
|---|---|
| Span | 2,44 m |
| Area of elevator and fixed tail (S′) | 1,73 m² |
| Area of elevator | All moving tail |
| Mass balance degree | 100% |
| Mass balance method | Distributed |
| Elevator trimming method | Tab |
| Construction | Metal. Fabrik covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,27 m² |
| Area of rudder | 0,54 m² |
| Aspect ratio | 2,07 |
| Aerofoil section | NACA 0009 |
| Construction | Metal. Metal covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,81 m |
| Max. height (at cockpit) | 1,22 m |
| Overall length | 8,15 m |
| Max. cross section | 0,81 m² |
| Number seats/arrangement | 2 |
| Undercarriage type | Fixed unsprung wheel and skid. Wheel brake |
| Construction | Metal monocoque. Side opening blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Conventional upper and lower surface spoilers with gap |
| Span (total) | 2 × 1,39 m |
| Area | 2 × 0,225 m² |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 168 kg |
| Equipped weight | 318 kg |
| Flying weight | 490 kg |
| Wing loading | 29,3 kg/m² |

**Straight flight performance**

Calculated at flying weight of 477 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 74 | 0,63 |
| Max. L/D condition | 90 | 0,72 |
| Max. L/D | 35 | |

**Design standards**

Airworthiness requirements to which aircraft has been built: CAR 05

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 133 | 5,80 |
| Point B | 264 | 5,80 |
| Point C | 152 | —3,80 |
| Point D | 264 | —3,80 |
| Factor of safety | | 1,5 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 252 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Fully aerobatic |
| Spinning permitted? | Yes |

# ROSS R-6

A high performance two-seater of metal construction.

Hochleistungs-Doppelsitzer in Metallkonstruktion.

Biplace de haute performance en métal.


| | |
|---|---|
| Type designation | Ross R-6 |
| Country of design | USA |
| Designer | Harland Ross |
| Date of first flight of prototype | June 1956 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 16,77 m |
| Area (s) | 11,61 m² |
| Aspect ratio ($b^2/s$) | 24,2 |
| Wing root chord ($C_r$) | 1,08 m |
| Wing tip chord ($C_t$) | 0,304 m |
| Mean chord ($C = s/b$) | 0,692 m |
| Wing section, root | NACA $63_2$-615 |
| Wing section, mid | NACA $63_2$-615 |
| Wing section, tip | NACA $63_2$-615 |
| Dihedral | 2,5° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | —4° |
| Taper ratio ($C_t/C_r$) | 0,282 |
| Construction | Two spar metal construction. Ribs 0,36 m spacing. Metal covered |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 5,48 m |
| Area (total) | 0,71 m² |
| Mean chord | 0,13 m |
| Max. deflection up | 25° |
| Max. deflection down | 12° |
| Mass balance degree | Nil |
| Construction | Metal. Rib spacing 0,36 m. Metal covered |

**Horizontal tail**

| | |
|---|---|
| Span | 2,59 m |
| Area of elevator and fixed tail (S') | 1,35 m² |
| Area of elevator | 0,675 m² |
| Max. deflection up | 20° |
| Max. deflection down | 25° |
| Aerofoil section | NACA 0009 (mod.) |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,57 m |
| Elevator trimming method | Spring trim and centering |
| Horizontal tail volume coefficient (S'1'/SC) | 0,60 |
| Construction | Metal. Rib spacing 0,36 m |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,22 m² |
| Area of rudder | 0,76 m² |
| Aspect ratio | 2,3 |
| Tail arm | 3,57 m |
| Max. deflection | ± 25° |
| Aerofoil section | NACA 0009 (mod.) |
| Aerodynamic balance | Nil |
| Construction | Metal. Rib spacing 0,36 m |

**Fuselage**

| | |
|---|---|
| Max. width | 0,69 m |
| Max. height (at cockpit) | 1,17 m |
| Overall length | 7,32 m |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Jettisonable unsprung wheel. No brakes. Rubber mounted skid |
| Construction | Metal monocoque fibre glass nose cap. Blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 3,04 m |
| Area | 2,00 m² |
| Location, % of chord | 50 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | Singleseater | Twoseater |
|---|---|---|
| Wings (with struts, controls, flaps and brakes) | 173 kg | 173 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 107 kg | 111 kg |
| Tailplane and elevator | 9 kg | 9 kg |
| Empty weight (including any fixed ballast) | 299 kg | 293 kg |
| Instruments | 11 kg | 11 kg |
| Other equipment (e.g. oxygen, radio) | 77 kg | 77 kg |
| Equipped weight | 387 kg | 381 kg |
| Flying weight | 478 kg | 556 kg |
| Wing loading | 36,1 kg/m² | 43,5 kg/m² |

**Straight flight performance**

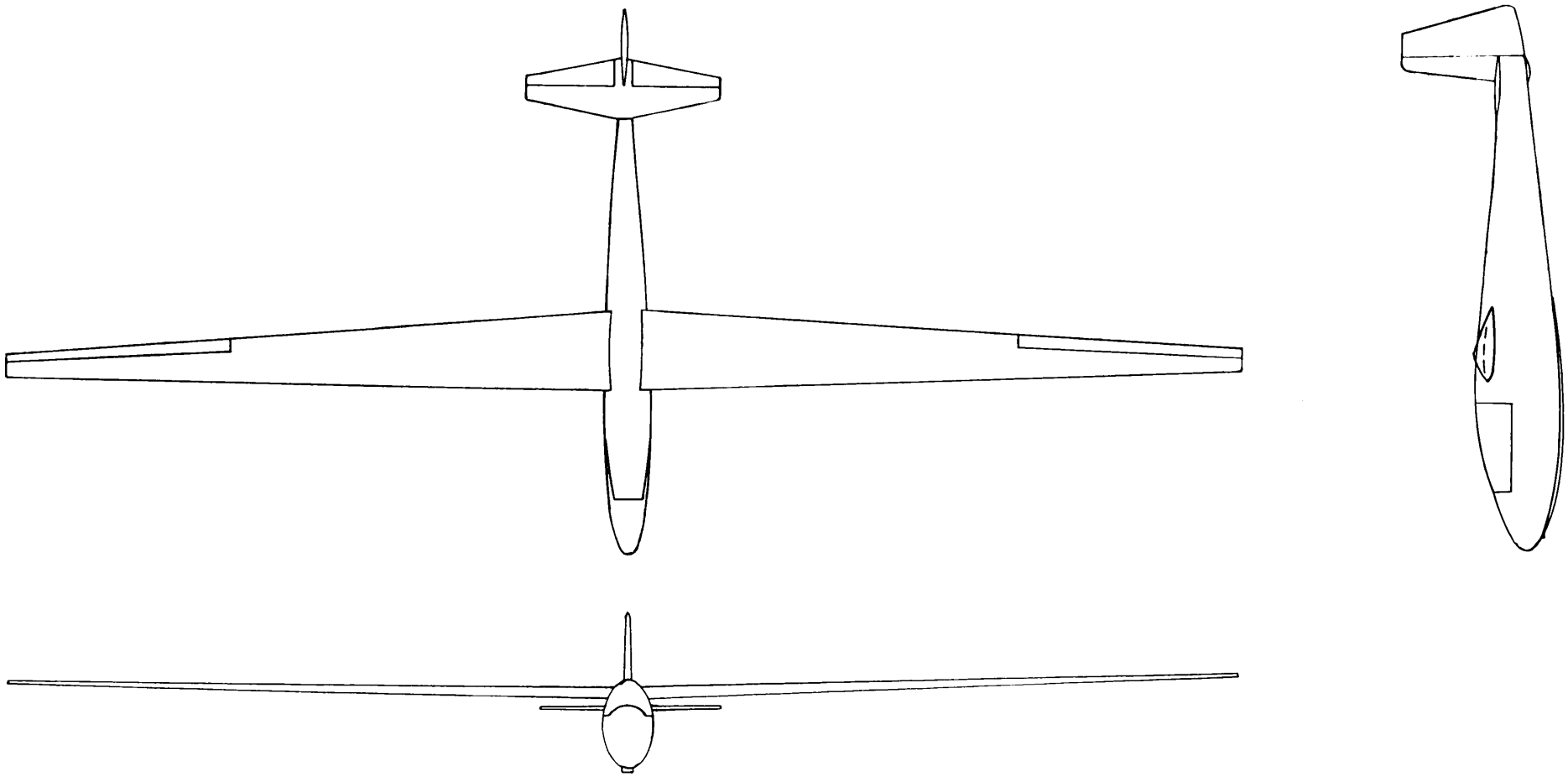
Calculated at flying weight of 410 kg

**No flap or brake**

| V km/h | v sink m/s |
|---|---|
| Min. sink condition | 95 | 0,686 |
| Max. L/D condition | 107 | 0,744 |
| | 143 | 1,616 |
| | 167 | 2,591 |
| | 191 | 3,872 |
| Stalling speed | 87 km/h | |
| Flap deflection | 0° | |
| Max. L/D | 40 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | CAR Part 3 |



| | | | |
|---|---|---|---|
| Date of issue of these requirements . . . | 1956 | Point C . . . . . | 272 —4,6 |
| Certificate of airworthiness . . . . . | Experimental | Point D . . . . . | 181 —9,1 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A . . . . . | 171 | 4,4 |
| Point B . . . . . | 272 | 4,4 |
| Point C . . . . . | 272 | —1,7 |
| Point D . . . . . | 181 | —2,6 |
| Factor of safety . . . . . | | 1,5 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A . . . . . | 181 | 9,1 |
| Point B . . . . . | 272 | 6,0 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions . . . | 245 km/h |
| Placard airspeed gusty conditions . . . . | 181 km/h |
| Aero-towing speed . . . . . | 181 km/h |
| Winch launching speed . . . . . | 167 km/h |
| Cloud flying permitted? . . . . . | Yes |
| Spinning permitted? . . . . . | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) . . . | 25–35 |

# U.S.S.R.

# A-11

This is an all-metal single seater, except for fabric-covered rear part of wing and fabric-covered control surfaces.

Ganzmetall-Einsitzer, mit Ausnahme des mit Tuch bespannten hinteren Teils des Flügels und der Leitwerkoberflächen.

Monoplace entièrement en métal, à l'exception de la partie arrière de l'aile et de la surperficie des empennages entoilés.

| | |
|---|---|
| Type designation | A-11 |
| Country of design | USSR |
| Designers | Oleg Antonov, Konstantinovitch |
| Date of first flight of prototype | May 12, 1958 |
| Number produced | 150 |

**Wings**

| | |
|---|---|
| Span (b) | 16,5 m |
| Area (s) | 12,15 m² |
| Aspect ratio ($b^2/s$) | 22,4 |
| Wing root chord ($C_r$) | 1,2 m |
| Wing tip chord ($C_t$) | 0,29 m |
| Mean chord ($C = s/b$) | 0,737 m |
| Wing section, root | P 111 A |
| Wing section, mid | P 111 A |
| Wing section, tip | P 111 A |
| Dihedral | 1,5° |
| ¼ chord sweep | 0° |
| Areo. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,242 |
| Construction | Single spar (root). Two spar (tip). Metal cantilever with sheet metal leading edge. 65% fabric covering. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Slotted with setback hinge |
| Span (total) | 2 × 3,6 m |
| Area (total) | 2 × 0,51 m² |
| Mean chord | 0,158 m |
| Max. deflection up | 25° |
| Max. deflection down | 18° |
| Mass balance degree | 100% |
| Mass balance method | Single external weight |
| Construction | Metal. Fabric covered. Can be drooped 8° as flaps |

**Horizontal tail**

| | |
|---|---|
| Span | Vee-tail 3,68 m |
| Area of elevator and fixed tail (S') | 2,28 m² |
| Area of elevator | 2 × 0,568 m² |
| Max. deflection up | ± 18° as elevator |
| Max. deflection down | ± 20° as rudder |
| Aerofoil section | NACA 0010/0008 |
| Mass balance degree | 100% |
| Mass balance method | External bob weight |
| Tail arm (from ¼ [1'] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,2 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S'1'/SC) | 0,715 |
| Construction | Metal. Rib spacing 0,2 m |

**Vertical tail**

Vee-tail 45°

**Fuselage**

| | |
|---|---|
| Max. width | 0,58 m |
| Max. height (at cockpit) | 1,2 m |
| Overall length | 6,0 m |
| Max. cross section | 0,475 m² |
| Wetted surface area | 10,9 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Retractable wheel. Sprung. No brake. Rubber mounted skid |
| Construction | Metal monocoque. Detachable blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Slotted flap |
| Span (total) | 2 × 4 m |
| Area (total) | 2 × 1,28 m² |
| Max. deflection down | 30° |

**Drag producing devices**

| | |
|---|---|
| Type | Upper surface spoilers without gap |
| Span (total) | 2 × 1,2 m |
| Area | 2 × 0,125 m² |
| Location, % of chord | 30 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

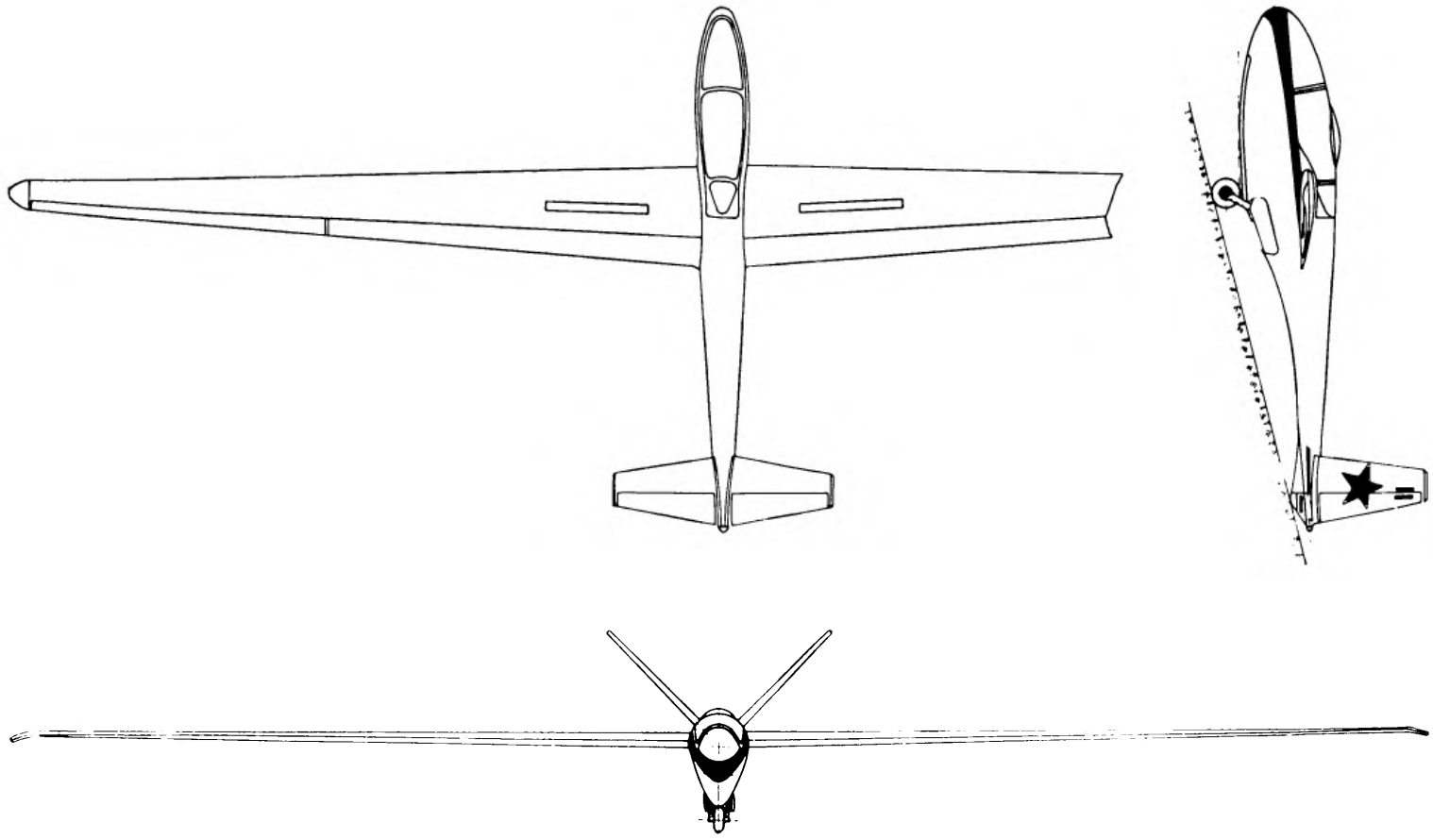
| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 160 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 120 kg |
| Tailplane and elevator | 14 kg |
| Empty weight (including any fixed ballast) | 294 kg |
| Instruments | 6 kg |
| Other equipment (e.g. oxygen, radio) | 10 kg |
| Equipped weight | 310 kg |
| Flying weight | 400 kg |
| Wing loading | 33 kg/m² |

**Straight flight performance**

| | |
|---|---|
| Flying weight | 400 kg |

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 86 | 0,74 |
| Max. L/D condition | 97 | 0,82 |
| | 129 | 1,33 |
| | 150 | 1,80 |
| | 172 | 2,64 |
| Stalling speed | 60 km/h | |
| Flap deflection | 30° | |
| Max. L/D | 32 | |



**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Airworthiness requirements of USSR, Sailplane Section |
| Date of issue of these requirements | 1956 |
| Certificate of airworthiness | 2 June, 1958 |

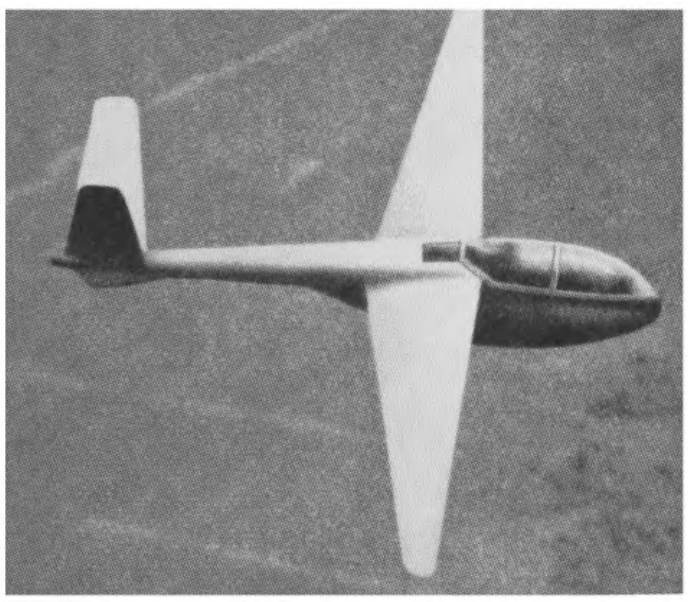
**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 183 | 8,66 |
| Point B | 300 | 8,66 |
| Point C | 300 | —3,9 |
| Point D | 123 | —3,9 |
| Factor of safety | | 1,5 |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 250 | 30 |
| Point B | 300 | 19 |
| Point C | 300 | —9,5 |
| Point D | 160 | —30 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 350 km/h |
| Aero-towing speed | 200 km/h |
| Winch launching speed | 120 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Aerobatic |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 21 to 28 |



# A-13

An aerobatic single seater built of light alloy with partial fabric covering.

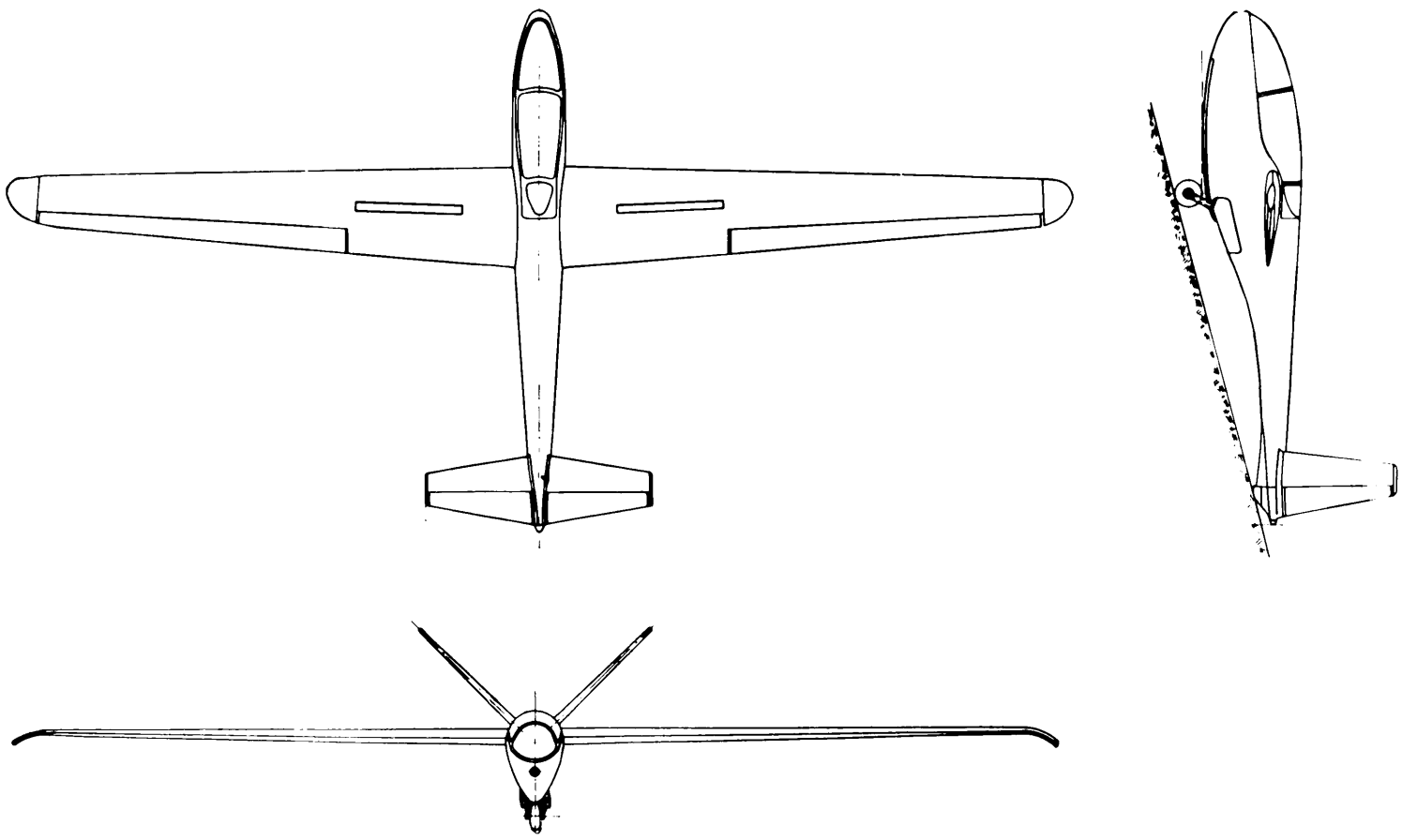
Kunstflugtauglicher Einsitzer aus leichter Legierung, teilweise tuchbespannt.

Monoplace apte au vol de virtuosité en alliage léger, partiellement entoilé.

| | |
|---|---|
| Type designation | A-13 |
| Country of design | USSR |
| Designers | Oleg Antonov, Konstantinovitch |
| Date of first flight of prototype | May 5, 1958 |
| Number produced | 200 |

**Wings**

| | |
|---|---|
| Span (b) | 12,1 m |
| Area (s) | 10,44 m² |
| Aspect ratio ($b^2/s$) | 13,8 |
| Wing root chord ($C_r$) | 1,2 m |
| Wing tip chord ($C_t$) | 0,524 m |
| Mean chord ($C = s/b$) | 0,87 m |
| Wing section, root | P-32-15 |
| Wing section, tip | P-32-15 |
| Dihedral | 0° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,436 |
| Construction | Single spar (root). Two spar (tip). Metal cantilever with sheet metal leading edge. 65% fabric covering. Ribs spaced 0,3 m |



**Ailerons**

| | |
|---|---|
| Type | Setback hinge |
| Span (total) | 2 × 3,15 m |
| Area (total) | 2 × 0,82 m² |
| Mean chord | 0,208 m |
| Max. deflection up | 25° |
| Max. deflection down | 25° |
| Mass balance degree | 100% |
| Mass balance method | Single external weight |
| Construction | Metal. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | Vee-tail 3,68 m |
| Area of elevator and fixed tail (S′) | 2,28 m² |
| Area of elevator | 2 × 0,568 m² |
| Max. deflection up | ± 18° as elevator |
| Max. deflection down | ± 20° as rudder |
| Aerofoil section | NACA 0010/0008 |
| Mass balance degree | 100% |
| Mass balance method | External bob weight |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 3,2 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S′1′/SC) | 0,773 |
| Construction | Metal. Rib spacing 0,2 m |

**Vertical tail**

Vee-tail 45°

**Fuselage**

| | |
|---|---|
| Max. width | 0,58 m |
| Max. height (at cockpit) | 1,2 m |
| Overall length | 6,0 m |
| Max. cross section | 0,475 m² |
| Wetted surface area | 10,9 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Retractable sprung wheel. Rubber mounted skid |
| Construction | Metal monocoque. Detachable blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper surface spoilers without gap |
| Span (total) | 2 × 1,2 m |
| Area | 2 × 0,125 m² |
| Location, % of chord | 30 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 120 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 120 kg |
| Tailplane and elevator | 14 kg |
| Empty weight (including any fixed ballast) | 254 kg |
| Instruments | 6 kg |
| Other equipment (e.g. oxygen, radio) | 10 kg |
| Equipped weight | 270 kg |
| Flying weight | 360 kg |
| Wing loading | 34,5 kg/m² |

**Straight flight performance**

| | |
|---|---|
| Flying weight | 360 kg |

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 97 | 1,14 |
| Max. L/D condition | 112 | 1,25 |
| | 145 | 1,88 |
| | 170 | 2,70 |
| | 194 | 4,25 |
| Stalling speed | 70 km/h | |
| Max. L/D | 25 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Airworthiness requirements of USSR, Sailplane Section |
| Date of issue of these requirements | 1956 |
| Certificate of airworthiness | 2 June, 1958 |

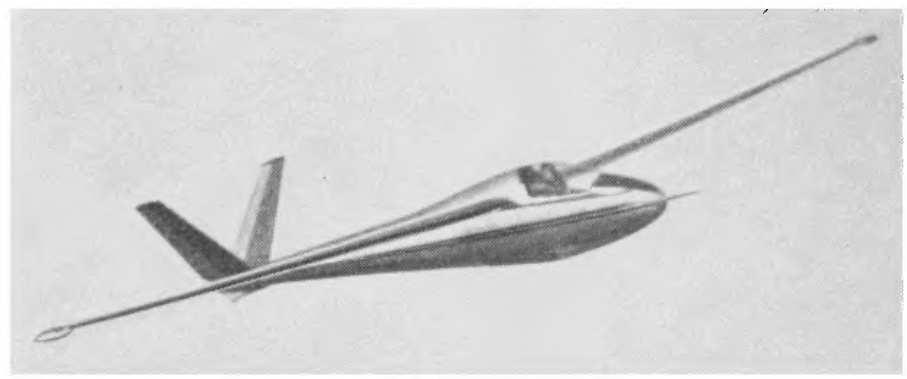
**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 183 | 8,66 |
| Point B | 300 | 8,66 |
| Point C | 300 | —3,9 |
| Point D | 123 | —3,9 |
| Factor of safety | 1,5 | |
| *Gust loads* | V km/h | Gust vel. m/s |
| Point A | 250 | 30 |
| Point B | 300 | 19 |
| Point C | 300 | —9,5 |
| Point D | 160 | —30 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 350 km/h |
| Placard airspeed gusty conditions | 350 km/h |
| Aero-towing speed | 200 km/h |
| Winch launching speed | 120 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has Sbeen shown or is intended (% m.a.c.) | 21 to 28 |

# A-15



The latest Russian single seater, a refined development of earlier types, keeping the butterfly tail and metal construction. The shape is more refined than earlier types and all the wing, fuselage and control surface covering is of light alloy.

Letzter russischer Einsitzer, eine raffinierte Weiterentwicklung früherer Typen, bei welcher das V-Leitwerk und die Metallkonstruktion beibehalten wurde. Die Formen sind gegenüber den früheren Ausführungen verfeinert; die Oberflächen von Flügeln, Rumpf und Leitwerk sind mit leichter Legierung bedeckt.

Dernier monoplace russe, un développement raffiné des constructions antérieures dont on a gardé l'empennage en V et la construction en métal. Les formes ont été améliorées; la superficie des ailes, du fuselage et de l'empennage est couverte d'un alliage léger.

| | |
|---|---|
| Type designation | A-15 |
| Country of design | USSR |
| Designers | Oleg Antonov, Konstantinovitch |
| Date of first flight of prototype | March 26, 1960 |
| Number produced | 5 |

**Wings**

| | |
|---|---|
| Span (b) | 17,0 m |
| Area (s) | 12 m² |
| Aspect ratio ($b^2/s$) | 24 |
| Wing root chord ($C_r$) | 1,07 m |
| Wing tip chord ($C_t$) | 0,34 m |
| Mean chord ($C = s/b$) | 0,707 m |
| Wing section, root | NACA $64_3$-618 |
| Wing section, tip | NACA $63_3$-616 |
| Dihedral | 1,5 ° |
| ¼ chord sweep | +2° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,318 |
| Construction | Single spar metal cantilever. Metal covered. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Plain. Lower surface hinge |
| Span (total) | 2 × 4 m |
| Area (total) | 2 × 0,55 m² |
| Mean chord | 0,137 m |
| Max. deflection up | 24° |
| Max. deflection down | 15° |
| Mass balance degree | 0 (hydraulic damper fitted) |
| Construction | Metal structure and covering. Can be drooped 8½° as flaps |

**Horizontal tail**

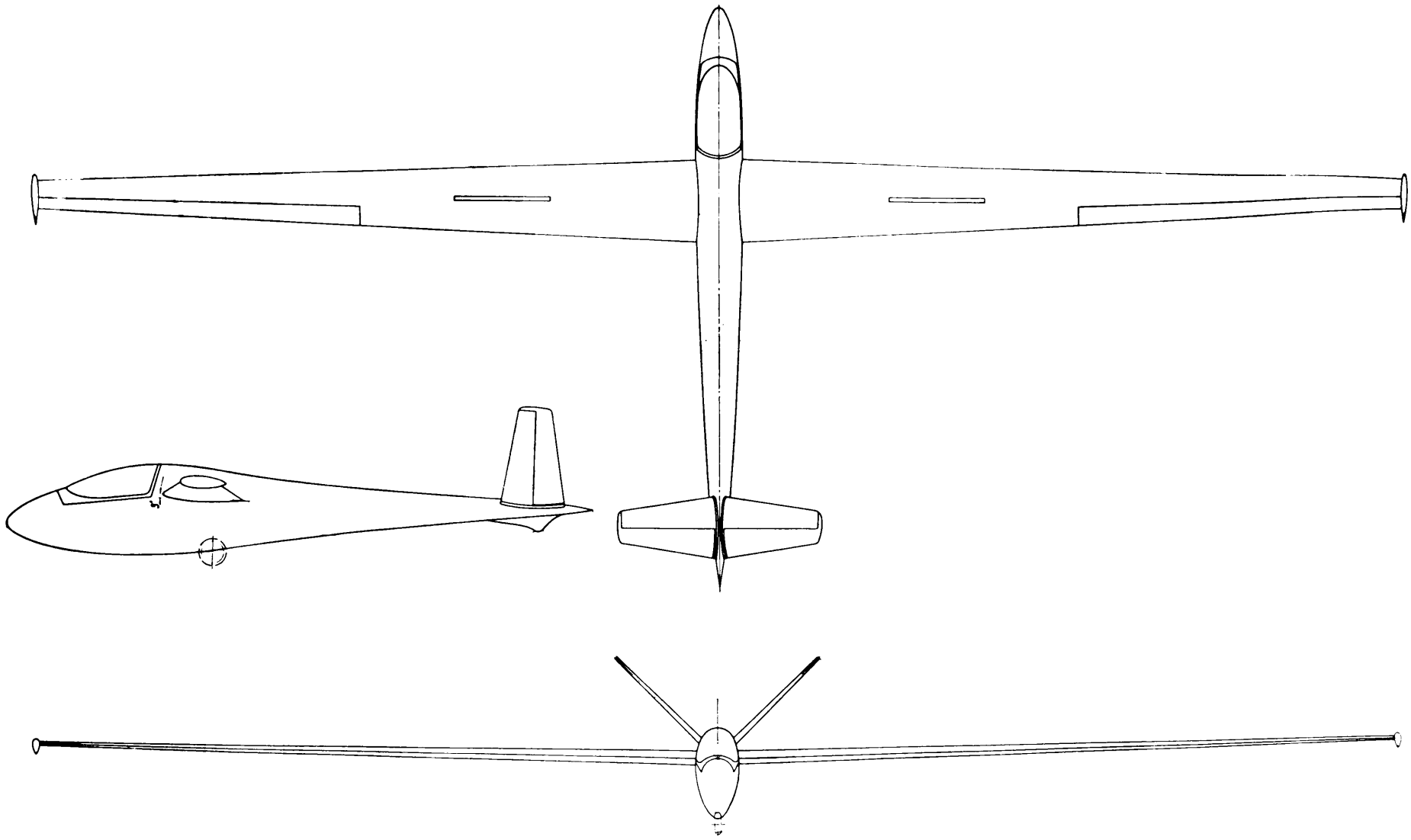
| | |
|---|---|
| Span | Vee-tail 3,68 m |
| Area of elevator and fixed tail (S′) | 2,27 m² |
| Area of elevator | 2 × 0,495 m² |
| Max. deflection up | ± 20° as elevator |
| Max. deflection down | ± 18° as rudder |
| Aerofoil section | NACA 0010/0008 |
| Mass balance degree | 100% |
| Mass balance method | External bob weight |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,08 m |
| Elevator aerodynamic balance method | Nil |
| Elevator trimming method | Nil |
| Horizontal tail volume coefficient (S′1′/SC) | 1,0 |
| Construction | Metal structure and covering |

**Vertical tail**

Vee-tail 45°

**Fuselage**

| | |
|---|---|
| Max. width | 0,58 m |
| Max. height (at cockpit) | 1,15 m |
| Overall length | 7,2 m |
| Max. cross section | 0,49 m² |
| Wetted surface area | 11,8 m² |
| Number of seats and arrangement | 1 |
| Undercarriage type | Retractable sprung wheel. No brake |
| Construction | Metal monocoque. Side opening blown perspex canopy |



**Lift increasing devices**

| | |
|---|---|
| Type | Fowler flap |
| Span (total) | 2 × 4,5 m |
| Area (total) | 2 × 1,3 m² |
| Max. deflection down | 18° |

**Drag producing devices**

| | |
|---|---|
| Type | Upper surface spoilers without gap |
| Span (total) | 2 × 0,9 m |
| Area | 2 × 0,075 m² |
| Location, % of chord | 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | No |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 160 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 100 kg |
| Tailplane and elevator | 13 kg |
| Empty weight (including any fixed ballast) | 273 kg |
| Instruments | 10 kg |
| Other equipment (e.g. oxygen, radio) | 17 kg |
| Equipped weight | 300 kg |
| Flying weight | 380 kg |
| Wing loading | 31,6 kg/m² |

**Straight flight performance**

Flying weight . . . . . 380 kg

**No flap or brake**

| V km/h | v sink m/s |
|---|---|
| 90 | 0,60 |
| 100 | 0,64 |
| 135 | 1,20 |
| 157 | 1,80 |
| 180 | 2,50 |

| | |
|---|---|
| Stalling speed | 55 km/h |
| Flap deflection | 18° |
| Max. L/D | 40 |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | Airworthiness requirements of USSR, Sailplane Section |
| Date of issue of these requirements | 1959 |
| Certificate of airworthiness | 27 April, 1960 |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 183 | 7,5 |
| Point B | 250 | 7,5 |
| Point C | 250 | —3,0 |
| Point D | 134 | —3,0 |
| Factor of safety | 1,5 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point A | 183 | 30 |
| Point B | 250 | 15 |
| Point C | 250 | —6 |
| Point D | 134 | —30 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 250 km/h |
| Placard airspeed gusty conditions | 250 km/h |
| Aero-towing speed | 140 km/h |
| Winch launching speed | 120 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Yes |
| Spinning permitted? | Yes |

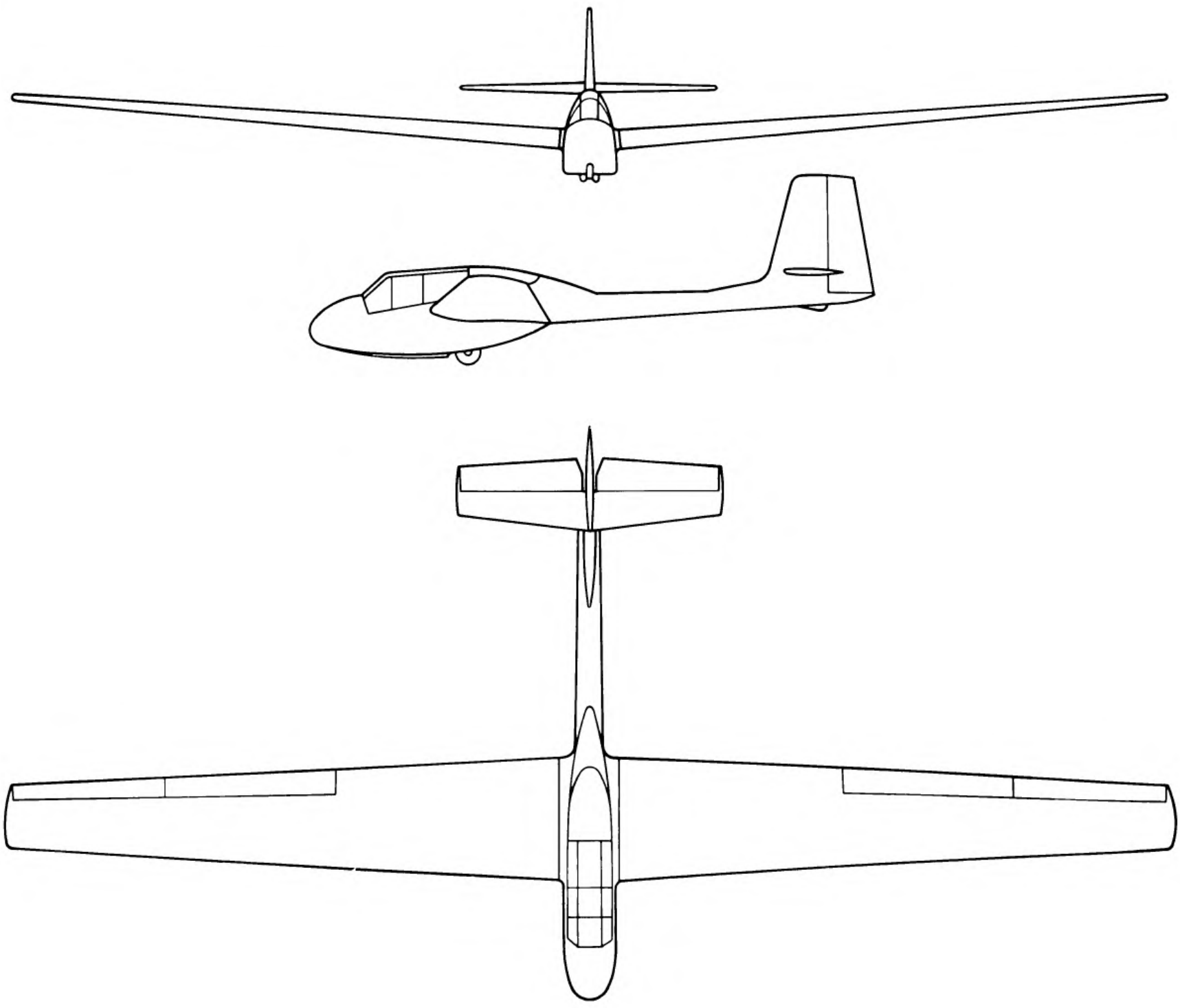
# YUGOSLAVIA

# BC-8 KOBAC

This is a training two-seater for rough fields and it has a dual wheel with shock-absorber. The fuselage is in two parts: the front part is a steel tube truss, the rear portion being a light metal stressed skin riveted monocoque. Fin and rudder are of light alloy. The wing and horizontal tail are of wood. There is a very good view from both sides of the cockpit.

Schulungsdoppelsitzer für schwieriges Gelände mit gefedertem Doppelrad. Rumpf zweiteilig: Vorderteil Stahlrohrfachwerk, Hinterteil tragende Schale aus Leichtmetall genietet. Seitenleitwerk: Leichtmetall. Tragfläche und Höhenleitwerk: Holzbauweise. Ausgezeichnete Sicht aus beiden Sitzen.

Biplace d'entraînement pour des terrains difficiles, avec une roue double élastique. Fuselage en deux parties: Partie avant en tubes d'acier, partie arrière monocoque, en métaux légers rivetés. Gouvernail de direction en métaux légers, ailes et gouvernail de profondeur en bois. Très bonne vue depuis les deux places.



| | |
|---|---|
| Type designation | BC-6 Kobac |
| Country of design | Yugoslavia |
| Designer | B. Cijan |
| Date of lst flight of prototype | 18 March, 1953 |
| Number produced | 2 |

**Wings**

| | |
|---|---|
| Span (b) | 16,00 m |
| Area (s) | 20,50 m² |
| Aspect ratio ($b^2/s$) | 12,50 |
| Wing root chord ($C_r$) | 1,74 m |
| Wing tip chord ($C_t$) | 0,825 m |
| Mean chord ($C = s/b$) | 1,28 m |
| Wing section, root | NACA 4415 |
| Wing section, tip | USA 35 B mod. |
| Dihedral | 4° |
| ¼ chord sweep | 1° 43′ |
| Aero. twist root/tip | 2° 38′ |
| Taper ratio ($C_t/C_r$) | 0,483 |
| Construction | Single spar cantilever wooden structure. Leading edge torsion box. 35% fabric covered. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Inner, plain<br>Outer, slotted |
| Span (total) | 8,98 m |
| Area (total) | 1,796 m² |
| Mean chord | 0,20 m |
| Max. deflection up | 25° |
| Max. deflection down | 15° |
| Mass balance degree | 80% |
| Mass balance method | Distributed weight |
| Construction | Wooden framework fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,714 m |
| Area of elevator and fixed tail (S′) | 2,96 m² |
| Area of elevator | 1,106 m² |
| Max. deflection up | 25° |
| Max. deflection down | 22° |
| Aerofoil section | NACA 0012 |
| Mass balance degree | 100% |
| Mass balance method | Bob weight in fuselage |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,84 m |
| Elevator aerodynamic balance method | Unshielded horn |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,547 |
| Construction | Wood. Fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,85 m² |
| Area of rudder | 0,736 m² |
| Tail arm | 4,84 m |
| Max. deflection | 30° |
| Aerofoil section | NACA 0012 |
| Construction | Metal. Fabric covered |

**Fuselage**

| | |
|---|---|
| Max. width | 0,70 m |
| Overall length | 7,675 m |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed sprung wheel. No brakes. Rubber mounted skid. |
| Construction | Front part steel tube fabric covered. Rear metal monocoque. Side opening blown perspex canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2,35 m |
| Area | 0,36 m² |
| Location, % of chord | 33 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S.?. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 150 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 139 kg |
| Tailplane and elevator | 19 kg |
| Empty weight (including any fixed ballast) | 308 kg |
| Equipped weight | 308 kg |
| Flying weight | 498 kg |
| Wing loading | 24,3 kg/m² |

**Straight flight performance**

Calculated at flying weight of 500 kg

| **No flap or brake** | V km/h | v/m sec |
|---|---|---|
| Min. sink condition | 75 | 0,91 |
| Max. L/D condition | 82 | 0,96 |
| | 112 | 1,56 |
| | 131 | 2,15 |
| Stalling speed | 54 km/h | |
| Max. L/D | 24 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS |
| Date of issue of these requirements | 1939 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 120 | 5,0 |
| Point B | 210 | 5,0 |
| Point C | 225 | 0 |
| Point D | 172 | −2,75 |
| Factor of safety | 2,0 | |

| *Gust loads* | V km/h | Gust vel. m/s |
|---|---|---|
| Point B | 140 | ±10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 200 km/h |
| Placard airspeed gusty conditions | 140 km/h |
| Aero-towning speed | 190 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Foremost and aftmost c.g. positions for which compliance with regulations has been shown or is intended (% m.a.c.) | 26–38,5 |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 220 km/h |

# KOŠAVA*

| | |
|---|---|
| Type designation | Košava |
| Country of design | Yugoslavia |
| Designers | Miloš Ilic, Adrian Kisovec |
| Date of first flight of prototype | 1953 |
| Number produced | 2 |

**Wings**

| | |
|---|---|
| Span (b) | 19,12 m |
| Area (s) | 21,12 m² |
| Aspect ratio ($b^2/s$) | 17,3 |
| Wing root chord ($C_r$) | 1,8 m |
| Wing tip chord ($C_t$) | 0,415 m |
| Wing section, root | Gö 549 —M |
| Wing section, mid | Gö 549 |
| Wing section, tip | CAGI 731 —M |
| Dihedral | 7° |
| ¼ chord sweep | —4,57° |
| Aero. twist root/tip | —4° |
| Taper ratio ($C_t/C_r$) | 0,23 |

| | |
|---|---|
| Construction | Wooden single spar cantilever with ply leading edge torsion box |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge, outer aileron semifrise. Inner aileron plain. |
| Span (total) | 2 × 5,80 m |
| Area (total) | 2 × 1,13 m² |
| Max. deflection up | 28° |
| Max. deflection down | 16° |
| Mass balance degree | 100% on outer section |
| Mass balance method | Nose weight |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,60 m |
| Area of elevator and fixed tail (S′) | 2,50 m² |
| Area of elevator | 1,00 m² |
| Max. deflection up | 25° |
| Max. deflection down | 18° |
| Aerofoil section | NACA 0007 |
| Mass balance degree | 100% |
| Mass balance method | Balance weight |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,6 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′ 1′/SC) | 0,493 |
| Construction | Wood. Ply covered tailplane. Elevator metal spar and torsion box |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,80 m² |
| Area of rudder | 0,87 m² |
| Aspect ratio | 1,83 |
| Tail arm | 4,90 m |
| Max. deflection | ± 28° |
| Aerofoil section | NACA 0008 |
| Construction | Wood. Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,62 m |
| Max. height (at cockpit) | 1,15 m |
| Overall length | 8,33 m |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Skid with droppable wheels. |
| Construction | Ply monocoque |

**Lift increasing devices**

| | |
|---|---|
| Type | Plain flaps and droppable ailerons |
| Span (total) | 2×3,25 m |
| Area (total) | 2×1,05 m² |
| Max. deflection up | Root —9°, mid —9°, tip —9° |
| Max. deflection down | Root +30°, mid +15°, tip +10° |

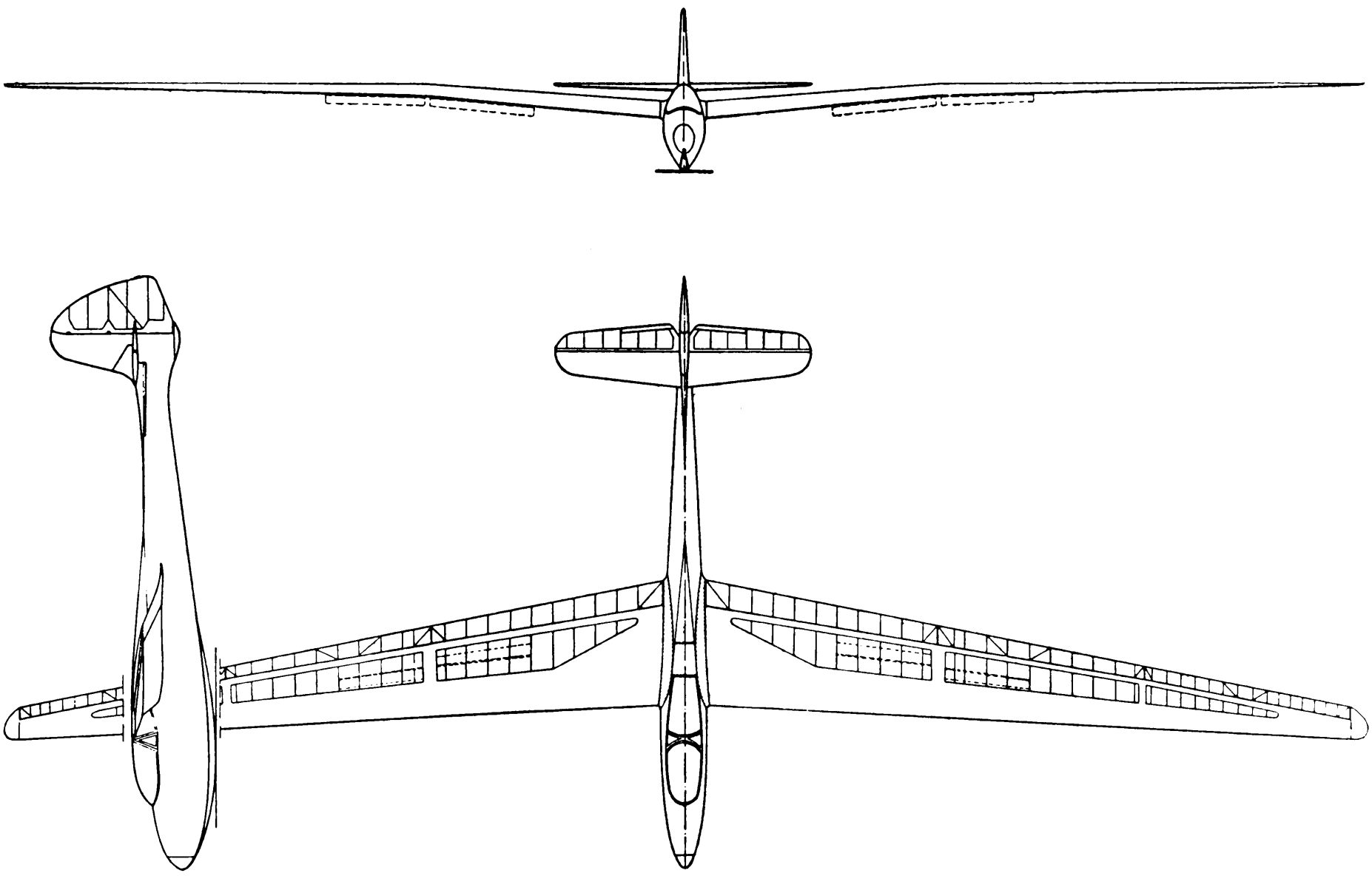
* Corrected and amplified data from "The World's Sailplanes" 1958
Korrigierte und ergänzte Angaben zu «Die Segelflugzeuge der Welt» 1958
Indications corrigées et élargies du livre «Les planeurs dans le monde» 1958

**Drag producing devices**

| | |
|---|---|
| Type | 1st a/c lower surface brakes. 2nd a/c Schempp-Hirth |
| Span (total) | 2 × 2,55 m 1st and 2nd a/c |
| Area | 2 × 0,49 m² 1st and 2nd a/c |
| Location, % of chord | 2nd a/c 45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 75 | 0,66 |
| Max. L/D condition | 87 | 0,72 |
| | with —6° flap and aileron | |
| | 120 | 1,2 |
| | 150 | 1,95 |
| Stalling speed | 62 km/h | 53 km/h |
| Flap deflection | —6° | 0° |
| Max. L/D | 33,5 | |



**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes) | 216 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 108 kg |
| Tailplane and elevator | 12 kg |
| Empty weight (including any fixed ballast) | 336 kg |
| Other equipment (e.g. oxygen, radio) | 36 kg |
| Equipped weight | 372 kg |
| Flying weight | 575 kg |
| Wing loading | 27,2 kg/m² |

**Straight flight performance**

Calculated

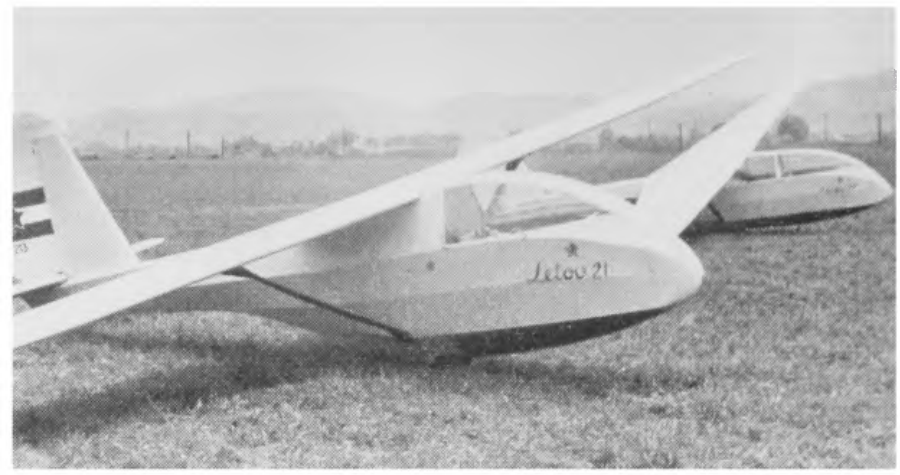
**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS |
| Date of issue of these requirements | 1939 |
| Certificate of airworthiness | Yes |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 220 km/h |
| Aero-towing speed | 130 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Spinning permitted? | Yes |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 230 km/h |

# LETOV 21



Letov 21 and 22 are mixed construction training gliders, the Letov 21 being a single-seater and the 22 a tandem two-seater.

Letov 21 und 22 sind Übungssegelflugzeuge in gemischter Bauweise, wobei der Letov 21 als Einsitzer, der Letov 22 als Zweisitzer mit Tandemanordnung gebaut wurde.

Les Letov 21 et 22 sont des planeurs d'écolage, de construction mixte, le 21 étant un monoplace et le 22 un biplace avec les sièges en tandem.

| | |
|---|---|
| Type designation | Letov 21 |
| Country of design | Yugoslavia |
| Designer | Adrian Kisovec |
| Date of first flight of prototype | May 1955 |
| Number produced | 1 |

**Wings**

| | |
|---|---|
| Span (b) | 15 m |
| Area (s) | 15 $m^2$ |
| Aspect ratio ($b^2/s$) | 15 |
| Wing root chord ($C_r$) | 1,18 m |
| Wing tip chord ($C_t$) | 0,50 m |
| Mean chord ($C = {}^s/_b$) | 1,00 |
| Wing section, root | Gö 549 |
| Wing section, mid | Gö 549 |
| Wing section, tip | Gö 693 |
| Dihedral | 0° |
| ¼ chord sweep | 0° |
| Aero. twist root/tip | 0° |
| Taper ratio ($C_t/C_r$) | 0,424 |
| | Wooden single spar strutted design with ply leading edge torsion box. 66% fabric covering. Ribs spaced 0,3 m |

**Ailerons**

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 2×3,60 m |
| Area (total) | 2×0,67 $m^2$ |
| Mean chord | 0,181 m |
| Max. deflection up | 25° |
| Max. deflection down | 13° |
| Mass balance degree | Nil |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,14 m |
| Area of elevator and fixed tail (S′) | 2,25 $m^2$ |
| Area of elevator | 0,90 $m^2$ |
| Max. deflection up | 25° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 0009 mod. |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,15 m |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,62 |
| Construction | Wood. Tailplane ply covered. Elevator fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,60 $m^2$ |
| Area of rudder | 0,90 $m^2$ |
| Aspect ratio | 1,40 |
| Tail arm | 3,75 m |
| Max. deflection | ± 30° |
| Aerofoil section | NACA 0009 mod. |
| Aerodynamic balance | Unshielded horn |
| Construction | Wood. Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,65 m |
| Max. height (at cockpit) | 1,25 m |
| Overall length | 6,91 m |
| Max. cross section | 0,60 $m^2$ |
| Number seats and arrangement | 1 |
| Undercarriage type | Fixed sprung wheel and rubber mounted skid. No brakes |
| Construction | Steel tube with wood stringers. Fabric covered. Aluminium nose cap. Side opening bent sheet plexiglass canopy |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 1,80 m |
| Area | 0,40 $m^2$ |
| Location, % of chord | 35/45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

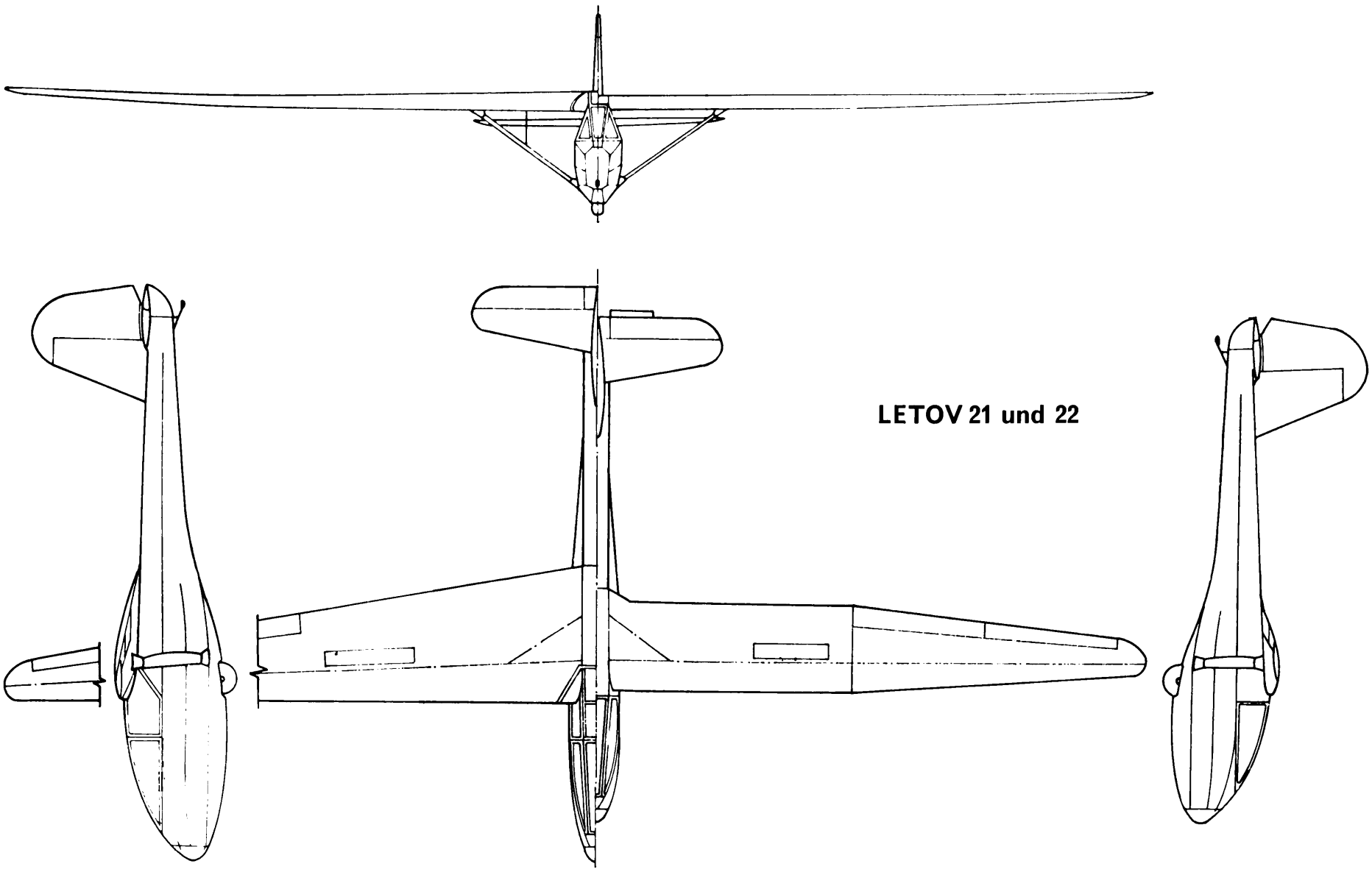
| | |
|---|---|
| Wings (with struts, controls, flaps and brakes | 133 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 112 kg |
| Tailplane and elevator | 14 kg |
| Empty weight (including any fixed ballast) | 259 kg |
| Flying weight | 350 kg |
| Wing loading | 23,3 kg/$m^2$ |

**Straight flight performance**

Calculated
at flying weight of . . . . . 350 kg

**No flape or brake**

| | Vkm/h | v sink m/s |
|---|---|---|
| Min. sink condition | 62 | 0,80 |
| Max. L/D condition | 71 | 0,86 |
| | 88 | 1,29 |
| | 94 | 1,50 |
| | 100 | 1,72 |



**LETOV 21 und 22**

| | |
|---|---|
| Stalling speed | 59 km/h |
| Flap deflection | 0° |
| Max. L/D | 23 |

# LETOV 22

### Design standards

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS (Olympic class) |
| Date of issue of these requirements | 1940 |
| Certificate of airworthiness | Yes |

### Design flight envelope

| | V km/h | Proof load factor |
|---|---|---|
| *Manoeuvre loads* | | |
| Point A | 61,5 | 5,0 |
| Point B | 77,0 | 5,0 |
| Point C | 250 | 1,0 |
| Point D | 110 | 2,75 |
| Factor of safety | | 2,0 |

| | V km/h | Gust velocity V m/s |
|---|---|---|
| *Gust loads* | | |
| Point B | 120 | +10 |
| Point C | 120 | —10 |

### Limiting flight conditions

| | |
|---|---|
| Placard airspeed smooth conditions | 250 km/h |
| Placard airspeed gusty conditions | 120 km/h |
| Aero-twing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Limited |
| Spinning permitted? | Yes |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 250 |

| | |
|---|---|
| Type designation | Letov 22 |
| Country of design | Yugoslavia |
| Designer | Adrian Kisovec |
| Date of first flight of prototype | May 1955 |
| Number produced | 1 |

### Wings

| | |
|---|---|
| Span (b) | 16,0 m |
| Area (s) | 18,75 m² |
| Aspect ratio ($b^2/s$) | 13,65 |
| Wing root chord ($C_r$) | 1,86 m |
| Wing tip chord ($C_t$) | 0,50 m |
| Mean chord ($C = {}^{s}/_{b}$) | 1,17 m |
| Wing section, root | Gö 549 |
| Wing section, mid | Gö 549 |
| Wing section, tip | Gö 693 |
| ¼ chord sweep | —2,5° |
| Aero. twist root/tip | —1° |
| Taper ratio ($C_t/C_r$) | 0,269 |
| Construction | Wooden single spar strutted design with ply leading edge torsion box. 66% fabric covered. Ribs spaced 0,3 m |

### Ailerons

| | |
|---|---|
| Type | Upper surface hinge |
| Span (total) | 2×3,60 m |
| Area (total) | 2×0,67 m² |
| Mean chord | 0,181 m |
| Max. deflection up | 25° |

| | |
|---|---|
| Max. deflection down | 13° |
| Mass balance degree | Nil |
| Construction | Wood. Fabric covered |

**Horizontal tail**

| | |
|---|---|
| Span | 3,14 m |
| Area of elevator and fixed tail (S′) | 2,25 m² |
| Area of elevator | 0,90 m² |
| Max. deflection up | 25° |
| Max. deflection down | 20° |
| Aerofoil section | NACA 0009 mod. |
| Mass balance degree | Nil |
| Tail arm (from ¼ [1′] chord m.a.c. wing to ¼ chord m.a.c. tail) | 4,65 |
| Elevator trimming method | Tab |
| Horizontal tail volume coefficient (S′1′/SC) | 0,472 |
| Construction | Wood. Tailplane ply covered. Elevator fabric covered |

**Vertical tail**

| | |
|---|---|
| Area of fin and rudder | 1,60 m² |
| Area of rudder | 0,90 m² |
| Aspect ratio | 1,40 |
| Tail arm | 4,20 m |
| Max. deflection | ±30° |
| Aerofoil section | NACA 0009 mod. |
| Aerodynamic balance | Unshielded horn |
| Construction | Wood. Ply covered fin. Fabric covered rudder |

**Fuselage**

| | |
|---|---|
| Max. width | 0,65 m |
| Max. height (at cockpit) | 1,25 m |
| Overall length | 7,83 m |
| Max. cross section | 0,60 m² |
| Number seats and arrangement | 2 tandem |
| Undercarriage type | Fixed sprung wheel and rubber mounted skid. No brakes |
| Construction | Steel tube with wood stringer false work. Aluminium nose canopy. Front canopy side opening. Aft canopy rear opening. Both of bent sheet plexiglass |

**Lift increasing devices**

| | |
|---|---|
| Type | Nil |

**Drag producing devices**

| | |
|---|---|
| Type | Upper and lower surface spoilers with gap |
| Span (total) | 2,4 m |
| Area | 0,50 m² |
| Location, % of chord | 35/45 |
| Is device intended to limit terminal velocity (vertical dive) to max. permissible I.A.S. | Yes |

**Weights**

| | |
|---|---|
| Wings (with struts, controls, flaps and brakes | 164 kg |
| Fuselage (with fin and rudder, less instruments and equipment) | 135 kg |
| Tailplane and elevator | 14 kg |


| | |
|---|---|
| Empty weight (including any fixed ballast) | 313 kg |
| Flying weight | 500 kg |
| Wing loading | 26,6 kg/m² |

**Straight flight performance**

Calculated
at flying weight of 500 kg

**No flap or brake**

| | V km/h | v sink m/s |
|---|---|---|
| Min. sink condition | 73 | 0,95 |
| Max. L/D condition | 80 | 1,00 |
| | 100 | 1,425 |
| | 107 | 1,66 |
| | 114 | 1,90 |
| Stalling speed | 67 km/h | |
| Flap deflection | 0° | |
| Max. L/D | 22 | |

**Design standards**

| | |
|---|---|
| Airworthiness requirements to which aircraft has been built | BVS (Olympic class) |
| Date of issue of these requirements | 1940 |
| Certificate of airworthiness | Yes |

**Design flight envelope**

| *Manoeuvre loads* | V km/h | Proof load factor |
|---|---|---|
| Point A | 65,5 | 5,0 |
| Point B | 76,0 | 5,0 |
| Point C | 250 | 1,0 |
| Point D | 117,5 | 2,75 |
| Factor of safety | | 2,0 |

| *Gust loads* | V km/h | Gust velocity V m/s |
|---|---|---|
| Point B | 120 | +10 |
| Point C | 120 | —10 |

**Limiting flight conditions**

| | |
|---|---|
| Placard airspeed smooth conditions | 250 km/h |
| Placard airspeed gusty conditions | 120 km/h |
| Aero-towing speed | 120 km/h |
| Winch launching speed | 90 km/h |
| Cloud flying permitted? | Yes |
| Permitted aerobatic manoeuvres | Limited |
| Spinning permitted? | Yes |
| Terminal velocity with brakes opened at max. all up weight from flight tests (if brakes are speed limiting) | 250 km/h |

# Index

*of Sailplanes described in this volume*