MANDATORY BULLETIN No. L 13/045

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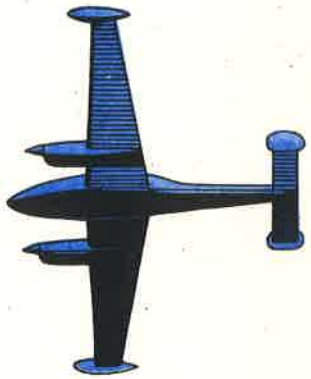

Effectivity: All models of the L 13 sailplane.

Reasons:
1. Revised service life of the L 13 and conditions of its applicability.
2. Conditions for future increase in service life. The L 13 sailplane service life in outlined in the L 13/042 Mandatory Bulletin, item C. This life is to be reassessed, based on initial materials and documents supplemented by service experience accumulated mainly outside this country and supported by latest technological achievements.

Description: The text of item C of the L 13/042 Mandatory Bulletin is superseded by this Mandatory Bulletin.

The L 13 service life is beingset to 3,750 flying hours under the average operating conditions as specified in detail below. The life period in years should be assessed according to technical and operating conditions of a sailplane. In addition, the methods for further increasing the sailplane service life are mentioned.

Latest date of incorporation: As per information contained in this Bulletin.

Incorporation and costs: The Bulletin to be accomplished by the Operator who will also cover any costs incurred.

Effective from: The date of delivery to Operator.

Čáslavský	Ing. Lukas
Manufacturer's Representative	Customer's Representative

1 July 1977

Ing. Olšan	Houdek
State Aviation Inspection	Omnipol

1. The service life of L 13 sailplane was specified on the basis of:

- average operating conditions assessment,
- measurement and evaluation of loading spectra,
- selection of R. A. E. fatigue curve,
- evaluation of laboratory fatigue testing of the wing structure and L 13 fuselage section.

The "Average operating conditions" were assessed using the data from the sailplane utilization in aeroclubs within Czechoslovakia, with the following results:

- ratio of winch take-offs to towed take-offs is 5
- there are 4.83 take-offs per one flying hour in total, out of that:

  4.02 winch take-offs
  0.81 towed take-offs

- 40% of operating hours are devoted to elementary training, 60% to advanced training and high-performance flying
- wing flaps are up during winch take-offs
- tractive force on rope during winch take-off is T = 4,000 N
- mean terrain altitude is 350 m.

The following variable loads wers evaluated during the process of service life specification:

- loads on ground
- ground-air-ground cycle during towed flight with subsequent circling. Initial state - taxying with a load factor n = 1.5 g downwards with no lift; final state - speed of 110 km/hr, flaps down 10^{0}, 30^{0} banked turn when dual, 55^{0} banked turn when solo.
- ground-air-ground cycle at winch take-off
- gust loads
- circling
- stall, side-slip, spin and sharp turn training
- aerobatics
- circuit flying
- thermal soaring
- return towing

The total time was divided by per cent to various flights according to available statistics and estimated operating data of aeroclubs in Czechoslovakia. Further division of individual flights was by per cent of dual or solo as well as per cent of winch to towed take-offs.

Loading spectra were partially taken from literature, partially based on measurements, carried out during the operational season of various aeroclubs within this country. The following is a list of the used spectra of varying loads:

- within the bottom section of the ground-air-ground cycle a substitute factor of n = 1.5 applied along gravity direction. This load factor resulted from a load factor spectra during taxying, according to Godeon: "Vertical acceleration of a sailplane at landing and taxying", Technika Lotnicza, No. 6, 1958.
- towing cable traction force for the ground-air-ground cycle as well as a stress within the critical flange area were obtained through a measurement of 50 take-offs;
- relative frequency of gusts taken from Data Sheets, Fatigue, R. A. S., 1959 and the absolute frequency was taken from the same source, in addition to other literature. From a recording barometer analysis a gust frequency of about 3.5 that of commercial airliners was estimated;
- circling - a period of introduction into circling as well as the bank angle were estimated from a barograph recordings;
- training of stalls, side-slips, spins and sharp turns: it was estimated that these flight regimes constitute approximately 8.4 per cent out of a total sailplane operating period. The load factor spectra were based on spectra designed for the training aircraft, both measured and estimated;
- aerobatics: 2 per cent of the total operating time was spared for aerobatics, while for the active aerobatics it was 0.26 per cent out of the total time. Due to lack of other appropriate data a manoeuvre spectrum of piston-engine aerobatic aircraft was used.

The overwhelming part of the fatigue damage in operation is due to gust loading (incorporated in all flight regimes), followed by winch take-offs, training and aerobatics.

Additionally, fatigue testing was carried out on assemblies of a wing spar flange section, incorporating a mount and a steel mounting bracket on fuselage, where the failure critical areas were found during the fatigue testing of total wing and fuselage assembly. With regard to the test results of these specimens and due to their scatter, the original service life set to L_B = 3,000 hours may be increased to L_B = 3,750 flying hours considering both the operating conditions and loading spectra mentioned above.

2. Conditions for eventual further increase in L 13 fleet service life

The L 13 service life can further be increased subject to more favourable ratio of dual to solo flights, reduction of the number of winch take-offs per one flying hour, and discontinuance of aerobatics, stall, side-slip, spin and sharp turn training.

For the purpose of a more precise determination of service life and its eventual increase the following statistical data concerning the average operating conditions of individual operators are required by the manufacturer:

1) Number of towed take-offs per one flying hour with a percentage division to dual and solo.

2) Number of winch take-offs per one flying hours with a percentage division to dual and solo, in each case, percentage of take-offs with flaps up and flaps down to 10° must be given.

3) Percentage division of flying time:

   a) standard flight regimes which include circling, thermal soaring, cross-country flights, standard training attitudes, return towing, divided by per cent to dual and solo

   b) stall, side-slip, spin and sharp turn training, divided by per cent to dual and solo.

4) Average flight time.

5) Loading spectra (if available).

Based on the above items 1) through 4), subject to approval by an Aviation Authority of the operator's country, the L 13 sailplane service life can be determined more precisely for the average conditions of a complete L 13 fleet in the appropriate country, provided that loading spectra from the original calculation are used.

The most reliable assessment of the safe fatigue life can be made on the basis of loading spectra supplied by the individual operators. It is, therefore, recommended to install a fatigue recorder (G-meter) approximately in the sailplane centre of gravity in order to record crossing of levels of individual load factors during a period of 300 flying hours minimum. It is, however, necessary to ensure that:

- the utilization of a sailplane provided with the G-meter represent average operation;
- the period of loading spectrum measurement given to the manufacturer represent the actual period of G-meter utilization;
- the G-meter be switched on after take-off and switched off before landing to exclude recording of load factors during ground movement which are of a different nature compared with those in flight.

On the basis of these measurements further increase in L 13 sailplane service life can be expected. It is supposed, however, that the increased service life set by the manufacturer will be applicable on the following conditions:

- maintaining the approved operating schedule by the operator;
- inspection of critical area on bottom wing spar flange extending to the length of 500 mm from the suspension axis; inspection of bottom flange in the centre section of wing all over its length. The flanges are to be inspected for fatigue cracks from the inner side, through holes in the wing end rib and in the centre-section spar web, at intervals of 300 to 500 hours starting from 3,000 flying hours.
- eventual meeting of the operator's country experts with Czechoslovak experts as well as inspection of sailplanes with the highest number of accumulated flying hours, which would be organized and carried out by the operator under an Aviation Authority representative attendance of the particular country.