THE GLIDING FEDERATION OF AUSTRALIA

BUILDING 130, WIRRAWAY ROAD, ESSENDON AIRPORT, VICTORIA 3041.

AIRWORTHINESS ADVICE NOTICE
GLIDER/POWERED SAILPLANE

TYPES AFFECTED: All gliders/powered sailplanes equipped with launching hooks.

SUBJECT: The likelihood of winch or aerotow cables catching on tailskids and other protrudances.

BACKGROUND: In 1982 we had a Boomerang destroyed because it picked up a second winch wire at the start of a wire launch, the wire being caught by the tail skid. Attached is a report from the Netherlands Department of Civil Aviation which examines the potential for tailwheels and skids to catch tow cables.

COMMENT: (1) The existence on a glider of a protrudance which can collect and hang onto a cable can stem from:-

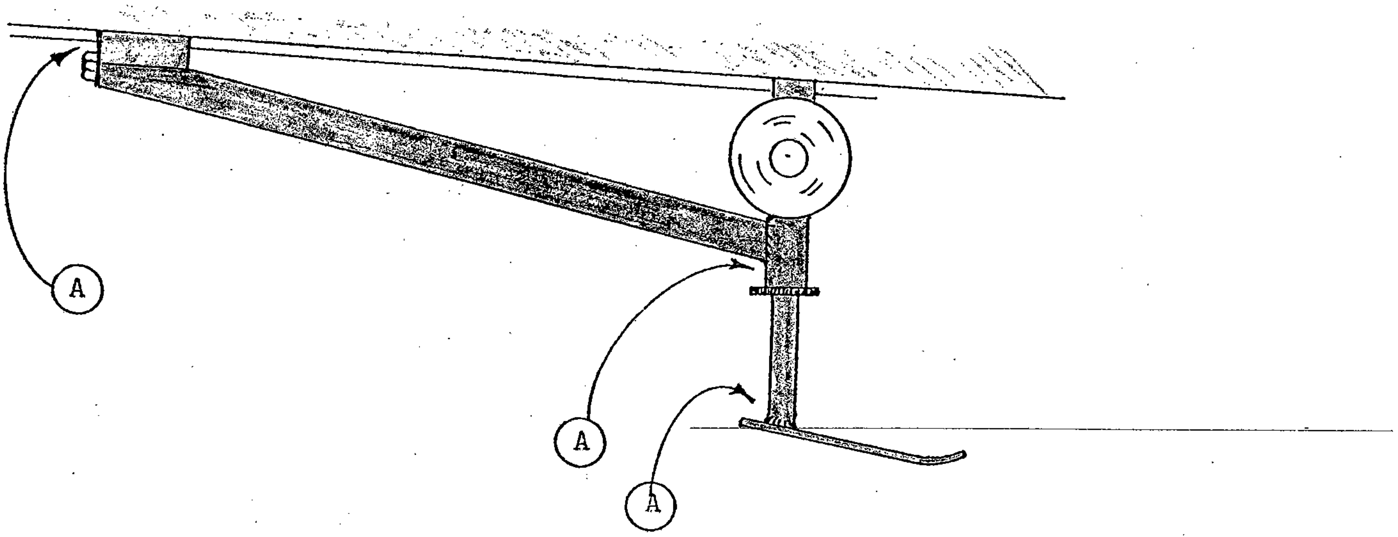
(a) Bad detail design by the manufacturer.

(b) Normal wear and tear which turns a non dangerous area into a problem area.

(c) Modifications which are incorporated without due regard for operational problems.

The following example shows how a simple modification can end up becoming a real threat to flight safety:

The sketch below shows a modification of a Blanik tail wheel assembly, carried out after the standard swivelling wheel became unserviceable.



The modification kept the sailplane operating, and was probably nearly as good as the original installation, but it introduced three points of concern.
The points marked "A" presented themselves as slots that could trap a tow line in the event of a winch launch malfunction.

The prospect of having a DEPLOYED drogue'chute trailing along behind the sailplane following a broken wire half way through a winch launch should have been obvious to everyone concerned with the operation.

WE ALL LOOK.........FEW OF US SEE.

COMMENT: (contd)

(2) Tow cables can become caught around protrudances in a number of ways.

(a) Running over another cable during takeoff. (Dual winch drum operations).

(b) Failure of the tow cable under tow and the sailplane end of the cable becoming caught.

(c) Over-running a tow cable during take off and being launched with the cable caught on a protrudance, (not towing through the release assy.)

RECOMMENDED ACTION:

(1) DAILY INSPECTION

Condition of tail skid/wheel is part of a Daily Inspector's responsibility.

(2) ANNUAL INSPECTION

C. of A. inspectors must check condition of tail skids/wheels damage, wear, etc, and be alert for unauthorised mods or repairs that have created a potential hazard.

(3) OPERATIONS

(a) Proper separation of multiple winch cables to handle crosswinds and pilot error.

(b) Adequate signalling between launch point and winch to stop a launch if an over-run has occurred.

CONCLUSION:

The subject is one that must be continually highlighted in our day to day operations, to avoid hurting ourselves or our sailplanes.

NOTE: REPORT No. NLR TR 82073L forms pages 5 to 12 of this AN.

M.P. BURNS
CHIEF TECHNICAL OFFICER AIRWORTHINES
GLIDING FEDERATION OF AUSTRALIA

INVESTIGATION INTO THE POSSIBILITY OF ACCIDENTS WITH SAILPLANES CATCHING WINCH LAUNCH CABLES

by

D.J. Spiekhout and P.de Rijk

SUMMARY

An investigation was made into the possibilities of catching a launch cable by the tailskid construction of sailplanes. Attention has been given to the design and the influence effects of wear and maintenance of tail skids.

It was found that the chances of catching a second launch cable are present for different designs. Also the construction type widely used for modern sailplanes made of composites may give problems.

The airworthiness requirements already cover these problems.

This investigation has been carried out under contract with the Netherlands Department of Civil Aviation (RLD), (RB.RLD-1982:7)

Division: Structures and Materials
Prepared: DJS, PdR/
Approved: JBdJ/

Completed : 27-7-1982
Ordernumber: 106.230
Typ. : EP

CONTENTS

5 REFERENCES

1. Joint Airworthiness Requirements JAR-22.
Sailplanes and Powered Sailplanes 1-4-80, first change 18-5-1981.

2. OSTIV Airworthiness Requirements for Sailplanes.
September 1976.

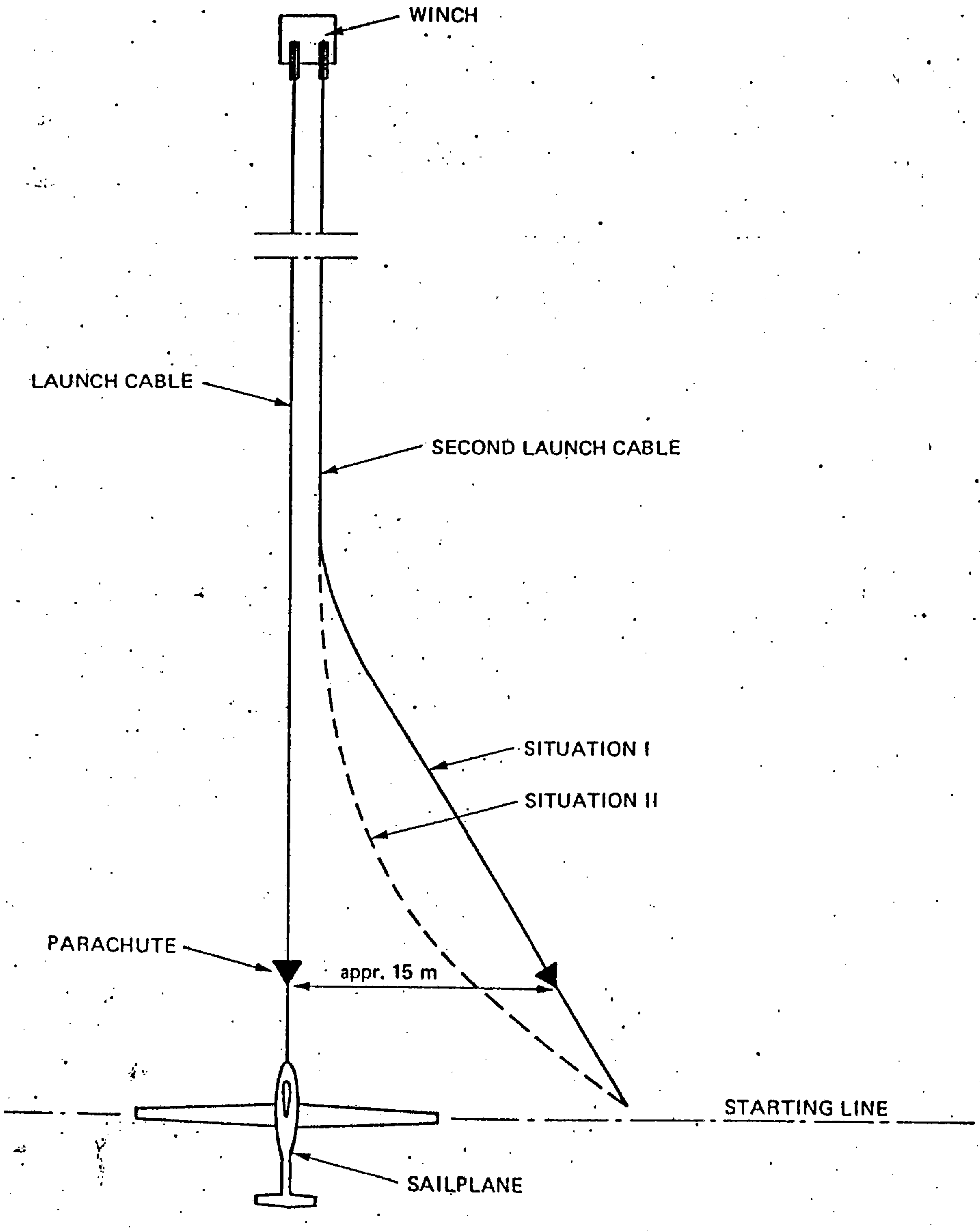


Fig. 1 Location of launch cables during a winch start

1 INTRODUCTION

In recent years a number of accidents have taken place with sailplanes catching another winch launch cable during the take off roll. In the Netherlands two cases have been reported in the last two years (Rhönlerche, Pirate).

At a recent meeting of the Sailplane Development Panel of OSTIV in May 1982 this problem has been discussed. Cases in the United Kingdom, Germany and Australia were mentioned. The impression in Australia was that the number of cases did increase due to the fact that more winch launchings have been made in order to fight the rising gasoline costs of aerotowing.

The accident occurs when two (or more) cables are laid along eachother from the winch to the take off position of the sailplane, see figure 1. In normal sailplane operation the second launch cable will be pulled aside. Care should be taken that the distance between both cables has been increased sufficiently.

At the location of the starting line one can think of about 15 metres. In the direction to the winch the distance between the two cables should not decrease too rapidly as is indicated in figure 1 (situation II). This may easily occur if the grass is very long or the field is very rough.

It has to be mentioned here that already winches with four or more cables are used. In that case the cable used for the starting sailplane will be pulled aside.

If the discipline at the field is good an acceptable and normally safe location of both cables can be ensured.

However, in the case of a long take off roll as a result of for example: low windspeed, heavy sailplanes (twoseaters) or pilot error, it is still possible that the sailplane rides over the second cable.

If pilot error is mentioned there are two possibilities. First the pilot waits too long before he allows the sailplane to go airborne and second in the case of crosswind the pilot steers too much into the winddirection.

As a result of the mentioned causes the sailplane may ride over the second cable and it is possible that this cable will be caught by the tail skid or tail wheel of the sailplane and the sailplane takes off with this second cable hanging from the tail resulting in a large nose up pitching moment.

It may be clear that this is an extremely dangerous situation.

In the present investigation different construction types of tail skids and tail wheels will be analysed in chapter 2. Influence of maintenance and wear of the construction will be discussed in chapter 3. The report ends with a few conclusions.

2 INVESTIGATION

An investigation has been carried out in order to get an impression of the different construction types of tail skids and tail wheels.
It was not intended to make a complete overview of all construction types present in the Netherlands. For this investigation visits were made to the local glider club in the North East Polder and to the glider centre Terlet near Arnhem.
In general there are two ways to gather the above mentioned information. First a study of construction drawings can be made. At Terlet this was tried but it turned out that very little information was available.
The second way is to have a look at different sailplanes. In this way a good impression could be obtained.
Four types of construction are distinguished:

- In figure 2 a kind of spoon is bolted to a package of metal spring blades. The other end of this package is bolted to the tail of the sailplane.
- In figure 3 a kind of spoon has been welded to a metallic tube. The other end of this tube is bolted to the tail of the aircraft. Shock absorbtion will be provided by a rubber block located between spoon and fuselage (see figure 4).
- In figure 5 a kind of construction type generally used for modern sailplanes made of composites is shown.
  A sketch of the construction is given in figure 6. Shock absorbtion is obtained by means of a synthetic rubber block.
  In order to protect this block against wear a metal plate has been screwed to a metal T plate which was moulded into the rubber block.
- In figure 7 the fourth construction type is presented. Different wheel sizes are in use.

At Terlet two modifications of the Cirrus tail skid were present, see figures 8 and 9.

The impression was given that sofar these construction types have only been used in experiments.
The one in figure 9 especially has been used for use on concrete runways.

3 DISCUSSION

The construction types described in the previous chapter will be discussed in more detail now. Special attention will be given to the influence of maintenance and wear of the construction on the possibility of catching a launch cable. It is possible that the tailskid does not catch the cable at once but first slides over it for some 10 or 20 metres if the angle between cable and X-axis of the sailplane is small. In this case the steel cable may act as a saw and make a "sawcut" in the construction of the tailskid.
In figure 10 a detail is presented of figure 3.
The chances of catching a cable are remote. However, sometimes a longer bolt end is used or a ring between skid and fuselage or the forward flat part of the tube is bent. In such cases it is possible to catch a cable
In the past protecting plates have been used at this location. Good maintenance may solve the problem.
This is also valid for the construction type of figure 2. At least one case in the Netherlands was experienced with this type.
As a result of wear the "spoon" became very thin. The cable was caught in the corner (in the horizontal plane) between springblade package and forward side of the "spoon".
Sofar for the older construction types. For the sailplanes made of composites a construction as presented in figure 5 is often used. Problems may occur if the synthetic rubber block has deformed or has partly worn away at the forward side. For example this may happen after usage of the aircraft on a rough field or a sandy field where the tailskid ploughs through the sand.
In figure 11 and 12 examples are given.
In these cases indeed deformation of the synthetic rubber block was experienced.
By regular inspection deformation of the synthetic block can be found. However, this inspection has to be done frequently because the problem may result from only a few flights.

It was found that the density of the synthetic rubber block is not the same for the different sailplane types.
A solution to the problem may be to increase the density and so the stiffness of the rubber block at least locally at the forward side. Further, care should be taken that the metal wear plate does not stick out in forward direction with respect to the lower side of the synthetic rubber block.
Figure 5 gives an example of such a case. A smaller plate would seem to be more safe.
With respect to the modified version of the Cirrus tailskid, presented in figure 9, it has to be said that also this design allows a cable to be caught. If the wheel is blocked by, for example, dirt a steel cable may "saw" into the wheel.
In general it is advisable for tail wheels that protective structure is present below the axis of the wheel, see figure 7.

From the discussion in this chapter it may be clear that more attention has to be given to the tail skid design and behaviour in practice.
It is interesting to mention that in the airworthiness requirements already rules are included to cover this problem. The appropriate parts of references 1 and 2 are reproduced in appendix A. With respect to the OSTIV-AR it has to be mentioned that at the last meeting of the Sailplane Development Panel it was agreed to focus the attention a little more on the tailskid design.

4 CONCLUSIONS

As a result of the design, usage, wear and maintenance more problems with sailplanes catching a second winch launch cable with the tailskid/wheel can be expected.

Attention should be given to the discipline on the field with respect to the proper distance between winch launch cables.

Attention of designers and maintenance people should be drawn to the problem.

With respect to the tailskid construction of modern sailplanes with a synthetic rubber block regular inspections have to be performed (especially after usage of the sailplane on a rough field).

APPENDIX A

From reference 1:

JAR 22.711 RELEASE MECHANISMS

(c) It must be extremely improbable for bolts or other projections on the release mechanism itself or the structure surrounding the mechanism, including the landing gear, to foul the towing cable or its parachute.

LANDING GEAR

JAR22.721 GENERAL

(c) The design of wheels, skids and tail skid and their installation must be such as to minimize the possibility of fouling by the towing cable.

From reference 2:

4.6 RELEASE MECHANISMS

4.61 INSTALLATION

4.611. It shall be impossible for bolts, or other projections on the release mechanism itself, or the structure surrounding the mechanism, including the landing gear, to foul the launching cable, towline, or towline parachute under any conditions. The forward end of the nose skid, in particular, shall be constructed so as to prohibit fouling of the towline and its parachute.

4.92 GROUND HANDLING

4.921. The design of the sailplane shall be such as to ensure its suitability for ground handling, and shall avoid any external fittings which might catch in towlines or cables, of receive damage in ground handling.

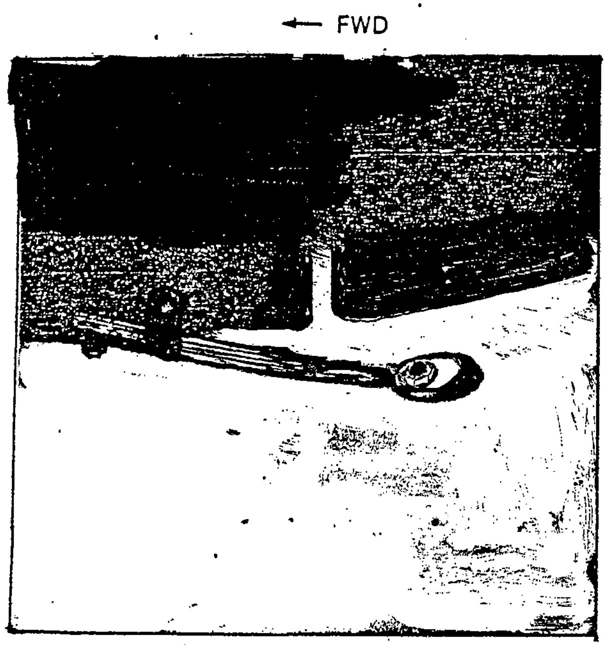


Fig. 2 Tail skid of Ka-6 CR

ALSO

Ka-6 E,
PREFECT
GRUNAU BABY

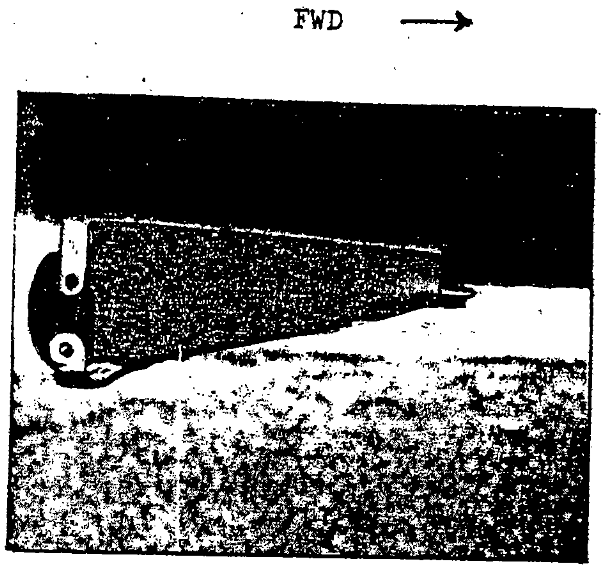


Fig. 4 Tail skid of Ka-8

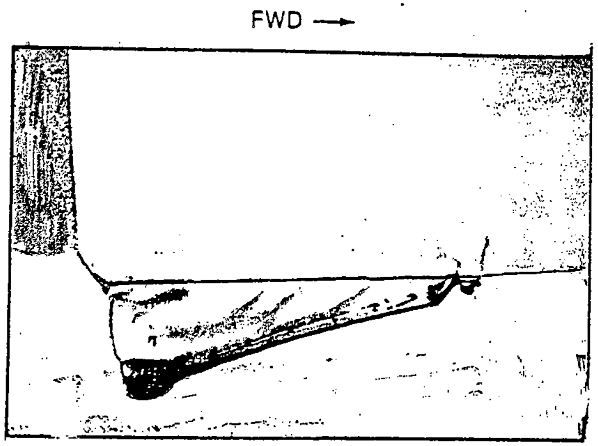


Fig. 3 Tail skid of Ka-8

ALSO

Ka-7,
ASK-13,
RHÖNLERCHE

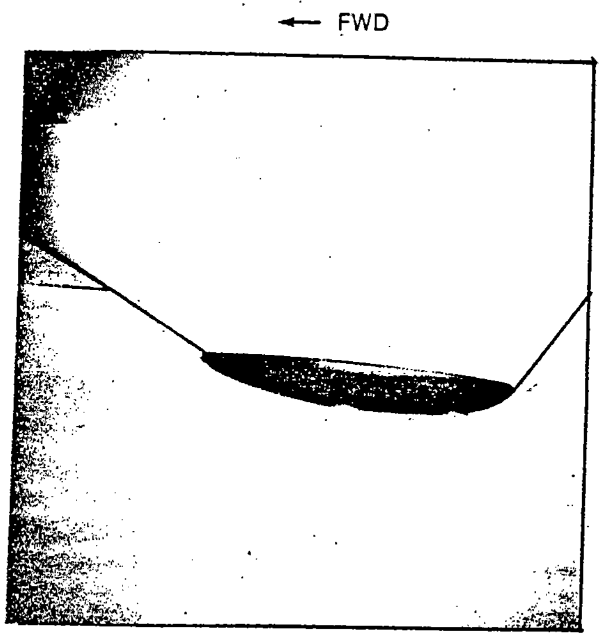


Fig. 5 Tail skid of ASW-20

ALSO

ASW-19
ASK-21

SIMILAR DESIGN FOR

CIRRUS
ASTIR STANDARD
ASTIR JEANS
ASTIR CS 77

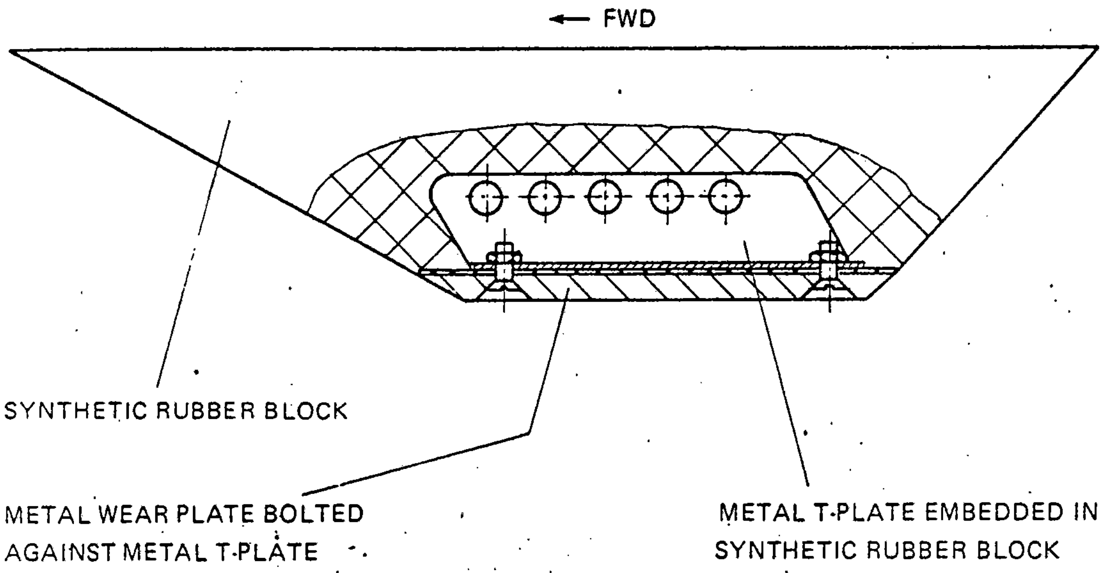


Fig. 6 Tail skid construction of Grob sailplanes (Astir)

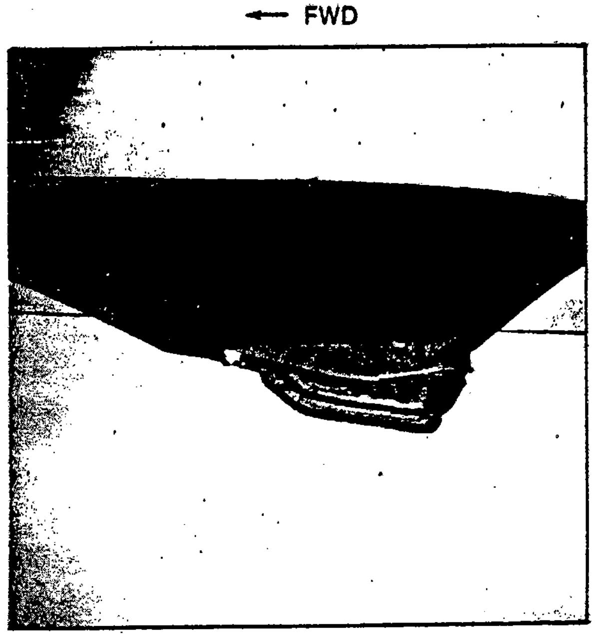


Fig. 8 Modification of Cirrus tail skid

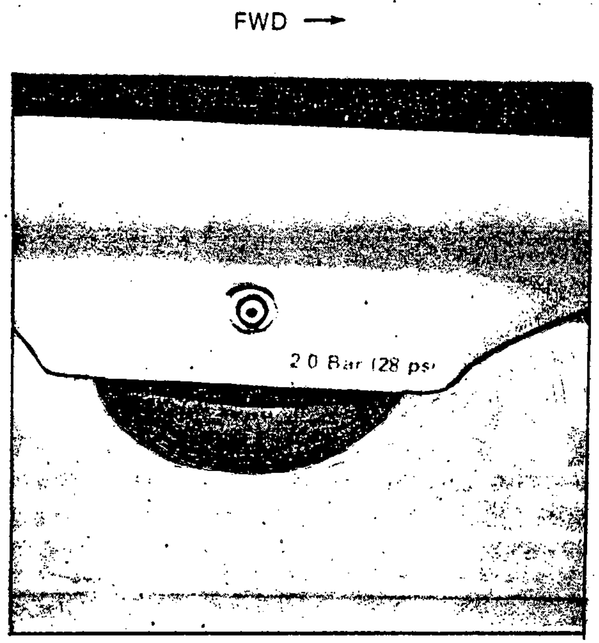


Fig. 7 Tail wheel of Pik 20

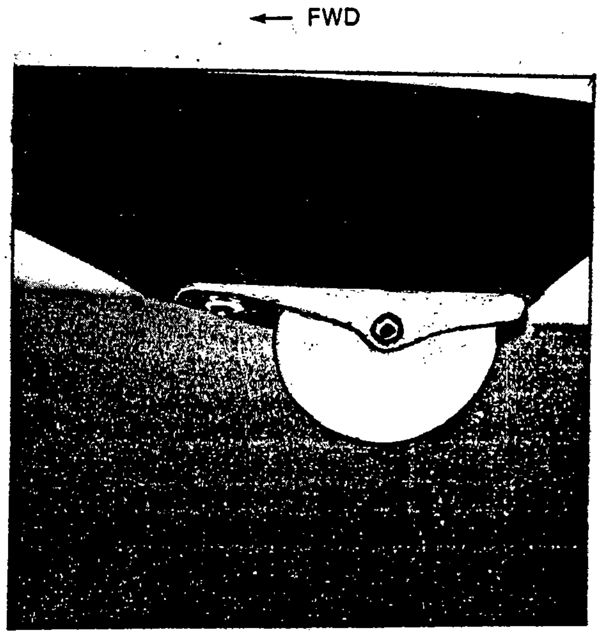


Fig. 9 Modification of Cirrus tail skid

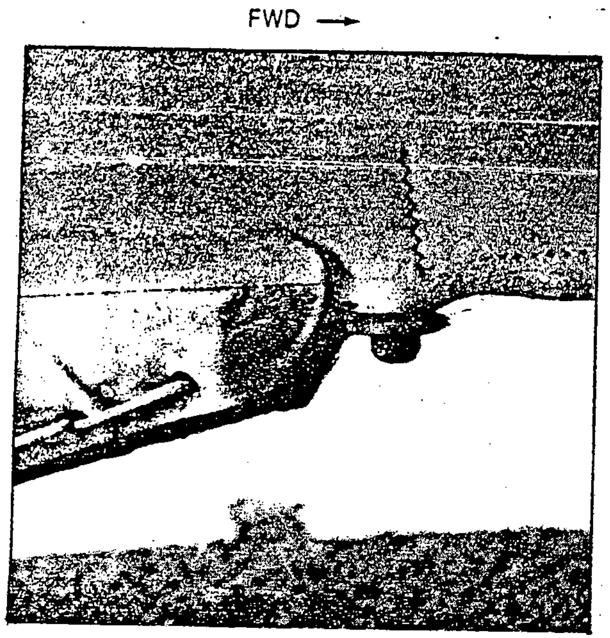


Fig. 10 Detail of tail skid of Ka-8

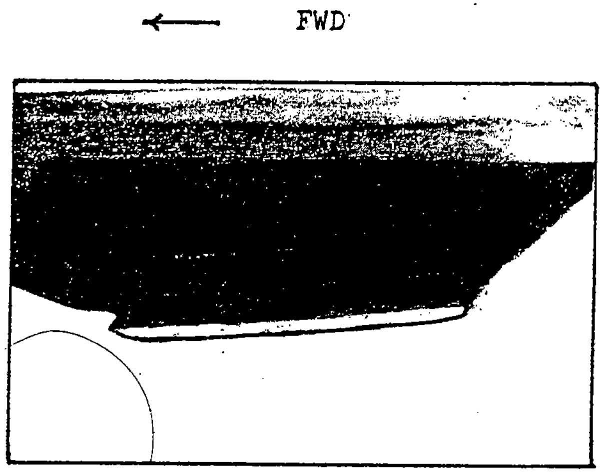


Fig. 11 Detail of tail skid of Astir

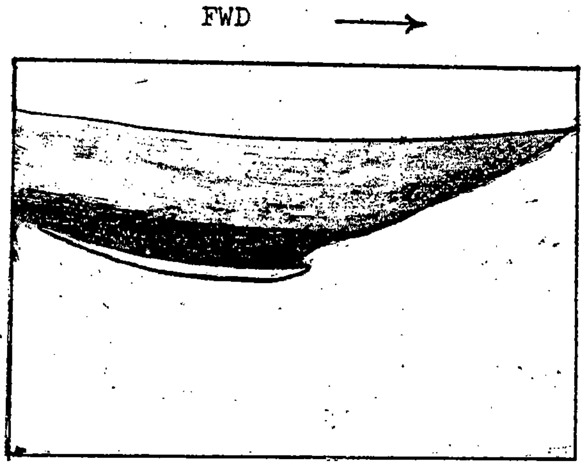


Fig. 12 Detail of tail skid of ASK-21