COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF TRANSPORT

AIR TRANSPORT GROUP

AIRWORTHINESS ADVISORY NOTICE GFA/AN23/GENERAL 2

Glider Types Affected: All Types

Subject: AIRWORTHINESS SAFETY
CABLE TENSION IN CONTROL SYSTEMS
UNSECURED BALLAST

This Advisory Notice should be brought to the notice of all Glider Pilots

CABLE TENSION IN CONTROL SYSTEMS.

A recent accident involving an ES -52 Mk3 Kookaburra highlights the necessity to continue teaching things which are generally regarded as common knowledge. Twenty years and more ago, people involved in gliding were verymuch aware of the necessity of maintaining correct cable tension in the control systems of their gliders, however, with the advent of push rod operated control systems much of this lore is becoming forgotten or neglected. The ES -52 Kookaburra has a control system typical of the old generation of gliders.

In an endeavour to reduce control forces in the aileron circuit the glider involved in the above accident had had all bearings in the system lubricated and to further minimize friction the control cable tension was slackened.

On aero-tow, following this action, aileron flutter occurred and on aborting the launch the aircraft stalled and spun.

The ES-52 has relatively large chord ailerons which are not mass balanced but years of operation has shown that with correctly tensioned control cables the aircraft is not prone to aileron flutter.

To understand the phenomena of flutter, it is necessary to understand the important terms used.

1. Circuit stiffness; this refers to the degree of flexibility of distortion under load of the control circuit. A high degree of circuit stiffness is indicated when only a small amount of movement of the control column is possible when the control surface is chocked, or alternatively only a small amount of movement of a control surface is possible with the control column locked.

   A low degree of circuit stiffness arises from deflection of mounting brackets and/or support structure, short lever arms, slack or worn bearings, stretch or springiness in control cables slack control cables and deflection in the control surface itself.

2. Circuit friction; this is a measure of the force necessary to achieve movement of the control circuit independent of air loads. Circuit friction arises from friction in bearings and fairleads and control surface hinges; it is affected by control cable tension, errors in circuit geometry and hinge line misalignment due to manufacturing error or deflection of the structure under load. Air loads can also increase friction.

   There are sometimes misunderstanding of these terms as a control circuit with high friction will be "stiff" to operate although the circuit may in fact have low "circuit stiffness".

Circuit friction:(continued)

On the other hand, many modern gliders with push rod operated controls and low friction bearings have high "circuit stiffness" but require very light operating forces due to low "circuit friction".

In general high circuit stiffness is always desirable; low circuit friction is desirable for handling qualities but for control surfaces which are not mass balanced may result in inadequate damping against flutter. It is, however, not desirable to rely on circuit friction to provide damping against flutter as factors such as wear, lubrication, etc. can vary the amount of friction present.

Aileron flutter arising from slack cables of an ES-52 Kookaburra is an alternating oscillation of the ailerons at a frequency of about 100 to 120 oscillations per minute depending on air speed. The disturbance of one aileron being transferred to the other aileron by the balance cable: cable slackness prevents damping of the oscillations with the control column. The flutter condition does not necessarily occur at high airspeed; experience indicates rather that the flutter in this case may be more usually damped by increasing the airspeed, however, this should not be looked on as a cure for flutter in general as for many forms of flutter increased airspeed aggravates the condition.

Known incidents involving aileron flutter of ES-52 Kookaburras have not caused serious control difficulties but produce an unpleasant sensation which would readily lead a pilot into error.

The above should emphasise the importance of maintaining correct control cable tension not only in ES-52 Kookaburras but in any glider having cable operated control surfaces. Proper adjustment of control cable tension being a factor effecting the airworthiness of a glider requires to be carried out by a person with the necessary knowledge and experience.

The above-mentioned accident also revealed deficiencies in the GFA Maintenance Notes for the ES-52 and a revision is being prepared.

UNSECURED BALLAST.

There is increasing evidence of an incidence of unsatisfactory methods of carrying ballast in gliders which could lead to dangerous conditions arising in flight. Due to the minimum pilot weight requirement of gliders many pilots require to carry ballast to meet this minimum weight at the pilots seat and this frequently is in the form of a sheet lead "cushion" shaped to fit the seat bucket and placed beneath the normal seat cushion.

Observation has shown that some pilots are using "lead cushions" placed in the seat bucket and relying only on the seat contour and the pilot's weight to secure the "lead cushion" ballast in place.

In turbulent conditions a pilot may frequently encounter negative"G" accelerations and under these conditions neither the pilot's weight nor the seat contour will ensure that the ballast cushion stays in place and the very real risk exists that the "lead cushion" will move to a position where it can obstruct the movement of the control column. For safety it is absolutely essential that seat cushion ballast be secured against inadvertant movement, (just as it is equally important that there be no other loose objects in the cockpit).

Unsecured Ballast (continued)

Ballast weight is subject to the same acceleration forces as every other item in the glider the securing means for the ballast must therefore be adequate to resist these forces. Ballast cushions must be secured, usually to the lap strap attachment points for the safety harness, and the securing straps must be adequate to restrain at least eight times the weight of the ballast cushion since if there is any slack in the straps they will not only be required to hold the ballast in place but to withstand the impact of stopping relative motion of the ballast arising from the slack.

It must be realised that ballast is essential to the airworthiness of a glider and it is just as important to have this ballast secured as it is to have the control surfaces connected. In daily inspections and preflight checks the condition of the ballast and it's security is of utmost importance. In addition to ballast cushions it is just as important that any other cushion used to adjust seating position are secured against movement where they could interfere with control movement.

Careless use of ballast could be dangerous, it is usually a result of thoughtlessness and this kind of thoughtlessness can be fatal.

Display a copy of this Notice on the Club Notice Board

Douglas Lyon

D.C.LYON.
CHIEF TECHNICAL OFFICER AIRWORTHINESS.

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