

Inspection of control cables in general aviation

Issued by the Air Accident Investigation Unit of Belgium, section of the FPS Mobility and Transport

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Addressee(s):

Aircraft mechanics
Aircraft owners performing maintenance tasks

Applicability:

All aircraft equipped with cables for the control of movable flight surfaces

Safety matter

Many aircraft maintenance programs do require a check of control cables but do not describe how to perform the task.

Further to the failure-up of a rudder control cable of an ultralight aeroplane (ULM) during take-off, this feedback has been issued to alert maintainers and operators of the risk of primary flight control cable failure and to ensure that all persons performing maintenance on aircraft are made aware of the need to adequately inspect all flight control cables.

Related incident

The left rudder control cable of the aeroplane failed completely at the point the cable ran over the first guide pulley (fig. 1).



Figure 1: failed left rudder control cable

The cable failed due to the cumulative effects of both fatigue cracking of the individual strand wires and chaffing wear. The cable suffered multiple wire failures on the inside bend of the cable, specifically where it contacts the pulley.

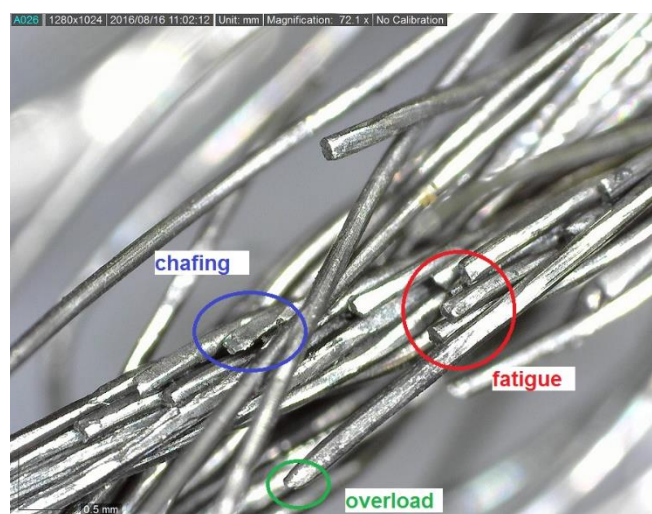


Figure 2: wire strand failure

The right rudder control cable did not fail but showed also the same phenomenon of individual failed strand wires and chaffing.



Figure 3: right rudder control cable



Figure 4: Individual wire strand failure



Figure 6: right rudder cable (with grease)

The inner surface of the left pulley groove showed damaged caused by chafing with the damaged cable.



Figure 5: pulley groove damage

Two small wire strand bits were found in the pulley groove.

Both cables were greased at the point of contact with the pulley. Close examination of the cable showed accumulation of dirt at that position, as grease tends to attract dirt and the compound is believed to increase inter-wire friction, causing wear. The presence of extensive grease prevented also the visual detection of failed wires.

The rudder cable was identified as a 1/8" diameter spiral-wound galvanized carbon steel cable, of 7 strands, each of 19 wire construction (7x19).

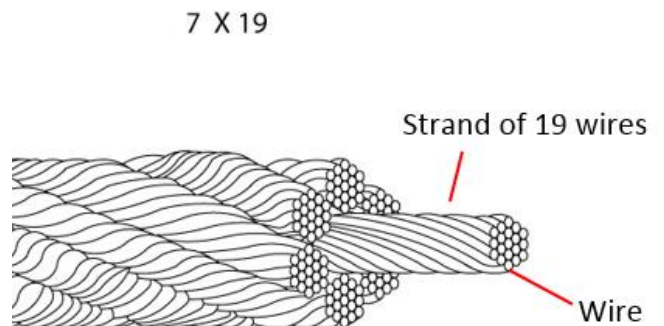


Figure 7: Construction of the control cable

The cable had been installed when the aircraft was manufactured in January 2013 and had been in service for 500 hours since new.

Safety message

- In order to detect failed wires in control cables, prevent cable separation and possible loss of control, AAIU(Be) advises to inspect flight control cables in accordance to the applicable maintenance program using **FAA AC 43-13-1B, chapter 7, section 8, paragraph 7-149(d)** as a guidance, particularly in the areas of the cable at the specific points of contacts with the pulleys and guides. This includes amongst others:
 - A **close inspection in the critical fatigue area** by first moving the controls towards its stops in order to clear the area to be inspected and thereafter **pass a cloth over the cable**. This will clean the cable for visual inspections and detect broken wires if the cloth snags on the cable.
 - A **visual inspection of the cable**, eventually by removing and **slightly bending the cable** at the critical area, to detect otherwise hidden damage.
- The **use of grease** on control cables (unless required per maintenance manual) is **to be avoided**.

About this Safety Feedback

This Safety Feedback is intended to diffuse lessons learned and good practices amongst the aviation community. The material is coming both from investigations as per EU Regulation (EU) no. 996/2010 on the investigation and prevention of accidents and incidents in civil aviation and from reports made by pilots, traffic controllers, mechanics, ground handlers, in application of EU Regulation (EU) no. 376/2014. Safety Feedbacks are **de-identified and safety messages have been established with the help of flight instructors, traffic controllers and/or manufacturers**.

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