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REPORT
INCIDENT

Rudder trim malfunction on initial climb, return to departure airport

Aircraft	ATR 72-212A registered F-OIQU
Date and time	25 June 2011 at 17 h 12
Operator	Air Tahiti
Place	On initial climb, after take-off from Papeete (French Polynesia) airport
Type of flight	Scheduled public passenger transport
Persons on board	Captain (PF), copilot (PNF)
Consequences	None

This is a courtesy translation by the BEA of the Final report on the Safety Investigation. As accurate as the translation may be, the original text in French is the work of reference.

HISTORY OF FLIGHT

On initial climb at a speed of about 170 kt, the captain noticed that the slip indicator ball had travelled to the extreme right. He used the rudder trim as far as the stop to reduce the load on the rudder. He managed to move the ball half-way back between the centre and the instrument right-hand stop. Reckoning that his instrument was possibly faulty, he asked the copilot to check on the indicator on the right. The latter confirmed the same sideslip information.

Fearing that they might not be able to trim the aeroplane in the event of a failure of engine n°1, the crew aborted the flight and landed back at the departure airport. During speed reduction on final, the crew indicated that the sideslip decreased. The crew landed without further mishap.

ADDITIONAL INFORMATION

The maintenance operation carried out after the incident showed that the trim tab control rod was not connected.

Rudder trim tab operation

The trim tab position enables variable trimming which increases automatically with the aerodynamic loading applied to the rudder. This in particular reduces pilot effort in the event of engine failure.

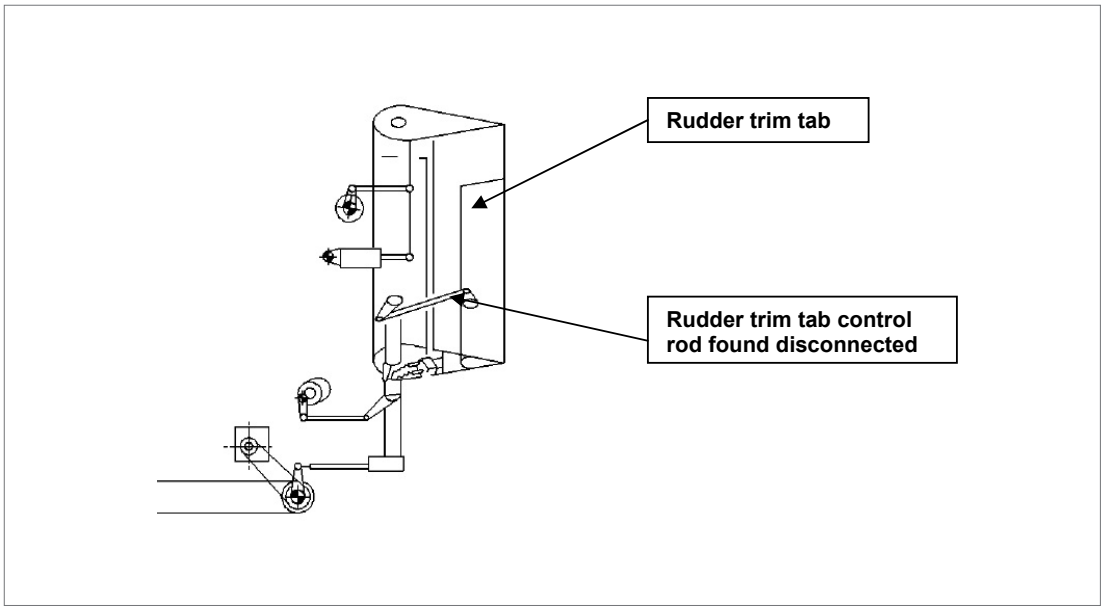
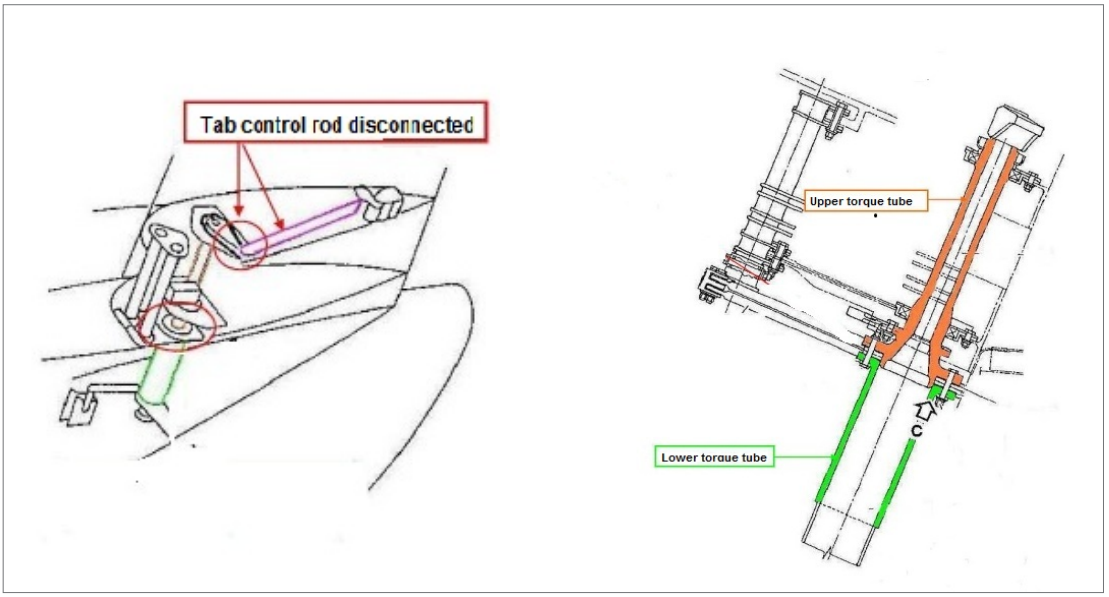


Diagram of the rudder trim tab

Maintenance operations

The aeroplane had a maintenance check from 30 May 2011 to 24 June 2011.

On 10 June 2011, a detailed inspection of the rudder control torque tube showed corrosion between the lower and upper sections. The upper section was located in the rudder and the lower section was in the rear fuselage cone. The two sections were linked by a screw-lock crown.



Position and diagram of the rudder control torque tube

On 20 June 2011, the team leader assigned the additional task generated by the discovery of corrosion to technician "A". The latter was a mechanic on ramp duty who was not part of the teams involved in the check, but was available at that moment.

The team leader gave him *the ATR72- Aircraft Maintenance Manual – Job Instruction Cards- JIC 27-21-45-RAI-10000-001- Removal and installation of rudder tube torque* work card and indicated that he should remove the torque tube.

This work card, with two columns for the signature of the mechanic and the supervisor in charge of the check, comprised the following four parts:

- Removal and installation of tail cone;
- Removal and installation of rudder trim actuator;
- Functional test of rudder control;
- Functional test of rudder trim tab control.

Each part comprised several items describing the operations to be carried out.

Technician "A" implemented the work card instructions and carried out in turn the items of parts 1 and 2 relating to the removal.

In compliance with the work card, he disconnected the rudder trim tab control rod located in the rudder.

The following operation required changing work areas (from the stabilizer to the cone) and removing the lower torque tube located in the rear fuselage cone.

Unaware of the work that had already been carried out on the rudder, the supervisor in charge of the check indicated to technician "A" that only the lower torque tube needed to be removed and that it was not necessary to remove the whole of the torque tube. The technician continued his work and removed the lower torque tube and then stopped. He mentioned the removal of the lower torque tube in the electronic file, but did not mention the disconnection of the rudder trim tab control rod, as the system did not give him this option. The computer system allows only for the start and end of a maintenance operation to be entered, without detailing the stages. In addition, he informed no-one of the disconnection of this tab control rod.

The lower torque tube was treated for corrosion then reinstalled on 21 June 2011 by technician "B". This technician only carried out the "installation" part operations relating to the lower torque tube. The operation requiring the reinstallation of the rudder trim tab control rod was in the "installation" part of the upper torque tube. This reinstallation was therefore not carried out.

The technician who closed up the access panels did not notice that the tab control rod was disconnected.

On completion of the work, the supervisor did not inspect the rudder area as no work was supposed to have been carried out on the upper torque tube.

The flight control deflection check required once the maintenance check was completed did not detect the anomaly. Indeed, the deflection check was not carried out by a direct visual check of the rudder trim tab deflection but by a visual check of the movement of a tag placed on the trim actuator drive motor. The position indicator of the rudder trim indicated the position of the actuator, not the real position of the trim tab.

The last part of the work card relating to the functional test of the rudder trim tab was not carried out *(Item 010 Functional test of rudder trim tab)* as no work was supposed to have been carried out on the rudder trim. This operation required measuring the deflection angles and enabled consistency to be checked between the real position of the trim tab in relation to the position of the trim actuator and the indications provided on the display in the cockpit.

Test flight

On 24 June 2011, the aeroplane re-entered service at the end of the maintenance check. The test flight gave rise to a comment in the technical log: *"At high speeds, the ball goes into the right sector even when trimming."*

Analysis of this comment ruled out a failure of the rudder trim system compensation since no known action was supposed to have been carried out on this system during the check. In addition, another aeroplane had experienced a similar phenomenon in April 2011 at high speeds. Its captain had noted a lateral asymmetry ("ball in the corner"). The problem came from a distortion of the aileron trimmer. As the aeroplane ailerons had been removed during the check, the supervisor thought that it was the same problem and had adjustments made again on the aileron trim tabs. The aeroplane was then put back in service without a second test flight.

LESSONS LEARNED AND CONCLUSION

Lessons learned

Following this incident, the operator put in place several measures to prevent such failures from recurring:

1. On the day of the incident, a meeting involving the team leaders and supervisors had been organised to allow them to share feedback and raise technicians' awareness of the necessity of tracing every action undertaken on the aeroplane.

2. New procedures were planned:

- ❒ When an additional task is set out, the supervisor or the team leader will enter in the computer system the work card to be followed by the technician(s);
- ❒ For operations on critical systems the work cards will be systematically attached to the additional work;
- ❒ Every technician should initial every stage carried out on the work card. This confirmation will enable redundancy of the traceability of the work done in addition to that on the computer system;
- ❒ Implementation of coloured flags referenced by the maintenance check team leader (a number = a task) and placed at access level (outside the aeroplane) where an operation is underway was also being considered. When a mechanic starts a task in an area, a warning flag will be placed on the access;
- ❒ The control surface deflection test card required at the end of the check was amended to include a warning on the visual check of the deflection of aileron, elevator and rudder trim tabs;
- ❒ After a test flight, failures will no longer be directly managed by the supervisor in charge of the maintenance check.

CONCLUSION

The incident occurred due to the incomplete completion and check on a maintenance operation. This generated the undetected failure to reconnect the rudder trim tab.

A combination of the following two factors contributed to this incident:

- A limitation in the computer system used by the airline during maintenance operations. This system allowed only the start and end of a maintenance operation to be keyed in without being able to detail the stages and
- The failure to initial work cards by the maintenance personnel and the supervisor for each maintenance task carried out.