



'EVERYTHING IS OK'

At Helsinki Airport in 2012, crew actions following a mechanical failure caused a passenger plane to veer off the runway. Michael R. Grüninger and Capt. Carl C. Norgren examine the reasons

It's a beautiful summer morning. Flight FCM992T from Tampere-Pirkkala is on approach to runway RWY 22L at Helsinki-Vantaa Airport.

Flybe Finland Oy's ATR 72-212A commuter aircraft is in-bound to its Helsinki hub with four crew members and 27 passengers on board, many of whom have connecting flights. The weather is Ceiling and Visibility OK (CAVOK) and the flight is on time. It looks like a punctual and OK arrival.

When established on the Instrument Landing System (ILS) at 6 nm from the threshold, the aircraft reduces airspeed. Passing 185 knots, suddenly the Master Caution activates and displays a Flight Control 'FLT CTR' malfunction. After another two or three minutes, the crew has to land the airplane and flight controls seem to be malfunctioning.

Since the flight crew is unaware of the consequences of the failure message for the approach and landing phases, they continue with the speed reduction and configure the aircraft for landing. The flight crew splits the workload to handle the flight control malfunction. While the commander

manages the autopilot of the aircraft and completes the final check by himself, the co-pilot deals with the abnormality by consulting the abnormal/emergency checklist in the Quick Reference Handbook (QRH).

When passing 1,200 ft above airport elevation, the co-pilot locates the correct 'TLU fault' checklist and identifies the cause of the Master Caution: the Travel Limitation Unit (TLU) of the rudder failed in the high-speed position.

Reading and interpreting the checklist continues until the aircraft passes 200 ft above aerodrome elevation (AAE).

Excessive rudder deflections in high speed can damage the aircraft structure. Thus, an automatic TLU limits the deflection of the rudder to ± 4 degrees when the aircraft is travelling at a speed of more than 185 knots. Below that speed, the rudder travel is not limited, and the pilot can deflect the rudder fully. A switch allows the crew to override the automatic TLU setting selection and manually select the TLU to the low- or the high-speed limitation.

The QRH confirms that a landing is possible with the limited rudder deflection, as long as some limitations are observed. Thus, the crew applies a speed increment of 10 kts as required by the abnormal checklist. An increment of 13% needs to be added to the normal landing distance. The crosswind must not exceed 15 knots.

The captain disconnects the autopilot at the landing minimum and flares the ATR gently. The flare becomes longer than usual. After touchdown, he applies reverse thrust. The right propeller goes into Beta Mode slightly before the left propeller and produces a yaw moment to the right.

The malfunctioning of the TLU blocked at high speed limits rudder deflection to ± 4 degrees. This limited deflection is not sufficient to maintain longitudinal control of the aircraft by the aerodynamic forces exerted by the rudder. The nose wheel steering initiates functioning only when the aircraft is fully on weight. Thus, the commander cannot maintain directional control of the aircraft during and immediately after the flare. The aircraft veers to the right and departs the runway surface.

Luckily, there are no obstacles in the path of the aircraft and it passes in between the runway edge lights. Once the aircraft is on weight, the commander regains directional control by using the nose wheel tiller and the aircraft is returned to the runway. Nobody is injured. The aircraft suffers minor damages. The bottom line: a serious incident did not escalate into an accident.

INCURSION
A Flybe airliner veered off the runway during the landing roll at Helsinki in 2012.

SAFETY SENSE

Time Management

The TLU malfunction occurred just about 2 minutes 30 seconds prior to landing. The aircraft had already travelled into the intermediate segment of the approach and was just 2,700 ft AAE. This is not a good moment for flight control failures to develop.

In this situation, the captain told the co-pilot to review the QRH for an abnormal procedure to resolve the failure. At the same time, the captain kept the aircraft on autopilot. The co-pilot frantically searched in the QRH for a procedure to follow. By the time the co-pilot was through the QRH, the aircraft was already descending through 300 ft above airport elevation. In plain words, there was simply not enough time to find, read, understand and act upon the QRH "TLU Fault" checklist.

Feeling Safe to Land

The company standard operating procedures requires the flight crew to execute a missed approach if the approach is not stabilized by 1,000 ft AAE and, at the latest, prior to reaching 500 ft AAE (depending on the weather conditions).

The captain did not call for it. The co-pilot did not call for it. They both felt misled, in part by the QRH, that a safe landing would be possible. However, there was no time to consider tactical options, nor did the pilots feel they needed more time for troubleshooting and decision-making.

Had the captain, or the co-pilot for what it matters, ordered a go-around, the crew would have gained enough time to perform all steps necessary to set up the aircraft for a successful landing. A missed approach would have given the crew time – time to complete abnormal checklists, time to discuss and evaluate, and time to inform both ATC and their cabin crew members of the technical malfunction and its possible consequences.

The flight crew could have prepared for the diminished ability to steer the aircraft after touch-down. They could have discussed the failure together and might have identified the possibility to manually select 'Low Speed' on the overhead flight control panel. In fact, had they done so, the aircraft would not have veered off the runway.

Their evaluation might have included alternative means of maintaining lateral control of the aircraft after



touch-down, including differential reverse thrust, differential braking and the use of the nose wheel steering.

Managing the resources of a flight deck is one of the key captaincy skills. This includes managing both human resources (such as other crew members and ATC), as well as the key resource of time. Making sure enough time is available for analysis, decision-making and communication could have made the crucial difference.

Documentation and System Awareness

The company QRH did not contain the entire content from the AFM concerning the TLU. Thus, the pilots were not fully informed about all the limitations linked to a TLU fault. As a result, the crew believed that it was possible to maintain longitudinal guidance when the TLU was locked in the Hi Speed position.

The fact that educational material used to train the pilots on the TLU system did not match with the AFM or the QRH content made it even more difficult for the pilots to fully grasp the nature and extent of the TLU failure.

A failure of the TLU does not by itself endanger the aircraft or its occupants when handled correctly by the crew. A TLU failure introduces additional operational restrictions. The failure lengthens the landing distance required and reduces the crosswind limitations. Last but not least, it requires the crew to understand the technical nature of the failure. The crew should have known that it was possible to manually switch the TLU to Low Speed and that the transition from High to Low Speed settings requires more than 30 seconds to happen.

Communication and Coordination

The commander did not inform the cabin crew or air traffic control about the controllability problems. It is true that he did not have much time to do so. Had ATC been informed, it would have called for a full emergency, as required when an aircraft approaches to land with controllability problems.

In the aircraft, cabin crew members would have known what to expect after landing. Unfortunately, the pursuer did not know about the potential for a landing mishap. When the aircraft left the paved runway, she felt and heard the shackle and noise of the ATR, which rolled at high speed through the grass right of the runway. She unbuckled from her jump-seat in the aft galley and moved forward into the cabin to see what was going on. Moving around in the cabin while the aircraft was barely under control exposed her to great danger of personal injury.

Also, within the confines of the flight deck, the flight crew were no longer working as a team. The captain did everything he could to land and steer the aircraft, while the co-pilot was dealing with the QRH. At no point did the co-pilot challenge the captain about his decision to land. At no time did the captain mention the TLU fault to anyone outside the cockpit. When the aircraft was rolling in grass next to the runway, ATC asked the captain whether anything happened. The captain replied: "Everything is OK."

Well, nothing really was OK. Only lady luck saved them from causing a major accident.



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FACTOR
The incident was caused by the rudder's insufficient authority for directional control.