A BUSY MORNING AT HEATHROW

The following account is based on the UK Air Accident Investigation Board Incident Report EW/C2005/06/03 dated June 2006. Much technical detail has been omitted from the report for the sake of clarity and brevity.

The complete report may be viewed at *http://www.aaib.gov.uk/publications/bulletins/june_2006.cfm*

An Airbus A320 departed on a scheduled passenger flight to London Heathrow Airport with an unserviceable No 3 Air Data Inertial Reference Unit (ADIRU). The aircraft is fitted with three ADIRUs, which provide vital information for the flight deck instrument displays and automatic systems. Nos 1 & 2 serve the pilots' instruments and No 3 is a standby. The aircraft was allowed to depart in this condition as Nos 1 & 2 ADIRUs were both serviceable, but as a precaution, the commander and co-pilot reviewed the Flight Manual Abnormal Procedures whilst en route, in case a second ADIRU became unserviceable.

Following an uneventful transit, the aircraft was given radar vectors and became fully established on the ILS approach to Runway 09L at LHR. At appropriate points, flap and landing gear were extended. As the landing gear locked down, a partial failure of the No 1 ADIRU was indicated. The failure caused several of the automatic systems to become inoperative and much of the commander's flight instrument information was lost, with only the ILS localiser and glideslope, airspeed and altitude indications remaining. At the same time, the mode of operation of the aircraft's flight controls changed and several other components of the aircraft system became unavailable.

Suddenly, an unremarkable, routine flight became anything but routine; although at this point, only the flight crew realised this. The commander handed over control of the aircraft to the co-pilot, whose instruments were functioning normally, and the ILS approach was continued.

About one minute later the aircraft started to deviate from the glideslope and localiser. The altitude continued decreasing and by about 300 ft radio altitude, when the airspeed was 130 kt, it was well below the glideslope. At this point the Enhanced Ground Proximity Warning System (EGPWS) gave a "glideslope" warning. The deviation continued to increase and a second EGPWS "glideslope" warning was given.

As the crew continued their approach, ATC advised that they would receive a late clearance to land. When the aircraft was at about 250 ft radio altitude a third EGPWS warning was given. The commander then decided to go around in order to attempt to restore the instruments but, before he could do so, ATC instructed the aircraft to go around as the preceding aircraft had

not yet cleared the runway. The commander acknowledged this instruction and called, "GOING AROUND, REQUEST A HOLDING PATTERN OVERHEAD CHILTERN OR OCKAM TO RESOLVE A LITTLE FAILURE," but ATC were not told what was wrong. The go-around proceeded and the landing gear retracted normally. At this point, the EGPWS warning ceased.

The controller became concerned that the aircraft was drifting south of the runway extended centreline and advised the crew of the missed approach procedure, but did not acknowledge the commander's request to enter a hold. He then transferred the aircraft to the Intermediate Approach Controller. Following the frequency change, the commander again requested radar vectors and said, "WE REQUIRE A FEW MINUTES TO RESOLVE A LITTLE ...NAVIGATION FAILURE ..." The controller asked for the message to be repeated, possibly due to the commander's heavily accented English, and subsequently acknowledged the request.

The co-pilot carried out the go-around and, in accordance with the prescribed procedure, turned the aircraft onto a heading of 040° and climbed to an altitude of 3,000 ft. The flaps were retracted, following which the aircraft was radar vectored downwind and instructed to climb to 4,000 ft. The Intermediate Approach Controller instructed the crew to fly at 220 kt and offered them 23 nm (track miles) to touch down. The commander accepted the distance but requested a speed of 180 kt, to give more time to address the problem. This was agreed by ATC.
The crew carried out the check-list procedure and considered taking action to

restore the No 1 ADIRU. However, the weather at LHR was deteriorating with the cloud base reported by another pilot at 350 ft aal. With the No 1 ADIRU fault and the No 3 ADIRU unavailable, the aircraft was limited to carrying out a CAT 1 ILS approach with Decision Height 200 ft aal. The commander decided to expedite the landing, accepting the flight instrument display limitations that he had, and did not attempt to carry out the ADIRU reset procedure, which would have delayed the aircraft's arrival.

A short while later, ATC asked if the aircraft had a problem. The commander reported that the aircraft had had "a double inertial reference failure" but the controller did not understand the significance of this. The A320 commander then stated that they were able to perform a CAT 1 ILS approach only. About two minutes later, he transmitted a PAN call requesting assistance for a radar-vectored approach to Runway 09L, explaining the aircraft had suffered a navigation problem. ATC did not respond initially, due to a double transmission, but another aircraft brought it to their attention. Following this, the aircraft was vectored to a position 23 track miles to touchdown.

In attempting to deal with the problem with the No 1 ADIRU, the flight crew turned the instrument off. The checklist procedure did not call for this action, but the crew recalled from their review of abnormal procedures in the Flight Manual that there were circumstances when this was required. The commander attempted to find the relevant text in the Flight Manual but was unable to do so before ATC instructed the aircraft to turn onto base leg.
The crew's decision to switch off the No 1 ADIRU with the No 3 ADIRU unavailable caused the loss of further information from the commander's instrument displays. The landing gear normal extension system was also rendered inoperative, but it was successfully lowered using the emergency gravity (free fall) extension system. Also, the nosewheel steering system became inoperative. Accordingly, the commander advised ATC that he was not sure if the aircraft would be able to clear the runway after landing.

By this point, the condition of the aircraft had degenerated so that the flight crew workload was exceptionally high. Many of the normal flight deck indications were absent, the mode of flight control was unfamiliar, and several of

the normal aircraft functions were inoperative. Added to that, the weather at the destination and the alternate airfield (Gatwick) was deteriorating.

As the aircraft was radar vectored onto an intercept heading for the localiser, the commander upgraded his PAN to a MAYDAY, transmitting, "ON FINAL, MAYDAY FROM THIS MOMENT, WE CANNOT PERFORM A GO-AROUND, AH FINALS 09L," in order to ensure priority. The MAYDAY element of this call was not heard by the controller. This was probably due to a combination of the commander not announcing the MAYDAY using the standard protocol and his heavily accented English. As a result, the airport Rescue and Fire Fighting Service was not brought to Local Standby. However, ATC switched traffic ahead onto Runway 09R to provide a clear approach and, due to his reduced airspeed, also radar vectored a following aircraft to the north.

When the crew advised ATC that the aircraft was fully established, control was transferred to the tower controller who advised that there was traffic on the runway to vacate. The crew responded that "WE HAVE AN EMERGENCY," which the controller acknowledged. Landing clearance was given for Runway 09L a short time later. The aircraft touched down at an airspeed of about 134 kt and began to decelerate. Some 50 seconds later, when the ground speed was about 50 kt, the aircraft made a right turn, using rudder and asymmetrical braking, onto the adjacent taxiway. The aircraft came to a stop and the parking brake was applied; the crew then requested a tug to tow the aircraft to the stand, and no doubt, gave a long sigh of relief!

So when you are sitting at your console on a busy morning, with the air full of arriving and departing aircraft all trying to get their calls in and stepping on each others' transmissions as a result, and generally making life difficult by not using standard RTF phraseology, etc., spare a thought for the pilots. Modern aircraft are complicated, highly automated pieces of machinery, designed to help the pilot fly with maximum ease and efficiency. They are extremely reliable, and usually everything works as it should. But when something does go wrong, the consequences can be unfamiliar - complex and confusing. If a failure occurs in a high workload situation (like on the approach to land), even a highly trained and very experienced pilot can make a mistake and, as in this case, make a difficult situation even more difficult.

You are not a mind-reader, and it is not your fault if for one reason or another you do not always receive all the pilot's messages; but you can use your experience, like the controllers did in this story, to know when everything is not going as planned. You may spot the deviations from normal smooth flight; the unexpected radio messages, perhaps with some excitement or nervousness in the voice that tell you that the flight crew may be in difficulties. If you do, you may be able to help the pilots cope with a dangerous situation.