OVERFLIGHT OF DENSELY POPULATED AREAS BY AIRCRAFT IN EMERGENCY

The overflight of densely populated areas by aircraft in an emergency raises a number of questions concerning routeing, destination and the possible presence of dangerous cargo on board. The incident described below illustrates some of these questions, the answers to which will depend on local circumstances. This account is abridged from the official report by the UK Air Accident Investigation Board (AAIB)*.

In April 2004 a B747-100 cargo aircraft departed Ramstein Airport in Germany for a flight to USA. For the climb and the transit across northern Europe the weather was good with clear skies and no forecast precipitation. On reaching the cruising level of FL360, a cruise speed of 0.84 Mach was selected and the crew prepared to obtain their Oceanic clearance when they noticed that the No. 1 engine EPR (Engine Pressure Ratio) started to reduce and initially stagnate in the mid-range before reducing further.

The crew confirmed that the engine had failed and the engine shut-down drill was performed. Air traffic control at the London Area Control Centre (LACC) was informed of the engine failure and a descent to FL310 was requested and approved. When level at FL310 the crew attempted to re-start the No 1 engine, but this was not successful. They then contacted their Maintenance Control and were instructed to return to Ramstein where maintenance support was available.

The co-pilot advised the LACC of the intended change in routing and a 180º left turn was approved with a descent to FL210. During the descent the commander became aware that the thrust levers were positioned well forward of the normal position for such a descent, yet the EPR indications were at idle. When the aircraft was levelled at FL210, the air speed began to decrease significantly. In consultation with Maintenance Control the crew agreed that if normal thrust was not available, an immediate diversion to London Heathrow would be the safest option.

Control of the aircraft was initially being carried out by the LACC controller. When the controller was made aware of the problems with the remaining three engines and the fact that the pilot was declaring an emergency, she contacted the London Terminal Control Centre (LTCC) Radar Coordinator and informed him of the situation. The emergency transponder code of 7700 was allocated to the aircraft and a radar controller was assigned to control the aircraft using a discreet frequency. Control was then passed to the LTCC.

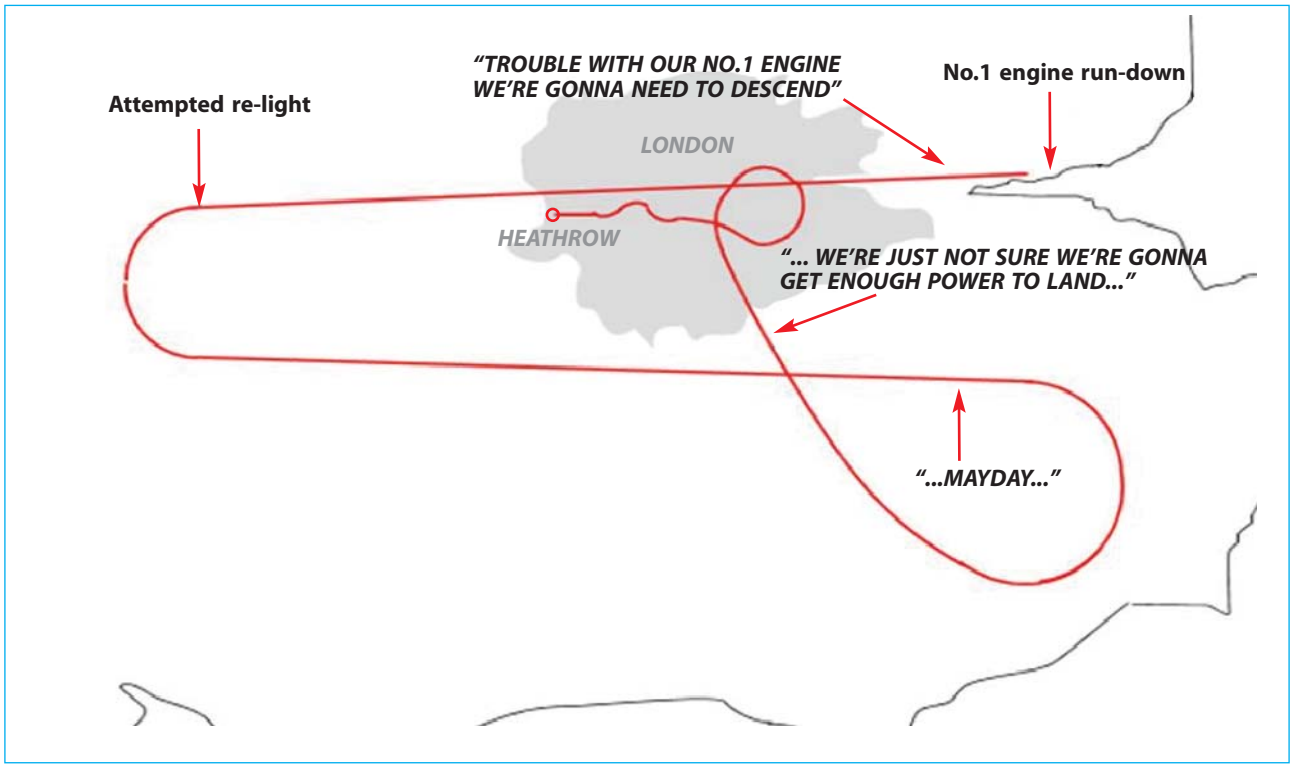
The assigned controller took up a radar console adjacent to the TMA controller who was managing all the other aircraft in or transiting that area of the London TMA below FL200. This permitted close dialogue between the two controllers when trying to sequence the air traffic.

The Group Supervisor decided that a London Heathrow approach controller would be needed to handle the final vectoring of the aircraft for the landing runway, which was runway 27R. The allocated approach controller made his way to where the TMA controller sat and occupied the adjacent console. Shortly afterwards the approach controller was joined by the Terminal Control Watch Manager.

Having created a controlling team co-located at adjacent terminals, ATC's intention was to use 35 track miles from when the aircraft was heading 315º to radar vector it from the left base position onto the final approach. At that stage the controllers believed that the aircraft was capable of reduced thrust and not suffering a total loss of thrust on the three remaining engines. Only when the co-pilot transmitted a warning "We're just not sure we're gonna get enough power to land," did the full extent of the problem become known. The controller immediately offered to vector the aircraft overhead the airfield to let down but this was declined.

At that point the aircraft appeared to stop its rate of descent and even climb slightly before continuing the descent. Given the height of the aircraft and its close proximity to Heathrow, the radar controller instructed that a 270º turn to the right should be executed to lose the excess height and speed. The flight crew accepted this instruction and the manoeuvre was flown, rolling out on an intercept heading of 305º for the extended centreline of runway 27R. This manoeuvre took the aircraft over the centre of London.

** See Report EW/C2004/04/04 in UK AAIB Bulletin 1/2006 at www.aaib.gov.uk/home/index.cfm*



The Heathrow Approach controller took over control of the aircraft using the same discreet frequency to avoid the flight crew having to make a frequency change. He wanted the aircraft to slow down in order to improve the accuracy of his control but also to reduce the radius of the turns being made which were large, due to the aircraft's high speed. He discussed the track miles required by the flight crew to lose their height and his offer of 18 nm was agreed.

The approach controller was still concerned at the height and speed of the aircraft in relation to the reducing track miles to run and so he verified with the co-pilot that they were making their approach to runway 27R as it appeared on the radar display that they were aligning with 27L. The crew confirmed that they were visual with runway 27R and were going to make 'S' turns to lose the height. The controller monitored the progress of the flight, confirming several times during the final approach that the pilot was able to lose the height, which still appeared too great for the distance to run.

The controller obtained a landing clearance from the tower and passed it to the crew. He also knew that the last opportunity for an orbit was at about six miles from touchdown and after that, with no thrust, the aircraft would be committed. As the aircraft rolled out of the left turn onto the final approach track at 2 nm, the controller could see that the aircraft's height and speed were reasonable and he attempted to re-assure the crew by confirming this to them and re-confirming their clearance to land.

The aircraft touched down within the normal touchdown zone and was brought to a halt using normal aircraft systems. After a discussion between the aircraft commander and the airport Rescue and Fire Fighting Service, the aircraft was taxied under its own power to a parking stand.

During the handling of the emergency, there was some speculation within ATC concerning the nature of the cargo onboard the aircraft. The airline was conducting flights in support of the US

military and it was not known if there were dangerous goods onboard.

The incident was investigated by the AAIB. The investigation team recognised both the professionalism demonstrated by the NATS personnel and the skill of the aircraft crew, all of which contributed to a safe landing under difficult circumstances.

No reasons were found which could account for either the apparent run-down of No. 1 engine or the crew's subsequent perception that the remaining three engines were not delivering selected thrust. It was clear from the evidence given by the crew and the aircraft performance that following the run-down of the left outboard engine, the three remaining engines were not producing the thrust expected. The aircraft diverted to the only airport that the flight crew considered suitable and in the process, flew over some of the most congested parts of London in a gliding configuration from which a safe landing was not reasonably assured.

The commander believed that he was only able to position the aircraft visually and the safe outcome would not have been possible in IMC. There was no guidance available to the commander on the glide performance of the aircraft or glide approach technique and he was fortunate to have an unobscured view of the airport. Had the weather conditions been IMC, forcing the crew to carry out an instrument approach, the aircraft might have landed well short of the runway.

In making recommendations, the Board observed that: "It must be considered where the proper balance of safety rests when considering the plight of persons onboard an aircraft in difficulties in relation to persons on the ground in densely populated and congested areas such as those of central and greater London. The balance between delaying an aircraft's landing by routeing it around a congested area, versus the aircraft's condition deteriorating and possibly leading to an accident outside the congested area, should be considered. Moreover, circumstances under which the condition of the aircraft, through damage or technical failure, may pose an unacceptable danger to persons on the ground requiring non-standard routeing should be defined."

The Board noted that guidance is issued in UK for ATCOs handling aircraft emergencies, including manoeuvring over a densely populated area such as central London, and diversion from the flight planned route whilst carrying dangerous goods. However, it recommended that this should be reviewed to consider whether sufficient guidance is provided on the avoidance of built-up areas when vectoring aircraft in emergency.

The Board also remarked that the flight crew decided to divert to Heathrow because they had seen the airport. They were not familiar with the range of airport options available to them nor was it obvious to them that their desired destination involved overflying metropolitan London in a configuration that did not assure a safe landing. One reason for their lack of awareness was that they were not carrying the requisite charts for likely en-route diversions.

Finally, the Board noted that information on what dangerous goods are carried normally resides on board the aircraft and at its airfield of departure. The information is not readily available to Air Traffic Control at the time they might need it and having to ask the crew for the information when they are quite naturally pre-occupied by dealing with an emergency is inappropriate. Following an earlier accident investigation*, UK requirements were amended to include the following:

a. a copy of the Notification to Captain (NOTOC - detailing dangerous goods on board) or the information on it must be readily available at the airfield of departure and the next scheduled arrival point;

b. if the size of a NOTOC is such that transmission of information to ATC would be impractical, provision is made for the pilot to pass a telephone number to ATC for the use of the Airfield Authorities to obtain a faxed copy.

So what are we to learn from this incident? Certainly, the emergency was well handled by the ATC team, who did all that could have been expected of them in the circumstances. The outcome was a safe landing with no damage to the aircraft but that was not the end of the story. The recommendations

** See UK AAIB Aircraft Accident Report 3/2003*