



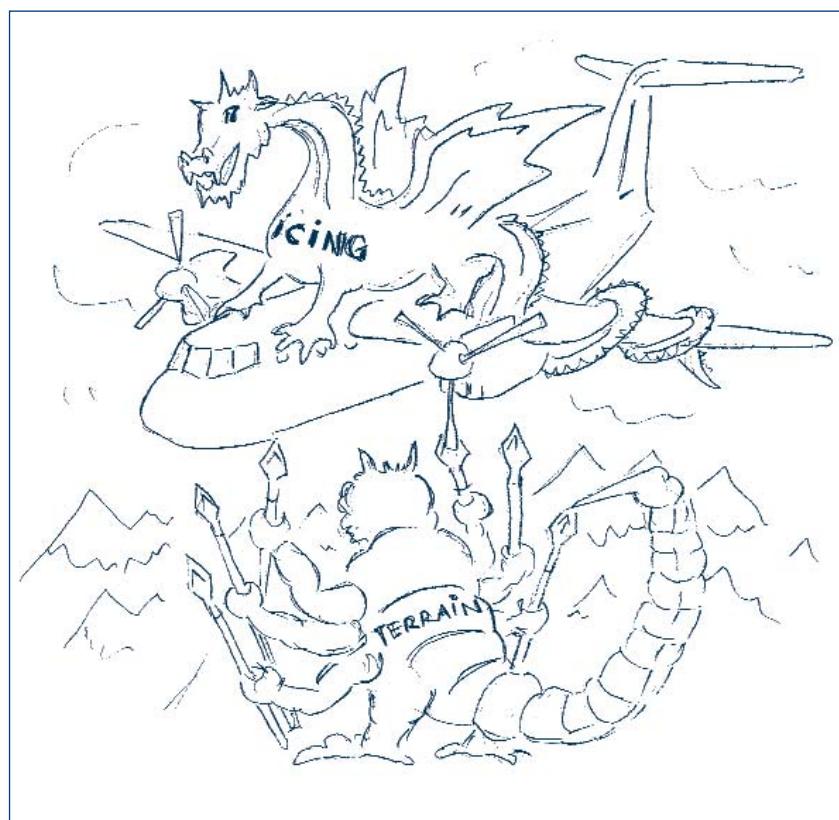
CAUGHT BETWEEN SCYLLA AND CHARYBDIS

This article is based on the official report of an incident described in UK AAIB Bulletin No: 9/2003. This may be viewed at http://www.aaib.gov.uk/cms_resources/dft_avsafety_pdf_023894.pdf

his sailors; but if he got too close to Charybdis, the whole ship would be lost. The story that follows is not a myth: it is a true story that happened only a few years ago; and the aircraft crew found themselves in just as

system, so a set of flight plans and pilot navigation logs (PLOGs) for the routes had been manually produced and copies of these were on board the aircraft. However, the crew were unable to find the PLOG from Pisa to CDG and a copy was faxed to them in Rome. Flight plan information, usually annotated on the PLOG, was missing on this faxed copy; therefore the crew were unaware of the cruising level that had been filed for them.

At Pisa, the commander supervised the cargo loading whilst the first officer, who was to be the handling pilot for the next sector, planned the route. He became concerned that one leg of their route had a Minimum Safe Altitude (MSA) of 15,900 feet and the aircraft they were flying had an operational ceiling of 15,000 feet. The pilots discussed this and decided to fly the planned route at FL160. The commander told his first officer that he had been told that a senior pilot within the company had successfully flown the aircraft to FL180.



In Greek mythology, Scylla and Charybdis were two sea monsters who lived on either side of the Straits of Messina, which separate the toe of Italy from Sicily. Scylla was a 6-headed monster who sat on a rock and ate anyone who came within reach. Charybdis, who lived under another rock, created whirlpools by sucking in and blowing out huge quantities of water from its enormous mouth. In Homer's *Odyssey*, Ulysses was forced to choose a route between these rocks: if he sailed too close to Scylla, he would lose some of

dangerous a position as Ulysses.

The story begins in November 2002 when the crew of an HS748 twin-engine turboprop aircraft was tasked to position from Paris to Rome, fly the aircraft from Rome to Pisa, and then on to Paris Charles de Gaulle. The crew was not very experienced in flying in this part of Europe and neither pilot had flown from Rome or Pisa before.

The company did not operate a computer-based flight planning

The take-off from Pisa was normal and they climbed to FL160 following a non-standard departure to 'SPEZI' waypoint. During the climb Milan Control offered a re-route to the north via 'CANNE' waypoint in the Swiss Alps, as opposed to their flight planned route to the west. The commander accepted the re-route but mistook 'CANNE' waypoint to be the CANNES/TANNERON VOR that is positioned close to the town of Cannes in southern France.

Although the crew followed ATC instructions, which continued to take them northbound, they were unsure what their final routing would be.

Approaching Genoa (GEN) VOR on the Italian coastline, the crew received a GPWS 'PULL UP' warning and initiated an immediate climb. As they climbed through FL180 the first officer pressed the radio altimeter test button which immediately cancelled the GPWS warning. The GPWS warning was spurious but probably added to the crew's anxiety.

The aircraft was levelled at FL180 and the crew decided to remain at this height as they were now heading towards an area with a higher MSA. A few moments later they noticed ice forming on the windscreens and wings. All their anti-icing and de-icing equipment was switched on and according to their instrumentation was functioning correctly, but the rapid build-up of ice continued. They estimated that the ice thickness reached 4-5 inches (10-13 cm) on the windscreens with a 'clear area no bigger than a letter box to look through'. Power was increased to the maximum continuous limit on both engines but the speed slowly decayed from 150 kt to 120 kt. A descent was requested along their route but this was denied by ATC because of the height of the terrain ahead. At 120 kt the stick shaker activated and they were unable to maintain level flight. At this point they had passed 'CANNE' waypoint and were heading directly towards the Luxeuil (St Sauveur) 'LUL' VOR. Terrain within 10 miles of their track reached a height of 14,100 feet. The airspeed was stabilised with the stick shaker activating intermittently but this resulted in a descent with a vertical speed of approximately 500 feet per minute. In response to a further request for descent ATC vectored the aircraft to the north-east

and authorised descent to FL160. At this level there was clear air which allowed the ice to dissipate and the airspeed to increase.

Eventually the aircraft was re-cleared to route to the 'LUL' VOR. When the crew altered course the aircraft re-entered cloud and almost immediately ice began to adhere to the airframe again and although the airspeed was indicating 160 kt the stick shaker activated. The crew were cleared to descend to FL100. The speed was increased in the descent to 205 kt before the stick shaker cancelled.

After levelling at FL100 the flight continued in clear air to CDG with the ice clearing. The landing, carried out with approach flap, was without incident. Visual inspection after landing revealed large lumps of ice remaining underneath the fuselage.

It would appear that this crew tried to emulate Ulysses without understanding the perils they might encounter. For them, Scylla was represented by the icing, which caused them to lose height, and approach dangerously close to the high ground that represented their Charybdis. But unlike Ulysses, who knew what lay ahead and planned his journey accordingly, the crew were poorly prepared and at one point did not seem to know where they were going. The official report of the incident comments that 'On the actual route flown, the crew flew through an area with an off-route MSA of 16,400 feet and along an airway with a base of FL125. If they had experienced a single engine failure, their stabilising altitude, in the prevailing conditions, would have been

approximately 4,000 feet *below* the base level of the airway'. If they had lost an engine, this story would probably have had quite a different ending.

Because most aircraft cross the Alps (and similar mountainous areas) without event, it is tempting to think of this as a 'one-off case'. But the dangers associated with flying a route like this are not confined to older, lower-powered aircraft. If an engine is lost on a heavily-laden modern jet, it will be forced to descend and may enter icing conditions where the excess power required to operate the anti-icing systems will force it even lower. Loss of pressurisation is a rare event these days, but it would have the same effect of forcing the aircraft to descend. The effects of turbulence and mountain waves extend well above the usual safe terrain clearance and prudent pilots apply 1000 or 2000 ft to the normal MSA to give an additional safety factor.

Of course, older turboprops can safely navigate these routes, but only if the crews are properly familiar with the terrain and its perils, and choose their route having regard to the meteorological forecast and their aircraft's performance. Their companies must support them with appropriate training and with the clear understanding that they will not be criticised if they decide for safety reasons not to follow the most direct route.

Breaking the rules by, for example, departing without full knowledge of the filed flight plan, or deliberately exceeding Aeroplane Flight Manual limitations is never acceptable. Topographical maps must be studied. Safe descent paths, critical points,

engine-out stabilising altitude and drift-down calculations may be necessary so that should the aircraft suffer an engine failure, the crew will know immediately whether to go on or to divert. Of course, if things go wrong, the commander remains responsible for safe terrain clearance, although assistance from air traffic control, especially when MSAW is available, will always be welcome.

For the controller, there are several messages, in addition, I hope, to an enhanced understanding of aircraft performance and meteorological hazards:

- Flight in icing conditions is fraught with danger. Unlike most limitations (e.g. crosswind, tailwind,

maximum take-off mass, etc.) deciding whether icing conditions are light, moderate or severe, and therefore whether they should proceed is a subjective decision based on a pilot's airmanship and experience. Moreover, actual icing conditions may vary considerably from those forecast, so that pilots may find themselves in difficult conditions without warning.

- Although most of the pilots that transit through your sector will be familiar with the airway structure, some will not and many will be quite unfamiliar with the topography; they may need a little help, especially if a proposed re-route passes over higher terrain.

- If an aircraft requests descent below its cleared level, this may be the first sign that it is in difficulties. The pilot may not immediately declare an emergency, but perhaps he should make at least a PAN call; so if the requested descent takes it towards higher ground, a little encouragement may be necessary.
- Finally, it is worth mentioning that some SIDs require rates of climb which are beyond the capability of older aircraft. Be prepared to offer alternative routes in such cases. By the way, where SIDs specify a minimum rate of climb, this is usually expressed in feet per mile, which is difficult for pilots to convert to feet per minute.

