



Epic journey

On the eve of ultra-long-range flight, health and safety questions remain, reports Cheryl Jones

AIR FORCES have been known to use amphetamines to keep pilots awake on long missions, but airlines will have to come up with more sophisticated solutions to ultra-long-range (ULR) flight fatigue.

Pilot fatigue is seen as the biggest hazard in ULR services – non-stop flights of more than 16 hours.

Prolonged exposure to cosmic rays and the low-humidity aviation environment, deep vein thrombosis and medical emergencies are among other health and safety issues being considered in the countdown to ULR services.

Another worry could be a lack of appropriate aerodromes to which to divert in medical emergencies, particularly on polar routes.

The new ULR aircraft (see Superjets) will deliver huge efficiencies to airlines, get passengers to their destinations sooner and help ease airport congestion.

ULR flight is controversial, however. Airlines say it can be done safely. The Guild of Air Pilots and Air Navigators agrees, saying the biggest problems were solved in long-haul flight.

Pilot and flight attendant unions are resigned to ULR services but say big safety issues are yet to be resolved.

The issue is complicated by a lack of hard empirical data ahead of the first ULR civil operations. Researchers have had to extrapolate from studies on long-haul operations, or work from theory.

Cosmic rays ULR flights will mean long periods spent flying at high altitudes, where there is less protection by the atmosphere from cosmic rays. Exposure would be even greater for routes over the poles because the Earth's magnetic field offers less shielding there.

Most players agree that cosmic rays will not be a problem, however.

Emirates aviation medicine specialist Ian

Hosegood has used the CARI computer program to calculate doses received by crew on ULR flights. CARI was written by the US Federal Aviation Administration to predict radiation doses for particular routes.

The airline entered data for the worst case scenario – a year of 1,000 hours' flying over purely polar routes at the height of the solar wind, which also bombards the Earth with radiation. No crew is likely ever to get this much exposure.

Hosegood presented the results at the last International Congress of Aviation and Space Medicine. In the worst case scenario, pilots would get an annual dose of up to 5.6 millisieverts, well below the legal occupational exposure limits laid down by governments around the world.

The average dose for a long haul pilot is normally about 3–4mSv a year, Hosegood says.

The Australian limit is an average 20 millisieverts a year over five years, with no

more than 50 millisieverts in any one year. (The sievert is a measure of potential harm from ionising radiation.)

The Australian and International Pilots' Association agrees with Hosegood's assessment. "We don't think that cosmic radiation will be an issue, except for pregnant crew," says Richard Woodward, the union's technical and safety director.

DVT Opinion is divided on whether pilots will face an increased risk of deep vein thrombosis. "There is no evidence to say that the incidence of DVT among pilots exceeds that in the general population," says Woodward. "In fact, the evidence seems to be that the incidence is lower."

However, another commentator says increased pilot immobility amid "locked door" policies in the wake of the September 11 attacks could raise the risk.

Medical diversions are of concern, however, especially on Arctic routes with few airfields appropriate for emergency landings. Medical diversions on polar routes can cost airlines up to \$1 million each, Hosegood says.

The big question, he says, is whether medical emergencies will increase with the duration of the flight. The answer lies in the role in medical crises of prolonged exposure to the reduced humidity, pressure and oxygen levels of the aviation environment.

Possible solutions are more medical training for cabin crew, more onboard medical equipment and perhaps even the reinstatement of the requirement that one crew member be a trained nurse, he says.

Operators also need to improve pilot training to help them make decisions on when to divert, he adds.

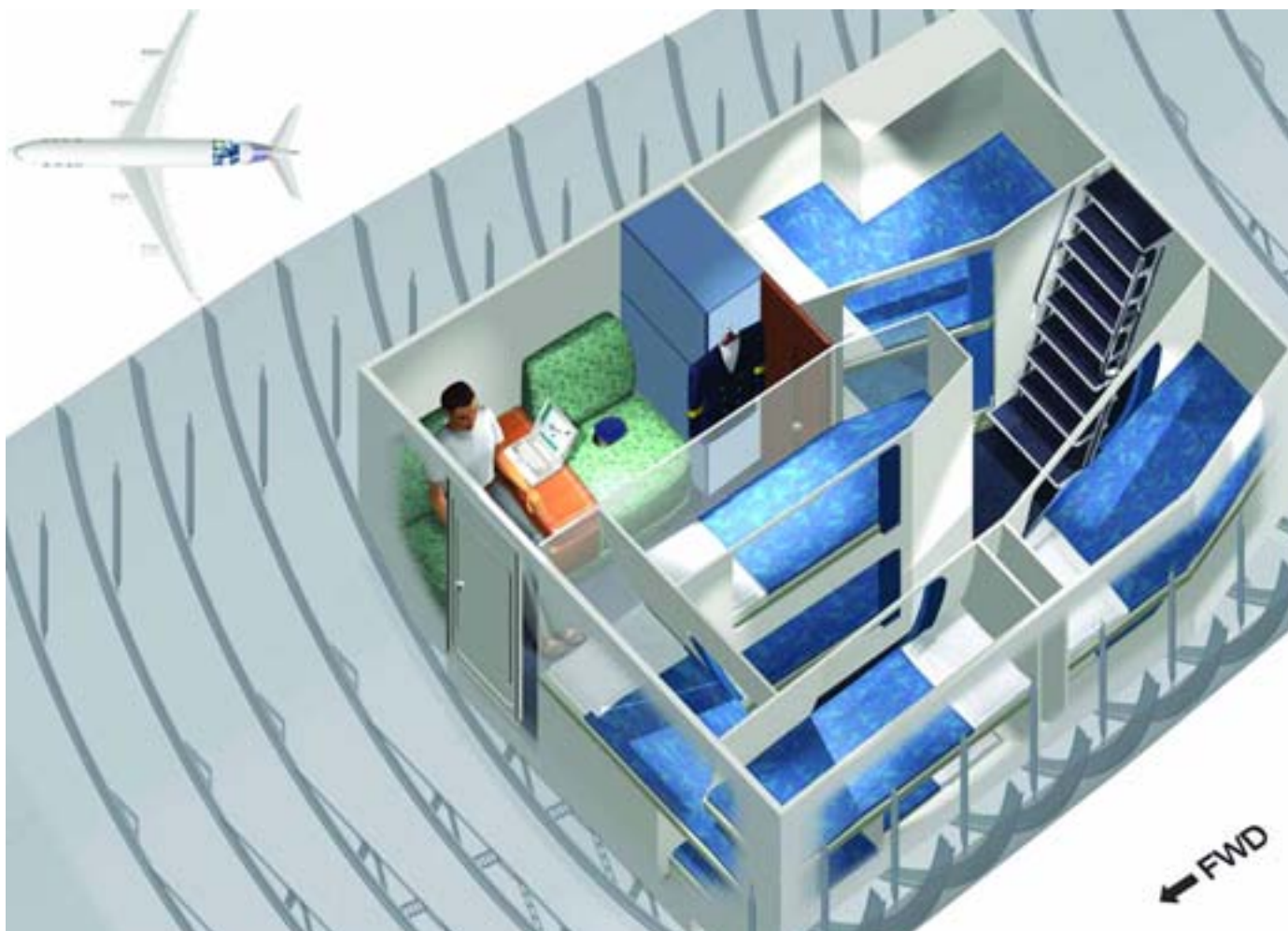
Dehydration Meanwhile, AIPA's Richard Woodward is concerned about the effect of longer hours spent in low humidity, with some of the newer aircraft models lacking cockpit humidifiers amid fears the devices promote corrosion and cause electrical problems.

"There is some evidence that in humidity below 25 per cent, people get irritable and their decision making becomes problematic," he says.

"Medical diversions on polar routes can cost airlines up to \$1 million each."

And pilots who did not drink enough water would face an increased risk of kidney stones, he adds, citing as evidence a "statistical blip" in the incidence of the problem in United States pilots following the installation of bullet-proof doors.

One explanation, he says, could be that pilots, reluctant to leave the safety of the cockpit to visit the toilet, are drinking less water.



A sample Airbus ultra-long-range crew rest facility.

Guy Maclean, of the international division of the Australian Flight Attendants' Association says the union is pushing for humidifiers in cabin crew rest facilities.

Meanwhile, it is unclear whether air rage will increase on ULR flights. "I'm not aware of any research showing a direct correlation between sector length and a propensity towards disruptive behaviour," says Maclean.

"But if crew became fatigued, they would be less effective in performing their safety duties, including the control of unruly or disruptive behaviour."

Fatigue Most of the attention so far has focused on the fatigue problem, and Australian research will figure prominently in the debate (see "Testing times for some tired pilots", p. 30).

The effect of fatigue on decision making is well understood. It impairs, among other things, memory, planning and the ability to adjust to new situations.

However, despite decades of research, big questions remain, including uncertainty about the impact of trans-meridian travel.

The Flight Safety Foundation (FSF),

airlines, manufacturers, scientists and unions from around the world have held workshops over the past two years to thrash out guidelines for regulators and operators to ensure safety on ULR flights.

The meetings surveyed the latest research and agreed on the best methodologies for investigating fatigue and alertness levels in assessing the safety of ULR routes.

Scientists attending the workshops, in Washington, Paris and Kuala Lumpur, agreed that high-quality in-flight sleep was the best way to maintain crew alertness, according to a report in *Flight Safety Digest*, published by the FSF. Other countermeasures, including cockpit naps, exercise, caffeine and light exposure, were less effective.

Airlines should schedule pilot sleep periods to coincide with circadian low points, the report says.

And despite the upgrade of crew rest facilities, in-flight sleep would rarely match that obtained at home or at a hotel, it stresses.

Delegates to the workshops agreed that the best way to regulate was to approve city pair routes case by case rather than grant general

approval to ULR flight.

Among other recommendations is a flight crew complement on ULR operations of at least four pilots, two of whom hold pilot-in-command qualifications. And with flight duty periods set to exceed 18 hours, even without disruptions, the delegates urged regulators to put limits on departure windows.

Although the workshops advanced knowledge greatly, players say there is still much to learn. Ongoing research and validation are imperative.

Perhaps the biggest problem is the uncertainty itself.

"There has been no dedicated health study following long-haul pilots throughout the 30 years of their careers," says Woodward.

GAPAN's Peter Raven also wants to see more research, especially into fatigue.

If fatigue could be managed, he says, ULR flight, with no stopovers, could reduce accidents, most of which happen during takeoff and landing. He adds: "The bottom line is that you could make aviation so safe, you just wouldn't take off."

