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Flight International turns the spotlight on simulators with a comprehensive survey of civil machines

NEXT WEEK

Greece, Germany, and the Netherlands have joined a growing number of nations that will benefit from Hughes Electronics' Advanced Medium-Range Air-to-Air Missile (AMRAAM) for their military aircraft. AMRAAM has its own radar, enabling pilots to engage single or multiple targets and maneuver out of danger. It also has the flexibility to be used on a number of other aircraft. For example, the Royal Netherlands Air Force will use the missile for its F-16 Falcon fighters, while Germany will use it for their Luftwaffe F-4Fs. Other nations selecting AMRAAM include Sweden, Switzerland, Finland, Denmark, the United Kingdom, Turkey, and the Republic of Korea.

Six months ahead of schedule, Saudi Arabia has received the world's most capable command, control, and communications system ever built, as part of the Peace Shield program. This comprehensive system, built by Hughes, integrates Peace Shield command centers, long range radars, diverse communications media, and multiple systems from other agencies. It provides the Royal Saudi Air Force with the ability to manage its airborne and ground resources to maintain the kingdom's sovereignty. To achieve this extraordinary manufacturing feat, Hughes used detailed planning along with integrated status reporting for every major program activity.

To help U.S. Navy ships avert the danger of mines in shallow waters, Hughes is developing a new anti-mine system. This Rapid Airborne Mine Clearance System (RAMICS) will be flown aboard the Navy's MH53-E Mine Countermeasures helicopters, and possibly the LAMPS SH-60 helicopters. RAMICS is more cost-effective than conventional methods. It will locate mines using a laser-targeting system, then fire a super cavitating projectile in bursts from a 20mm gun. When the projectile strikes the mine's warhead, it will disperse a material into the warhead, causing it to detonate.

Astronomers and astrophysicists will soon be able to obtain data that would be impossible to obtain from the ground. This is the result of NASA's AXAF (Advanced X-ray Astrophysics Facility) telescope, an orbital X-ray telescope scheduled to be launched into high-Earth orbit in 1998. The heart of AXAF's telescope, a nest of concentric cylindrical mirror pairs, was built by Hughes. These mirrors are the largest and most precise set of grazing incidence optics ever built. With its superior capability for detecting very faint, remote sources, AXAF will provide insights into the age, distance, composition and history of celestial bodies.

A new, commercial radar system from Hughes can track a car 60 miles away. This precision radar could help in many surveillance and reconnaissance areas, such as: detecting smugglers, monitoring sea lanes, detecting illegal fish harvesting, tracking oil spills, and protecting the nation's forestry resources against illegal harvesting. The new HISAR (Hughes Integrated Synthetic Aperture Radar) is a lighter, more affordable version of Hughes' radar pioneered for military aircraft. It uses off-the-shelf hardware to minimize life cycle costs and enable it to fit on executive class aircraft. This long-range, high resolution radar system provides near photographic quality images, day or night, in all weather. It has air-to-air as well as air-to-ground capability.

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AN UNSAFE IDEA

EUROPE'S DIRECTORS-general of civil aviation (DGCA's) have decided (belatedly or after due deliberation, depending on your point of view) to take a more active interest in the safety of the airlines flying into Europe from elsewhere. In showing that increased interest, they are catching up with the Federal Aviation Administration in the USA, but they may not achieve its results.

The initiative taken by the FAA and later endorsed by ICAO has led to the application of sanctions against unsafe airlines or airlines from unsafe countries. This was an FAA initiative, taken by the US safety regulator on grounds of safety concern. The latest European action, however, did not originate within the European safety regulator (the Joint Aviation Authorities),

but with politicians who have passed it on to the European Civil Aviation Conference (ECAC). Part of that difference stems, naturally, from the limited powers of the JAA which persuades by co-operation; the FAA rules by legislative right.

The ECAC countries may well be following the FAA into combat, but they do so without the legislative armour which the Americans have. An integral part of every bilateral agreement which the USA signs with another country is a safety clause, under which the USA is entitled to send in inspectors to ensure that the second country is complying with the letter and spirit of ICAO regulations. It seems that no European countries insist on such clauses, or therefore, have an already-extant, legally agreed basis for applying the sanctions now wanted by politicians.

To some people in the industry, of course, positive aviation interest from a politician would be a cause for celebration. For others, however, the question must be: why have the politicians taken an interest in this issue, and why now?

Are they motivated by the fear of their voters being killed by unsafe airlines from non-ECAC countries, or are they motivated by the fear of

their airlines being mugged by low-cost airlines from non-ECAC countries? Such questions were less important in the US case, where access to the market by foreign airlines is rigorously controlled

by the politicians anyway. The concept of a US tour operator wet-leasing in a Russian-built airliner operated by a Hungarian airline under a flag of convenience is not a worrying one, because it would never happen. In Europe, where some 50% of all passengers travel on charter flights against less than 10% in the USA, it does.

So far, the European initiative is one of data collection only — concentrating purely on finding out how safe (or unsafe) are the airlines which fly into Europe, and how sound are the attitudes and procedures of the countries from which they come. Applying

sanctions against miscreants is another subject, for another time — and with good reason.

There is no one body which can apply the sort of sanction envisaged on behalf of all the European countries involved. ECAC is an association of 33 countries, but which does not have the power of enforcement in or on behalf of any of those countries. The JAA acts as the co-ordinating body for safety and related issues on behalf of 23 European states: it has the power of granting licences and certificates, but not the power of enforcement. The EU represents 15 European states, on behalf of which it has some powers of enforcement — but even those are limited by powers of national sovereignty, and because bilateral aviation agreements are still between states, however much the EC would like to take over the role of EU member nations.

In short, the European safety initiative is a good idea — especially if it has been taken on the grounds of increasing safety rather than on grounds of hobbling inconvenient competition — but it has very little chance of achieving very much, unless by persuasion. That power is in short supply in Europe. □



"Europe has little chance of achieving very much unless by persuasion."

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NEWS IN BRIEF

■ ATR GOES MARITIME

The Italian customs border guard has ordered two heavily modified ATR 42s to fulfil a maritime patrol role. The aircraft's mission systems will include a podded search radar, forward looking infrared/TV turret, inertial navigation and global positioning systems and a secure data-link. GF Sistemi Avionici-Fiar will carry out systems installation.

■ FOKKER TALKS

Negotiations between a group of Russian companies led by Yakovlev and Tupolev over the possible purchase of Fokker continued during the first week of April with a visit by Russian executives to the Dutch aircraft makers plant. Yakovlev general designer Alexander Dondukov says agreement could be reached by the end of April.

GE to sanction new growth plan for GE90

GUY NORRIS/LOS ANGELES

GENERAL ELECTRIC is set to sanction a revised growth plan for the GE90 turbofan by the end of this month, by agreeing to develop an engine capable of being in service at thrust levels up to 445 kN (100,000lb) by 1999. The engine will be capable of powering every version of the Boeing 777 now planned.

The new growth plan effectively leapfrogs the original scheme, which involved an intermediate development of a 423-436kN powerplant, followed later by a move to a much more powerful version capable of between 467kN and 512kN.

The plan will see GE bypassing the staged growth plans of rivals Pratt & Whitney and Rolls-Royce, both of which are developing engine variants in the 423-436kN category for the 777-300.

"Initial approval could be granted by the end of the month," says GE90 marketing development manager Vince DiGiovanni. The 445kN engine would be derated for use on the 777-300, heavier versions of the -200 and possibly the -100X or ultra-long range -200 alternative. GE expects that the growth engine could be certified in 1998 and enter service in 1999. The additional thrust would be created through revised blade aerodynam-

ics throughout the rotating parts of the engine, using technology derived from the recent CFM56-7. The fan would be identical to the current GE90 in size and make-up.

"We designed and built a 100,000lb thrust engine from the beginning. We made the (intermediate growth) steps six years ago," says DiGiovanni. Testing on the first growth step engine, the GE90-92B rated at almost 410kN, is virtually complete.

"It's on-line for certification in June," he says, the engine will power the first Boeing 777-200IGW (increased gross weight) aircraft scheduled for delivery to British Airways early in 1997. □

UK group is set to acquire airship from Westinghouse

RAMON LOPEZ/WASHINGTON DC

THE STAGE is set for a resurgence for airship manufacturing in the UK with the pending sale of designs, patents and other assets of Westinghouse Airships to UK investor group London Wall.

The transaction is expected to be finalised on 15 April. Leading the financiers is chief designer Roger Munk who previously worked for Airship Industries (AI) and Westinghouse Airships.

Initially Westinghouse Airships was thought to have been acquired by Northrop Grumman when it purchased Westinghouse's defence-electronics business earlier this year. The US airship maker, however, was not part of the \$3 billion deal, and Westinghouse Airships was sold to London Wall.

In the early 1980s, the US Navy became interested in fielding giant lighter-than-air platforms to guard against cruise missiles targeted

against its surface warships. It hired the UK's Airship Industries to perform preliminary research, and in 1987 a Westinghouse/Airship Industries team was awarded a contract to begin work on a prototype airship, dubbed the Sentinel 5000.

The partnership later ended when the UK concern declared bankruptcy. Westinghouse acquired all rights to the Sentinel 1000/5000 and hired key AI workers, including Munk. The only existing Sentinel 1000 non-rigid airship and its hangar at the firm's Airship Flight Center at Weeksville, North Carolina were destroyed by fire last August, however.

Plans to build a replacement airship stalled when Westinghouse's defence business was auctioned. Westinghouse Airships was unable to undertake an airship demonstration to the USN which had been scheduled for late 1995. The UK Ministry of Defence is continuing trials of an airship. □



Turkish attempts to buy more Cobras have been blocked by Washington

White House blocks Turkish Cobra deal

THE CLINTON Administration is sitting on a year-old request from Turkey for ten additional Bell Helicopter Textron AH-1W SuperCobra helicopters.

The White House has held up the foreign-military sales transaction for fear that the gunship sale to Turkey would damage US relations with Greece.

The lack of action also reflects pressure from human-rights advocates who fear that Ankara will use the gunships to attack civilians such as Kurdish rebels.

The Turkish military currently operates 20 AH-1Ws and wants ten more to satisfy current military

requirements. Bell Helicopter Textron officials also say Turkey plans to launch a competition within the next 12 months for procurement of more than 100 advanced helicopter gunships.

The helicopter maker plans to offer the AH-1W with a new rotor system and advanced cockpit being developed for the US Marine Corps. The fear in the USA is that Eurocopter, which already supplies Cougar utility helicopters to Turkey, could step in the gap left by the US hesitation to mount a serious bid for the next-generation attack requirement with its Tiger helicopter. □

A321 deal breaks Boeing monopoly at Asiana

PAUL LEWIS/SINGAPORE

ASIANA AIRLINES OF South Korea has selected the Airbus Industrie A321 rather than the Boeing 737-800 as its next narrowbody passenger aircraft and signed a letter of intent for 18 aircraft.

The agreement, expected to be announced shortly, does not include any options, but does give Asiana cancellation rights on six of the aircraft ordered. The A321 is the first non-Boeing jet-airliner ordered by Asiana and represents a major loss for Boeing.

Airbus had been tipped to win the Asiana narrowbody aircraft order for some time. It was determined to beat Boeing in an Asian competition after some recent set-

backs in Malaysia, Singapore and Taiwan.

Asiana has not yet selected an engine for the A321, but a decision is expected to follow shortly. International Aero Engines and CFM International have submitted their best and final offers on the V2500-A5 and CFM56-5B engines, respectively.

Industry attention now turns to Asiana's forthcoming order for up to 30 new widebody passenger aircraft. A final decision on the choice of airframe is expected in May, with engine selection following by early July.

Asiana is likely to opt for a mixed purchase of Boeing 777 and Airbus A330 twinjets. Boeing originally submitted pricing on up to 20 777 and a further ten 767-

300s. Asiana is now understood to favour the recently launched A330-200 over the 767.

General Electric (with the GE90 and CF6-80), Pratt & Whitney (with the PW4084 and PW4168) and Rolls-Royce (offering the Trent 800 and 700) are competing to power the 777 and A330.

The widebody deal will also include an order for an undisclosed number of additional 747-400 freighters. Asiana now operates a fleet of 39 aircraft, consisting of eight 747-400s, 11 767-300/ERs and 20 737-300/500s, all of which are powered by GE or CFM engines.

■ Philippine Airlines (PAL) has signed a contract for its previously announced order for 24 A320s/330s/340s. □

Kuwait opts to buy armed Black Hawk

KUWAIT HAS agreed to buy an armed version of the Sikorsky UH-60L Black Hawk to meet its attack-helicopter requirement, rather than the McDonnell Douglas (MDC) AH-64A Apache.

The Black Hawk will be supplied without the sophisticated combined forward-looking infra-red (FLIR)/laser designator used on armed Black Hawks operated by the US Army's 160th Special Operations Air Regiment, say US Army and US industry sources.

The deal was held up because of Pentagon reluctance to provide Kuwait with Hughes Aircraft's Airborne Electro-optical Special Operations Payload, the FLIR/laser designator used on the US Army's MH-60 Defensive Armed Penetration helicopter.

The Pentagon offered a less-sophisticated FLIR/laser designator instead, which Kuwait has reluctantly accepted. It is believed that a unit being developed by FLIR Systems using commercial components may be offered. □

Deutsche BA suspends deliveries of Saab 2000

ANDRZEJ JEZIORSKI/MUNICH

DEUTSCHE BA HAS suspended further Saab 2000 deliveries to its fleet, after both it and Swiss carrier Crossair were hit by poor dispatch reliability during the harsh European winter.

The main problems were brake icing and the ingestion of de-icing fluid by the auxiliary power unit (APU), causing smoke in the cabin. The aircraft has also suffered nuisance cockpit warnings which have caused flights to be delayed.

Crossair, which operates 18 of the slow-selling 50-seat turboprops, says that it has restored dispatch reliability to about 99% now, from a winter low close to 98%. Deutsche BA, which has a smaller fleet of five aircraft, was harder hit.

While declining to give details, Deutsche BA managing director Richard Heideker confirms the aircraft's reliability has been "unsatisfactory" in recent months.

As a result, the company has shelved plans to take two more air-



Brake icing problems and ingestion of de-icing fluid by the APU have plagued the Saab 2000

craft in the third quarter of this year until Saab comes up with adequate improvements to the aircraft.

In an earlier attempt to solve the brake icing problems, Saab fitted new water shields to the undercarriage which exacerbated the problem. Crossair avoided the worst of the troubles by returning to the old shield and improving its ventilation, but Deutsche BA attempted to use the modified shields and suffered as a result.

According to Saab operations

chief Johan Oster, the company still has no solution to this.

The APU de-icing fluid ingestion problem initially led to the unit having to remain switched off while the aircraft was being de-iced. Saab says that this problem has now been solved by the addition of a spoiler at the intake of the APU.

Crossair says that it has also found that pilots were frequently receiving nuisance status messages from propeller overspeed sensors.

Oster says that the problem will be solved by software improvements this year.

The Swedish manufacturer has still not met guaranteed internal cabin noise levels of 76dB. Saab is to issue operators with a new improvement kit to the active noise-control system which will bring noise levels down to 78dB, and Oster says that tests carried out at Saab of further noise reduction measures have yielded "encouraging" results. □

277,804 flights, more than two million metric tons of emergency relief material. From April 1, 1948 to August 16, 1949 an air lift kept West Berlin alive. Whether in humanitarian or military operations, transport planes have always played an important part in crisis scenarios.

And their significance is on the increase, because the security picture has undergone

major changes over the last few years. For crisis management in particular, the forces are dependent on highly mobile, top performance equipment.

The transport aircraft previously in operation are too old to be practicable in every mission situation. Curtain up for FLA, Future Large Aircraft!

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25 metric ton payload is far larger than its predecessors'. The cargo bay has enough room for a Tiger/Uhu type helicopter, for instance, or 96

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fully equipped paratroopers, or a mobile Roland anti-aircraft system. The 4,500 kilometer range can be extended



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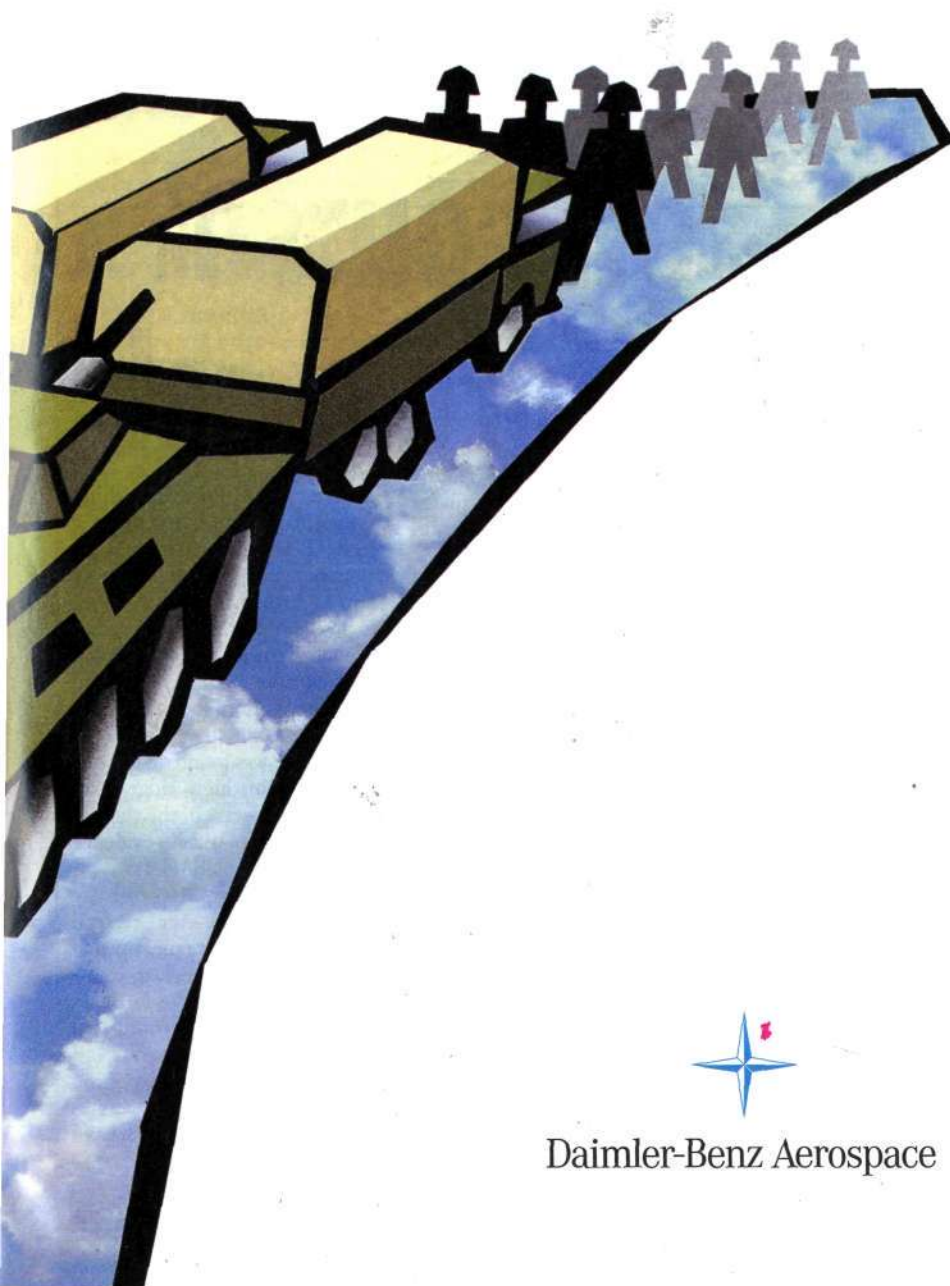
Daimler-Benz Aerospace together with its Airbus partners and Alenia are planning to found the Airbus Military Company for development, production and support of FLA, providing the experience gained from the Airbus program. This way, we can even show extraordinary "passengers" how to fly.

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em how to fly.

ical engine for turboprop operations. The FLA has excellent slow flight characteristics,

handling system. Initial development on the FLA is due to begin in 1996, with the full development phase to follow in 1999. The



Daimler-Benz Aerospace

Sparring begins over Thomson-CSF sell-off

GILBERT SEDBON/PARIS

THE LAGARDERE GROUP, the powerful holding company for missiles and satellites builder Matra, has launched an offensive to acquire defence-electronics giant Thomson-CSF.

Speaking during a presentation on 1996 profit forecasts for the media and aerospace group, chairman Jean-Luc Lagardere said that the privatisation of Thomson-CSF "...interests our group to the highest degree".

Lagardere, already a majority shareholder in Matra Marconi Space with GEC-Marconi, and renegotiating a missile tie-up with British Aerospace, is interested in all or parts of Thomson-CSF.

French President Jacques Chirac announced in February a reform of the French defence industry to create two centres of expertise, one for defence electronics, the other for aerospace. Chirac says that he wants Thomson SA, which includes a huge loss-making consumer-electronics arm, to be privatised as one entity.

Lagardere is waiting to hear the details of the privatisation of Thomson SA before formally expressing its intention to bid. "We

believe Matra is the right partner for Thomson-CSF, and the creation of a high-technology defence industry in Europe," says Lagardere. The group is expected to face heavy opposition to the buy-out from rival Alcatel-Alsthom.

While Lagardere and Alcatel spar over Thomson-CSF, France's aerospace industry is, for the first time in several years, heading for a slight recovery in fortunes this year.

Lagardere says expects to make a Fr1 billion (\$200 million) net profit in 1996. GIFAS, the industry federation representing 120 aerospace companies, expects sales to grow by 1.9% this year, to around Fr102.5 billion after dropping in 1995 by 4.6% to Fr100.6 billion. According to latest estimates, the industry has slumped by 20% since 1991.

Among the three main industrial sectors, only equipment manufacturers posted a sales rise in 1995, managing a 2.4% increase. Aircraft and missiles sales fell by 6.5%, while sales at aero engine suppliers dropped by 8%.

GIFAS vice-president Edmond Marchegay, who is also chairman of equipment maker Inter technique, says that 1995 was the first year since 1990 that new orders had overtaken sales. □

Robinson design cleared by NTSB

ASPECIAL US National Transportation Safety Board (NTSB) investigation has exonerated the Robinson R22 and R44 light helicopters of suspected design defects, but it recommends that tougher flight-training requirements remain in force.

The ruling comes after an investigation which started in 1994 after a series of fatal R22/44 accidents involving loss of main rotor control, followed by break-up, while the helicopters were being operated well within their defined operating envelope. At the time, the NTSB expressed concern that "...the stability of the R22 main rotor blades is compromised by an inherent rotor system design deficiency",

and recommended that the R22 and R44 be grounded.

The US Federal Aviation Administration rejected the grounding recommendation, but has ordered new pilot and certificated flight-instructor training rules and some flight restrictions.

Investigation of 34 R22/44 accidents between 1981 and 1995 did not identify inherent mechanical failures or material defects. Instead, many accidents most likely stemmed from "a large, abrupt pilot input to a helicopter that is highly responsive to cyclic-control inputs," says the report. As a result, special training is required for student pilots and flight instructors, it adds. □



Thai takes off with first Trent-powered 777

BOEING HAS HANDED OVER the first Rolls-Royce Trent 800-powered 777 to Thai Airways International. Thai's first aircraft, a -200, will enter scheduled service in June on routes from Bangkok to Hong Kong and Seoul. The airline has 14 of the 777s on order, including eight -200s and six stretched -300s. The -300s order is subject to Government approval.

USAF 737 was 'off course' before crash

GRAHAM WARWICK/ATLANTA

AUS AIR FORCE Boeing T-43A is believed to have been off course when it crashed into a hill in stormy weather with poor visibility on the approach to Dubrovnik Airport in Croatia on 3 April.

All 33 passengers and crew, including US Commerce Secretary Ron Brown, were killed. The aircraft, a military 737-200, was not equipped with cockpit-voice or flight-data recorders.

The T-43A was carrying Brown and US businessmen from Tuzla, Bosnia, to Dubrovnik as part of a commercial mission to discuss reconstruction projects in the former Yugoslavia. Three aviation-industry executives scheduled to accompany Brown were not on the flight: Boeing Commercial Airplane Group president Ron Woodard, DynCorp president Daniel

Bannister and Northwest Airlines co-chairman Alfred Checchi.

The T-43 had been cleared for an instrument approach to runway 12 at Dubrovnik's Cilipi Airport. No problems had been reported to the control tower. The aircraft disappeared from radar at 14.52 local time, about 5min before it was expected to land.

Wreckage was found on top of a 2,300ft (700m)-high ridge 3km (1.5nm) north-west of the runway threshold. There was no evidence of hostile fire, the USAF says.

At the time, horizontal visibility was given as 1,000m and vertical visibility 90m. Heavy rain impeded rescue attempts. Based at Ramstein AB in Germany, the T-43 was built in 1973, had accumulated 17,000h and 12,000 landings and had undergone a major inspection in June 1995. The USAF operates 12 T-43s as navigation trainers and passenger transports. □

Europe aims for tighter foreign-airline safety

DAVID LEARMOUNT/LONDON

FOREIGN AIRLINES are to face tougher safety surveillance when they enter European airspace because of an agreement by the directors-general of the 33-member European Civil Aviation Conference (ECAC) to raise safety standards. This follows a similar decision by European Union ministers early in March.

Collection of safety-related data on foreign aircraft flying to European airports will start immediately, using the European Joint Aviation Authorities (JAA). The information will be shared among the member

states, and an implementation programme will be agreed at the June meeting of the ECAC.

The European programme will harmonise with a US Federal Aviation Administration international aviation safety-assessment programme which has been in operation since 1992.

The European programme will benefit from increased safety-over-sight activity by the International Civil Aviation Organisation (ICAO), according to JAA secretary-general Klaus Koplin.

FAA sanctions imposed in 1995 on countries failing to meet the international safety-over-sight stan-

dards affected several nations, particularly in Latin America, restricting services to the USA, and in some cases halting them until the country complied with the standards.

The Europeans seem unlikely to take the same route. Koplin says that the ECAC's intent is to use "discussion" rather than impose sanctions on countries.

The different approach is largely a result of contrasting ways of negotiating bilateral agreements. The USA includes a safety requirement in all its bilateral aviation agreements. European states do not, preferring to rely instead upon mutual adherence to ICAO standards. □

USA guarantees GPS availability

THE LONG-AWAITED US Government policy statement on civil use of the global-positioning system (GPS) has guaranteed continuous, worldwide, availability free of direct user charges. The USA will also stop deliberately degrading civil-GPS signals within the next four to ten years, enabling commercial-receiver accuracy to increase to 20m from 100m.

The policy opens the door to bilateral and regional agreements on the exploitation of the GPS by foreign governments.

"International customers can now make confident investment decisions," says the US GPS Industry Council (USGIC). The Council is urging the Government to start discussions with Japan, the Asia-Pacific region and Europe.

The President Decision Directive, issued on 29 March, is intended to promote worldwide acceptance of the GPS and encourage US private-sector investment in GPS products and services. The policy is also intended to protect US security by directing the military to develop resources to operate without the protection of selective availability — the deliberate degradation of civil signals — and measures to prevent the hostile use of the GPS "...without unduly disrupting or degrading civilian uses".

A permanent inter-agency GPS executive board, jointly chaired by the US Departments of Defense and Transportation (DoD and DoT), will manage the GPS. The DoD will continue to acquire, operate and maintain the system, while the DoT will develop and implement civil augmentations. "Beginning in 2000, the President will make an annual determination on continued use of selective availability," the policy says.

"We look forward to the early removal of selective availability, since this will significantly enhance the built-in integrity features for the civilian user," says the USGIC.

Under the policy, the US Government will advocate acceptance of the GPS, and items such as the Federal Aviation Administration's wide-area augmentation system, as international standards. □

Air New Zealand plan for Ansett rejected

PAUL PHELAN/CAIRNS

NEW ZEALAND'S Commerce Commission has rejected Air New Zealand's plan to acquire up to 50% of Ansett Holdings. The scheme foundered on the monopoly effect the deal would have on domestic services in New Zealand.

Air New Zealand managing director Jim McCrea says that "...we are still committed to securing an influential stake in Ansett Australia". The airline is considering challenging the decision.

Ansett shareholder News Corporation says that it is considering separately buying out the interest of co-shareholder TNT in Ansett

New Zealand as a way of processing the tie-up.

Commission chairman Dr Alan Bollard says that the plan has been rejected because "...we are not satisfied that Air New Zealand and Ansett New Zealand would not acquire a dominant position in the domestic air-services markets if this acquisition went ahead. The Commission requires public benefits to outweigh the detriment likely to arise from the acquisition, and, in this instance, it is not satisfied the benefits likely to accrue are such that it should be permitted."

The Commission says that the deal would give Air New Zealand and Ansett New Zealand almost 100% of the domestic market.

Air New Zealand had proposed a joint-venture structure isolating Ansett New Zealand from Air New Zealand, preventing the two parties from being "associated" under regulatory definitions.

The submission also says that the threat of entry to the main trunk passenger market, in the form of cabotage by an international carrier, would constrain the two companies.

Nevertheless, the Commission is "...not satisfied that the likelihood of such entry is great enough to constrain them, or that such entry would be timely". Australian rival Qantas has said that it will not be a major entrant on New Zealand domestic routes. □

Dornier 328 makes French debut with Proteus

DORNIER HAS made a breakthrough into the French market with its 328. The first of two aircraft has now been delivered to Dijon-based carrier Proteus. The airline will start operating the aircraft this month on Air France/Air Inter regional-express routes, serving destinations such as Frankfurt, Lyon, Milan, Nantes, Strasbourg and Zurich.



NEWS IN BRIEF

■ SUDAN BOYCOTT

The US and the UK are considering a campaign to persuade the UN Security Council to impose an arms and aviation embargo against Sudan if it persists in refusing to surrender to Ethiopia three men accused of involvement in the June 1995 assassination attempt against Egyptian President Mubarak in Addis Ababa. A new US resolution imposing diplomatic and visa restrictions against Sudan is imminent.

■ SHEFFIELD AIRPORT

Amsterdam and Paris are the most likely destinations for scheduled services when Sheffield City airport opens late in 1997. Plans for the privately funded airport are expected to be unveiled on 9 May. The northern English city of Sheffield, reputedly the largest in Europe without an airport, was to have had one in 1993. The previous developers, however, met financial trouble after much of the preparatory work had been completed on a site east of the city at Tinsley. The original £15 million (\$23 million) proposal envisaged a 1,200m (4,000ft) runway.

■ SWIFT ACTION

Australia's newly elected government has ordered swift action to remove the chronic air-traffic bottleneck at Sydney's Kingsford Smith (KSA) Airport, and boost its capacity by about 25%. Movements on KSA's intersecting east-west runway 07/25, whose approaches overflowed the electorates of two ex-government members including former transport minister Laurie Brereton, will resume. The runway had been closed by the former minister except for emergencies. The ministerial direction also requires KSA to provide a long-term plan by December for operation of the airport.

USA and Japan start new row over passenger flights

PAUL LEWIS/SINGAPORE

JUST A WEEK after Japan and the USA reached a basic agreement on air-cargo services, the two countries have become embroiled in a new row over passenger flights.

The fresh dispute centres on the US Department of Transport's (DoT) rejection of Japan Airlines (JAL) application to fly between Tokyo and Kona, in Hawaii. JAL had planned to launch the thrice-weekly service from 1 April.

Japan's Ministry of Transport

(MoT), in a tit-for-tat retaliation, turned down United Airlines application to temporarily increase its frequencies between Honolulu and Kansai from seven to 14 flights a week for a holiday period in April.

The DoT decision to block JAL's Kona service follows complaints by United Airlines that the MoT had failed to approve its application to launch beyond services from Tokyo to Seoul and Bangkok.

Japan is refusing to grant US carriers any more fifth-freedom passenger services, until the 1952

bilateral air-services agreement between the two countries is renegotiated. MoT accuses United of abusing the agreement by carrying more than 50% Japanese traffic.

JAL argues that its planned route to Kona was a substitute for its service to Washington, which was discontinued in November, and is allowed under a 1989 memorandum between Japan and the USA.

This latest row is not expected to affect the signing of the new air-cargo-services agreement in Washington, due in mid-April. □

Italy becomes part of Eurocontrol

ITALY HAS finally become a full member of Eurocontrol, clearing the way for its full participation in the agency's efforts to harmonise air traffic control (ATC) throughout Europe.

Italy is the 21st nation to join Eurocontrol, its membership having previously been blocked by successive governments which failed to ratify membership. The country already participates in Eurocontrol's EATCHIP ATC harmonisation programme, and has allowed its Rome ATC centre to be integrated into the Central Flow Management Unit (CFMU). Eurocontrol's finances will benefit from Italy's financial contribution from route overcharges.

■ Airlines filing flight plans to the CFMU can now use a paperless on-line process connecting to Eurocontrol's Integrated Flight Plan Processing System (IFPPS). The IFPPS consists of two computers, one at Haren in Belgium and the other at Bretigny-sur-Orge, near Paris in France.

The system processes the flight plans for accuracy, takes account of likely congestion, sends them automatically to ATC units in any of the 32 participating countries, and advises the airline of the route. □

North and South Yemen airlines to merge

SIX YEARS after North and South Yemen became a single republic, their airlines are to merge into a single company.

Yemen Airways (Yemenia), based in the northern capital of Sana'a, was formed in the 1970s as a joint venture between the North Yemen Government and the Saudi Arabian flag carrier Saudia, which had a 49% stake.

Yemen Airlines (Al Yemda) was 100% owned by the Aden-based Government of the former People's Democratic Republic of Yemen.

Yemenia chairman Hassan Subhi says that Saudia will hold 49% of the merged company. The new company, as yet not named, will operate 12 aircraft, including two Airbus A310-300s scheduled for delivery in 1997. □



Condor fresh at 40

LUFTHANSA CHARTER SUBSIDIARY Condor Flugdienst is celebrating its 40th birthday with a light-hearted new look for one of its Boeing 757s, courtesy of well-known US artist James Rizzi and Lufthansa Technik's Hamburg paint shop. The aircraft, christened the "Rizzi Bird", has provoked mixed reactions. Condor officials at the 28 March roll-out believe that the bright design will please passengers and raise the carrier's public profile, while at least one Lufthansa executive believes that Condor could have done better. Rizzi's commission remains undisclosed.



United awaits permission for DC-10 freighter flights between the USA and Asia

United plans to launch all-cargo service to Asia

GRAHAM WARWICK/ATLANTA

UNITED AIRLINES plans to launch an all-cargo service between the USA and Asia, using four McDonnell Douglas DC-10-30 freighters. Approval is being sought for six flights a week in both directions between Tokyo, Osaka, Taipei and Manila and New York, Chicago, Los Angeles and San Francisco.

Services are scheduled to begin in the fourth quarter. United expects a quick approval as rights to operate the services were acquired from Pan American World Airways in 1986, but never used. The airline now carries

cargo between the USA and Asia in the belly holds of passenger aircraft, but says it is turning away business in both directions.

The DC-10 freighters will either be leased or converted from passenger aircraft now in service with United. The airline already operates four passenger DC-10-30s which were converted from freighters. United's Worldwide Cargo division says that it has no plans presently to expand its all-cargo service beyond Asia.

Northwest Airlines is the only other US carrier to operate both passenger and cargo aircraft, flying eight Boeing 747 freighters

between the USA and Asia. Japan Airlines and Nippon Cargo Airlines also operate all-freight services across the Pacific, as do FedEx and UPS.

United's move comes as the USA and Japan have agreed a new cargo bilateral which will allow additional flights by both US and Japanese carriers. UPS, which has announced plans for a \$400 million hub in Taipei, will get 12 additional weekly flights to Asia via Kansai.

United World Cargo vice-president James Hartigan says the DC-10s will add only about 3% more capacity to a market that is growing faster than 7% a year. □

El Al and American agree codeshare

EL AL AND American Airlines have agreed a codeshare on several of the Israeli airline's services to the USA. A letter of intent was signed in early April and the aim is to have the agreement working by 1 November.

Three weekly Tel Aviv-Newark flights and two weekly Chicago services will be codeshared.

Dov Koniak, El Al's commercial vice-president, says that the original plan was also to operate codeshared flights to New York Kennedy, but a gate shortage prevented implementation. The Israeli flag carrier had also held talks with Continental Airlines. □

Reno adds to MD-90s

NEVADA-BASED Reno Air plans to add a third McDonnell Douglas MD-90 to its fleet in 1997, having inaugurated services with its first two MD-90s on 4 April.

Final negotiations over the third twinjet were under way on 2 April as Reno introduced its "Orange County Flyer" service to John Wayne Airport, California. The airline doubled its daily services from Orange County to 14 as a result of its MD-90 acquisition which enabled it to grab additional slots at the noise-sensitive airport.

Reno, which started in 1992 with one MD-80 and 150 staff, now operates 24 MD-80s and two MD-90s and has 1,600 employees. □

IAE strives to cut 20% from V2500 operating costs

INTERNATIONAL AERO Engines (IAE) is working to cut the operating cost of its V2500 powerplant by more than 20%, as part of the company's short-term development plans.

The move is primarily in response to growing pressure from US carriers to drive down costs, says IAE president Barry Ecclestone. He reveals that a programme was initiated in 1995 and that it was hoped to achieve at least a 20% cost reduction within the next 12-18 months.

Measures have included trying to increase the time on-wing of

individual engine components, repairing rather than replacing parts, and also extending their service lives.

Attention has been focused mainly on parts in the V2500's hot section, such as the combustion chamber, high-pressure and low-pressure turbines. The life-extension programme has not entailed any changes to the engine's bill of material.

A total of 214 V2500-powered Airbus A320/321s and McDonnell Douglas (MDC) MD-90-30s has been delivered since the engine's entry into service in mid-1989. A

V2500A1 fitted to an Air 2000 A320 has achieved the highest on-wing time of 16,300h to date.

In the longer-term, IAE is continuing to look at further developing the V2500 series beyond the existing 105-150kN (23,500-33,000lb)-thrust range for new aircraft applications, according to Ecclestone.

Development of a 150-156kN growth derivative is being considered for a future 200-seat passenger aircraft aimed at beating the Boeing 757. Suitable new airframes would include an MDC proposed MD-XX, a possible fur-

ther A321 stretch or A310 shrink.

Ecclestone adds that the company is continuing to look at offering a V2500 growth engine to allow it compete against the CFM56 on a 275-285t higher-gross weight version of the Airbus A340, providing that there is "a sound business case for it."

He rules out developing an engine for any airframe that goes beyond a 300t maximum take-off weight, such as the proposed A340-400. That aircraft would need an engine rated at more than 178kN and a larger 1.8-1.9m-wide fan. □

NEWS IN BRIEF

■ **SABENA INTRODUCTION**

Sabena began operation of the Airbus A340-200 on 31 March, replacing a Boeing 747-200 for its Brussels-New York service. The Belgian airline, a launch customer for the A340, dry-leased its five aircraft to then-shareholder Air France. Now only four aircraft are being returned as their leases expire — the fifth was destroyed by fire at Paris Charles de Gaulle Airport.

■ **CAMBODIAN EXPANSION**

Royal Air Cambodge (RAC) has signed an agreement to lease a third ATR 72 turbo-prop from June. The move follows recent threats made by the Cambodian Government to revoke RAC's monopoly, unless the flag carrier acquired more aircraft and improved its services. RAC was relaunched in January 1995 as a joint venture with Malaysian Helicopter Services and operates two leased Boeing 737-400, in addition to its ATR 72s.

■ **VIENNA EXPANSION**

Vienna's Schwechat Airport has opened a new terminal, pushing capacity up to 12 million passengers. The addition of the Pier West terminal follows a record 1995 for the Austrian airport, reporting passenger growth of 10.6%, compared with the previous year, to top 8 million passengers for the first time. Airport director Dr Gerhard Kastelic expects Schwechat to see "9.5 million guests" this year.

■ **SAUDI SELECTION**

Saudi Arabian Airlines has selected Honeywell/Racal multi-channel satellite-communications systems for 23 Boeing 777s, five 747-400s, 29 McDonnell Douglas MD-90s and four MD-11s on order. The systems will provide cockpit and cabin communications.

Air France opens hub in drive to improve services

JULIAN MOXON/PARIS

AIR FRANCE HAS stepped up its efforts to become competitive with its inauguration on 31 March of a new "hub" at Paris Charles de Gaulle Airport.

The airline has spent Fr51 million (\$10 million) on the changes, which it hopes will increase by 117% the number of connections between long- and short-haul flights. The carrier's timetable has been restructured around five 2.5h time segments in each day, within

which connecting flights will be concentrated.

The aim is to reduce transfer times by 45min, although this depends on the ability of the national carrier to surmount continuing problems with delays, which still affect around 30% of its flights.

The airport is also hampered by having just two main runways to handle up to one flight every 90s. The baggage system will also have to handle considerably more items at higher speed, giving rise to concerns about baggage following the

passengers through the system.

Air France will begin its summer season with a 3.5% increase in the number of seat-kilometres being offered on its short-range flights compared to 1995, while frequencies will increase by 6%.

Numbers of flights on many European routes have been increased, with 2,600 services to 54 destinations, while long-range frequencies have grown by 8.5%. Fare wars have had a bad effect on earnings per passenger, however, which are 9.5% below plan. □

Zambia hit by new air service withdrawal

AIR SERVICES TO Zambia have been hit again, this time by the withdrawal of Air France, a long-time supporter of services between France and Zambia. The airline made its last weekly Paris-Lusaka flight on 27 March, further damaging the southern African nation's tourist-dominated economy.

Air France's withdrawal leaves just five weekly direct flights from Europe, providing a total capacity of around 1,500 seats. Two are flown by British Airways from London Gatwick, using Boeing 747s, two by KLM from Amsterdam using a McDonnell Douglas MD-11, and one by Aeroflot from Moscow using an Ilyushin Il-62M.

Although two local airlines (Aero Zambia and South African-supported Zambia Express) started operations soon after the liquidation of flag carrier Zambia Airways on 3 December, 1994, with a third, Eastern Air, opening flights on 26 March between Lusaka and Ndola, the Zambian Government appears reticent to issue any intercontinental licences.

Zambia has had the opportunity to join the Alliance partnership of South African Airways, Uganda and Tanzania, but declined to participate, because the Government coffers were empty. □

Jet Airways widens routes with new 737s

INDEPENDENT INDIAN carrier Jet Airways is expanding its fleet and sphere of influence. It has signed an agreement with Boeing for the lease of two 737-400s, which will bring its all-Boeing fleet to six 737-400s and four 737-300s.

The new aircraft are due to join the fleet in May and June, and will be used on four new routes linking Bombay (Mumbai) with Baroda, Jaipur and Trivandrum, and Madras with Trivandrum. Additional

frequencies will be offered on routes from Bombay to Cochin, Delhi, Hyderabad and Madras.

Plans are also being made for the establishment of two feeder airlines — one in the west of India, in conjunction with Gujarat Industrial Investment and the State Industrial Investment Corporation of Maharashtra, and the other in the eastern sector, in collaboration with the Government of West Bengal, based on Calcutta. □



A flying Big Mac?

THIS McDONNELL DOUGLAS MD-83 flying advert for McDonald's hamburgers was flown on 1 April. Swissair subsidiary Crossair is providing the aircraft and crew, travel agent Hotelplan is providing the passengers and, says the airline, McDonald's is "...bringing the cheerful atmosphere of its restaurants". Passengers on the "McPlane" flying from Zurich and Geneva to the Mediterranean will be served hamburgers.

Pentagon plans aerostat cruise-missile defence

RAMON LOPEZ/WASHINGTON DC

THE US MILITARY is moving ahead with plans to field helium-filled aerostats to help support cruise-missile defences.

A new tri-service project office, called the Joint Aerostat Project Management Office for Cruise Missile Defence is being established under US Army auspices at the Redstone Arsenal in Alabama. The US Navy and US Air Force are also participating.

The aerostat will serve as the airborne platform for advanced radars able to track and target low-flying cruise missiles. The feasibility of using radar-carrying aerostats against cruise missiles was established by a 1994 Defense Science Board study.

The system will consist of an aerostat, sensor suite and ground station. The sensors will provide real-time targeting information to anti-cruise-missile weapons, such

as the PAC-3 missile under development or tactical aircraft including the McDonnell Douglas F-15 and Lockheed Martin F-16 fighters, via the Boeing E-3A airborne warning and control-system aircraft.

The USAF is already using a string of Loral Defense Systems-Akron 420K aerostats fitted with Lockheed Martin L-88A radars as part of the Tethered Aerostat Radar System (TARS) for drug interdiction along the US/Mexico border and over the Gulf of Mexico. A 420K system costs \$20-\$25 million.

Loral will bid for the cruise missile defence project. The 420K, which contains 12,000m³ (420,000ft³) of helium, is viewed as the baseline aerostat for the programme, but company officials may offer an aerostat as large as 42,000m³. The smaller air vehicle can carry a 900kg payload to 15,000ft (4,600m) while the much larger aerostat can support a sensor

suite weighing 4,500kg at up to 20,000ft in altitude.

Loral will finalise its bid after evaluating the request for proposals which is expected to be released in the next four months. Yet to be determined is the number of aerostat systems and the sensor suite required by the Pentagon. A combination of on-board and ground station target-information processing is envisaged.

Industry officials believe that the joint programme office will make multiple awards for the concept demonstrations. Another US company expected to submit a bid is TCOM. A limited initial operational capability is expected in 2001-2.

Loral and Thomson-CSF have agreed to market aerostat systems worldwide. The Target radar — a key segment of the French Horizon helicopter-borne battlefield surveillance system — would fit the 420K aerostat well. □

South Korea seeks more helicopters

THE SOUTH Korean navy has issued a request for proposals for a second batch of 13 anti-submarine warfare (ASW) helicopters to equip its new fleet of KDX-class destroyers.

At least three manufacturers have so far submitted proposals, including Kaman offering the re-manufactured SH-2G Super Sea Sprite, Sikorsky (with the S-70B Seahawk), and Westland (with the improved Super Lynx).

South Korea requires the additional naval helicopters to supplement 11 Super Lynx Mk.99s in service since 1990.

The new requirement includes a single attrition replacement for a lost Lynx.

The new helicopters will be equipped similarly to South Korea's existing Lynx machines, with a dipping sonar, 360° search radar and anti-ship missiles.

A procurement decision is expected towards the end of the year, with initial funding for the programme to be included in the 1997 defence budget. □

Egypt plans to buy additional F-16Cs

EGYPT IS TO BUY an extra 21 Lockheed Martin F-16Cs to complete the re-equipment of two airbases. A letter of request has been received by the US Government. Authorisation for the deal is expected by the end of May, enabling deliveries to begin in 1999 and continue into 2000.

Egypt already operates more than 160 F-16s (a combination of A/Bs and more-capable C/Ds) and the new aircraft would be built to the same configuration as its existing F-16Cs. In the longer term, Egypt has a requirement for further F-16s to replace its 80 Dassault Mirage 5s.

This latest Egyptian batch, plus a resumption of F-16C production for the US Air Force, is expected to extend the line beyond the year 2000. Lockheed Martin forecasts at least 500 more F-16 sales, 60-80% of them from existing customers. □ See feature, P30.

DarkStar rises over California

THE LOCKHEED Martin/Boeing DarkStar high-altitude endurance unmanned air vehicle (UAV) had its first flight at Edwards AFB, California, on 29 March.

The 21m-span UAV had a fully automated flight lasting 20min from take off to landing using differential global-positioning-system (GPS) navigation signals for guidance throughout. "The vehicle achieved its planned altitude of about 5,000ft and completed all pre-planned basic flight manoeuvres," says the DarkStar team.

The UAV is being developed for the US Defense Department's Tier III Minus programme and had been expected to have flown originally in December 1995. A series of software and hardware problems, primarily concerning the flight-control system and speed brakes,



The DarkStar takes off for its first flight from Edwards AFB

dogged the UAV before being overcome in March.

The test programme will also evaluate the performance of the UAV's high-resolution synthetic-aperture radar and electro-optical reconnaissance payloads. Following completion of the tests, the DarkStar will be shown to the US military in a series of tactical demonstrations. The DarkStar was

developed under a Defense Advanced Research Projects Agency-/Defense Airborne Reconnaissance Office contract. The UAV is powered by an 8.5kN (1,900lb)-thrust Williams-Rolls F129 (FJ44) turbofan buried in the saucer section.

The aircraft will be able to operate at a range of more than 900km (500nm) and stay on station for over 8h at more than 45,000ft. □

Norway briefed on JAST/JSF

GRAHAM WARWICK/ATLANTA

NORWAY HAS been briefed formally on the US Joint Strike Fighter (JSF), as a potential candidate for its next combat-aircraft purchase. The Royal Norwegian Air Force is looking to replace its Northrop F-5s and is already evaluating the Dassault Rafale, Eurofighter EF2000, Lockheed Martin F-16, McDonnell

Douglas F-18 and Saab JAS39 Gripen.

The JSF is planned to emerge from the Joint Advanced Strike Technology (JAST) programme, and is intended to replace, among other aircraft, the US Air Force's F-16s. Development is scheduled to begin in 2001, with first deliveries in 2008. Norway is planning an F-5-replacement decision by 1998 and first deliveries by 2004, seem-

ingly too late for the JSF, unless Norway delays selection.

Norway requested additional information on the JSF after F-16 operators were briefed on the programme by US Air Force acquisition chief Gen George Muellner. JAST programme manager Adm Craig Steidle travelled to Norway to give the detailed briefing.

Norway plans to replace its F-5s initially, but the chosen air-

craft is expected to replace its F-16A/Bs eventually. Belgium and the Netherlands are in the early stages of drawing up requirements to replace their F-16s from around 2010. The UK is now the only offshore nation in the JAST concept-demonstration programme, but foreign partners may be sought for the JSF development phase from 2001. □

See feature, P30.

Re-usable software tested by MDC

MCDONNELL DOUGLAS (MDC) has begun flight-testing a re-usable navigation-software module hosted on a commercial Power PC processor. The software and hardware were flown for the first time on 29 March in an AV-8B Harrier II technology-demonstrator.

The same MDC-developed software module will be flight-tested in an F-15 equipped with a MIPS R4400 processor and in an F-18 equipped with a Power PC processor. The F-15 and F-18 flights are due this month.

The aim of the demonstrations is to prove that the navigation-software module is compatible with different computer processors and does not alter the operation of the cockpit controls and displays. MDC test pilot Jackie Jackson says that the head-up display symbology and responsiveness are "identical to that of the production AV-8B". □



UK will receive US Army help in qualifying RTM322 for the Apache

US clears UK Apache impasse

RAMON LOPEZ/FORT WORTH

THE US ARMY has agreed to assist the UK Ministry of Defence (MoD) in qualifying the Rolls-Royce Turboméca RTM322 turboshaft for the Westland/McDonnell Douglas WAH-64D Apache attack helicopter being procured for the British Army.

The US decision to support the engine-integration effort helps UK prime-contractor Westland and the MoD overcome contractual differences concerning the purchase, which threatened to delay the programme. The contract was signed on 25 March.

One problem facing the parties was the installation and testing of the RTM322 on the Apache. The UK opted to use the RTM322 rather than the General Electric

T700 fitted to all other versions of the helicopter.

Two options were under discussion: testing the RTM322 on a US Army Apache and using the first WAH-64D for engine integration and certification.

Col Stephen Kee, the US Army's AH-64 programme manager, says: "We have been asked to assist the UK MoD with integration of the RTM322 powerplant into the AH-64D Apache. They will use one of the US Army's prototype aircraft to conduct the integration."

As to whether the UK should expect problems with the engine/airframe integration, Kee says: "There are always problems with integrating [an engine] into an aircraft it was not designed for, [but] those are challenges which can be overcome." □

THAAD misses mark — again

ANALYSIS OF flight data is continuing to determine the cause of the Lockheed Martin Theater High Altitude Area Defense (THAAD) missile test failure on 22 March.

A THAAD prototype failed to hit its ballistic missile target — the second failure in two intercept attempts. During the test, which took place at the White Sands Missile Range in New Mexico, the missile flew past the target after its in-flight command and control functions failed to operate, says the US Army.

It was then destroyed so that missile debris would not land outside the test range.

Programme officials are trying to determine whether missile components failed or whether the THAAD ground-based radar malfunctioned. The test was the fifth for the THAAD.

A software glitch caused a THAAD missile to miss a Storm target in the 13 December, 1995 test, the THAAD's fourth and the first of 11 planned intercepts.

The THAAD is designed to engage theatre ballistic missiles at high altitudes and long ranges using hit-to-kill technology. Lockheed Martin is working under a \$689 million research and development contract. The Pentagon wants to delay THAAD production by about two years and shave spending on the weapon by \$1.7 billion. □

NEWS IN BRIEF

■ DANISH EVALUATION

The Danish air force is to evaluate an advanced aerial photography system developed by Israeli manufacturer El Op. The system, based on technology used in the payload of the Ofeq 3 Israeli spy satellite, will be installed in a pod developed by Per Udsen for Danish air force Lockheed Martin F-16s.

Eurocopter is close to clinching Cougar sales

JULIAN MOXON/MARIGNANE

EUROCOPTER president Jean-Francois Bigay claims that the Franco-German consortium is aiming to conclude orders for "around 100" AS.532 Cougar military-transport helicopters this year.

Kuwait, Saudi Arabia, Turkey, the United Arab Emirates and a further unnamed country are among those which could, says Bigay, make 1996 a "notably better" year than last, when military sales at Eurocopter were at an all-time low.

Negotiations with Turkey, which is looking at buying a 30-helicopter batch to follow its initial 20 Cougars, are "almost finished", says Bigay, and centre on the conclusion of the offset deal, under which Turkey will manufacture subassemblies and carry out final assembly of the Cougar.

Talks with Saudi Arabia on a possible 40-aircraft order are "just beginning", while discussions are under way on a potential seven-aircraft order from Kuwait.

Eurocopter handed over the first of 17 Cougars ordered by the Royal Netherlands Air Force on 1 April.



Bigay: orders for around 100 Cougars?

This was also the 400th aircraft to be delivered. Total sales of the type now stand at 467. The RAAF machines form part of the service's air-mobile brigade, which also includes Boeing Chinook transports and McDonnell Douglas Apaches ordered in 1995. The brigade will be officially inaugurated in the middle of the year.

Bigay says that the French Government has promised that it will come up with its half of the Fr2.6 billion (\$500 million) needed to tool up for production of the Tiger attack helicopter. "I have an

assurance that the production investment contract will be signed in 1996," he says.

This would enable delivery of the first helicopter in 2001.

He adds that he still has "no confirmation" that the number of French Tigers has been reduced from 215 to 180, although sources indicate that this is now becoming the accepted figure.

The helicopters will, he says, be ordered in batches of between 20 and 30, probably in two-year contracts, until delivery of the last machine in 2015.

On the four-nation NH90 transport helicopter, Bigay says that he is now "convinced" that development will proceed normally up to the production investment decision, which he says "must be taken" in 1998. This would allow delivery of the first of 20 helicopters to the Royal Netherlands Navy to be made at the end of 2002.

The position on French procurement of the NH90 is less clear, he says, because the planned 2003/4 delivery of the first helicopter comes after the current five-year spending plan. □

BAe names Hawk team partners

BRITISH AEROSPACE has named Qantas, Hawker de Havilland, Hunter Aerospace and maintenance group AirFlite as its major partners in a 16-company line-up for the supply and support of up to 40 Hawk 100 lead-in fighter (LIF) trainers for Australia.

The Hawks are shortlisted as replacements for the RAAF's Aermacchi MB-326H trainers, in competition with the McDonnell Douglas T-45 Goshawk and Aermacchi MB-339.

Under a plan unveiled by BAe on 3 April, Australian companies will secure long-term service and manufacturing contracts worth more than \$1 billion from the package. It is expected that the first squadron of 12 aircraft will be ready for service by January 2000.

BAe proposes that up to 20 LIF Hawks will be assembled in Australia by Hunter, which is located at Newcastle Airport, adjacent to the Royal Australian Air Force (RAAF) Williamtown base, where about half the new trainers will be based.

Qantas will assemble, test and provide through-life maintenance and repairs to the Hawk's Rolls-Royce Adour engine; Hawker de Havilland will manufacture the tailplane, rudder and aileron; AirFlite will maintain and repair seats and ejection systems at the RAAF's second jet-training base in Pearce, Western Australia; and British Aerospace Australia will manufacture and maintain advanced avionics components.

The tender also commits the company to build and manage a contractor support base at Williamtown, where specialist companies will maintain and repair Hawk airframes and components.

In its request for tender for a new lead-in fighter, the RAAF specifies that the aircraft will be used for advanced flying training, weapons and tactical training and training support for the Army and Navy.

BAe is offering a Hawk customised to meet Australia's requirement for a cockpit environment similar to that of the McDonnell Douglas F-18, to minimise conversion training of pilots graduating to the frontline aircraft. □

Aermacchi refuelling tests of MB-339 nearly complete

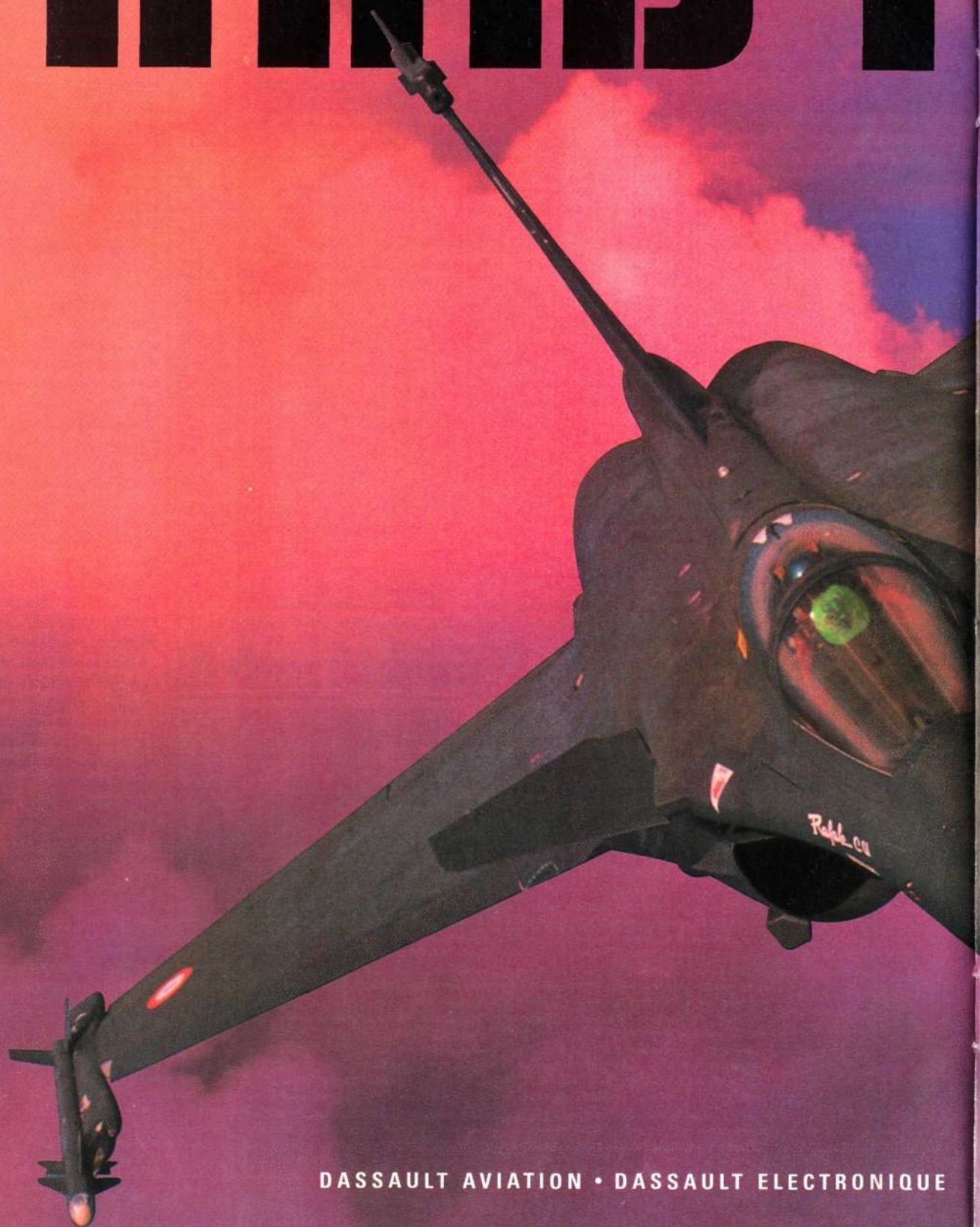
AERMACCHI is completing in-flight refuelling tests of its MB-339 advanced jet trainer at the Italian air force base of Pratica di Mare. The aircraft has already been qualified with the Panavia Tornado strike aircraft fitted with a centre-line buddy pod and a Boeing 707 T/T tanker. Tests are continuing



to obtain full night qualification. The MB-339 has been fitted with a fixed probe which will be a standard feature on the 15 MB.339 CDs which the Italian air force is due to start receiving later this year. The aircraft, newly equipped with fully digital avionics, will be used by the air force for advanced training, including complete air refuelling qualification.

HARD T

AZTEC • PHOTO: DASSAULT/AVIAPLANS - F. ROBINEAU



DASSAULT AVIATION • DASSAULT ELECTRONIQUE

O B E A T



RAFALE

Agile. Stealthy. Survivable. Rafale is the only 4th generation air combat aircraft to be fully operational before the year 2000.

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NEWS IN BRIEF

■ **ISRAELI-CHINESE VENTURE**

China National Aero-Technology Import and Export (CATIC) and two Israeli companies have formed the Beijing Catic-Azimuth Electronics joint-venture, the first producer of global-positioning-system equipment in China.

■ **ATLAS AIR TO SELL SHARES**

US cargo carrier Atlas Air plans to sell 3 million shares to help pay for six Boeing 747-200s to be purchased from Thai Airways International. The sale will reduce chairman Michael Chowdry's stake by 6.7%, to 63.5%.

■ **TEXTRON BUYS VALOIS**

US company Textron has completed the acquisition of French fastener manufacturer Valois for \$120 million, plus the assumption of \$130 million in debt. Paris-based Valois had 1995 revenues of \$435 million.

Russia plans to unite MAPO MiG suppliers into one consortium

RUSSIAN PRESIDENT Boris Yeltsin has signed a decree calling for the establishment of a consortium to combine 12 Russian production plants and design bureaux involved in MAPO MiG aircraft programmes.

The level of integration which will take place is not yet clear, but company officials say that the arrangement will be "more relaxed" than that pertaining to the merger between the Mikoyan design bureau and the Moscow aircraft production plant MAPO, which took place a year ago.

The new organisation is to be called VPK MAPO, which stands for Military Industrial Complex.

Helicopter design bureau Kamov has joined the new organisation hoping to benefit from the export rights that MAPO holds as a registered weapons exporter. □

Aer Lingus continues cost drive despite recovery

KEVIN O'TOOLE/LONDON

SIGNS OF RECOVERY at Aer Lingus have been accompanied by stern warnings from management that the airline will continue its "remorseless" drive to keep down costs.

The Irish flag carrier, which made heavy losses three years ago, posted a relatively respectable IR£15 million (\$24 million) net profit for 1995.

Group chairman Bernie Cahill warns that the result is not enough to shield the carrier from the impact of another downturn, expected within the next two to five years.

The objective remains to seek growth in "carefully selected" niche markets, while tying up partnerships and alliances to strengthen the carrier's international reach.

The start of direct Airbus A330 services from Dublin to New York and Boston, brought in two years ago as part of the restructuring, have continued to produce traffic growth, with an 8% rise in 1995.

Initiatives to bring in new feeder



A330 services to the USA have contributed to Aer Lingus' recovery

traffic from provincial UK airports also appear to be working, with the carrier reporting a 30% traffic rise over the past year. Traffic elsewhere in Europe rose 10%.

Overall, the core airline operations contributed operating profits of IR£44 million, up by almost one-third on 1994, although the troubled TEAM maintenance business lost IR£5 million.

The group's balance sheet is also looking increasingly healthy be-

cause of asset disposals, including the sale of the Copthorne hotel chain, and to the injection of IR£175 million of government cash, the last tranche of which arrived in 1995.

At the height of its financial problems, the group had built up debts of IR£555 million, but by the end of last year that was cut to IR£41 million. Cahill says that balance sheet ratios need further improvements, however. □

UK ATC tiptoes towards independence

DAVID LEARMOUNT/LONDON

THE UK'S AIR-TRAFFIC-control system made its first steps towards independence on 29 March as the National Air Traffic Service ceased to be a government department and emerged as a limited company.

National Air Traffic Services (NATS) now becomes a wholly owned subsidiary of the UK Civil Aviation Authority, but the move has come under fire for stopping short of full privatisation.

NATS chief executive Derek McLauchlan complains that the compromise leaves the new company unable to raise badly needed finance on the open market.

He says that NATS has seen its share of public investment fall by

around £250 million (\$380 million) over the past three years, under a development budget which has been cut by one-third. That would have led to a decline in the standard of ATC services around the next century if unchecked, he says.

Instead, NATS is being asked to raise funds through the Government's private finance initiative (PFI) scheme, under which ATC centres and equipment would be owned by private companies, but leased to NATS.

McLauchlan fears that this could lead to fragmented ownership and less control over future development. He also points out that under the previous system, NATS was required to make an 8% profit which was to be re-invested in the system. Under the

PFI arrangements, he warns that site landlords could eventually begin to demand higher returns.

McLauchlan says that NATS intends to "...make the best of the PFI" but would much rather have gone direct to the market for finance, following the example of the state-owned German ATC.

The only project so far up for provision under the PFI is the new £200 million Prestwick-based Scottish en route ATC centre (SCATCC) and the co-located Oceanic control centre (OCC). The deadline for bids is set for the end of April and May respectively, but only two bidders have so far emerged. Hughes has combined with UK construction company Laing, while Loral has linked with UK builder Bovis. □

Regionals continue to grow in USA

KEVIN O'TOOLE/LONDON

WHILE THE MAJOR US carriers continue to make the most of the present business recovery, beneath the surface the second tier of national and regional airline groups are in the throes of making major changes.

Perhaps the most visible evidence of these changes is in the rapid growth rates which some, although not all, of these carriers have achieved in the past year. The best of the low-cost nationals have come close to doubling traffic, while the sharpest regionals bettered 20% growth in 1995. Early signs for 1996 suggest that growth may be more modest, but is still on the right course.

The changes taking place among the regionals have largely occurred as a consequence of the two years of restructuring within the majors which the regionals serve. As the big airlines have ceased striving for market share in favour of the search for profits, so they have been increasingly prepared to hand down a bigger role to their feeders, once confined to only the weakest of routes. In short, the regionals are becoming a more integral and strategically important part of major networks.

This change of role is clearly visible in the changing fleet profiles of many of the key regionals. Regional jets are being acquired, in exchange for the traditional 19-seaters, now redundant.

Comair led the way with the first US fleet of 70-seat Canadair Regional Jets, and its traffic has blossomed. Fellow Delta Connectors SkyWest and Atlantic Southeast have followed suit with similar results.

United Express carrier Air Wisconsin, resurrected three years ago with a fleet based solely on the British Aerospace BAe 146, has shown the potential for growth. With the pending arrival of the low-cost Embraer EMB-145, the trend could accelerate.

Other carriers such as AMR Eagle have yet to show an interest in regional jets, but are nevertheless

US REGIONAL AIRLINE SCHEDULED PASSENGER STATISTICS - 1995

	Airline partner	Traffic (RPK) (million)	change	Capacity change	Load factors (%)	change	Passenger yields c/RPK	change	Seat costs c/ASK	change
1	American Eagle	American	4,010	0.2%	2.5%	55.5%	-1.2	na	na	na
2	Mesa Airlines	Various	2,023	23.6%	21.8%	52.2%	0.8	na	na	na
3	Comair	Delta	1,911	24.1%	18.3%	52.2%	2.4	21.66	0.9%	9.28
4	Horizon Airlines	Alaskan	1,354	14.7%	21.3%	59.5%	-3.4	19.56	-5.6%	12.10
5	Atlantic Southeast	Delta	1,227	-2.3%	2.1%	45.2%	-2.0	25.92	6.4%	na
6	Continental Express	Continental	1,226	-2.8%	-3.3%	49.4%	0.2	na	na	na
7	SkyWest Airlines	Delta	909	19.9%	27.0%	48.0%	-2.8	20.57	-8.3%	9.82
8	Air Wisconsin	United	768	43.6%	42.4%	53.5%	0.4	na	na	na
9	Atlantic Coast	United	561	-11.3%	-17.5%	47.7%	3.3	27.41	11.1%	12.31
10	Mesa Airlines	Northwest	523	2.6%	1.8%	45.5%	0.4	27.22	3.7%	11.45
11	Great Lakes Av	United	400	16.7%	18.6%	43.9%	-0.7	na	na	na
12	CCAair	USAir	222	-6.1%	7.8%	44.1%	-6.6	26.54	6.0%	12.74

NOTES: Figures for scheduled services only in calendar year 1995. Figures recalculated for Mesa, Comair and SkyWest. Yield/cost data for SkyWest for nine months only, CCAir for year to June 1995. RPK = Revenue passenger kilometre. ASK = Available seat kilometre. 1 mile=1.609km

less beginning to strip out 19-seaters, leaving the market to those with lower costs.

The major network carriers have good cause to look to their costs. The new low-cost independent carriers have been gaining ground fast. Estimates vary as to the size of the threat, but the suggestion is that low-cost airlines could now account for as much as 15% of the US domestic market. The influence they are having is greater still. American Airlines recently suggested that around 40% of its bookings are being affected by low-cost competition.

Where start-ups seem to have got the formula right, growth rates have certainly been explosive. ValuJet came close to trebling its traffic in 1995 and has no intention of slowing down. Its profitability has also been maintained, with the best operating margins and seat costs in the business.

AirTran Airways has proved to be another fast riser. It started life within the AirTran group in mid-1994, alongside regional carrier Mesaba, but was floated off with-

in the Airways Corporation in 1995. Since then, the airline's traffic has been growing at the rate of more than 40% each a quarter.

Not all of the independent national carriers have been as successful. Hawaiian's brush with bankruptcy is one reminder, although better yields and action on costs appear to be having an effect. Even Kiwi, which also sailed close to collapse, now believes that it is back on course to make profits because of the

tough cost controls which it has implemented.

The true extent of the impact which low-cost competitors are having should become apparent when the US Department of Transportation (DoT) releases its imminent study on the subject.

Whatever the DoT's conclusions, there seems little doubt that the changes will continue to take place in the USA, and if analysts are right, can be expected to start to emerge in Europe before too long. □

US NATIONAL & REGIONAL AIRLINE GROUP FINANCIAL PERFORMANCE - 1995

Airline		Sales (\$ million)		Operating margin		Net profits (\$ million)	
		1995	change	1995	1994	1995	1994
1	Alaska Air Group	1,418	7.7%	5.4%	5.7%	17.3	22.5
2	Amtran	715	23.2%	2.3%	1.4%	8.5	3.5
3	Mesa Air Group	473	16.6%	6.6%	10.1%	15.1	24.3
4	Comair	414	25.2%	19.0%	14.8%	48.8	30.3
5	ValuJet	368	174.7%	29.3%	25.8%	67.8	20.7
6	Hawaiian Airways	347	13.4%	-0.5%	-4.1%	-5.5	-26.8
7	Atlantic Southeast	329	5.3%	23.1%	27.0%	51.1	52.7
8	Midwest Express	259	27.3%	12.1%	5.5%	19.1	6.7
9	Reno Air	257	31.2%	1.4%	-7.1%	2.0	14.0
10	SkyWest Airlines	238	5.8%	3.8%	12.0%	6.6	17.3
11	Kiwi	170	49.0%	-0.4%	-21.7%	-0.8	-24.7
12	Atlantic Coast	157	-1.2%	8.2%	-14.6%	12.9	-25.1

NOTE: Figures are for scheduled airline groups for which figures were available for calendar year 1995. Mesa, Comair and SkyWest recalculated for calendar year. Group figures include all operations.

US NATIONAL AIRLINE SCHEDULED PASSENGER STATISTICS - 1995

	Traffic (RPK) (million)	change	Capacity (ASK) change	Load factors (%)	change	Yields c/RPK	change	Seat costs c/ASK	change
1 Alaska Airlines	13,812	13.1%	14.9%	61.8%	-1.0	7.20	-5.0%	4.79	-6.8%
2 American Trans Air	7,519	46.9%	39.6%	70.8%	3.5	4.81	2.4%	na	na
3 Hawaiian Airways	5,103	10.1%	6.1%	74.8%	2.7	5.84	-3.1%	na	na
4 ValuJet	4,222	179.0%	159.3%	68.8%	4.9	8.35	-2.4%	4.23	0.3%
5 Reno Air	3,363	28.8%	24.1%	62.9%	2.3	7.21	3.6%	4.72	-2.6%
6 Kiwi	1,890	21.7%	29.6%	53.2%	-3.5	9.01	22.4%	4.81	-5.2%
7 Midwest Express	1,851	18.2%	12.2%	64.1%	3.3	11.06	6.6%	6.84	1.9%
8 AirTran Airways	684	na	na	58.4%	na	na	na	na	na

NOTE: Figures for scheduled services only, excluding regional subsidiaries for calendar year 1995. Kiwi's costs and yields for whole operation. AirTran figures recalculated over first full calendar year. RPK= Revenue passenger kilometre. ASK= Available seat kilometre. 1 mile=1.609km

US general aviation targets new pilots

KAREN WALKER/TAMPA

A CAMPAIGN IS TO BE launched to accelerate the revitalisation of the US general-aviation (GA) industry. The GA Team 2000 initiative will combine the efforts of the General Aviation Manufacturers Association (GAMA) and the Aircraft Owners and Pilots Association (AOPA) to increase the number of GA pilots. The goal is to achieve 100,000 new-student starts in 2000 and every following year.

The programme will be launched officially by January 1997, by which time a board of directors will have been appointed to develop a budget and define the tasks. Industry and aviation organisations are being invited to join the team for a fee of \$5,000 each. Founding members include companies such as AlliedSignal, BFGoodrich, Cessna, Cirrus, FlightSafety International, Mooney, New Piper Aircraft, Raytheon Aircraft and Teledyne Continental.

At today's student start and drop-out rates, the AOPA believes that the US pilot population will drop from 650,000 to 530,000 by the year 2000. An effective student-start revitalisation programme, however, could expand that figure by the turn of the century to 700,000, says AOPA.

AOPA says its research has found a "startlingly more positive environment" for GA recently. Its target audience is in the 25-65-year-old age group, has a household annual

income of over \$50,000 and sees itself as "independent, adventurous, take-charge and competent."

The GA Team 2000 will aim to change the public's misconceptions about how expensive it is to learn to fly — most people over-estimated this cost in surveys — and how long it takes to get a pilot's licence.

It will also try to make flying courses more attractive to women and to an increasingly sophisticated customer base which demands better service. □

NEWS IN BRIEF

■ GROUND BREAKING

Sino Swearingen Aircraft has broken ground on the \$12 million final-assembly plant for its SJ30 business-jet in Martinsburg, West Virginia, where the first customer aircraft is scheduled to be completed in September 1998.

■ COMMANDER RENAISSANCE

Twin Commander Aircraft reports increased demand for its Grand Renaissance refurbishment programme and now expects to sell five Twin Commander "like-new" upgrades in 1996.

■ NETJETS MAINTENANCE

Raytheon Aircraft Services' network of US fixed-base operations is to provide all aircraft and avionics maintenance for 17 Hawker 1000s operated by Executive Jet Aviation under its NetJets shared-ownership scheme.

■ FLIGHTCRAFT ADDITIONS

Portland, Oregon-based Flightcraft has added a Cessna Citation II and III to its corporate-aircraft management fleet, and now manages more than 30 aircraft.

■ CHILEAN PIPER

New Piper Aircraft has appointed Piper Chile, based at Santiago's Tobalaba Airport, as its sales and support representative for Chile.



Berliners will be able to inspect the GlaStar in May

GlaStar heads for Berlin

STODDARD-HAMILTON Aircraft plans to display the GlaStar two-seat kitplane outside the USA for the first time at the ILA show in Berlin, Germany, in mid-May. The 860kg aircraft will be flown across the Atlantic via Greenland, an estimated 40h trip, and will be demonstrated in Europe before being returned to the USA in July for display at the Oshkosh show.

The aircraft displayed will be the first customer-completed GlaStar, owned by MDB Aerospace, which

plans to install its new FM2600 piston engine in the GlaStar.

The aircraft will be powered by a Teledyne Continental IO-240 for European tour.

Stoddard-Hamilton president Bob Gavinsky says that there is strong European interest in the GlaStar, which has already proved popular in the USA.

The Arlington, Washington-based company has sold some 300 of the \$19,950 kits since introducing the aircraft in 1994. □

AlliedSignal develops TFE731 upgrade

ALLIEDSIGNAL Aerospace plans to introduce a TFE731-3D engine upgrade based on the -3C modification now offered on the Cessna Citation III and VI.

The -3D upgrade is aimed at improving engine durability and cutting maintenance costs by increasing turbine-inlet temperature margins by more than 15°C. Thrust and fuel consumption will be unchanged by the modification

which introduces new temperature-resistant materials into the hot section. The -3D upgrade is available from May at the time of either a major periodic inspection, or a core-zone inspection.

Garrett Aviation Services has obtained the supplemental type certificate for the upgrade on the Dassault Falcon 50 and Raytheon Hawker 400, 600 and 700 under contract to AlliedSignal. □

Extra 200 is flown for first time

ANDREJ JEZIORSKI/DINSLAKEN

GERMAN AIRCRAFT manufacturer Extra Flugzeugbau has flown its newest sports aircraft, the Extra 200.

The maiden flight from the Dinslaken factory took place on 2 April, with company founder Walter Extra at the controls. Extra says that he is satisfied with his latest product. Minor adjustments to aileron balance were necessary, and other small modifications.

The aircraft is a fully aerobatic, two-seat, low-wing monoplane based on the earlier Extra 300L. The largely composite structure is smaller and lighter — with a 550kg empty weight — and the 150kW (200hp) Lycoming AEIO-360A1E provides two-thirds the power of its predecessor's engine.

The aircraft will be sold at a basic price of DM250,000 (\$370,000), compared with the 300's price-tag of DM395,000.

Extra says that much of the flight-test programme — expected to total 25-50h — will be flown on the second prototype, now nearing completion. Within days of getting airborne, the first aircraft was to be sent to the US to fly on an experimental-aircraft certificate for marketing purposes.

The USA is Extra's biggest market, and the company is planning to open a second production unit to serve the region, at St Augustine in Florida. The new factory is expected to be open later this year. □

Asia Pacific space booms with three satellite orders

TIM FURNISS/LONDON

THE ASIA PACIFIC region's space-communications business has taken a big stride with the award of \$440 million-worth of contracts to build three satellites.

Singapore and Taiwan have awarded a \$240 million deal to Matra Marconi Space (MMS) to build the ST-1 communications satellite and two ground stations, while Loral Space Systems has won a \$200 million deal from the Asia Broadcasting and Communications Network (ABCN), of Thailand and Laos, to build the L-Star 1 and 2 spacecraft.

The 20th MMS Eurostar spacecraft bus, the 3,000kg ST-1, will be launched in 1998, to be located at 88°E in geostationary orbit (GEO), providing 16 Ku-band and 14 C-band communications services from the Middle East to the Far East. It will have a power requirement of 6.5kW. The satellite is believed to have non-commercial capabilities.

It is thought that Singapore is "fronting" the project for Taiwan



Ariane will launch the L-Stars

which does not have a GEO slot registered with the International Telecommunications Union.

The contract for the ST-1 is the fifth for an MMS Eurostar to be received in six months. MMS says that the ST-1 will be launched on an Ariane 5 or a Long March.

Arianespace is to launch the Loral L-Stars in 1998. These craft will be co-located at 116°E in GEO

over Laos, to provide direct-to-home television services to China, India, South-East Asia and Taiwan. Thailand's ABCN will hold an 80% stake in the venture, while Laos will have 20%. The L-Stars contract brings to 43 the number of satellites to be launched by Arianespace.

■ ILS International Launch Services has won the contract to launch Japan's JCSAT 4, Hughes HS-601 satellite aboard an Atlas 2AS in January 1997. □

Alpha will host anti-matter experiment

NASA AND THE US Department of Energy (DoE) have agreed to fly an anti-matter experiment on the Alpha International Space Station. The experiment will be developed by a team led by the Massachusetts Institute of Technology.

The DoE-sponsored state-of-the-art Alpha Magnetic Spectrometer (AMS) physics experiment will look for anti-matter originating from outside our galaxy and may lead to the discovery of dark matter, a material which some scientists believe makes up at least 90% of the Universe.

The AMS will be evaluated for 100h during the Space Shuttle STS90 mission in 1998 and will fly on the STS110 in 2001, to be installed on the Alpha until 2004. □

Third success is achieved for Shuttle-Mir programme

THE SPACE Shuttle STS76/-Atlantis landed at Edwards AFB, California, on 31 March after the successful third Shuttle Mir Mission (SMM).

The Atlantis, launched on 22 March, docked with the Russian Mir 1 space station, delivering US astronaut Shannon Lucid to the station to undertake a 143-day flight with two Russian cosmonauts (*Flight International*, 20-26 March).

NASA hopes that Lucid's flight will begin a permanent US presence in space. More NASA astronauts will make Mir missions by the time the first astronaut-commander of the Alpha International Space Station is scheduled to be launched, in 1998.

The Atlantis also delivered 635kg of water, 740kg of US science experiments and 880kg of Russian supplies to the station. Two Atlantis astronauts also completed the first spacewalk between the docked spacecraft.

An emergency landing by the Atlantis was avoided by just 10min on 30 March after the orbiter's landing at the Kennedy Space Center in Florida had been put back by one day. Its payload bay doors could not be opened.

Flight rules dictated an immediate return to the nearest-available emergency landing site, but this was avoided when an errant computer indication was over-ridden and the doors were opened. □

NEWS IN BRIEF

■ LAND MOBILE

Italy's Italsat 2 communications technology satellite, to be launched on an Ariane this year, will be fitted with the European Space Agency's Land Mobile Services L-band payload, providing services to car or truck mobile user in Europe and North Africa. The service will be leased to Italy's Nuova Telespazio for marketing of voice, data and facsimile services.

■ SPACE BOTTLE

NASA's Cassini spacecraft, which will be dispatched towards the planet Saturn in October 1997, will carry the space-age equivalent of a message in a bottle — 1 million signatures stored on a disc. The space agency's Jet Propulsion Laboratory has invited interested "space travellers" to send signatures on a postcard.

■ FAILURE SCENARIOS

China Great Wall Industry has identified four possible reasons for the failure of the inertial-guidance platform of the first Long March 3B booster which was destroyed moments after launch on 14 February. They are a broken wire leading to the torque motor, a blockage in the interior of the unit, the failure of a circuit to close, and possible launch environment stress.

First replacement GPS satellite launched

MCDONNELL DOUGLAS (MDC) launched the first replacement Navstar global-positioning satellite (GPS) into orbit aboard a Delta 2 from Cape Canaveral in Florida on 27 March.

The launch demonstrated MDC's capability to support the 24-satellite operational constellation which could become an industry-standard for air navigation and other civilian applications, after the US Government's decision to widen civilian access to it. □

NEWS IN BRIEF

ALUMINIUM EXPANSION

California-based Universal Alloy plans to build an aircraft-aluminium extrusion mill in Canton, Georgia, to "...keep pace with the rejuvenation of the aircraft industry". The \$10 million mill will be fully operational by January 1998.

UNIVERSAL DEAL

Universal Avionics Systems of Arizona and DAC International of Texas have signed a marketing alliance. The agreement gives the Austin-based company responsibility for marketing Universal's flight- and navigation-management system, global-positioning system and cockpit-voice and flight-data recorder products in the airline and military markets.

GEORGIAN SITE

Pratt & Whitney plans to open a JT8D overhaul site in Columbus, Georgia. The new site will be operational in the fourth quarter of 1996 and will be capable of up to 200 complete overhauls a year. P&W decided to place it in the Georgia area because of the large number of locally based JT8D users which have decided to extend their powerplants' lives with hushkits.

ESTONIAN RADAR

UK-based Cossor is to supply a monopulse secondary-surveillance radar (MSSR) to the Estonian civil-aviation administration, for installation at Martna. The Raytheon subsidiary's MSSR at Martna will provide *en route* radar coverage as part of the country's programme to upgrade air-traffic-control equipment.

MERLIN RECORDERS

The first three production mission-recording systems for the Anglo-Italian EH Industries EH101 Merlin helicopter have been delivered to GKN Westland Helicopters. The system was developed by Normalair-Garrett.

DERA claims world first in hollow carbon fibre

ANDREW DOYLE/LONDON

THE UK DEFENCE Evaluation and Research Agency (DERA) claims to have produced the world's first continuous, hollow carbon fibre, from a polyacrylonitrile precursor. Hollow fibres have the potential to improve significantly the compressive properties of composite materials, says DERA, as well as providing further weight reductions compared with conventional materials.

"Micro-buckling of fibres has been identified as a critical failure

process, but a relatively large-diameter hollow fibre will be much more resistant to buckling than narrower, standard fibres," says DERA. A hollow fibre could also incorporate a different material along its core, allowing composites with novel or specialist properties to be applied in areas such as stealth technology, smart systems or "self-repairing" structures.

The hollow fibre can be manufactured with an outside diameter of about 20µm, with a wall thickness of around 5µm. More development work, aimed at maximising compos-

ite compressive strength while maintaining tensile properties, is assessing the effects of varying the fibre diameter and wall thickness. Later studies will consider scaling-up fibre production to larger-scale multi-filament tows, and to the fabrication of composite components for performance evaluation.

The process has been developed by DERA's Structural Materials Centre (SMC) in conjunction with Strathclyde University, Scotland. The fibres are produced by the SMC's research-scale pilot plant at Farnborough.

PTI's infra-red system de-ices 727 in 6min

A RADIANT ENERGY de-icing system has been demonstrated to airlines, airports and regulatory authorities at Rochester in New York. The InfraTek system developed by Process Technologies (PTI) burns low-cost natural gas to generate focused infra-red energy which melts the ice and dries the aircraft without damaging the surface or heating the interior (*Flight International*, 25 October-1 November, 1995).

A US Federal Aviation Administration Boeing 727 used for the March demonstration was de-iced in 6min, in the first full-scale test of the InfraTek system. Cheektowaga, New York-based PTI says that a 727 can be de-iced for under \$250, compared with \$3,500 using glycol fluid.

PTI's InfraTek System 2000, which can de-ice narrowbodies up to Boeing 757 size, will cost \$1.7 million and consists of an open-ended structure with gas burners suspended from the ceiling.

De-icing and drying takes 5-7min, enabling one system to handle six to seven aircraft an hour. Energy costs for the demonstra-

tion were \$100-200 an hour, according to PTI.

Changes are being made as a result of the demonstration, including reconfiguring the burners to increase tail clearance and remove ice on the fuselage sides. An air curtain is being developed to blow snow off the aircraft as it enters the structure. A Boeing 747-sized structure is being designed in response to airline interest, says PTI.

The system was developed under a co-operative research and development agreement with the FAA, which conducted tests on the InfraTek in 1995. The FAA's technical report is due out soon and is expected to describe the system as an acceptable alternative to glycol de-icing.

According to PTI, the increased use of glycol resulting from tighter de-icing regulations, introduced after several ice-related accidents, has led to "skyrocketing" glycol costs, while escalating opposition from environmentalists has resulted in tougher restrictions on the recapture and treatment of the de-icing chemicals.



E-Systems will integrate flight-control systems on the Premier I

E-Systems awarded place on Premier I

RAYTHEON AIRCRAFT has selected its sister company E-Systems as integrator of the flight-control system for the new Premier I business jet. E-Systems' Montek division will also manufacture the spoiler actuation system and spoiler/flap electronic control-unit.

E-Systems' responsibility includes integration of the Dowty supplied landing-gear and door actuators and the flap-actuation system provided by Kaiser Electroprecision. In addition, the Montek division will produce the nosewheel landing-gear and trimtab actuators for Raytheon's existing Hawker 800XP business jet.

Contracts for work on both aircraft are worth \$13.1 million initially, and potentially more than \$200 million over the lives of the programmes, says Dallas, Texas-based E-Systems.

Holding out

Israel Military Industries is looking for partners in a desperate effort to restore its fortunes.

ARIE EGOZI/TEL AVIV

ISRAEL MILITARY Industries' new president and chief executive Shlomo Milo is looking at new ways to slim the business after an often painful rationalisation programme failed to return the company to profit in 1995.

In the past five years, Israel Military Industries has downsized dramatically. From a workforce of 11,000 in 1990, the company now employs just over 4,000 people. Plants have been closed or merged and loss-making activities dropped.

The company is a major manufacturer of ammunition of all kinds, from small arms to heavy artillery. One of its latest innovations is the successful 155mm artillery cluster shell which has already been selected by some overseas armies, including the British Army. In addition it is also a major manufacturer of small arms, from pistols to Uzi sub-machine guns and the Galil assault rifle.

Despite capacity closures and redundancies, 1995 still ended with a loss of \$90 million. As a result, Milo believes that the steps taken to date are not enough. In an effort to push on towards the break-even target, the new president wants to turn the company into a holding company. "The headquarters will be sized down to a minimum and we will seek partners for almost all our activities. We think foreign companies are potential partners for these activities," he says.

Contacts with possible partners have already begun. US companies Lockheed Martin and Olin are said to be possible suitors for a holding in the Israeli company's ammunition activities. McDonnell Douglas (MDC) and British Aerospace are mentioned as potential partners for the aerospace activity, mainly weapon systems.

MDC has already established a project office to evaluate a special



Israel Military Industries Delilah decoy missile

"The Delilah variant has been dubbed 'Light Defender' in the USA and while the immediate potential client is the US Air Force, MDC is probably eyeing its capabilities in foreign markets."

version of the Delilah decoy, a platform the Israeli company believes can be used for the development of stand-off weapon systems.

The Delilah variant has been dubbed "Light Defender" in the USA and while the immediate potential client is the US Air Force, MDC is probably eyeing its prospects in foreign markets. Milo confirms that BAe is also considering a version, for development.

"Pinpoint accuracy is not always the main requirement from a stand-off weapon system. In such cases a low-cost system is the answer. We will offer powered and non-powered versions," says Milo.

The company also sees launcher motors as a potential basis for international co-operation. Israel Military Industries has already signed a co-operation agreement

with ARC in the USA in a failed attempt to win a recent NASA competition for small expendable launchers.

"Our capability in developing motors for low-orbit launchers puts us in a niche that in our opinion will help us enter this growing market," he says.

"The company may find that its air-weapon capabilities may now serve as a vital life line."

Israel Military Industries already manufactures the motors for the Shavit launcher which has put three Israeli Ofef satellites into orbit. US observers believe that the launcher is a civil version of Israel's Jericho long-range ballistic missile.

While trying to penetrate new markets, Israel Military Industries continues to manufacture the TALD and I-TALD decoys. Brunswick, the US partner in the powered and non-powered decoy

production, has decided to leave the programme. If the US Navy reaches a decision to procure the I-TALD, the Israeli company will become the sole supplier.

Israel Military Industries is also hoping that the 2,275litre fuel tanks developed for Israeli air force Lockheed Martin F-16s will bolster sales. The tanks, which improve the fighter's range by around 50%, are now being tested by Lockheed Martin. The US company's approval would lead to a host of export opportunities.

While the forecast for 1996 is for a more than halving of 1995 losses, to around \$39 million, the plan to seek foreign partners for each area of activity, including aerospace and an air-launched weapon system, is the only remedy Milo can see to rescue the company from its plight.

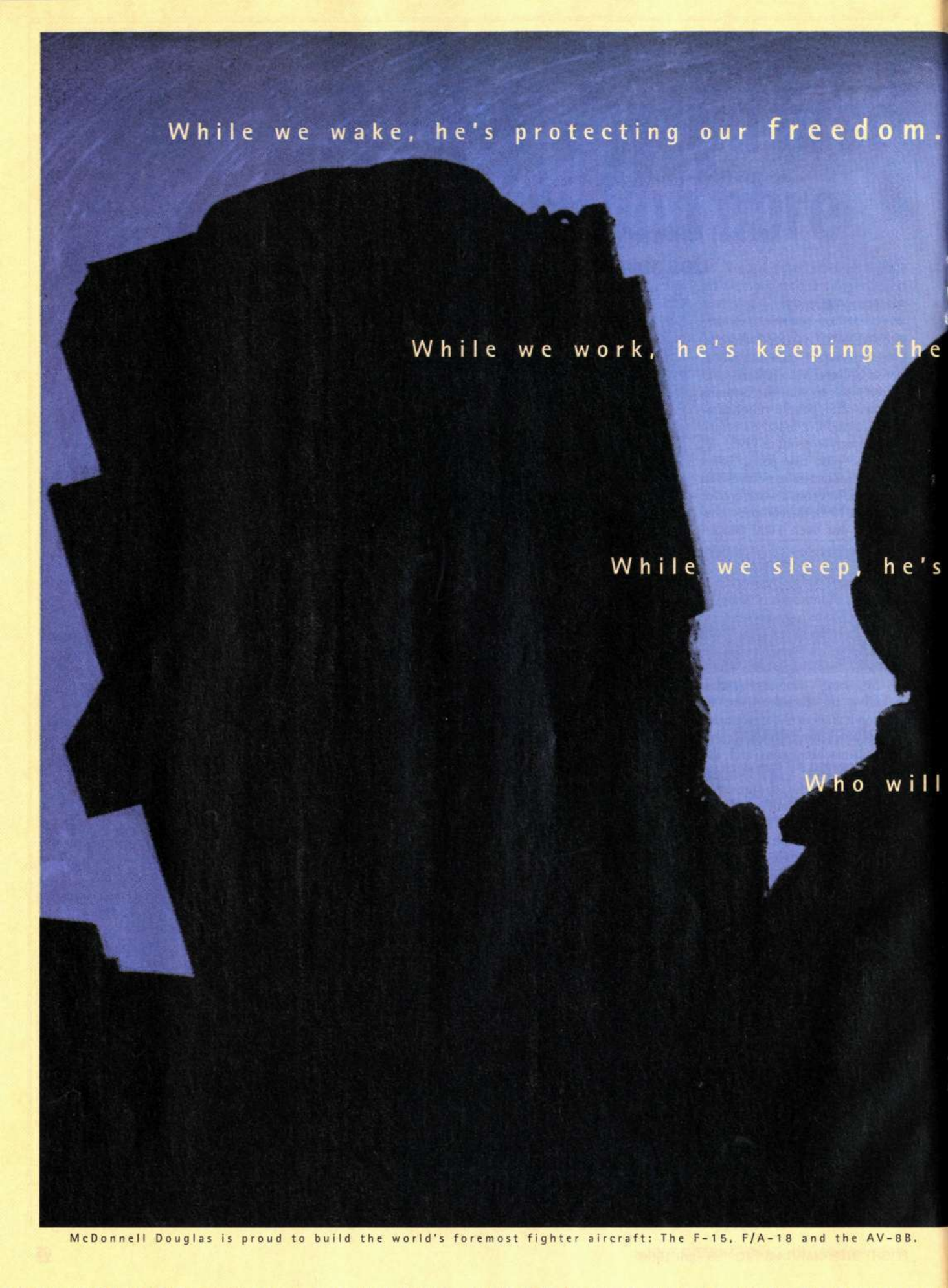
As a former fighter pilot in the Israeli air force, Milo has a natural tendency to talk about the aerospace products his defence company produces.

Leaving aside his air force memories, Milo talks positively about the company's potential in the aerospace sector — particularly stand-off weapon systems.

To prove the point, he says: "Aviation products constitute a large portion of sales. In 1995, we sold some \$120 million of products in this sector, compared with total company sales of \$450 million."

Israel Military Industries has often faced criticism for its work on stand-off weapons. The basis of these criticisms has been that a company in financial trouble should not be spending money on such weapons when Israel's vast experience in the sector is already shared by two other state-owned defence industries.

In its effort to survive, the company may find that its air-weapon capabilities may now serve as a vital life line. □



While we wake, he's protecting our freedom.

While we work, he's keeping the

While we sleep, he's

Who will

peace.

guarding our dreams.

be there with him?

McDonnell Douglas will.

MCDONNELL DOUGLAS



Pilot worries

Not enough of it, sometimes too much of it — pilots remain concerned about technology.

HARRY HOPKINS/DUBLIN

AIRLINE PILOTS have issued strong warnings about the premature use of new technology in air-traffic operations, but the absence of technology troubles them as well, it emerged at the annual conference of the International Federation of Air Line Pilots Associations (IFALPA) in Dublin, Ireland, on 20-23 March. It also became apparent that a dearth of technology in parts of the developing world is still a prime concern for pilots.

Satellite navigation is available worldwide and datalink is around the corner, observes IFALPA, but inadequate voice communications and sub-standard air-traffic control (ATC) in large parts of the world remain a problem.

IFALPA has decided to shift its focus to raising the aviation safety performance of Third World countries and to the air-transport infrastructure they can offer. The conference noted that, while the 20 largest airlines own half the world's fleet, they have less than one-fifth of the world's hull-loss accidents. The Federation, it seems, is starting its crusade by streamlining its own communications, including expanding its electronic-mail links and using "position papers" to outline its developing policy between conferences.

At the top of IFALPA's list of "premature-technology" concerns is the use of airborne collision-avoidance systems (ACAS) for monitoring in-trail separation on climb or descent. Fed-

eration president Capt Rob McNnis singles out the activities of the Informal South Pacific Air traffic services Co-ordinating Group (ISPACG), highlighting the fact that, in part of the Pacific, lateral separation has already been reduced to 110km (60nm), with plans to reduce lateral and longitudinal separation to 90km, and then 55km. "Earlier fears that the [US Federal Aviation Administration], Australian and New Zealand elements of ISPACG would continue their headlong rush were not unfounded," he says.

"IFALPA, assisted by the International Federation of Air Traffic Controller Associations, has played a major role in attempts to prevent this", McNnis says, emphasising, however, that "...we are no less eager than the airlines to see reduced separation and an increase in the traffic flow on a global scale. The overriding need is to have the enhancements in communications, navigation facilities and surveillance all in place and proven, before separation minima can be effectively reduced."

The Federation strongly backs the more measured approach of the International Civil Aviation Organisation (ICAO) in pursuit of a uniformly safe operating environment. Airline operators are particularly interested in having a 'level playing field' for their commercial operations but, points out Capt Ted Murphy, IFALPA Principal

Officer for technical matters, "...some states are attempting to bypass the formal ICAO process by use of informal and limited regional groupings. Many states and airlines are changing their work practices to avoid the full rigour of dispassionate and open investigation of their technical proposals". Murphy observes: "Changes to long-accepted standards are being introduced in selected areas of the globe — and then being exported [based on] their supposed regional acceptability... Most of us would be well advised to enquire of our own administrations what they are doing to ensure the effectiveness of ICAO, and to protect its future."

A consistent theme was the aim of achieving global safety effectiveness through ICAO, with full backing and finance by the international community — and a balanced introduction of advanced technology. "It's ludicrous," says Murphy, "that we are having these discussions on high technology, yet [ATC] communication on HF



New technology should be thoroughly proven in accordance with ICAO procedures before going operational, says IFALPA

The extreme limits of ATC technology worry the pilots. Both those who are pushing ahead "too fast"...



...and those who are getting left behind



Going up market

Russia's Orient Avia is getting the best out of its Ilyushin Il-62 airliners.

PAUL DUFFY/MOSCOW

THE COMMONLY HELD belief that Russian and ex-Soviet civil aircraft are not able to achieve the high utilisation levels of Western airliners has been challenged by the experience of Orient Avia, whose first two Ilyushin Il-62s logged 7,000h during 1995.

The Moscow-based airline was founded in mid-1994, although director general Amiran Kurtanidze had spent the previous year concentrating on two tasks to establish a solid basis for operation. Firstly, he spent three months studying Western airlines, noting the different approaches to those of Russian airlines. Then he set about building a team of suitable investors for his new company.

Drawing on 20 years of experience working for the old Soviet national airline, he persuaded Aeroflot-Russian International Airlines (ARIA) to invest a 10% share in Orient. Next on board was Vladivostok city council because the city, located on Russia's pacific coast, was anxious to develop traffic and tourism. The Kazan Aircraft Production Factory, manufacturer of the Il-62M, also became a shareholder.

In August 1994, the first of Orient Avia's new Il-62Ms was delivered. A second new aircraft arrived in the second quarter of 1995, entering service in May, and a third arrived by the end of the year. A fourth, a low-time aircraft, which had previously served with the Czech Government and which had been virtually rebuilt by the factory, was due before the end of April this year. Two more are expected to follow, both new.

AVAILABLE SUPPORT

"New aircraft, whether they are Boeings or Ilyushins, should always be more reliable," says Kurtanidze. He believes that the ability to achieve high flight hours is not a problem provided that the right support is available. "If they are well maintained, and have a good spares

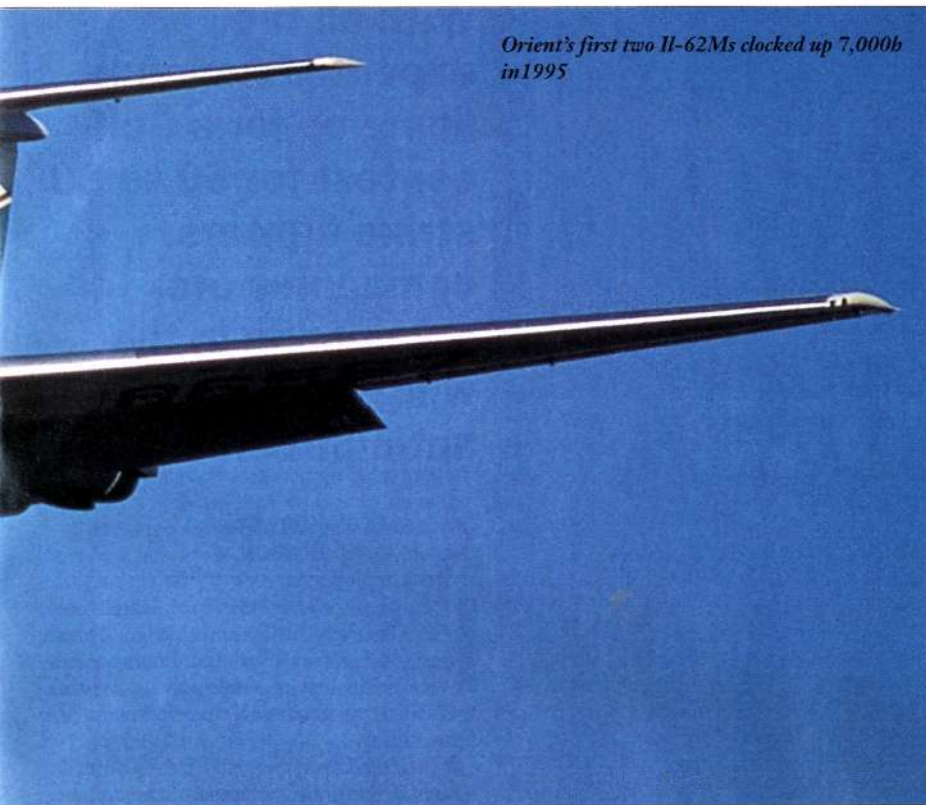
back-up, they can fly equally as much."

With the Kazan factory as part of the team, Orient has secured the support of a manufacturer. Twenty-five of the airline's own line engineers have been joined by up to ten from the factory and, as the factory is also the major spares provider for everything except the engines, an adequate spares supply is available too.

By the time of its inaugural flight, on 3 October, 1994, the airline had worked out a strategy. With ARIA catering for the low-cost market, Orient has aimed for the business and first-class traveller, and for economy-class passengers willing to pay a bit more for service levels more usually found on Western airlines. The Il-62Ms are fitted with 138 seats — domestic Il-62Ms are usually 170 seaters. On some aircraft, a better, more contoured seat has been installed. A choice of menus is offered — two for economy, up to five for first class. Cabin crews have been trained by Orient instructors who have been trained in France and Ireland.

Orient has also aimed for scheduled flights, not the charter and holiday services offered by most non-Aeroflot Russian carriers.

The first service which the airline operated



Orient's first two Il-62Ms clocked up 7,000h in 1995

was a daily return linking Moscow's Sheremetyevo Airport with Vladivostok, with just one Il-62M and a return block time of 17.5h, which seemed to be ambitious. Engineers in both cities were helped, however, by Orient purchasing diagnostic equipment from Switzerland to monitor engine condition.

The second Il-62M entered service in June 1995, allowing one extra flight a week to be flown to Vladivostok, four a week to Petropavlovsk-Kamchatka (from Moscow), and a twice-weekly Vladivostok-Phattaya, Thailand service on which Orient Intourist (a joint venture between Orient and the Russian tour company Intourist) takes 100 seats, leaving 38 available for sale.

By the end of 1995, the two Il-62Ms in service had logged over 7,000h between them. Two engines were replaced in the year, neither involving any operational delays. Well over 4,000h were flown on the first aircraft, and some 2,500h on the second.

This is not the first time that ex-Soviet aircraft have achieved such times: the Department of Air Transport says that in the 1970s and 1980s, Il-62s of Domodedovo often achieved 4,000h a year, and Tupolev says that Yugoslav carrier Aviogenex regularly flew its Tu-134s for 3,500h a year. Until now, however, these data were never available. Recently, utilisation of this sort appears not have been possible.

Orient is paying attention to costs as well as to flying hours. Fuel costs \$200 per tonne in Moscow and \$400 in the far east of Russia. So Orient's aircraft leave Moscow at or close to

maximum take off weight (MTOW). An Il-62M can carry up to 87t of fuel. Kurtanidze says that at MTOW, fuel consumption in the flight east can be 2-3t higher because of the extra weight, but the uplift in the east is only 50t, whereas the former Aeroflot airlines are picking up 70-74t. The money saving is worthwhile.

FLIGHT ECONOMICS

"We have studied our flight economics and found that a slightly nose-up attitude reduces fuel burn. We also seek higher levels as fuel burn reduces the aircraft's weight. Aeroflot usually flies at 10,000m [32,800ft], but we climb to 12,000m when we can. On the return flight, we take enough fuel to take account of *en route* winds and weather, plus 1.5h reserve, which so far we've rarely needed."

With the introduction of the third Il-62M in

March, the airline started a Vladivostok-St Petersburg service, and will follow that with a Vladivostok-Kiev route, then Vladivostok-Singapore and Moscow-Magadan.

Kurtanidze continues: "We are now awaiting a decision from the US authorities to operate Vladivostok-Honolulu. All our aircraft are fitted with TCAS [traffic-alert and collision-avoidance system] and global-navigation systems".

Kurtanidze says that the airline will shortly take delivery of its first Tu-134. "We have bought four aircraft, plus an extensive range of spares from pre-Baltic airlines (the first two from Lithuanian Airlines). Although they were not due for a major overhaul, we wanted trouble-free aircraft, so we had one done anyway." He explains that Tu-134s rather than the Boeing 737 or the McDonnell Douglas DC-9 were chosen because technical support for the type is available at Sheremetyevo.

He adds that the Tu-134s will begin to fly from Moscow to Lvov and Kishinev in April and to Anapa and Antalya (in Turkey) in May. Current schedules call for 111 block hours a week but, says the director, this will grow.

Until now, Orient has marketed its flights mainly through ARIA, but it will shortly come on-line in the Gabriel flight-reservation system and has recently joined the airline industry's international communications network, SITA — moves designed to widen its customer base.

At the moment, Orient and Kazan are working to set up finance to market the Rolls-Royce-powered Tupolev Tu-204/Tu-224. Kurtanidze says: "We see a good future for Orient with this aircraft. Its 7,000km [3,800nm] range is ideal for us, and will allow us to seek extra work for our Il-62Ms, which the 224 will replace on our long-range domestic services."

In 1995, Orient carried 95,800 passengers and 860t of cargo, considerably up on the 11,000 and 60t of its three months operations in 1994. More impressive was the 667 million passenger kilometres in 1995, compared to 77 million the previous year, indicating that each passenger averaged 6,950km on the airline.

"Safety is our top priority: then comes quality of service and value for money," says Kurtanidze — definitely a change of emphasis for most Russian airlines. □



Orient and Kazan are working to find finance to market the Tu-204

The usual suspects

With all the expected hopefuls lining up for a Gulf contest for 50 to 80 strike fighters, companies are scrambling in the wings in anticipation.

GRAHAM WARWICK/ATLANTA
DOUGLAS BARRIE/LONDON

IF IT were any where else, the finalists would be collectively sitting on the edge of their seats. As it is the United Arab Emirates, then the anticipation of a decision on a future strike fighter is tempered by the expectation of a further delay.

The UAE's "requirement" for 50-80 strike fighters is one of two potentially large procurements to be decided in the relatively near term in the Gulf region. Saudi Arabia is also looking to select a replacement for its Northrop F-5s. As with the UAE programme, this procurement has suffered the vagaries of fortune. By mid-1995, its future looked uncertain, with indications that the Royal Saudi Air Force intended to shelve the project. Industry sources suggest, however, that the programme is "back on".

The UAE competition has all the usual suspects lining up to offer their wares: McDonnell Douglas (MDC) is offering the F-15U derivative of the F-15E; Lockheed Martin is likely to be pushing the so-called Block 60 variant of the F-16; Dassault is offering the Rafale and the Mirage 2000-5; British Aerospace is proposing 24 Panavia Tornado GR4s and, possibly the Eurofighter 2000; and Sukhoi is offering derivatives of the Su-27 Flanker.

Whether the UAE will choose a winner in 1996 remains to be seen. Some competitors now expect a decision in May or June, other analysts believe any decision may not now be made until 1997. Unlike in Malaysia, where MAPO-MiG was successful with the MiG-29 Fulcrum, a Russian purchase by the UAE is considered to be unlikely.

The significance of the UAE competition is that it provides a potential export launch customer for several of the contenders. For others it provides the opportunity to push a new variant of mature airframe into the export market.

BAe, Dassault and Sukhoi are all looking to secure their first export customers for the latest designs from their respective stables.

Dassault's offer of the Rafale, however,

Air-refuelling capability enhances the MiG-29E's export prospects

received a blow when the French Government decided to delay purchasing the aircraft for the French air force. Availability of the air force Rafale is now pencilled in for 2004-5. It is unlikely, though not impossible given the charms of French marketing initiatives, that the UAE will be tempted to risk being the launch customer for the land-based variant.

Lockheed Martin's strategy with the F-16 is to offer customers a sliding scale of capabilities, depending on the requirement, and the budget. While the UAE is likely to be offered the advanced Block 60, the Royal Saudi Air Force may be looking more towards the current-production Block 50 aircraft.

CRITICISMS ANSWERED

The Block 60 aircraft is the company's answer to criticisms that the F-16 is not as capable as the F-18 nor as modern as the EF2000. It combines improvements developed for the F-16A/B mid-life update (MLU) with upgrades envisaged under the US Air Force's fighter-configuration plan (FICOP), plus advanced options to be developed with customer funding. The most advanced configurations under consideration would cost "several hundred million dollars" to develop, the company says.

From the MLU comes the modular mission-computer and colour liquid-crystal multifunction displays. From the FICOP would come infra-red targeting, helmet-mounted cueing and missile-warning systems, plus terrain-following/synthetic-aperture radar. Options requiring customer funding include an air-refuelling probe and the APG-78 radar, a derivative of the F-16's APG-68, with electronically scanned active-array antennae.

Lockheed Martin does not expect that one customer will select all the options, and says that two or more customers could co-operate to fund development of expensive systems such as the active-array radar, which the USAF presently has no plans to develop. An infra-red targeting system is a "fundamental requirement" of most customers, the company says, and two options are being considered: an internally mounted sensor and a low-drag derivative of the present LANTIRN pod.

Key to Lockheed Martin's plans for the Block 60 are its efforts to keep the F-16 in production beyond the year 2000. The 400-aircraft firm-order backlog will keep the F-16 in production until September 1999, although the last F-16C on order will be delivered in November 1998. The company foresees production continuing beyond 2005, and is forecasting more than 500 additional export sales, 60-80% of them from existing customers.

That forecast does not include a planned 120 new F-16Cs for the USAF, the first six of which have been purchased for delivery beginning in 1998. The decision not to reduce Air National Guard units from 18 to 12 aircraft could generate a requirement for an additional 115 new F-16s, and extend production to 2010 when the



Eurofighter EF2000 export prospects include Australia and the UAE

Joint Strike Fighter is to enter service.

A victory in the UAE would provide the platform for the launch of an advanced variant of the F-16, something that Lockheed Martin has long hankered after. It would also keep the door closed on rivals Dassault and BAE.

MDC's bid with the F-15U marks an increasingly rare appearance of this aircraft on the fighter market. The key development for MDC is that production of the F-15E for the USAF is being restarted and could extend the line beyond the year 2000.

Far more important for the company in both the domestic and export arenas are the prospects for its F-18 programme.

Cost is the major issue facing MDC as the US Navy makes the transition from the F-18C/D to the upgraded F-18E/F. The USN plans to buy its last C/Ds and first E/Fs in fiscal year 1997, but has a requirement for additional C/Ds that could, if funded, help sustain production of the current aircraft.

MDC is working to hold the F-18C/D price steady and to extend production to 2005, by which time the E/F will be exportable, early F-18 customers will be looking for a replacement aircraft, and the cost of the C/D and E/F "will be similar", the company says.

The company admits, however, that holding the line on cost will be a challenge. MDC will build 84 aircraft in 1996, including all 34 SF-18s

for Switzerland. F-18C/D production for the USN will halve, to 18, in 1997 and end in 1998 unless the US Congress provides money for additional aircraft.

At the same time, MDC is working to make the F-18C/D more attractive to export customers. An "international" version, with additional standard features, was briefly considered but dropped because of concern that it would become another F-18L — the original land-based variant which failed to sell because customers wanted commonality with the USN.

Instead, the company is working on a series of upgrades which will also be offered to the USN. These include a 9G airframe; additional internal fuel and larger external tanks to extend combat radius by 40%; increased chaff/flare expendables; and, potentially, upgrading of the cockpit with the liquid-crystal displays developed for the E/F.

A 9G airframe is seen as necessary to offset the F-16's perceived competitive advantage over the 7.5G F-18 in the export market. No strengthening of the primary structure is required, MDC says, and re-certification of the existing airframe for 9G is expected soon. Switzerland is likely to be the first customer to adopt the 9G upgrade.

Tackling perceived weaknesses in manoeuvrability and range are key to MDC's plans to offer the F-18C/D in every fighter competition where the F-16C/D is a contender. The company is counting on increased capability, including the uprated F404 engine and improved APG-73 radar now available, offsetting the higher cost.

GAP-FILLER RESOLVED

One "competition" which has recently been resolved, though not in the USA's favour, was that of the Royal Air Force's need for a gap-filler fighter. The delay to the service introduction of the EF2000 (a first RAF air-defence unit will not be operational until 2004-5) has meant that an interim solution had to be found. Leasing F-16s was examined as an alternative to upgrading the RAF's Panavia Tornado F3s, but was deemed to be politically unpalatable and too costly.

This competition may also have marked the first foray onto the marketplace of the Lockheed Martin/Boeing F-22. Some sources maintain that the F-22 remains on the table for the RAF should it want a "silver bullet" fighter force to complement the EF2000 in the first decades of the next century. The F-22 is unlikely to feature in any fighter competitions in which its service entry is required for before 2010, and when it does appear only a handful of countries will be able to afford the aircraft.

With Lockheed Martin proposing the Block 50-level F-16 for the Saudi F-5-replacement programme, BAE is understood to have re-examined its strategy based on pushing a single-seat Hawk derivative. Instead, the most likely candidate in its stable for the Saudi requirement is the Saab JAS39 Gripen.

Saab and BAE plan to compete definition ►

PACIFIC RIM

SEVERAL F-16 operators including Singapore have begun to consider which aircraft will succeed the Lockheed Martin product in their fighter inventories. Australia has also begun to examine its future fighter options beyond the McDonnell Douglas F-18. The Royal Australian Air Force has, for instance, been kept informed of the availability of the EF2000 by the Eurofighter partners. Japan has begun studies into a fifth-generation fighter programme to replace the F-15 and designated the FI-X.

LATIN AMERICA

THERE ARE STRONG indications that the USA will lift its blanket ban on the sale of combat aircraft to Latin America this year, and replace it with case-by-case consideration of the release of advanced fighters to certain nations.

The ban has been in place since the 1970s, with only one exception: the 1982 sale of 24 Lockheed Martin F-16s to Venezuela. The ban was imposed because of the threat of conflict between the then-military governments in the region. Now almost all the countries in Latin America have civilian-controlled, democratically elected governments and the combat-aircraft ban is under review by the US Departments of Defense and State. A decision is expected soon.

If the ban is lifted, there is unlikely to be a rush to buy US fighters, as the leading nations in the region, Argentina, Brazil and Chile, are not looking to make new combat-aircraft acquisitions before

the year 2000, at the earliest. Their timetables are paced by economic growth, with Chile leading the region and Brazil recovering strongly.

Lifting the ban will still leave US fighter-makers facing several issues in the region, where the F-16 is viewed as outdated, the McDonnell Douglas F-18 as expensive and the USA as an unreliable ally. While the respective manufacturers are moving to counter the first two criticisms, dealing with the latter lies in the hands of the US Government.

A case in point is Brazil's FX requirement for a Dassault Mirage replacement, scheduled to get under way around the year 2000, with deliveries beginning around 2005. The country wants an off-the-shelf fighter which it can adapt to meet its requirements.

Technology releasability will be an issue with US aircraft, says Brazilian manufacturer Embraer, which hopes to be given the

role of "missionising" the chosen aircraft.

The USA is moving to restore its image with Latin American countries by staging joint exercises in the region, most recently conducting dissimilar air-combat training with the Chilean air force using US Air Force F-16s. Joint peacekeeping operations on the disputed Peru-Ecuador border have also led to closer co-operation between the USA, Argentina, Brazil and Chile.

As a signal of its changing attitude to Latin America, the USA fielded a strong presence, including daily F-16 and F-18 flying displays, at February's FIDAE '96 show in Santiago, Chile, after boycotting the show in 1994. A confident showing by the Saab/British Aerospace Gripen joint-venture, building on its FIDAE '94 presence by unveiling a full-scale mock-up, highlighted the struggle which US manufacturers face to re-establish themselves in the region. □

of an export variant of the Gripen in August. The two companies formed a joint venture in June 1995 to "market, adapt, produce and support" export variants of the aircraft. As a first step, a NATO-compatible version of the basic Swedish air force Gripen has already been offered to Hungary.

The export Gripen will represent the next step, but will still be an "adaptation" of the JAS39, the team says. Baseline changes will be restricted to those features required for operation outside the Swedish environment for which the aircraft was designed, and will involve items such as the environmental-control system and NATO compatibility.

Exportability is a major issue for the Gripen team, particularly after the abortive Finnish competition, when US refusal to release the AIM-120 advanced medium-range air-to-air

missile (AMRAAM) effectively ended Saab's ability to compete. The joint venture says it has strong Swedish and UK Government support for exports of the fighter. Some sources, however, suggest that a Saudi Arabian sale would require the Swedish Government to revise its position opposing sales into the Middle East.

Importantly, the US Government has agreed that the Gripen, which has substantial US content, can be sold to any country cleared to receive the F-16 and F-18. In addition, the team says, the USA has undertaken that releasability of the AMRAAM will never again be used to give US fighter manufacturers an advantage in competing against the Gripen.

In support of Gripen export sales, Saab has secured the assistance of Sweden's Wallenborg industrial group to help place indirect-offset

work with local industry. BAe, which will have a 45% workshare in the export Gripen, is also offering offsets, as are the US suppliers involved. Hungary is being guaranteed 100% offset.

The joint venture forecasts a market for more than 1,200 aircraft in the Gripen's 8t weight class, with two-thirds of that represented by replacements for Dassault Mirage IIIs, Mikoyan MiG-21s and Northrop F-5s. Competition will come from the Mirage 2000, F-16 and MiG-29, the team believes, with the F-16 setting the benchmark for cost and capability.

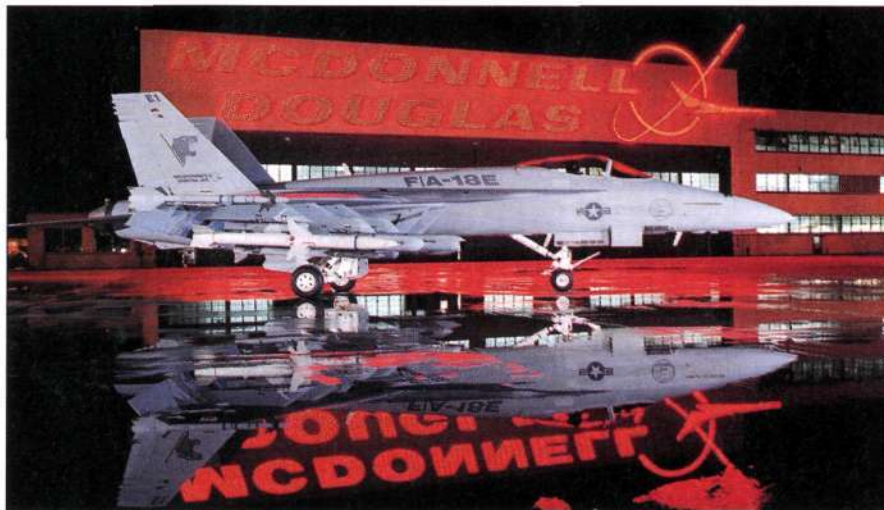
SURPLUS OPTIONS

Lockheed Martin continues to attempt to maintain the F-16's dominance in the export market, and the USAF has also been offering used F-16A/Bs to several states. The USAF has up to 400 early-model F-16s in storage which are being made available for export.

Sources close to the USAF suggest that the baseline aircraft are now being offered at a unit cost of \$6 million. With the Falcon Up structural upgrade and potential engine and avionics updates pushing this cost up to \$13-14 million, while airframe life remains limited to 4,000h, sources question the rationale of this option when a new-build F-16A/B Block 20 aircraft costs \$15-\$16 million.

There are suggestions that the USAF is looking to drop the initial cost of a used F-16A/B to around \$3 million to address this issue.

The US Joint Strike Fighter (JSF) programme, although still many years away, is already beginning to attract the attention of European F-16 operators as they look ahead to replacing their aircraft around 2010 or beyond. Norway has been briefed formally on the JSF, and precursor Joint Advanced Strike Technology (JAST) concept-demonstration effort,



McDonnell Douglas F-18Es are scheduled to enter the export market around 2005



Lockheed Martin sees the Joint Strike Fighter as an F-16 follow-on

after F-16 customers were introduced to the programme at a recent operators' meeting.

The JSF is intended to replace US Air Force F-16s, as well as US Navy Grumman A-6s and F-14s, US Marine Corps MDC AV-8Bs and F-18s, and UK Royal Navy BAe Sea Harriers. Development is scheduled to begin in January 2001 and the JSF is envisaged as a minimum 3,000-aircraft production programme.

The JAST/JSF concept is based on development of three variants of the same single-seat, single-engined aircraft, including a carrier-capable conventional take-off and landing (CTOL) version for the US Navy and a short take-off/vertical landing (STOVL) version for the Marine Corps and Royal Navy. Of most interest to F-16 operators is the US Air Force CTOL variant. Compared with the F-16, the CTOL JSF will offer stealth and substantially increased range. The target flyaway unit-cost for the land-based CTOL variant is \$30 million, which compares with \$20 million for the current USAF-standard F-16C.

RUSSIAN PRIORITIES

The clearest indication yet of Russian fighter-manufacturers' priorities came with this year's FIDAE show in Chile. At the previous year's event, Russian manufacturers had a substantial presence: this time there were no combat-aircraft on display and only a small exhibit.

MAPO-MiG and Sukhoi appear to be re-focusing on what, under the Soviet Union's tenure, would have been known as their traditional markets — China, India, and certain Arab and Pacific Rim states.

MAPO-MiG is continuing to offer derivatives of the MiG-29 Fulcrum. Having developed an air-to-air refuelling capability for the Royal

Malaysian Air Force, it is now offering this to Fulcrum A users as a potential upgrade along with several other options. The most significant of these is an upgrade to the aircraft's NO19 radar providing a two-target engagement capability and the option of using the Vympel R-77 (AA-12 Adder) active-radar missile.

The company has also been searching for potential customers for the upgraded MiG-29M, with India a prime candidate. The MiG-29M programme has been "reinstated" by the Russian Government, although no funding has yet been forthcoming for the completion of flight trials. In the short to middle term, MAPO-MiG's main aim will be to try to keep as many existing MiG-29 users as possible tied to the aircraft through limited upgrades.

The most significant development for Sukhoi has been the agreement in principle to allow China to licence-manufacture the Su-27, believed to be dubbed Project 11 by the Chinese. Following delivery of two batches of Komsomolsk-produced Su-27s, China is likely to move to kit-assembly of the aircraft as a first step towards local production. Chinese press reports claim that three Su-27s had already been assembled locally in 1995, and that a further 20 will follow during 1996.

Chinese licence-production of the Su-27, possibly under the designation Su-27SMK, may threaten not only US and European manufacturers competing for non-aligned markets, but possibly Sukhoi. Whether this issue is addressed within the agreement is still to be determined.

China is developing the F-10, as well as building the Su-27, using Israeli Lavi technology. This may also increasingly figure in fighter competitions in non-aligned states as the first decade of the next century draws to a close. □

EUROPE

POLAND IS likely to be the first former Warsaw Pact nation to buy Western combat aircraft, with US and European manufacturers offering their wares. MAPO-MiG has also been offering licence-production. A defence ministry commission reported in February that co-operation with Saab in producing the JAS39 Gripen would be the best choice for the Polish air force and industry. The ministry says that the report simply lists the advantages and disadvantages of all the contenders, which include the Dassault Mirage 2000, Lockheed Martin F-16 and MAPO-MiG MiG-29.

In the Czech Republic, a Czech/US "commission of experts" recommended in March that the air force lease seven unmodernised F-16As for five years, for about 2 billion korunas (\$73 million), then purchase 18 modernised F-16A/Bs for delivery from 1998, for 5-6 billion korunas, then buy another 18 after 2007.

Hungary has announced that the Gripen meets air force requirements, but that a competition will be held once parliament has approved the Government's decision to buy new aircraft for delivery beginning in 2000 to replace its MiG-21s and -23s. Competitors will include the F-16, McDonnell Douglas F-18, Mirage 2000-5 and MiG-29.

Requirements will include long-term credit with favourable interest rates, guarantees to buy Hungarian exports and investments in Hungary worth at least the value of the order — expected to be around 200 billion florints (\$1.4 billion).

Norway may narrow the choice for its F-5 replacement programme in late 1996, reducing the field to two, or possibly three contenders. The F-18, F-16, Eurofighter EF2000, Dassault Rafale and Gripen are in contention. Although Norway has been briefed on the US Joint Strike Fighter, the aircraft "...is too far out in terms of availability" unless the F-5 replacement slips by a few years. A decision may be reached in late 1998, with a letter of acceptance scheduled for August 1999. First deliveries of the aircraft would follow in 2002.

Austria needs a fighter to replace its Saab Drakens. Discussions have been held with Switzerland on the potential benefits of Austria buying the F-18 and sharing support costs with Switzerland, which needs to replace its Mirage IIIs from 2006 and its Northrop F-5s around 2010. If funds become available before 2000, the air force would like a second batch of F-18s, otherwise a new fighter competition would be held. □



The rugged "common core" of the T406 turboprop is the vital ingredient in the AE3007

Baby big fan

The AE3007 turbofan marks a quiet advance in Allison Engine's product range.

GUY NORRIS/INDIANAPOLIS

SOLID ENGINEERING, a wealth of military-research work and a degree of luck have all contributed to the successful development of the AE3007, Allison Engine's first commercial turbofan and one of the quietest jet engines in the world.

The vital ingredient in the AE3007 story, however, is the rugged "common core" of the T406 turboprop, around which the new turbo-

fan and its AE2100 turboprop sibling are based. "We would classify it as a model development programme, in part because we started with a core that had 50,000h of development running on it. We were developing a turbofan at the same time as two other programmes were developing the core. It made it really quite painless for us," says Allen Novick, Allison Engines large commercial engines vice-president.

The roots of the AE3007 development go back to 1988, when Allison and Rolls-Royce

began joint studies of a 33kN (7,500lb)-class engine to power the FJX, a regional jet proposed by Short Brothers of Northern Ireland. The FJX engine, dubbed the RB580, was to have combined the T406 core with a low-pressure spool developed by R-R. By late 1989, amid uncertainty over the Shorts project and the growing importance of the Trent programme, R-R pulled out and Allison elected to go it alone.

(The fleeting relationship between Allison and R-R was consummated six years later when the UK manufacturer bought the Indianapolis-based company. Ironically, 1995 was also the same year that the re-christened AE3007 engine had its first flight on a regional jet, the Embraer EMB-145.)

Allison restructured the programme, although it was still aimed at the original thrust bracket under the initial "airline-standard" design criteria. It also embarked on the design of a new wide-chord, clapperless (or snubberless), fan and low-pressure turbine.

Within months, Allison secured a vital launch order from Embraer to power its EMB-145 and, six months later, in September 1990, it announced the selection of the engine for Cessna's Citation X, the world's fastest business jet. The first GMA3007 engine, as it was called during Allison's years under the ownership of General Motors, went to test in mid-1991 and, by the middle of 1992, flight tests had begun on a Citation testbed.

TWO-SPOOL ENGINE

The AE3007 is a two-spool turboprop with a 5:1 bypass ratio and a thermodynamic thrust capability of slightly over 38kN. It is externally distinguished by a large one-piece duct of almost constant cross-section extending from the deeply recessed wide-chord fan to the 12-lobed exhaust mixer.

The 24-blade fan is 970mm in diameter and made from solid titanium. "We looked at alternatives," says Novick, "but the weight was OK for what we needed and it met every target we had. The weight advantage of a composite fan gave us very little in the way of pay-offs for this size of design."

The fan was the biggest single development challenge for Allison. The company conducted the first rig test ten months after the programme launch. Although initial tests showed that the fan was flutter-free, a second fan was designed to improve high-speed efficiency and airflow. The new fan then sustained some damage during birdstrike testing and the blade leading-edge was "sharpened" to increase tolerance to large-bird strikes. Verification of the final blade design was achieved during a fourth fan rig-test in 1993 and full-up 1.8kg bird-ingestion tests in 1994.

Another part of the fan assembly to change during development was the spinner. To save weight, Allison initially adopted a composite spinner, but changed to a more conventional

aluminium design after it was damaged in a hail test. The composite unit showed potential for causing secondary damage by shedding debris into the core intake. The slope of the spinner is aligned with the lip of the core path inlet which is spaced well behind the fan. "This was done intentionally for centrifuging water and foreign objects, though we also get some noise benefit as well," Novick says.

The tip of the spinner is made from rubber, which distorts when loaded with ice. This movement should shatter the accumulation before it can grow dangerously large. The entire fan assembly is enclosed in an aluminium fan case with an integrated Kevlar-based containment system.

The fan is driven directly by an uncooled, three-stage, low-pressure (LP) turbine with no intermediate gearbox. Through the combination of wide-chord blades and the multi-staged LP turbine, fan tip-speed is lower than for other, similar, high-bypass, ratio engines, eliminating the familiar "buzz-saw" noise usually associated with a turbofan on take-off.

Using three-dimensional viscous computational-fluid-dynamics analysis, the blade shape has been designed to minimise the strength of fan-rotor-generated shock waves and rotor/stator wake interaction. In addition, the spacing between the fan and bypass vanes has been based on sub-scale modelling designed to reduce the generation of tonal noise at harmonics of the fan-blade passing frequency.

The entire engine cycle is controlled by corrected fan speed, rather than the more conventional exhaust pressure-ratio. "We looked at both with the RB580," says Novick, who adds that fan speed was selected because it could be more closely optimised to control the operation of the lower-thrust engine. The engine's Lucas full-authority digital engine-control (FADEC) controls the fan speed to a customer-defined schedule as a function of altitude, ambient temperature, throttle setting and Mach number.

Fan or core speed can be synchronised on command by the dual-redundant FADECs, which on both the Citation X and EMB-145 are mounted in the fuselage and away from the potentially hostile engine environment. The control units interface with the aircraft via ARINC 429 databuses. The engine-control system also provides for automatic take-off thrust control and auto-relight.

COMMON CORE

The T406 heritage of the AE3007 begins immediately aft of the fan with the high-pressure (HP) compressor. The 14-stage axial-flow compressor is enclosed in a chemically milled titanium (Ti6-2-4-2) case for weight saving, but uses steel blades and vanes for durability. The first eight stages of the HP compressor are made from 17-4PH steel, as used in the T406, while stages nine to 14 are made from the higher-heat-resistant Inconel 718.

"We thought it was important to use steel for its higher resistance to [foreign-object damage], corrosion and erosion. We wanted to carry over our operational experience of the T406, which has to operate everywhere from a carrier deck to a beach front. The use of steel is an enhancement for operational reliability reasons. Like everything, it's a bit of a compromise," says Novick.

The integrated diffuser/combustor assembly was also expected to be a direct follow-on from the T406, but Allison was forced to change because of the AE3007's higher overall pressure ratio of 24:1, compared to 16:6 in both the T406 and AE2100. As a result, the lining of the annular combustor is effusion cooled, rather than convection/film-cooled as originally planned. The combustor is fitted with 16 "piloted" directional airblast fuel nozzles and is dotted with thousands of laser-drilled holes arranged in a specific pattern and orientation tailored to combustion patterns observed in tests and simulations.

The two-stage HP turbine differs only in fine detail from that of the T406/AE2100. All aerofoil castings are identical, but cooling-control orifices in the air-cooled blades are adjusted to suit the higher operating temperature of the turbofan. The first three aerofoil rows (first-stage blade, and first- and second-stage vanes) are air-cooled. The second-stage HP-turbine blade, which is made from CMSX-4 single-crystal alloy, like the first stage, is not cooled.

The LP turbine differs from that of the T406 in having a third stage. The three-stage design was required to give the lower rotational speeds dictated by fan tip-speed requirements. The first-stage LP turbine vane incorporates a thermocouple which measures turbine inlet temperature. Both first- and second-stage blades are made from Inconel 738, with the third-stage blades made from Inconel 713.

Exhaust gases meet bypass air in an elaborately designed forced-air (lobed) mixer made from titanium. Allison originally considered an axisymmetric mixer, but after performance testing opted for the current 12-lobed design. The company says that the design produced improvements in specific fuel consumption, as well as a 6dB reduction in noise made by the mixing of the jet. This equates to a 2dB cut in environmentally perceived noise as measured at a sideline station during take-off.

STRUCTURAL DUCT

The bypass duct channelling fan air to the mixer is a large, but relatively simple, component. It doubles as a structural load-bearing part of the engine as well as a noise suppressor. By using the bypass duct as a structural member, any bending and moment loads, which may result from heavy landings or turbulence, are transferred through the casing rather than the core of the engine. "It was designed for performance retention and to stop clearances opening up through heavy landings," says Novick. The number and ►



FLIGHT INTERNATIONAL

This space used to hold a full-size cutaway poster of the Allison AE3007.

If it is missing, or you would like further copies, please contact Kim Hearn at The *Flight* Collection, on +44 (181) 652 3427.

If you would like reprints of this or any other article in *Flight International*, please call Jan Crowther on +44 (181) 652 8229.

- 97 Retaining nut - bearing and
- 98 Aft sump
- 99 Thermocouples
- 100 Sump cover
- 101 Insulation blanket
- 102 Turbine rear-bearing support
- 103 Engine-to-airframe aft mount
- 104 Aft engine mounts
- 105 Support lugs - locate in slot mounting ring
- 106 Exhaust forced-mixer
- 107 Support - forced mixer, core
- 108 Tail cone
- 109 Accessory gearbox (AGB)
- 110 Permanent magnet alternator
- 111 Fuel pump and metering unit
- 112 Filter

- 54 Aft stationary labyrinth-seal
- 55 LP turbine shaft
- 56 Eighth/ninth-stage LP bleed-air manifold
- 57 Bleed-air ducting to airframe
- 58 Fourteenth-stage HP bleed-air ducting - fed



Four mount pads on the front frame are designed to accommodate either fuselage or underwing mounting, an important consideration given the changing design requirements of the EMB-145

locations of the struts supporting the duct, which is made from composites and honeycomb aluminium, were also carefully optimised to cut noise generation. NASA-developed analysis methods were used to select the depths of honeycomb material and the porosity of the acoustically treated face sheet. Further work by nacelle specialist Rohr at its acoustic test site in Brown Field, San Diego, refined the design.

The core of the engine is also enclosed in a composite inner-duct lining from the inlet lip of the core to the diffuser/compressor section. Allison originally intended to enclose the entire core as far aft as the LP turbine, but dropped the idea to give easier access for maintenance personnel to areas such as the fuel nozzles and thermocouples. "It cost us about 0.2% efficiency in performance to take it out, but we get some weight advantage and the maintenance benefits make it worthwhile," comments Novick.

These access considerations also prompted Allison to change the size and, in one case, orientation of six large access panels located in the bypass duct.

The engine is mounted to the airframe at the front frame and rear mount ring. Four mount pads on the front frame are designed to accommodate either fuselage or underwing mounting, an important consideration given the early changes in the EMB-145 design. The rear titanium mount ring is designed to accommodate a heavier, four-point, universal mounting system for regional-jet applications and a slightly lighter two-point rotatable system for business aircraft. In either case, the system is designed to retain the engine in the event of a mount failure.

The accessory gearbox is mounted on the front frame below the engine and takes power from the HP spool via a bevel-gear/tower-shaft arrangement to drive engine and airframe systems. These include oil and fuel pumps on the engine, as well as the permanent-magnet alternators which power the FADECs. Airframe accessories powered by the gearbox include two generators, an air-turbine starter and a hydraulic

pump. The AE3007 accessory gearbox differs from the turboprop unit, which is divided into two and which takes power for aircraft systems from the propeller gearbox.

The engine uses a self-contained lubrication system which consists of an oil tank, pump, 3μ-filter, and both fuel-cooled and air-cooled oil coolers. The oil pump both scavenges and pressurises the system.

FLIGHT TEST AND THE FUTURE

The AE3007C version of the engine, rated at 28kN, was certificated by the US Federal Aviation Administration for the Citation X in February 1995. Full FAA type certification is expected by the end of April, followed by European Joint Aviation Authorities (JAA) certification around the middle of 1997.

The 39kN AE3007A is expected to be certificated for the EMB-145 in mid-1996. The thrust rating of the engine on the Brazilian airliner was evaluated at 33kN and new FADEC software is now being written.

Allison received a boost in 1995, when the AE3007H version of its engine was selected for the US Defense Department's Tier II Plus unmanned-aerial-vehicle programme led by Teledyne Ryan Aeronautical. The requirement calls for long-endurance flying at altitudes of up to 70,000ft (21,300m). An engine under-

went testing at these rarefied altitudes in February 1996 at the Arnold Engineering Development Center at Tullahoma, Tennessee. The first AE3007H will be delivered in May.

Changes made to enable high-altitude operation include a slight trimming of the trailing edges of the HP-turbine vanes, to suit changes in flow characteristics expected in the thinner atmosphere, and a "tune-up" of the lubrication system. Allison is confident of good high-altitude performance having tested the unmodified AE3007C version at the high-altitude test site in Trenton, New Jersey, in 1992 and 1994. The tests included steady-state performance at 51,000ft, snap accelerations and decelerations, inlet distortion, control stability, windmilling and air-starting.

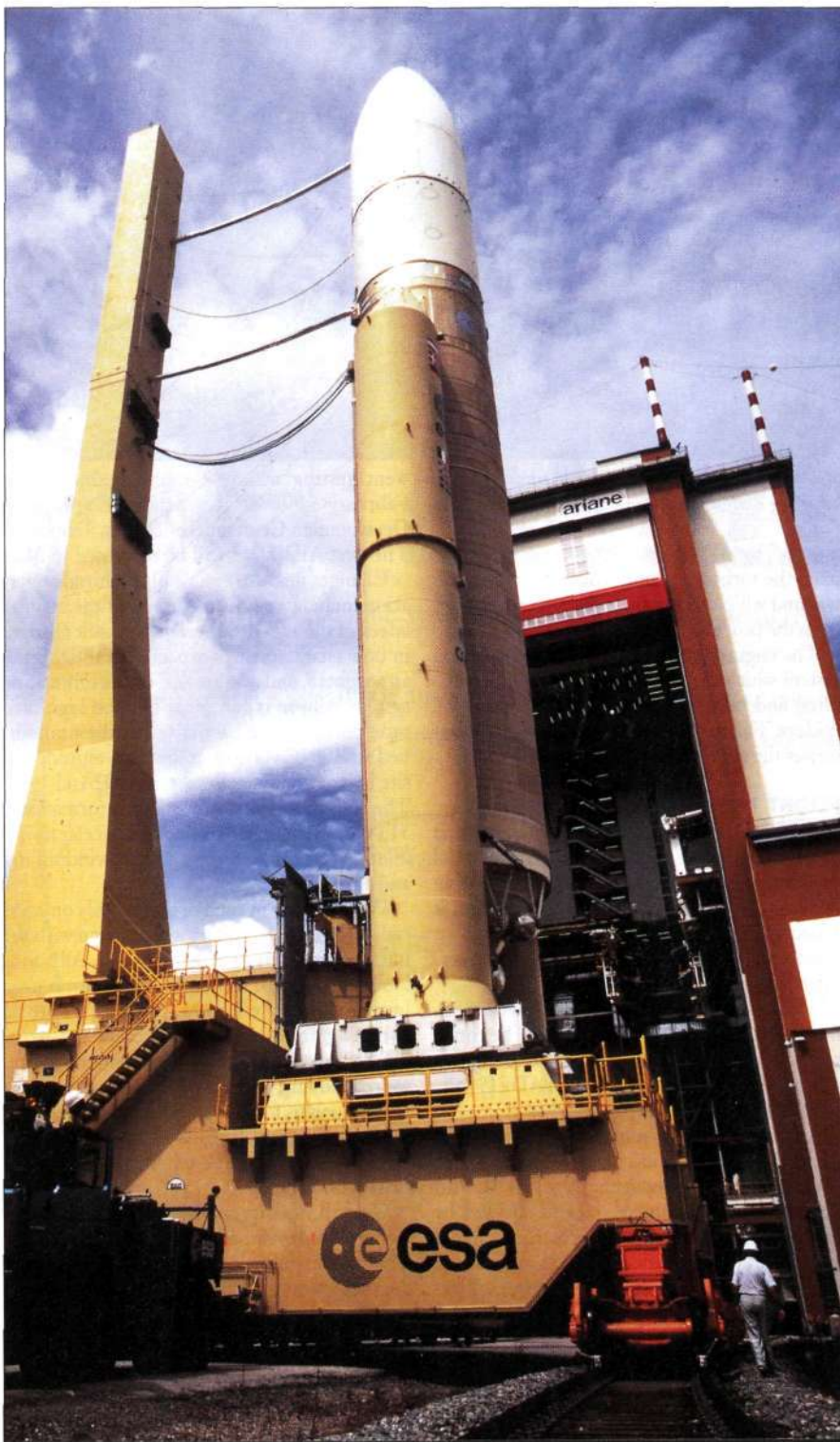
With a finger in each of the pies of commercial, business and military aviation and with the industrial weight of R-R behind it, Allison is looking to spread its market penetration even further. "With the A and C versions, we are on two programmes that are winners and we've got some other letters of the alphabet that we're studying," says Novick. Indeed marketing campaigns for the B, D, E, F and G variants are under way, involving "both regional jets and business jets", says large-engine marketing director Ron Riffel.

Growth variants continue to be studied and technology developed to support the initiative. The successful run of the 44kN AE301X demonstrator in September 1994 confirmed the basic engine's ability to run at higher ratings, with little change other than an advanced technology cast-cooled HP turbine. Further growth to provide a powerplant with a 42-75kN range is also envisaged with the use of the advanced HP turbine and a larger, 1.12m-diameter, fan.

Negotiations are under way with the parent company to define the upper levels of thrust growth for AE3007 derivatives and avoid conflict with the rest of the family. In the meantime, 1996 promises to be the busiest year ever for the AE3007 family with entry into service on the Citation X and Embraer EMB-145 and flight-testing on the Tier II Plus. □



The first Citation X will be delivered in June after certification in February 1995



The Ariane 5 programme will receive belated UK investment

Space minister Ian Taylor is paving a way forward for the UK in space.

TIM FURNISS/LONDON

IAN TAYLOR, THE UK's space minister, is directing efforts to co-ordinate a long-term master plan to obtain full value from an annual budget of about \$300 million. The MP and Parliamentary Under Secretary of State for Science and Technology has announced that the UK will now be joining the Ariane 5 launcher programme, albeit belatedly and with only a modest input of \$4.3 million over the next four years. This decision has certainly saved existing UK business in the Ariane 5 and future upgrades. The supply of pipework for the Ariane 5's Vulcain first-stage engine represents about 10% of the business of Avica — part of the Meggitt Aerospace group — based in Hemel Hempstead, north of London.

Arianespace has almost 60% of the commercial-launcher market and, if the Ariane 5 — due to have its maiden flight on 15 May, and to be operated by Arianespace from 1997 — can maintain that business performance, the UK has "a strong interest in sharing" in this success, says Taylor's recently published Space Policy discussion document.

The UK's approach, the document says, should be to encourage the development of a fully competitive international launcher-services market, "...to maintain our support to the Kourou launch site, to renew our links with the Ariane, and to encourage promising means of reducing launch costs, including increased availability of affordable launcher services for small satellites with the key role that they can play in broadening and opening up the market". This UK strength in small, low-cost satellite technology should be exploited to the full, Taylor urges.

The minister admitted the Government's original error over the Ariane 5 at a Space Policy Forum at the University of Surrey in September 1995, an innovative first gathering of all parties interested in the UK space industry (*Flight International*, 27 September-3 October, 1995).

The "no-holds-barred" Forum, which allowed home truths to be openly discussed, exposed the need for a forward plan for the UK's space activities. As a first step, Taylor has published his Space Policy discussion document. This will be debated further at another Space Policy Forum, and then a consolidated Space Plan will be published this summer.

The UK is a surprisingly effective force in space, according to the document: its space-supplies industry employs over 6,000 people, generates an annual turnover of over \$1 billion (with new orders of \$700 million), and holds an esti-

The way ahead

mated 23% European market share. The UK is the largest user of space in Europe and the second-largest in the world.

UK space-sector revenue represents about 15% of the world market for services, with major uses of space being companies in the telecommunications, meteorology, Earth observation and space science sectors. Particular use is made of operational space data for meteorology and environmental applications. The space industry's share in the world civil-telecommunications satellite and ground-segment market, which may be worth \$86 billion in 2004, is 10%. Its share in meteorology and Earth observation is 5%, with this market expected to grow by 20% a year, to \$35 billion by 2004.

The UK space industry has excellent access to civil and military telecommunications, surveillance and remote-sensing technologies and is a leader in low-cost, small-satellite technology and Earth-observation applications. The document says that the industry has a strong manufacturing and supply capability, which is world-class in subsystem and component levels, and a cost-effective and competitive culture by European standards, with good access to UK insurance and financial markets.

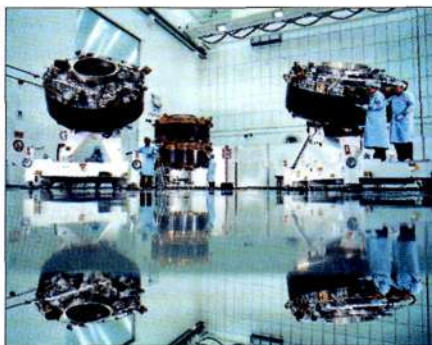
UK space science groups — mainly university based — have a high reputation in Europe and worldwide. They gain access to European Space Agency (ESA) missions against fierce international competition at a rate far above the UK's contribution to ESA. This space-science success story is threatened by the growth of the ESA subscription at the expense of resources available for exploitation. "We need to fully exploit our scientific strengths and potential, to maintain a strong ESA space-science programme by continuing to press for improved efficiency and to maximise science output at the smallest cost with appropriate support for national experiment contributions," says the document.

MINORITY VOICE

The UK's annual contribution of about \$180 million to the ESA provides it with a minority voice in seeking reforms, especially to the agency's industrial policy which contributes to modest UK and European competitiveness, compared with the USA, the document says. It says that ESA needs to be reformed and slimmed down. The agency has already agreed to reduce its staff by 12% by 1998.

ESA procures from member states on a policy based on each country's contribution to the agency, with the proportion of work reserved to contributor's industries. Contracts placed account for over 80% of total ESA costs. Under pressure from the UK, the agency will now adopt a more flexible price-procurement policy.

The document also recommends more private-finance co-funding of ESA and national programmes by industry. It says that these should focus on technology development and be commercially relevant. "ESA should stop seeing itself first and foremost as an organiser of space



UK space science will play a major role in the Cluster missions

missions," says the document.

The UK's priorities in telecommunications, meteorology and Earth observation must be pursued, and an active UK involvement in international space-science collaboration maintained. ESA's space-science budget takes a high percentage of UK science funding, depriving UK university space-science researchers of cash. Taylor has helped to cap this spending until 1999.

Taylor believes that major opportunities for UK projects lie in the areas of consumer navigation products, broadcasting, multi-media, the Internet and other integrated wide-band networks, personal communications and space-data applications. "Demand for fully integrated navigation and broadband multi-media services is clear and must be exploited in the ground segment," the document says.

The British National Space Centre and related European bodies "...must ensure that meteorological missions are firmly user-driven", and work to "...reduce mission costs". Longer-term requirement for Earth observation and the market structures which would best serve them, should be defined, it says. The infrastructure needed to support the Envisat polar platform and to ensure its interoperability with wider information networks needs to be completed and the role of the European Union as major user of Earth observation data should be confirmed formally, the document recommends.

The document also highlights the fact that there is no current UK requirement to commit to European military-surveillance programmes. Total European military ordering is smaller than that of the USA by a factor of ten and will never match the US level, but it is important that "...we use European ordering, in which the UK plays a significant part, not only to secure value for money, but to position European satellite manufacturers more effectively in the wider markets", the document says.

According to Taylor, maximum value from the military and civil programmes can be achieved by paying particular attention to the interactions between procurement, technical capability and European rationalisation — which will need to be developed further to increase European competitiveness. The exploitation of ballistic-missile defence technol-

ogy in the commercial arena is one example.

Another recommendation in Taylor's document is that the UK "...must work for maximum civil-military synergy across space-related research and development, ordering programmes and setting specification with an eye to dual use, and seeking to position UK industry to best advantage within Europe and in the wider market".

The balance of the UK programme across international collaboration, ESA and national activities should be re-appraised, the document says, taking into account the needs of scientists, suppliers, operators and customers. This could include bilateral/multi-lateral commercial programmes outside ESA and could be in commercial radar missions, in exploiting small-satellite missions and in exploring joint ventures with the Japanese and developing nations.

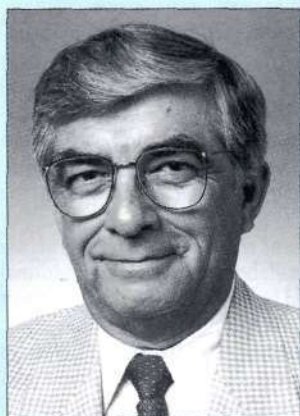
The increasing use by Government departments of space applications is promising, the document says. It cites as examples the Department of Transport's use of navigation, the Department of the Environment's embrace of satellite imagery and the Ministry of Agriculture's enthusiasm for crop monitoring and landcover mapping.

"We must develop new markets, new applications and new opportunities," says Taylor. "If we focus on them and are competitive, we can do well. Some industries are [still] not using the competitive advantages space data can bring."

THREATS TO UK

The document warns of some of the major threats to the UK space programme. US spending on expendable launchers, for example, could erode Europe's short-term competitive position. Dominant investment by the USA in strategic technologies — particularly in advanced telecommunications — is being exploited effectively to support US civil launchers and satellite industries. It provides a massive advantage to contractors such as Hughes, Lockheed Martin and TRW in, for example, production-line economies. US commercial investment in mobile satellite services, such as the Iridium and Globalstar, and in future broadband satellite constellations, such as the Spaceway, point to US dominance. Lack of timely European investment in technology, allowing Japan and the USA to dominate new markets, is another of the document's concerns. US investment in single-stage-to-orbit technology could provide its industry with longer-term, low-cost access to space, it notes.

The developing Franco-German axis in military and civil space could also lead to possible marginalisation of UK industry. The countries' co-operation on the Helios optical-surveillance project and the potential Horus radar system will underpin the Daimler-Benz Aerospace/Aerospatiale joint venture. This could undermine the UK lead in space radar and work against the Anglo-French Matra Marconi Space, according to the document. □



Jose Olvera

■ SIMUFLITE

SimuFlite Training International, of Dallas/Fort Worth, Texas, has appointed **Jose Olvera** regional sales manager for South America, based in Fort Lauderdale, Florida. Olvera, with the US Air Force for 27 years, was formerly director of Latin American sales for Learjet.

■ HEXCEL

Composites and structures developer and manufacturer Hexcel, of Pleasanton, California, has completed its merger with Ciba Composites, of Basle, Switzerland, and named **John Lee** chairman and chief executive, with **Juergen Habermeyer** president and chief operating officer. **Stephen Forsyth** will be senior vice-president of finance and administration.

■ AAR

Aviation-parts and service company AAR, of Elk Grove Village, Illinois, has appointed **Don Ward** president and general manager of its AAR Oklahoma maintenance and service site, of Oklahoma City. Most recently general manager of the General Electric plant at Strother Field, Kansas, Ward was with GE for 32 years.

■ SAAB

Sterling, Virginia-based Saab Aircraft of America, the marketing arm of Saab commercial aircraft in

the West, has named **David Hunt** director of regional-airline sales. He was most recently regional-airline sales manager at Embraer Aircraft, in Fort Lauderdale, Florida, and, before that, he held positions with Beech and Cessna Aircraft. **Kenneth Martin** becomes corporate-aviation consultant. He was most recently with Dornier Aviation, and, before that, with de Havilland and Cessna Aircraft.

■ SANDERS

Lockheed Martin defence-electronics company Sanders, of Nashua, New Hampshire, has named **Steven Walker** vice-president of operations. He was formerly director of the marine-traffic-management business at Lockheed Martin Ocean, Radar & Sensor Systems, of Syracuse, New York.

■ BAR UK

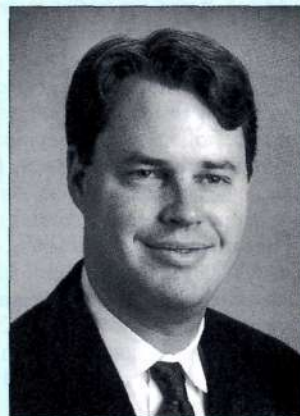
Monika Warburton, general manager of Austrian Airlines, has been elected to chair the Board of Airline Representatives in the UK (BAR UK). The first woman to become general manager of any airline in the UK, Warburton also chairs the Foreign Airlines Association.

■ ALENIA

Filippo Bagnato is named executive vice-president of the aeronautics area of Finmeccanica company Alenia, of Rome, Italy. He succeeds **Nino D'Angelo**, who will leave the company on 31 May. Bagnato was most recently vice-president for technological development and new programmes.

■ UNC

Component supplier and overhauler UNC Accessory Services, of Annapolis, Maryland, has appointed **Craig Huston** vice-president of sales and marketing. He was most recently with aero-engine manufacturer Allied Signal. UNC International has named four new regional sales managers. They are **Roberto Rivas**, formerly with AAR Aviation Services, who will be responsible for Latin America; **Gregory Crill**, who will cover the western USA; **Edward McKiernan**, formerly with Lori, who will be responsible for the south-western USA; and **Scott Mahler** previously with ITOCHU Air-lease, who takes over coverage of the north-eastern USA.



James Brown

■ HARTZELL

James Brown has been promoted to vice-president of parts and service at propeller-system manufacturer Hartzell Propeller, of Piqua, Ohio. He was most recently director of the Hartzell Service Center, where he is replaced by **Jeffrey Slattery**. Slattery, with the firm for 16 years, was formerly superintendent of composites manufacturing.

■ DELTA AIR

Willy Buysse has been appointed general manager of Delta Air Transport, the commuter subsidiary of Belgian flag carrier Sabena. He was previously vice-president for corporate development and subsidiaries.

■ SOBELAIR

Luc Cloetens has been appointed general manager of Belgian national carrier Sabena's charter subsidiary, Sobelair. With Sabena since 1990, he was formerly executive vice-president for passenger services (handling and catering).

■ US AEROBATICS

Boris Baird has been named manager of the US Aerobatic Team, taking over from **Fred Peters**, who is relocating to Anchorage, Alaska. Baird, a former US Air Force fighter pilot, held the position of manager of the 1994 US Aerobatic Team.

■ WILCOX

William Marberg has joined Wilcox Electric, of Kansas City, Missouri, to be senior managing vice-president of navigation systems. He was formerly vice-president of air-traffic control at Loral.

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Comparing notes seems a good idea

Sir — Do civil and military flying organisations ever discuss their accidents and incidents with each other? If they do, then they do not seem to learn from them.

The report "Disconnected ailerons are blamed for RAF Hawk crash" (*Flight International*, 13-19 March, P4) bears an uncanny resemblance to an Airbus A320 near-miss in 1994. In both cases, flying controls were disconnected or de-activated during maintenance and not re-instated by the engineers. No subsequent checks were carried out before the aircraft were handed over for

flight. The flightcrew in both cases failed to establish "full and free" movement (to use an old phrase). There were three chances to get it right — all were missed.

The A320 pilot, who apparently forgot to check his controls, made a miraculous recovery and landed safely (with errant spoilers waving in the wind). The Hawk pilot, sadly, was not so lucky.

The publicity surrounding the A320 incident was widespread at the time and, in civil-aviation circles, is considered to be a classic close shave from which



Cockpit pre-flight control-surface checks are essential

the flightcrew and maintenance engineers have learned a lot. Were Royal Air Force engineers not told about it, or did they not read about it in the technical press? When will we learn from one another?

STEVE KIRBY
Twickenham, Middlesex

Wake up and join the real world

Sir — At last an accident investigation board, the UK AAIB, has had the courage and professionalism to speak its true mind. The crash of the Boeing 737 freighter at Coventry in December 1994 was contributed to by the likely fatigue of the crew. Crew members had been on duty for over 10h, starting at midnight, and were attempting a fifth landing, probably after little real sleep. It is not surprising they were fatigued.

It is accepted by the accident investigating authorities that, ultimately, the weakest link in the chain of aviation safety is the human one. Why then is the Joint Aviation Authorities (JAA) proposing to further weaken that link significantly with its flight-time limitation scheme? Why are the national authorities not opposing the JAA proposals? Could it be that, because aircraft can fly far greater distances than ever before, crew have to work longer hours? We shape the things we build and thereby they shape us. Members of the JAA, join the real world. If you do not, you will be seen not as custodians of professionalism and safety, but as puppets having their strings

pulled by the commercial managers of the airlines.
CAPT P MARSDEN
Hong Kong

Most expensive not necessarily the best

Sir — My distaste of the attitudes held by the majority of pilots I have met was increased by Peter Llendell's letter, "Dangers of paying less than going rate" (*Flight International*, 28 February-5 March, P37).

How does Mr Llendell arrive at the conclusion that the safest pilots are those who are attracted by the most money? Not only are those pilots engaged in long-haul operations with the airline which has most recently adopted a divided pay scale and some of the highest paid, underworked pilots in the UK, they also hardly do enough flying to remain current. What little flying they do is controlled by computers which make the ship inherently safe for the most inept pilot.

I believe that the safest pilots are those who, through some fanaticism, have chosen to pursue a career at "grass-roots" level, or those who are stuck at that level.

I cannot help but feel that some of the companies which have gone down the tubes would not

have done so if:

■ pilots had not demanded the amount they did in financial rewards and time off;

■ there had been an earlier implementation of a flight-time-limitations scheme, akin to that proposed by the European Joint Aviation Authorities.

ADRIAN MILDWATER
Fenny Compton, Warwickshire, UK

Sponsorship sought for UK's FAI entry

Sir — This year's *Fédération Aéronautique Internationale* (FAI) World Microlight Flying Championships are to take place near Durban, in South Africa, from 31 July-10 August.

The British Team (the world and European champions) is seeking sponsorship to help cover the costs of transport, their aircraft and all of the necessary equipment to South Africa.

Any company which wishes to be associated with the British Microlight Team, and which can offer any form of sponsorship, should contact Peter Woodliffe-Thomas; tel (daytime): +44 (1442) 229291, or (evenings) +44 (1844) 213881.

P WOODLIFFE-THOMAS
Thame, Oxfordshire, UK

WHAT'S ON

Association of Aviation Medical Examiners Annual Scientific Meeting 19-21 April, Malta. Contact: Sterling Services, Pembroke, STJ 07, Malta; tel: +356 377393; fax: +356 377398.

IATA Conference: Financial Management 96 22-23 April, New York, USA. Contact: Joanna Robinson, Seminar & Exhibition Services, IATA, 75-81 Staines Road, Hounslow, Middlesex TW3 3HW, UK; tel: +44 (181) 572 4934; fax: +44 (181) 572 4929.

The European Air Transport Conference 22-23 April, Brussels, Belgium. Contact: Clive Rigden, 54 Selkirk Road, Twickenham, Middlesex TW2 6PX, UK; tel: +44 (181) 893 3795; fax: +44 (181) 893 3796.

The Stress Analysis and Design of Composite Structures 22-26 April, Cranfield, Bedford, UK. Contact: Lesley Roff, Short Course Manager, Cranfield University, Cranfield, Bedford MK43 0AL; tel: +44 (1234) 750111, ext 2564; fax: +44 (1234) 751206.

The UK Attack Helicopter 23 April, London, UK. Contact: Ref 298, Conference Office, Royal Aeronautical Society, 4 Hamilton Place, London W1V 0BQ; tel: +44 (171) 499 3515; fax: +44 (171) 493 1438.

Electronic Distribution & Ticketing 23-24 April, London, UK. Contact: Ben Gallienne, Customer Services Manager, IIR, 6th Floor, 29 Bressenden Place, London SW1E 5DR, UK; tel: +44 (171) 915 5055; fax: +44 (171) 915 5056.

Aeronautical Telecommunications Network Seminar 23-25 April, Brussels, Belgium. Contact: Linda Drisdell, IATA; tel: +1 (514) 985 6368; fax: +1 (514) 844 4698.

National Air Transportation Association Annual Convention and Trade Show 23-25 April, Las Vegas, Nevada, USA. Contact: National Air Transport Association, 4226 King Street, Alexandria, Virginia 22302, USA; tel: +1 (703) 845 9000; fax: +1 (703) 845 8176.

DSA '96 23-26 April, Kuala Lumpur, Malaysia. Contact: Defence Services Asia Exhibition and Conference '96, Malaysian Exhibition Services, Sdn Bhd 468-1B Batu 3, Jalan Ipoh, 52100 Kuala Lumpur, Malaysia; tel: +60 (3) 291 0311; fax: +60 (3) 292 7241.

RAeS Bristol AGM and Accident Investigation Lecture 24 April, Bristol, Avon, UK. Contact: Andy Evans, Branch Secretary, Royal Aeronautical Society Bristol, WH34, Rolls-Royce, PO Box 3 Bristol BS12 7QE, UK; tel: +44 (117) 979 5491; fax: +44 (117) 979 0759.

The opinions on this page do not necessarily represent those of the editor. *Flight International* cannot undertake to publish letters without name and address and reserves the right to select or edit letters

FLIGHT

AIRCRAFT
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75 YEARS AGO

Extracts from *Flight*, April 14, 1921

Dishonest Intent

In reading some of our foreign aeronautical exchanges we have noted from time to time that *Flight* is "quoted" occasionally — but not too often. We only wish it were otherwise. When we are quoted it is generally some quite minor mention of ours. *Per contra*, when whole articles — illustrations and all — are lifted bodily from *Flight*, original articles that have often entailed a vast amount of technical work, it is curious that there never appears to be room to squeeze in either in front or at the end, that little word "Flight". We have had many times, in over flagrant cases, to draw attention to this lapse — there are honourable exceptions — and what we would prefer is to let the minor items from *Flight* go without "quotes" as our respective contemporaries work, and for recognition of the really useful articles which are generally annexed. At times the selection of passing items to which credit is duly given to *Flight* is, by contrast, quite ludicrous. Filching without acknowledgment may be very complimentary, but it is not honest.

Airships and Sheds

It is probably true that the progress of airship design has more than once been hampered by considerations relating to available shed space. Obviously, it is no use designing airships so large that they can not be housed in existing sheds if new sheds can not be built for them in time. Thus designers are prevented from getting the best results because they are restricted to certain overall dimensions determined by existing buildings.

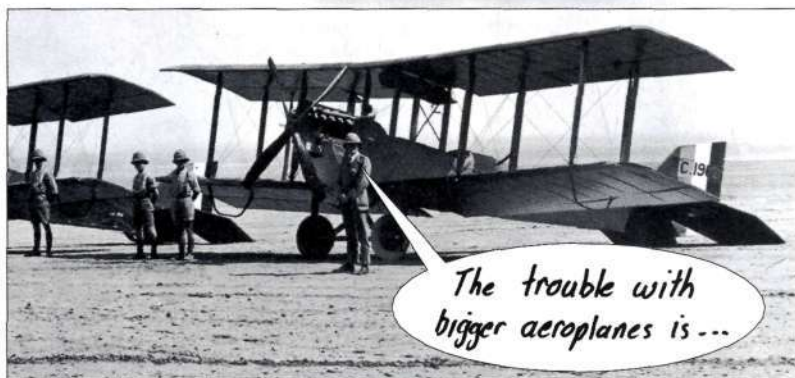
Various Mishaps

On Sunday at Bruges, during the unveiling of a monument in the stadium of the Sporting Club in honour of members who fell in the War, an aeroplane from Brussels, while descending to drop a wreath, hit the monument and crashed to the ground.

Naval Joiners for the RAF

The Admiralty have notified the Fleet that the Air Ministry are prepared to consider applications from joiner ratings in the Royal Navy who may desire to be transferred to the Royal Air Force.

A choice of mocktails in addition to the fruit juice service is now presented to Club Premiere passengers with a continental...non-alcoholic ones, presumably. Jet Airways (India) press release



Airco DH.6, probably in Egypt, c 1918

◆ Nephew Ezio Bonsignore asks from Bonn "WIHIH" in that pic of an Airborne Express DC-8 (*Budgie News* p51, 20-26 March). The short answer is "Dunno". The long answer is that whatever he's doing, he would appear to be either older or less bold than the bloke does doing similar things, but much lower, with an Air Zimbabwe 707 at African airshows.

Gen Strike: "Well, Laddie — that's it. I'm afraid it's no more flying for you."

Jock Prentice: "But Sir! I've passed all my checks and medicals, I've passed the conversion course from Groundsquirrel to Pitbull Terrier, I'm top of my class, I don't drink or smoke, I've not been on a charge. Please, Sir! What have I done wrong?"

Gen Strike: "Yes, Yes. All very commendable, Laddie, but you're just too light for your parachute. Next!"

ROGERNOMICS Lesson No 100,496

"We would ask: 'Why are



Monarch in-flight magazine

we flying from Greensboro to Greenville eight times a day?' They would reply: 'Well, it's strategic.' And then we'd say: 'When was the last time it made money?' And they'd say: 'Well... er... it sort of never has.' And then we'd ask whose girlfriend lived there...."

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Budgie News: "Er... We came up here so you could show us inter-service inter-

operability by using your Flying Gas Station to refuel Navy aircraft, but we're returning to base having not refuelled a single aircraft in five hours. Why?" **Sgt Fletcher:** "Well... er... it seems no-one told the Navy we'd be up there... umm. Wanna Coke?"

◆ Keynote address at helicopter conference: "It's great to see you all out there. You know, this helicopter conference is all about helicopters and helicopter operators — collectively speaking."

Logan



Handley Page Hastings, 1947

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