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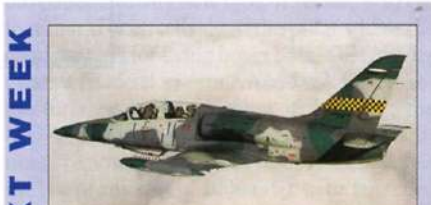
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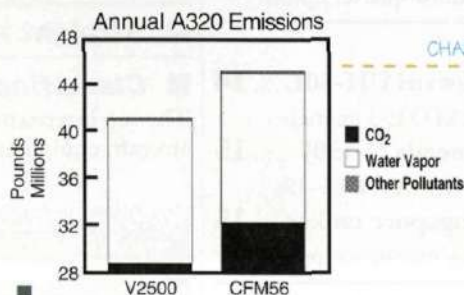


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# COMMENT

## A DYING BREED

**V**ALUJET EFFECTIVELY (and finally) launched the McDonnell Douglas (MDC) MD-95 on 19 October, with an order for 50. The deal will be seen by

some as the launch of the last of the old-style regional jets, but its pricing appears to be all too modern. Either way, ValuJet's order will have a profound effect on the market, and on the prospects for other projects.

The MD-95 has had a difficult birth. MDC has come close to launching it several times, but it has always failed to secure a big launch order — most famously when Scandinavian Airlines System opted for Boeing 737s instead to replace its MDC DC-9s.

For many operators, the MD-95 did not

offer enough of a step forward, despite its new-generation BMW Rolls-Royce engines and avionics and systems based on those of the larger MD-90. Regional operators, like their longer-haul brethren, are looking for quantum leaps in operating economics for their next-generation aircraft. They talk of seat-kilometre costs 15-20% lower than those of current aircraft — and they want lower acquisition costs.

MDC has probably been able to deliver on the acquisition-cost front to ValuJet. The airline's existing DC-9-30s cost only \$5 million and ValuJet made clear that it would only take on a new aircraft if the price was right.

Whether other operators will receive such apparently advantageous prices is another matter — after all, Airbus senior executives are rumoured to have blanched at the prices that ValuJet was willing to pay them for their A319. On operating costs, it will have been able to do less for ValuJet. The new engines will be much more fuel-efficient than those of its old DC-9s, and the modern systems should be more reliable than the old ones, but MDC would have to have thrown in a new lightweight structure and advanced aerodynamics to offer a real breakthrough.

Undoubtedly, the MD-95 will be an attractive product — not as good as the customer would hope for, but better than the customer now has. Its greatest attraction is that its limited technical advance carries the advantage of limited technical risk, which, in turn, means that its advances can be delivered quickly.

It is an argument which Boeing has used to good effect in marketing its new-generation 737s in the next class up. Even though they incorporate more new technology through a new wing, they offer the same sort of advance from a proven base, which has appealed to many operators.

That places a greater burden on those in Asia and elsewhere who would rather build a

totally new aircraft to satisfy the demand for new 100-seaters. Any such aircraft will carry a development tag many times that of the derivative MD-95, but will have engines and avionics which are no more advanced. Any new aircraft will have a better structure and aerodynamics, but much of its advantage will be lost, making each operating economic benefit more expensive and difficult to justify.

Especially at the lower end of the market, acquisition cost is more of an issue than it is further up. Reducing standing costs — even if it implies accepting slightly higher running costs — is the key. Many operators are faced with replacing older, noisy and uneconomical aircraft, which cost them very little to buy second-hand, with new types which they can ill-afford.

The only hope for a manufacturer wanting to introduce a totally new type, it seems, is to cut that first cost effectively to the point where the operator pays for flying hours only. That implies massive financial investment and risk for a manufacturer or lessor. Without it, however, the MD-95 might not just be the last of the traditional regional 100-seaters to be launched, but the last of any sort of 100-seater to be launched for a very long time. □



*"Undoubtedly, the MD-95 will be an attractive product — not as good as the customer would hope for, but better than he now has."*

*Flight International and BPC Milton Keynes apologise to our readers for the serious errors at our printing plant which resulted in the cutaway poster of the Embraer EMB-145 being inserted wrongly in the issue of 18-24 October*





RAF C-130J roll-out heralds international sales boost for Lockheed Martin

## Saudis open talks for 70 C-130Js

SAUDI ARABIA HAS opened talks with Lockheed Martin on the possible purchase of up to 70 C-130J Hercules 2 transports over ten years. The Saudi fleet of more than 40 C-130E/Hs would be replaced, and additional KC-130 aerial-refuelling tankers acquired.

Lockheed Martin rolled out the C-130J on 18 October, unveiling the first of 25 stretched C-130J-30s on order for the Royal Air Force. The first standard-length C-130J, for the US Air Force, was rolled

out at the company's Marietta, Georgia, plant on 20 October.

The USAF finally signed the contract for its first two C-130Js on 13 October, launching what Lockheed Martin hopes will be a 400-aircraft fleet-replacement programme.

A Royal Australian Air Force team is in Marietta, evaluating Lockheed Martin's offer of C-130J-30s, and expects to place an order for 12 aircraft in April 1996. □

See *Defence*, P15.

## Italy boosts aerospace-spending

ITALY'S STRUGGLING aerospace industry stands to receive L3,850 billion (\$2.4 billion)-worth of state funding over the next five years under plans now being discussed in the Italian parliament.

The funding aims to support Italian participation on a range of international aircraft engine programmes and systems, including the Future Large Aircraft, the McDonnell Douglas MD-95 and any future 100-seat regional-aircraft project in Europe.

The proposed package comes as part of continuing efforts by the Italian Government to support its ailing aerospace/defence industry.

The rescue plan was first drafted in 1994 as Alenia came close to crisis. L750 billion was put aside to bail the industry out, but was never spent. Another L1,100 billion was also put aside in the Government's 1995 budget, with proposals for a further package of L2,000 billion in the 1996 budget proposals. This is still awaiting approval by the Italian Parliament, however.

The state-owned Finmeccanica group will get the bulk of the funds, with its Alenia subsidiary alone accounting for nearly one-third of the projected spend. Engine makers Alfa Avio and Fiat Avio are also to receive support. □

### STATE FUNDING PACKAGE FOR ITALIAN AEROSPACE 1995-2000

| Company                   | Value        | Major programmes (by value)  |
|---------------------------|--------------|--|
| <b>Finmeccanica group</b> |              |  |
| Alenia                    | 1,280        | ATR 82, FLA, G222J, AMX-E, MD-95, ATR 52C.                         |
| Alfa Avio                 | 336          | "New" turboprop project and engine for new 100-seat airliner       |
| Agusta                    | 532          | AB-412, A 109X, EH101  |
| Fiat                      | 194          |  |
| Total                     | 2,342        |  |
| <b>Private companies</b>  |              |  |
| Fiat Avio                 | 638          | Participation on FLA and A340 engines, GE90, EJ200, PW4098, GE T64 |
| Aermacchi                 | 427          | Yak-130, Do-324EC, AMX-E, new trainers                             |
| Elettroica                | 294          | EW for AMX-E and new protection/surveillance system                |
| Total                     | 1,359        |  |
| <b>TOTAL</b>              | <b>3,701</b> |  |

# Europeans resolve space-station row

JULIAN MOXON/TOULOUSE

AFTER SIX YEARS of wrangling, the 14 members of the European Space Agency (ESA) have finally agreed on their financial contribution to the US/Russian-led Alpha international space station.

An ESA ministerial meeting at Toulouse on 18-20 October hammered out a substantial compromise which overcame fundamental differences between France and Germany over spending priorities.

France can now pursue developments of the new Ariane 5 launcher, will have leadership of the automatic transfer vehicle for the space station, and can begin development of a crew-rescue vehicle, while Germany will lead work on the COF orbital laboratory. France has been forced to reduce spending on two major national space programmes, however.

A major stumbling block was overcome by solving Italy's objection that over the years it has not

received enough work to compensate for the money it has paid into ESA. Italy will now receive more space station work than previously planned, allowing ESA to take advantage of the low value of the lira.

A space station budget of 1.4 billion European Accounting Units (£1.75 billion) was approved by the ministers, to be spent between 1996 and 2000. Germany will provide EAU 600 million, France EAU 400 million, and Italy EAU 250 million, of which EAU 50 million will be in the form of an ESA loan, to help Italy over its present budget crisis. The other ESA countries will contribute EAU150 million between them.

An attempt by the UK to cut ESA science programmes by 25% was blocked, leaving the spending plan virtually intact, but linked to a 3% rise in inflation. France's own SPOT and Stentor satellite programmes will suffer cuts of around EAU 122 million. □

See *feature*, P35.

## Boeing/GE propose new icing test waiver on GE90

BOEING AND GENERAL Electric are proposing a revised plan to test the effectiveness of modified acoustic panels on the GE90 engine which suffered ice-impact damage during a crucial natural-icing flight-test on 9 October.

The icing test is the last significant hurdle to be overcome before the GE90-powered 777 is certificated and delivered to British Airways.

GE hopes that the revised plan could lead to certification by 30 October. Sources close to the European Joint Aviation Authorities, which has to certify the airframe/engine combination before BA can operate it, believe this date is "optimistic", however.

The US Federal Aviation

Administration says that continuing function and reliability testing does not need to be started afresh as a result of the problem.

It also says that component tests of the new panels should be made before putting them into the engine and completing a second natural-ice test.

GE plans to send strengthened panels to Boeing so that flight-tests can be re-started around 23 October, but is proposing to the FAA that it waive new natural-icing tests and rely instead on the component test to prove the modification.

GE is studying various solutions, including replacing the panels with a glassfibre-reinforced plastic fairing and strengthening the present design. □





ValuJet order will send MD-95 on its way

## MD-95 launched with ValuJet

RAMON LOPEZ/WASHINGTON DC  
GUY NORRIS/LOS ANGELES

**M**CDONNELL DOUGLAS (MDC) has launched its MD-95 on the back of a single 50-aircraft order from fast-growing low-cost operator ValuJet Airlines.

The value of the order from the successful low-fare US carrier based in Atlanta, Georgia, exceeds \$1 billion, and ValuJet holds options for a further 50 of the MD-95-30s which will carry 129 people in a single-class configuration.

ValuJet, which now operates about 40 older DC-9-30 twinjets, is also the launch customer for the BMW Rolls-Royce BR715 turbofan engine, a growth version of the BR710 used on the Gulfstream GV and Bombardier's Global Express.

The 94kN (21,000lb) European engine will now be offered exclusively on the MD-95, BMW R-R having beaten off a challenge from Pratt & Whitney, offering its mid-thrust family of engines. The P&W engine proposal is still in its infancy and, although P&W's bid was cheaper, ValuJet was not prepared to take the risk involved in a completely undeveloped powerplant. BR715 certification is scheduled for September 1998.

It was a see-saw battle for the short- to medium range 100-seater which ultimately won out over the Airbus A319, the Boeing 737-600 and Fokker 100. At one stage, Airbus was in sole negotiation with ValuJet, but the bidding was reopened when the European consortium failed to commit itself to guarantees on the break-even load factor on the A319.

"After an analysis which considered many factors, the MD-95 was deemed the right aircraft for ValuJet. No one single factor eliminated Boeing or Airbus," says Lewis

Jordan, ValuJet's president.

The fact that ValuJet is getting the 50 twinjets discounted to about \$20 million each is believed to have been a persuasive factor.

Harry Stonecipher, MDC's president and chief executive, says that launching a new aircraft programme with only 50 firm orders is a small risk to pay. "It will take a while longer," he says.

ValuJet will not receive its first MD-95 before June 1999. In the interim, it is acquiring eight additional used twinjets — five DC-9s and three 167-seat MD-80s — and it is searching the world for more

used MDC aircraft.

The requirement for additional aircraft is becoming urgent as the carrier reported impressive performance gains in its third quarter results. Operating revenues grew to \$1.09 billion, compared with \$400 million in 1994. Operating income advanced to \$36 million, against \$10 million.

While analysts have been doubting ValuJet's ability to continue delivering performance gains, the carrier reported load factors up from 52.9% to 73.2% and operating margins at 33.6%, compared with 27.2% in 1994. □

## MDC will hire more staff

**M**CDONNELL Douglas (MDC) is immediately "ramping up its resources" as a result of the ValuJet order and will add up to 450 design and development staff by mid-1996, says MD-95 deputy programme manager, Jerry Callaghan.

A further 1,500 assembly line jobs will also be created, starting in 1996 to support the start of assembly in May 1997.

The first airframe will be completed before January 1998, when the first shipset of BR715 turbofans is due in Long Beach.

First flight is scheduled for the second quarter of 1998, with planned simultaneous US Federal Aviation Administration and European Joint Aviation Authorities certification a year later.

The first MD-95 will be delivered in the second half of 1999, with production rising from 12 a year to 18. This would rise to 24 a year if the airline exercised some of its options in the first few years of production. □

MDC is now preparing to cut the fuselage of the static prototype at Long Beach (a former Eastern DC-9-30), to insert a 1.5m plug forward of the wing to stretch it into a representative MD-95. The extra length adds two seat rows (compared with the DC-9-30) and helps balance the heavier tail-mounted engines.

Release of drawings has passed the 70% mark and "...we will now speed up that activity", says Callaghan, who adds that 90% release should be achieved by mid-1996. "It's a steep gradient to climb," he says. Many of the original 1960s vintage blueprints are being used for the MD-95 structure although entirely new areas such as the engine pylon and empennage interface will be digitally modelled and designed using a three-dimensional system.

Windtunnel tests for the take-off, cruise and landing configurations are also largely complete and, "...all basic parameters are validated". □

## Exim Bank 'will finance Il-96s'

**T**HE US EXPORT-Import (Exim) Bank was expected to announce on 20 October that it is prepared to help finance the purchase of Westernised Ilyushin Il-96s by Aeroflot-Russian International Airlines (ARIA).

Russian economics minister Yevgeniy Yasin says that Exim support for the \$1 billion purchase of 20 Il-96M/Ts "...is practically predetermined". The first production aircraft, an Il-96T freighter, is due to be flown in December.

ARIA is seeking a loan to cover the US content in the Il-96M/T, which includes Pratt & Whitney PW2337 engines and Rockwell-Collins avionics.

ARIA has agreed to form an off-shore trust company to control the assets. This will allow Exim to repossess the aircraft if the airline defaults on payments.

Boeing and McDonnell Douglas, which opposed the deal, will be compensated by the extension of a waiver of Russian tariffs on the import of aircraft (nominally 50%) to seven years, from the previously agreed three years. □

## Walter hit by Fould's death

**C**ZECH ENGINE manufacturer Walter faces an uncertain future following the death of Emilian Fould, the entrepreneur who took control of the company in March, but had still not paid for the acquisition.

Fould was found shot dead in Prague on 3 October, although news of the violent death was not announced for a week. Investigators appear to be treating the death as murder.

Fould's death came as he was still attempting to find funds to finance the 66% stake in Walter which he acquired from the company's state owners in March. Although he had agreed a purchase price of CKr500 million (\$15 million), only around CKr25 million materialised. Fould had promised to pay the remainder by the end of October. □



## Taiwan calls a halt to IDF production

**T**AIWAN AERO INDUSTRY Development Center has halted production of its Indigenous Defence Fighter and recalled the 40 delivered to the air force because of concerns about its fuel system.

Chiang Chung-Ling, Taiwan's defence minister, told the country's parliament that production of the aircraft had been stopped. The halt will last for at least six months.

Several IDFs have been lost, most recently in July. The loss of this aircraft was attributed to "a generator failure".

Chiang says that the Government remains committed to producing 130 IDFs. Originally, 250 aircraft were due to be built, but numbers were cut when Taiwan was able to procure combat aircraft from the USA and France. □

## China Hainan plans big boost to Metro fleet

**C**HINA HAINAN AIRLINES is to buy an additional 19 Fairchild Metro 23 19-seat regional aircraft to meet increased demand for feeder services in China.

The carrier has signed a memorandum of understanding with Fairchild Aircraft. The San Antonio, US-based manufacturer's financial division will help to finance the deal. Delivery of the initial two aircraft is due in December.

China Hainan took delivery of two Metro 23s in 1994. □

### NEWS IN BRIEF

#### INDIA FUNDS UPGRADE

The Indian defence ministry has approved an initial \$33.3 million to allow MAPO-MiG to begin upgrade work on the Indian air force's Mikoyan MiG-21Bis Fishbeds. The upgrade will be carried out by Hindustan Aeronautics in Bangalore.

# 747-X plans gather speed

GUY NORRIS/LOS ANGELES

**M**AJOR BOEING 747 operators have been called to Boeing's Seattle headquarters in mid-November for meetings on the proposed -500X and -600X stretched derivatives, as plans for the possible 1996 launch of the next-generation 747 gather pace.

Those attending include British Airways, Cathay Pacific, Singapore Airlines — the world's largest 747-400 operator — and Qantas, says Boeing Everett division vice-president and general manager, Ed Renouard.

Boeing recently told British Airways that making a launch decision in 1996 "...would be a good time to do it" (*Flight International*, 11-17 October).

The meeting is intended to update carriers on Boeing's latest development ideas for the -500X/-600X stretches. Boeing is seeking operator input as part of its drive to involve airlines in the development of the aircraft.

"They'll be putting a lot of city-pair notions together, and things like that," says Renouard, who adds that the 747-500X and -600X "...product-development effort is gaining a lot more momentum. I think that a derivative of the 747 [rather than an all-new design] is the right answer, and we'd like to keep Airbus from doing an A350 or an A3XX."



Largest 747-400 operator SLA is among airlines discussing stretched 747s

Studies are also being made of the order in which any new 747 derivatives would be launched. There is "some thought" of developing the higher-capacity -600X before the -500X, says Renouard.

This is likely to be driven by Boeing's need to satisfy the more immediate demand for extra-large capacity and protect its potential market base of current 747 operators.

The -600X is expected to have seating for around 550 in a tri-class arrangement, with room for up to 700 in an all-economy layout. The smaller -500X, designed around the same new wing design as the -600X, would offer a relatively

modest increase in payload over the 747-400, but would have a much greater range, of more than 14,800km (8,000nm).

By shuffling the launch order, Boeing is also expected to be able to protect its 747-400 market until the longer-range -500X market is firmly established.

Manufacturing issues will also be discussed, as the Everett site is unlikely to be expanded to accommodate the proposed giants.

Most of the new investment for the new-generation 747s would therefore go into modular manufacturing systems which would allow Boeing to produce 747-400s, -500s and -600s on the same line. □

# FAA expected to issue AD for CF6

**A**N AIRWORTHINESS directive (AD) to inspect the high-pressure spool of General Electric CF6 engines is expected to be issued by the US Federal Aviation Administration following recent engine failures on an Egyptair Airbus A300 and a Thai International Airways McDonnell Douglas DC-10.

The AD follows recommendations by the US National Transportation Safety Board and covers inspection of the 3-9 spool of the high-pressure compressor (HPC). Operators will be required to

inspect for two main defects in the HPC. Each bore of every disc will have to be scanned for the presence of impurities in the titanium from which they are made.

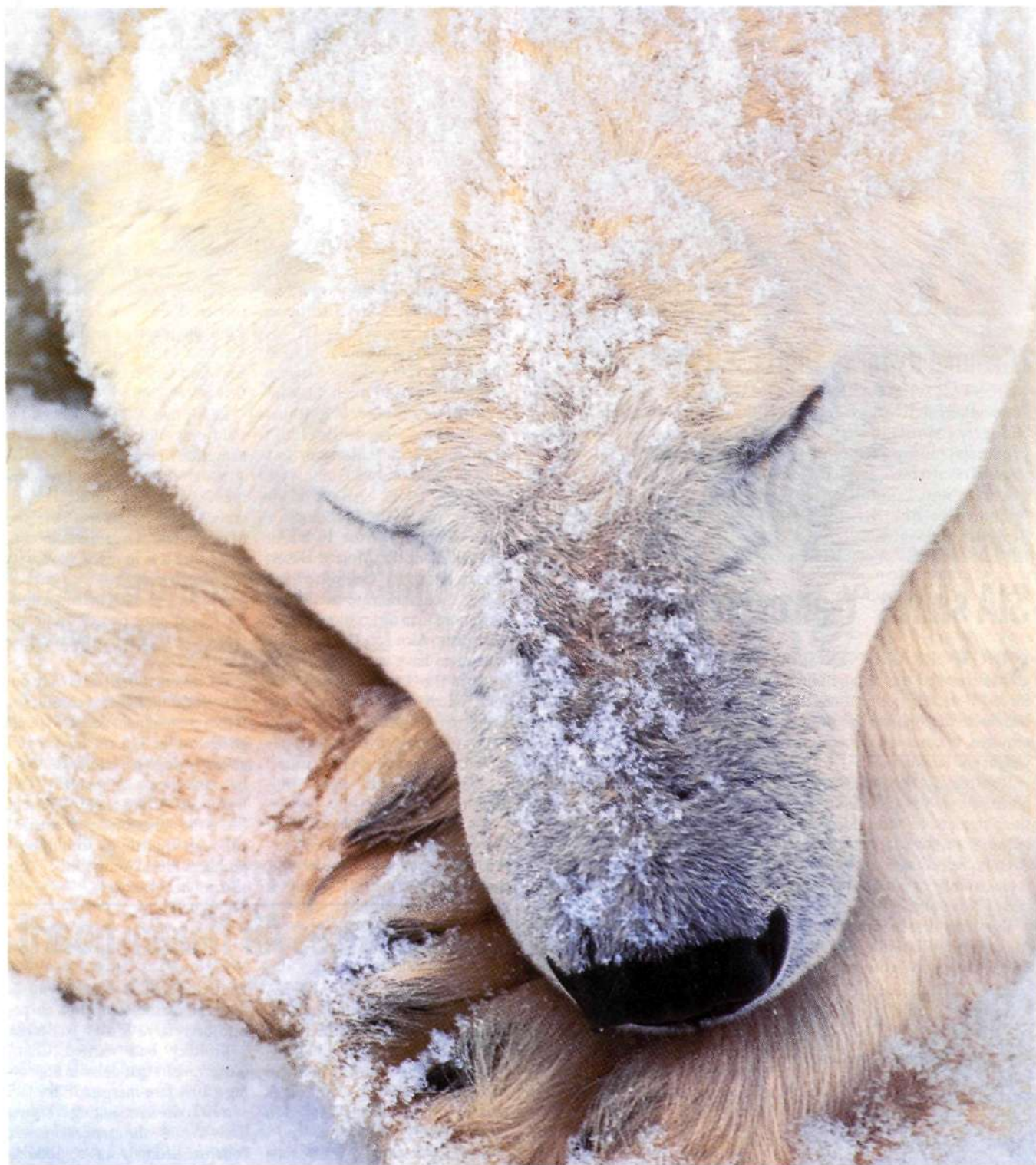
The presence of foreign particles in the titanium acts like a vacuum and breaks down the strength of the material, leading to the possible start of cracking. Tests will also be conducted to scan for dwell-time fatigue in each disc. The fatigue can occur when grains of metal became layered during the manufacturing process, rather than being laid down randomly.

GE says that the incidents have occurred in older engines which have HPCs made using billets measuring between 330mm and 405mm diameter. In the 1988-9 period, GE switched to using smaller billets, none of which has so far shown any evidence of weakness.

The AD is therefore likely mostly to affect CF6-50 and -80C2s made before 1989. As *Flight International* went to press it was unknown whether the FAA would require one-time inspection of all CF6 engines. □



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# BA looks to desert 146s for quieter life

GÜNTER ENDRES/LONDON

**B** RITISH AIRWAYS IS considering bringing up to 18 British Aerospace 146s into its fleet as noise regulations start to bite on European routes flown to by its UK regional service.

The airline will have to stop its Boeing 737-200s flying between Birmingham and Zurich this winter because of noise. With other provincial routes under threat, BA could make a quick decision on a 100-seat-plus Stage 3 regional jet.

Speculation has been rife on the airline's intention to re-activate some, if not all, of the 18 USAir 146-200As in the Mojave Desert aircraft store in California, but recent events indicate that this is now more than just rumour.

British Airways Air Trading executives have visited Mojave to look at the 146s, and it is also believed that BA managers have been to Australia to check on Qantas Airlink, a franchised regional operation flown by National Jet Systems with eight 146-100/200s.

BA Regional managing director George Cooper says that the airline wants to replace, one-for-one, the 18 Stage 2 Boeing 737-200s it

operates from Birmingham, Glasgow and Manchester.

Choosing the USAir 146s is the cheapest option, as it would generate revenue from a dormant asset through its shareholding in the US carrier. Views are being sought from engineering companies on the cost of bringing the aircraft back into service, but it is unlikely that all 18 could be re-activated.

In any case, BA is understood to want only nine of the 146-200As alongside nine larger 146-300s — although its most urgent requirement is for six of the smaller aircraft. British Aerospace's Asset Management Organisation confirms that it is in discussions with British Airways, but says that all passenger 146-300s in its portfolio are leased until two Crossair aircraft come back on to the market in March 1996.

BA says that the 146 is only one of several options being considered. If the re-equipment decision should go against the 146, the Fokker 100, already being operated in BA livery by associate companies TAT European Airlines and Deutsche BA, is the most obvious alternative, although availability could be a problem. Hushkitting the 737s can also not be ruled out. □

## PNG replaces Air Niugini board

**P**APUA NEW GUINEA (PNG) prime minister Sir Julius Chan has ousted Air Niugini's board and general manager, following former chairman Mike Bromley's public warnings that the airline is being "choked to death" by the Government.

Bromley had cited price controls, gross undercapitalisation, inflated operating costs resulting from the devaluation and subsequent float of the national currency, and unpaid Government-travel debts to the carrier.

Under the new board, headed by former Air Niugini general manager Joe Tuavasa, general manager

Dieter Seefeld is expected to be replaced by the company's corporate secretary, Moses Maladina.

Bromley had warned Chan's Government that delay in approving a 10% fare-increase in the face of a 30% rise in operating costs was likely to cause the carrier's financial collapse. Bromley was responding to parliamentary attacks on Air Niugini and demands for its privatisation by the prime minister, who controls two rival airlines.

Air Niugini operates a network of domestic and regional international services with Fokker F28s, Airbus A310s and de Havilland Canada Dash 7s. □



## Community takes Shorts 360 from Liberty

**UK START-UP CARRIER COMMUNITY Express Airlines** has taken delivery of its first Shorts 360-300 aircraft from Liberty Express in the USA. Community Express, which has financial backing from Mesa Air Group of the USA, entered the aircraft into service three times a day between Birmingham and London on 23 October. Further expansion is planned to link Bristol, Cardiff and Liverpool with Birmingham and Gatwick.

## SIA shifts 'Y-aircraft' goalposts

**S**INGAPORE AIRLINES (SIA) has changed the requirements for its "Y-aircraft" competition and increased the number of aircraft required, to cover a wider range of weight and size options.

Rival airframe and engine manufacturers have all resubmitted their tenders to meet SIA's new requirement for a larger family of aircraft. Selection is not expected to be completed until towards the end of November.

Bids were first submitted in late May, with a decision expected by early October on an order for up to

16 aircraft, plus 17 options. Competing for the deal are Boeing, with its 777, and Airbus, offering its A330/340. Engine manufacturers competing are General Electric, with its GE90 and CF6-80; CFM International; Pratt & Whitney, with the PW4168/4084; and Rolls-Royce, offering its Trent 700/800.

The competition was intended originally to find a partial replacement for SIA's Airbus A310, which is used on higher-density regional routes. The selection has now been enlarged to include the airline's requirement for a 200- to 250-seat aircraft and a larger-capacity regional jet.

SIA is keen to keep the number of different airframe and engine types to a minimum, by ordering one basic aircraft type in large numbers.

Airbus and Boeing, in response, are proposing families of different A330/340 and 777 variants to SIA. Derivative aircraft under consideration include Boeing's "stretch" 400- to 550-seat 777-300 and Airbus' proposed "shrunk" A300-M10. In the past, SIA has also expressed interest in the planned ultra-long-range Boeing 777-100X and Airbus A340-8000. □

### NEWS IN BRIEF

■ **LUFTHANSA BACKS SHANNON**  
Shannon Aerospace shareholder Lufthansa Technik, has signed a contract with the Irish maintenance company worth IP50 million (\$80 million) over the next six years. Shannon will carry out heavy airframe overhaul on the German airline's Boeing 737s and Airbus A320s. Shannon is bidding for similar agreements with other airlines.





## Austrian receives Fokker 70 amid revamp

IN TANDEM WITH TAKING DELIVERY of its first Fokker 70 regional jet (christened the X-Large Fokker-Jet), Austrian Airlines has introduced a revised corporate image. The new design, created by GKK Vienna and UK consultancy Davies & Baron, features Austrian Airlines titles in anthracite grey on the winter-white fuselage, preceded by its red arrow symbol, which has also been added to the aircraft tail. Austrian's interior decor has also been completely revamped.

## Flights from Taiwan to China via Macau gain approval

TAIWAN HAS concluded a five-year commercial air agreement with Macau which permits for the first time "through flights" to China, using the same aircraft.

Under the agreement, signed on 17 October, start-up carrier Air Macau will be permitted to fly from Taipei or Kaoshiung to Macau and then on to China, with only a change in flight number.

Taiwanese law bans any direct air or sea links between the island and China, which previously also meant a change in flights at a third point, mainly Hong Kong. Taiwanese carriers have been pressing for a restoration of direct air links to China, broken more than 40 years ago.

The new bilateral deal, which is still subject to political ratification, clears the way for Air Macau to start services as soon as the Portuguese enclave's new airport is opened on 8 December. Up to two airlines from each side will be allowed an initial weekly capacity of 4,200 seats, rising to 8,400 by April 1996.

Sino-Portuguese-owned Air Macau plans to operate three flights a week to Taipei from

December, increasing to six by April. A weekly flight between Macau and Kaoshiung is scheduled to be added in January. Trans-Asia Airways and Eva Air have applied for the route, but have yet to be officially designated as Taiwan's carriers.

Hong Kong and Taiwan, in the meantime, have extended a temporary air-services agreement for another month, to allow more time to negotiate a new treaty. The two sides have agreed to allow each a second carrier, but cannot agree on the number of added frequencies between Hong Kong and Taipei. Taiwan's civil aviation authority has reduced its demand from 35 to 21 additional flights, but Hong Kong is still insisting on only 14.

■ Taiwan's flag carrier, China Airlines, unveiled a new logo on 7 October which omits the national flag. The carrier hopes that will ensure continued flights to Hong Kong after the 1997 handover of the colony to China by the UK, and that another obstacle to direct flights to the mainland will have been removed. □

See feature, P31.

# Air Liberté makes a move for rival AOM

JULIAN MOXON/PARIS

THE PRESIDENT of French airline Air Liberté, Lotfi Belhassine, has formed a consortium with the aim of acquiring rival private carrier AOM, "...if the price is right".

Belhassine has for some time made no secret of his desire to purchase AOM, creating what he calls a "privatised sector in French air transport". A merger of the two carriers would create Europe's sixteenth largest airline.

The consortium assembled to purchase AOM has ten partners and around Fr1 million (\$200,000) of initial capital. Called Air Invest, the group includes Belhassine, International Lease Finance and various non-airline investors.

The Air Liberté president says that he is in "serious negotiation" with the financially ailing Credit Lyonnais, the principal shareholder in AOM, over a possible deal. No details of the bid

have yet been revealed.

Both airlines are based at Paris Orly Airport, and would benefit from the extra muscle they would bring to the French private sector, particularly in obtaining more slots at Orly, where capacity is severely limited.

The private sector is now starting to emerge as a serious rival to state-owned Air France and Air Inter as European liberalisation has forced the French Government to relax its previously monopolistic air-transport policies.

Together, the two private-sector companies would also be in a better position to take advantage of full European air-transport deregulation on 1 April 1997, when French domestic routes will be open to competition from foreign airlines.

The fleets of both carriers are largely based on McDonnell Douglas MD-83s and DC-10s, although Air Liberté also operates a small number of Airbus A300 and A310s. □

## Air UK Leisure narrows choice

AIR UK LEISURE has narrowed its choice of a new aircraft to replace seven Boeing 737-400s. It will choose between the Airbus A320/321 and the 737-800. The charter operator has asked several leasing companies to submit tenders by the end of November for six new aircraft.

Managing director Jeremy Dixon says that the final selection will be made on the basis of the most attractive offer and that, if this turns out to be the new 737-800 which will not be available until 1998, the airline will take short-term leases of other types as a stopgap.

If the deal involves Airbus

aircraft, Air UK Leisure would most likely opt for a mix of A320/A321s, giving it flexibility in seating capacity (up to 200), according to Dixon. Its 737-400s are fitted out for a maximum of 172 passengers. Air UK Leisure is returning the first three 737-400s to the lessor in November and intends to replace them with three other leased types for the 1996 northern summer season. □



First 737-400s will leave Air UK Leisure in November



# Chinese start recruiting for Hong Kong start-up

PAUL LEWIS/SINGAPORE

CHINA NATIONAL Aviation (CNAC) is pressing ahead with plans to establish a Hong Kong-based international airline, at the same time as negotiating to purchase a 10% stake in Dragonair.

The new CNAC carrier, provisionally named China Hong Kong, has already begun to recruit Boeing 737-300 pilots with UK-recognised licences. The move is designed to support its application to the Hong Kong Civil Aviation Department (CAD) for an Air Operator's Certificate (AOC).

It has also hired former Dragonair operations general manager Lew Roberts to help assist with the start-up of the carrier. Roberts is understood to have particular experience with AOC applications, having originally been involved with the establishment of

Dragonair in 1985.

CNAC (Hong Kong) submitted its AOC application to the CAD in March, with the intention of operating Airbus Industrie A300-600s. It has since scaled this back to the smaller 737-300. CNAC already operates two 737-300s and a Boeing 757 on charter services from Hong Kong to Chengdu and Chongqing in China.

Its application to set up China Hong Kong comes as a major shock to Cathay Pacific Airways, threatening its post-1997 position with the handover of the UK colony to Chinese rule. In response, Cathay and parent company Swire Pacific offered to sell a share of its highly profitable sister-carrier Dragonair to CNAC in an attempt to head off its bid (*Flight International*, 23-29 August).

In an interview with Hong Kong newspaper *Sing Tao*, however, CNAC general manager Wang

Gui-xiang makes it clear that its negotiations with Swire Pacific and Chinese investment company CITIC for a stake in Dragonair are considered a separate issue, and will not affect CNAC plans to set up a Hong Kong carrier.

An agreement has yet to be reached on the terms and conditions of a share sale and it has been suggested that CNAC might not be able to raise the required funds. Dragonair's market value has been boosted by CITIC's recent surprise revelation that Dragonair made a net profit of HK\$593 million (\$77 million) for 1994.

Dragonair's financial results have traditionally remained a closely guarded secret, but the disclosure has led to strong speculation that CITIC, together with Swire Pacific and Cathay Pacific, which collectively control 89% of the company, intend to list it publicly in the near future. Floating the company would help protect it after 1997, suggest analysts.

■ The Civil Aviation Administration of China (CAAC) is considering an offer by US currency speculator George Soros to purchase a 25% stake in provincial carrier Hainan Airlines. The \$25 million deal has reportedly been approved by the local Hainan authorities, but still needs the permission of the CAAC to go ahead.

In the past, China has ruled out foreign investments in local carriers and it is unclear whether the Soros bid will prove to be any different. □



China wants to ride Dragonair as well as starting a Hong Kong-based carrier

## Vienna is first choice for CEATS centre

JULIAN MOXON/PARIS

AFTER TWO YEARS OF controversy, Vienna in Austria has been provisionally chosen as the location of the Central European Air Traffic Services System (CEATS).

The decision follows the failure by the seven CEATS countries (Austria, Croatia, the Czech Republic, Italy, Hungary, Slovakia and Slovenia) to agree on a location for the centre, which was originally to have been installed in a brand-new, Maastricht-like, upper-air-space air-traffic-control centre (ACC).

Austria will now host what amounts to a much less ambitious system, to be sited in the Vienna ACC. Hungary and the Czech Republic have not joined the "CEATS 1", since they are introducing new ACCs of their own. A future "CEATS 2" has not been ruled out, and could be operational in 2005, "...but only if we can agree on a location quite soon", says one source.

Hungary had pitched for the full-up CEATS to be located in its Budapest ACC, saying that it would be "three times" less expensive than one based in Vienna. A senior Hungarian air-traffic-services official says that the country is "...not interested in an interim solution". The two-track decision will "...force users to pay twice again in ten years' time", he adds.

The CEATS 1 service will be provided by Eurocontrol staff working within the Vienna ACC. Final approval is expected at the end of October. □

## Israeli/Jordanian airport under study

A TEAM LED BY Lockheed Martin Management and Data Systems is to conduct a feasibility study for the proposed joint Israeli-Jordanian international airport serving Aqaba in Jordan and Eilat in Israel.

The Jordan civil-aviation authority

has awarded the six-month US-funded study partly in a bid to resolve the problem of operating a series of terminals to be built on the two countries' borders while retaining a high level of security.

The idea is to connect the Jordanian runway to a passenger terminal

to be built on the border, 9km (5 miles) north of Eilat Airport.

The Israeli-Jordanian air agreement has not yet been signed, as the countries have to agree on the security issues involved in operating scheduled flights between the capitals, Tel Aviv and Amman. □

## South Africa bound

BRITANNIA AIRWAYS is to re-enter the South Africa market, probably late in 1996. The UK charter operator failed in the early 1990s to launch a non-scheduled service, citing lack of interest from holidaymakers.

The airline plans to use Boeing 767-200s on the route. □



# UPS expects instant ETOPS for 767

GUY NORRIS/LOUISVILLE

UPS AIRLINES HAS "tentative approval" from the US Federal Aviation Administration for instant 180min extended-range twinjet operations (ETOPS) with its new General Electric CF6-80C2-powered Boeing 767-300ER freighter.

If approved, the UPS 767 will become the second twinjet after the United Airlines 777-200 to enter service with FAA clearance for 180min ETOPS. The three-point plan hinges on FAA acceptance of UPS' maintenance, operations and support systems to conduct ETOPS safely with the 767.

The two other major elements of the plan, the ETOPS qualification of the 767-300ER and the documentation and certification testing by Boeing and UPS, are largely complete. General Electric-powered versions of the passenger 767-300ER have had 180min ETOPS clearance since 1989.

"We have presented a plan to the FAA to get 180min ETOPS and we have tentative approval once



UPS is poised to start ETOPS freight operations with GE-powered 767s

we've finished our proving runs," says the package freight company. These began on 16 October, following delivery of the first aircraft to the UPS base in Louisville, Kentucky, and are expected to be completed by 27 October (*Flight International*, 18-24 October).

Despite the ETOPS initiative, initial 767 operations will be limited from early November to US flights until "discussions" are complete between UPS and its pilots over crewing arrangements for flights lasting longer than 8h. The FAA requires a relief crewmember, either a captain or first officer, to be

aboard a flight of this length. UPS pilots say that either rank is sufficient, but are believed to be pressing for a new pay scale for the relief crewmember.

The strike at Boeing also presents UPS with another hurdle in its attempt to introduce five 767s by the end of 1995. Boeing and UPS are discussing contingency plans, ranging from short-term leases of other freighters to the temporary use of the fourth and fifth aircraft in semi-completed form.

UPS has firm orders for 30 767s, plus options on 30. Eleven are due to be delivered in 1996. □

## Virgin may expand Manchester services

VIRGIN ATLANTIC IS considering expansion of its Manchester operations following the successful launch of its 1996 service to Orlando, Florida.

With 40% of available seats for the summer period pre-sold in the package-holiday market and scheduled bookings looking "healthy", the carrier is interested in other

transatlantic opportunities.

The most likely destination is understood to be Los Angeles, California, where bilateral rights are unused following British Airways' withdrawal in 1994 of a service from Manchester. Virgin says that it could equally be looking at other US destinations, including Boston and New York. An

announcement is not expected until May 1996.

Meanwhile, Virgin boss Richard Branson has made it clear that he would like to compete with BA shuttle services between Manchester and the London airports of Heathrow and Gatwick, although slot restrictions at Heathrow have put plans "on hold". □

## Canada injects extra funding into CAATS programme

TRANSPORT CANADA IS to contribute an additional C\$75 million (\$55.7 million) to the Canadian Automated Air Traffic System (CAATS) under an amended contract with Hughes Aircraft of Canada.

The additional money pushes the project's total budget to C\$734 million. An independent report by Intermetrics of McLean, Virginia, suggests, however, that the figure understates the true cost of the CAATS project, which

is now two years behind schedule.

The study, commissioned by Transport Canada, concludes that the project remains "technically sound", but warns that its life-cycle maintenance costs could be much higher than expected.

Transport Canada hopes to sell the entire air-traffic-control (ATC) service, including the CAATS, by April 1996 to Nav Canada, a non-profit-making corporation run by user groups, including airlines and air-traffic controllers.

Nav Canada will earn revenues by billing airlines for the provision of ATC services over Canada. The organisation says that it intends to examine the amended CAATS contract carefully before making any offer which means accepting responsibility for future lease payments, which will easily top C\$30 million a year.

Transport Canada has now agreed to lease the computer equipment, rather than buy it, when it starts operations in 1998. □

### NEWS IN BRIEF

#### ■ AMECO FIRST

Beijing-based Aircraft Maintenance & Engineering (AMECO) has completed the first C-check of a Boeing 767-200 to be carried out in China. The 52-day check of the Air China aircraft included China's first JT9D engine-reverse synchronised-lock modification, together with landing-gear overhaul, corrosion prevention and cabin refurbishment. AMECO is seeking to reduce its next 767 turnaround time to 42 days.

#### ■ FREIGHTER CONVERSION

Boeing's Wichita division has redelivered two Boeing 747-200s to Malaysia Airlines (MAS) modified for use as freighters. The four-month conversion included fitting the two Rolls-Royce RB.211-powered aircraft with a side cargo door, removal of passenger furnishing, reinforcing the main deck and installing a powered cargo-handling system. The two 747s join MAS' growing fleet of freighters, including three McDonnell Douglas MD-11s.

#### ■ WORLD CARGO APPROVAL

World Airways has received Australian Government approval to fly four weekly McDonnell Douglas MD-11 all-cargo services from the US west coast to Melbourne via Penang and Kuala Lumpur. Australia is conducting a study to identify and eliminate impediments to the transport and distribution of perishable products.

#### ■ BOMB DETECTOR

Delta Air Lines has purchased several CTX 5000 explosives detection systems from InVision Technologies. They will be integrated into its baggage-handling system at Atlanta Airport, Georgia. The CTX 5000 combines computed axial tomography and X-ray imaging to highlight suspicious objects in bags.



## Military business bolsters MDC

**T**HE MILITARY AIRCRAFT business again helped McDonnell Douglas (MDC) continue its run of record profits into the third quarter, although the shrinking airliner-division has reported a small loss.

The military-aircraft unit has turned in operating profits of \$652 million over the first nine months of the year, nearly one-third higher than in 1994. Margins in the business are now averaging 11%, says the group.

The commercial-aircraft business turned in a \$7 million loss for the quarter, after taking provisions on the sale of MD-90 twinjets scheduled for delivery in 1996. Sales also declined by nearly one-third, to \$663 million, with the delivery of only two MD-11s, but eight MD-80/90s.

Airliner deliveries are still ahead over the first nine months of the year, largely because of the delivery of the first ten MD-90s. □

## US electronics sector improves

**H**UGHES AND Raytheon have each reported stronger third-quarter profits as the effects of consolidation in the US defence-electronics sector begin to show through.

Profits at Hughes grew by 5%, to reach \$244 million, rising nearly twice as fast as sales. The company says that increased commercial-electronics sales helped the result, as well as the acquisition of CAE-Link, which pushed revenues up by 4% in the aerospace and defence segment.

Raytheon's profits increased by 4.6%, to \$201 million, but revenues leaped by nearly 14%, helped by the acquisition of E-Systems, which helped to offset a further decline in performance at the group's defence-electronics operations.

The group's civil businesses also posted strong performances, with a record quarter from the Raytheon Aircraft corporate-jet and light-aircraft division. □

# French industry warns of crisis as budget cuts bite

**T**HE FRENCH aerospace industry has launched a concerted campaign to head off the threat of further cuts in the country's defence budget, warning that a round of massive job cuts and plant closures will follow.

The campaign comes in response to growing fears that the Chirac Government is planning to slash its defence-procurement budget to around Fr75 billion (\$15 billion). At that level, the industry will face "extinction", warns Serge Dassault, president of Dassault and of French aerospace-industry body GEFAS, leading the campaign.

While the industry could live with announced spending levels of Fr90-95 billion a year, any further cuts would leave the industry with no choice but to "close factories", he says.

The Government is carrying out a fundamental review of defence spending, with defence minister Charles Millon making it clear that he expects the industry to make severe cuts in costs to improve efficiency and competitiveness.

Dassault complains that the Government is failing to take into account the strategic importance of the French industry, which he says is alone in Europe in retain-



*Dassault: industry faces extinction*

ing a complete capability.

Major programmes are threatened by the review now taking place, including the Dassault Rafale fighter, NH90 transport helicopter, Eurocopter Tiger anti-tank helicopter and the planned Future Large Aircraft.

Dassault explicitly rules out any merger between Dassault and state-owned Aerospatiale, which is looking for private investment to offset its Fr10 billion debt. "We do not work in the same areas," says Dassault.

The Government, meanwhile, has told Aerospatiale president Louis Gallois that his demand for recapitalisation can only be met "...if Aerospatiale demonstrates that it has established a more dynamic strategy". □

## Intertechnique looks abroad

**F**RENCH EQUIPMENT manufacturer Intertechnique plans to expand its workforce outside France, to offset high domestic wage rates and social costs.

Its president Edmond Marchegay says that the company will hire no more employees in France "...to protect today's workforce". He adds that the French industry will die if it does not adapt, underlining that the cost of labour in France is excessive compared to that of Spain, the UK and the USA.

Intertechnique will double its US workforce in 1996, says Marchegay, through its acquisition of IDD, and is increasingly purchasing components from the UK, which is "more competitively priced".

Serge Dassault also warns that work may have to move abroad to areas such as the UK, where engineering labour costs are half those in France. □

# Thomson-CSF swings back into profit

**T**HOMSON-CSF swung back into the black for the first half of the year, setting up the defence-electronics group for its pending privatisation, which could now take place in the first quarter of 1996.

The group has sustained two years of heavy losses, largely because of the crisis at Credit Lyonnais, the French state-owned bank in which Thomson holds a 19% stake. With the bank's rescue now in hand and Thomson's liabilities capped, the group was able to show a half-year profit of Fr364 million (\$73 million). That turns around a 1994 loss of Fr170 million.

Thomson's sales and operating margins remain under pressure, however, as it struggles with tighter defence budgets. For the half year, margins dipped to little over 5% on sales, which edged down to Fr15.5 billion. The full-year results are expected to be similar.

Privatisation of the group is still in prospect, with the French Government proposing in its latest defence budget that a sale could take place early in 1996. It is still unclear whether the Thomson-CSF defence group will be sold as a package together with its sister consumer-electronics business

Thomson Multimedia.

■ Elsewhere within the French defence industry, the Dassault Aviation group kept profits relatively steady, at Fr277 million, despite the fact that sales edged down again to below Fr5.2 billion.

Almost half of the sales are now from civil markets as a result of growth from the Falcon business jet. Civil aviation also accounted for 57% of orders as military markets remained weak.

The group admits that full-year sales are likely to continue to slide, falling to around Fr11.7 billion, from Fr12.4 billion in 1994. □



# Embraer plans ambitious growth

JULIAN MOXON/BAVENO

**T**HE NEW PRESIDENT of Embraer, Maurice Botelho, says that the newly privatised Brazilian manufacturer should return to sales of \$700 million within five years, helped by an expansion in the European market.

"That's what we earned in the past, and there's no reason we can't earn it in the future," he said, speaking at the European Regional Airline Association annual meeting at Baveno, Italy.

Botelho became president on 27 September, and has made a dynamic start on reversing the fortunes of the company. Since privatisation in December 1994, Embraer has suffered heavily from the combined effects of the depressed regional-aircraft market, and the cost of developing the EMB-145 regional jet.

"We will be absolutely financially healthy within three years. We expect to break even by the first



Botelho: emphasis on Europe

quarter of 1997," says Botelho. In 1994, Embraer turned in a net loss of \$310 million on sales of only \$177 million. Sales have fallen steeply since 1990, when the group turned over more than \$580 million.

Botelho's first move has been to create five new profit centres (three geographical, plus light-aircraft and government sales), each headed by what he calls an "entrepreneur", whose prime responsibility will be to improve the relationship between

Embraer and its customers.

"We want to change our image somewhat, from that of being a technically based manufacturer to one that is concerned more with the customer," he says. Three new vice-presidencies have also been created, charged with finance, industrial development and strategic planning.

A further 1,700 layoffs have recently been added to the 1,200 jobs lost in the last three years. "We need to rebuild confidence now," says Botelho, who says that the workforce, now standing at 4,000, will probably remain stable, "or even grow", if market conditions allow.

The revival of the regional market, with its emphasis on regional jets, comes at a good time for Embraer. Botelho reveals that firm orders for the 50-seat EMB-145 regional jet now stand at 18, with another 19 options, and "120 letters of intent". The first unnamed European customer signed for

three aircraft in early October, bringing the total number of European sales to 11.

Embraer plans to build 24 EMB-145s in 1997, the first full year of production. First deliveries are planned for late 1996, with four aircraft scheduled to be handed over to launch customers by the end of the year. Production is due to reach two a month in 1997 rising to three in 1998.

Botelho says that the USA "...remains the largest area for growth", but adds that he intends to put considerably more emphasis on Europe, which now accounts for only 15% of total sales, against the USA's 60%.

A new European customer-support division is planned, possibly at Embraer's base in Le Bourget, France. "We're determined to put the resources where they are needed," he says. The centre would mirror a similar operation at Fort Lauderdale, Florida. □

## US carriers report robust third quarter

**S**TRONG RESULTS from Continental, USAir and others have led what promises to be a record third-quarter performance from the US airline industry.

Wall Street analysts are projecting that industry operating profits could climb to \$2.3 billion for the quarter once results are in from the other major carriers. In the third quarter of 1994, the industry made \$1.6 billion.

Continental, which is partially responsible for the upturn because of the cancellation of its low-cost CAL Lite experiment, ended the quarter showing net profits of \$111 million — the highest in its 61-year history. The result leaves the airline with a \$183 million profit for the first nine months, against 1994's loss.

USAir also continued its recovery by posting a third-quarter profit for the first time in seven years. The net profit of \$43 million compares with 1994's loss of \$180 million.

Seth Schofield, who has stayed



Cancellation of Continental Lite aids US profits recovery

on as chairman at USAir while the carrier considers takeover offers from American Airlines and United Airlines, confirms that the group is on course for a "profitable fourth quarter and a profitable 1995".

Northwest Airlines achieved another record, with net profits of \$231 million in the September quarter. Revenues were up by more than 11% on the back of a 10% rise in passenger traffic. Yields also edged up by another 3.7%. The American Airlines

group reports a healthy rise in net profits, to \$229 million for the quarter, with the airline operations contributing \$109 million. Although operating figures continue to look strong, the group warns of a charge for its early-retirement programme in the fourth quarter.

America West also followed with its highest-ever third-quarter profit of nearly \$22 million, bolstering plans to raise capacity by around one-third, adding at least eight cities to its network. □

### NEWS IN BRIEF

#### ■ ILLUMINATING SALE

Bell Industries has sold its Illuminated Displays division to IDD Aerospace, a unit of France's Intertechnique, for around \$7 million in cash.

#### ■ RAISING UNC'S PROFILE

UNC has raised \$25 million from investors and a further \$28.4 million from the sale of property to enable it to return to the acquisition trail after a major restructuring. The Annapolis, Maryland-based company remanufactures and overhauls aircraft accessories and engines.

#### ■ PUBLIC OFFERING

US start-up carrier Western Pacific Airlines plans to raise \$36.5 million through an initial public offering. The Colorado Springs, Colorado-based airline began operations in May, operates eight Boeing 737-300s.



## DASA begins NATO E-3 work

**D**AIMLER-BENZ Aerospace (DASA) is to begin work on the full Mod Block 1 upgrade of NATO's Boeing E-3 Airborne Warning and Control System (AWACS) fleet in February 1996.

The company is now carrying out a kit-proof upgrade on the number two aircraft (N-2) of the Geilenkirchen-based AWACS fleet at its military aircraft site in Manching.

This phase is designed to ensure that kit equipment and instructions are complete, and that DASA employees are familiar with them before the fleet-wide retrofit, which will upgrade all 18 NATO aircraft, begins.

The kit-proofing is overseen by German-based Boeing crews. The Seattle-based manufacturer itself completed a trial installation to verify hardware and software

upgrades on aircraft N-1 in March. This was followed by ground and flight testing to confirm system-level integration and performance.

The modification programme includes the fitting of new colour displays, Have Quick UHF radios with secure anti-jam and NATO's Link 16 version of the US Air Force Joint Tactical Information Distribution System.

This last upgrade will increase the amount of information collected and distributed among other AWACS and Allied aircraft and ground stations.

A new electronic-support-measures system enabling the aircraft to detect, identify and track electronic surface transmissions is also to be fitted. DASA has constructed a new hangar at Manching to accommodate up to three AWACS aircraft at a time. □



No laser in sight for Kuwait's Black Hawks

## Kuwaiti UH-60L purchase falters

RAMON LOPEZ/WASHINGTON DC  
GRAHAM WARWICK/ATLANTA

**S**IKORSKY'S EFFORT to sell an armed version of its UH-60L Black Hawk to Kuwait is being blocked by the US Department of Defense (DoD), which is reluctant to release laser-designator systems for export to the Gulf state, say sources close to the deal.

The defence department has refused to clear a Hughes-developed combined forward-looking infra-red (FLIR)/laser designator for export to Kuwait as part of the armed Black Hawk package.

The armed Black Hawk is equipped with Rockwell's Hellfire2 laser-designated anti-armour missile.

The FLIR/laser-designator initially offered by Sikorsky is thought to be based on the AAQ-16 which is fitted to the MH-60G and MH-60L helicopters.

A second FLIR/laser designator, being developed by FLIR Systems using commercially available components, may be approved by the DoD, but any decision on this is thought to be at least several months off.

The new twist to Kuwait's attempts to procure an attack/combat support helicopter comes after Sikorsky appeared to have stolen the Kuwaiti order from

under the nose of McDonnell Douglas Helicopter System (MDHS). Originally, Kuwait had chosen the AH-64 Apache to meet its requirement, but the procurement fell apart.

MDHS had worked hard to sell Kuwait between 18 and 24 Apaches. Company officials had hoped to sign a contract by the end of 1994, but, six months later, the Black Hawk/Hellfire deal was announced.

In mid-July, the Pentagon advised the US Congress that it intended to provide Kuwait with 16 of the military helicopters, 500 Hellfire 2 anti-armour missiles, 38 Hellfire launchers, four spare General Electric T700 engines, rockets, 20mm gun pods, 50-calibre machine guns, and related logistics support worth an estimated \$461 million.

Kuwait's purchase has been stalled, however, because of the US Defense Department's failure thus far to approve transfer of Hellfire's terminal aiming system.

MDHS is hoping to exploit any delay over the Black Hawk deal by attempting to revive Kuwait's interest in the Apache.

■ A Pentagon decision is expected by the end of 1995 on Sikorsky's unsolicited proposal for an additional tri-service procurement of the UH-60 Black Hawk utility helicopter. □

## F-22 cockpit passes USAF evaluation

**P**ILOTS FROM US Air Force Air Combat Command have completed a "highly successful" evaluation of the cockpit design for the Lockheed Martin/Boeing F-22. The seven-pilot cockpit-evaluation team consists of a customer review board established to ensure that the design meets USAF requirements.

The part-task simulation test, the fifth in a series of evaluations begun in 1992, was conducted in Lockheed Martin's cockpit/avionics-integration laboratory in Marietta, Georgia. Each operational ACC pilot flew eight mission scenarios in the simulator to evaluate features such as head-up and

multi-function display symbology.

"The pilots noted a couple of minor things, but that was why we did the test. Most of the items they found were 'desirement' changes, rather than requirement changes," says John Dobbs, F-22 pilot/vehicle-interface integrated-product team manager.

The test was the most advanced yet conducted, says Lockheed Martin, and the functions evaluated are scheduled to be incorporated in the F-22's cockpit displays, beginning with the fourth of nine flyable aircraft which will be built during the current engineering-and manufacturing-development programme. □

## US Army picks Corps SAM contenders

**L**OCKHEED MARTIN and a joint venture established by Raytheon and Hughes Aircraft have been named by the US Army as the US teams to undertake initial research and development on the Corps Surface-to-Air Missile (Corps SAM) programme. The two were selected over a third US team formed by Loral, TRW and Westinghouse.

The Corps SAM programme and related European Medium Extended Air Defence System

(MEADS) project will lead to the deployment of the next-generation medium-range air-defence system by the USA, Germany, France and Italy. In February, the four nations agreed to pursue development of the SAM system.

Contracts for project definition and validation are expected to be awarded to the US contractors in January following the formal signing of the US/European MEADS memorandum of understanding, which had been set for October. □



# Alenia G222 hopes ride on C-130J deal

ANDREA SPINELLI/GENOA

ITALIAN AIRCRAFT manufacturer Alenia is trying to launch a new variant of its G222 military transport on the back of the Italian air force's proposed purchase of the Lockheed Martin C-130J Hercules II.

The company wants development of the G222J, as the derivative is dubbed, as part of the offset agreement covering the purchase of 16 C-130Js for the air force.

Sources close to the C-130J negotiations say that Alenia wants to launch the G222J, with the aircraft to be marketed by Lockheed Martin as part of a "hi-lo" mix of military transports. The C-130J would provide the heavy-lift capability, while the G222J would perform as an in-theatre transporter.

The G222J would have an upgraded digital flightdeck and improved navigation equipment. The engine is an uprated version of the

General Electric T64, known as the T64G. A proposal to re-engine with Allison AE2100 turboprops proved too expensive. A new four-bladed propeller is also to be fitted.

While industry and the Italian industry ministry are enthusiastically endorsing the scheme, the Italian air force has scant interest in upgrading its G222 fleet or purchasing new-build aircraft. It says that the impetus for the G222J comes only from Alenia and its Government supporters.

The air force has already submitted a request to parliament for the purchase of four Lockheed Martin C-130H Hercules transports to supplement its transport capability.

The air force is pursuing early approval of the acquisition, ostensibly for C-130Hs. Sources indicate, however, that, once approval is given, the air force would pursue modifying the order from the H- to the J-model Hercules. □

# Thais want F-18s with AMRAAM

PAUL LEWIS/SINGAPORE

THAILAND HAS ISSUED a formal letter of request (LoR) for an initial eight McDonnell Douglas (MDC) F-18C/Ds, with the proviso that the deal includes the Hughes AIM-120 advanced medium-range air-to-air missile (AMRAAM).

The US Navy's foreign-military sales (FMS) office is now understood to be preparing a letter of offer and acceptance, with pricing and a delivery schedule, for Thai signature. The US Congress will first have to be given a 50-day notification of the proposed sale.

The Royal Thai Air Force (RTAF) has already secured 10 billion baht (\$400 million) from the 1995/6 defence budget to fund the purchase. It plans to seek additional funds in 1996 for a second batch of eight fighters and spares and support package.

The F-18 had been facing strong competition from the Lockheed Martin F-16C/D, but was recently given a strong boost by the confirmation that Air Chief Marshal Siripong Thongyai will remain head of the Royal Thai Air Force for another year. Siripong is known to be a strong supporter of the F-18.

The AMRAAM, however, has yet to be officially cleared by the US State Department for sale to Thailand. Further talks between

the US Government and Thailand are due to be held this month. The Thai LoR is understood to have included a cover note making the deal conditional on the release of the missile.

The RTAF has already threatened to turn to other non-US fighter manufacturers, such as Dassault or Sukhoi, if the AMRAAM is not supplied. The purchase of Russian R-77 (AA-12 Adder) active-guided missiles by Malaysia and Vietnam has strengthened Thailand's case (*Flight International*, 20-26 September, P18).

Other items to be included in the proposed F-18 FMS package include MDC AGM-84 Harpoon and Raytheon AIM-9 missiles, the Hughes AAR-50 forward-looking infra-red pod, the Loral AAS-38 laser-targeting pod, an electronic-countermeasures system — believed to be the IIT/Westinghouse ALQ-165 internal jammer — training, support equipment and initial spares.

The F-18s will also be equipped for air-to-air refuelling, although the RTAF does not yet possess any tanker aircraft.

An earlier proposal to convert three surplus Thai Airways International MDC DC-10-30ERs had been vetoed by the US Government.

Air force attention is now understood to focus on modified Lockheed Martin C-130s. □

# USAF tackles F-16 yaw problem

A US AIR FORCE TEST team at Edwards AFB, California, is investigating unusually high yaw rates on some LANTIRN-equipped Block 40 versions of the Lockheed Martin F-16C.

The F-16 Combined Test Force (CTF) is now into the second phase of an investigation which began when aircraft fitted with the navigation pods experienced problems at high angles-of-attack (AoA).

"We're experiencing high sustained yaw rates never seen before on the F-16," says the USAF test team.

The team recommends that Block 40 F-16C manoeuvring

limits are restricted at low altitude, and that operators, "...must be warned about yaw rates".

The investigation began after the USAF became convinced that the unexpected behaviour could restrict the aircraft's operational envelope and tasked the CTF with exploring the F-16C's air-to-air capabilities with the LANTIRN and HARM-targeting-system pods.

Phase one of the tests revealed that "...the first unusual characteristic with the LANTIRN [attached] was the dive angle needed to recover to controlled flight. We had a reduced cone of recovery," says the team. □



# Germany begins MiG-29 maintenance work

THE RUSSO-GERMAN MIG AIRCRAFT Product Support (MAPS) joint venture has received the first Mikoyan MiG-29 fighter for maintenance work at its site in Manching, southern Germany. The aircraft, delivered on 16 October, belongs to the German air force's 73 fighter squadron, and is one of 24 MiG-29s in German service, which will all now be maintained by MAPS. MAPS is 50%-owned by Germany's Daimler-Benz Aerospace, with the remaining share divided between ANPK-MiG (17%), MAPO (17%) and Rosvooruzhenie (16%) on the Russian side. The company is also marketing its services to MiG-29 users outside Germany.



# Four bidders emerge for Singapore tanker

PAUL LEWIS/SINGAPORE

**F**OUR COMPETING manufacturers are bidding to supply aerial-refuelling tanker aircraft, to support the Republic of Singapore Air Force (RSAF) fleet of Lockheed Martin F-16 fighters.

Airbus Industrie, Boeing, Israel Aircraft Industries (IAI) and McDonnell Douglas (MDC) are understood to have responded

to a recent Singapore request for tenders for two or three tankers. A decision is expected by the end of the year.

The aircraft are required to be fitted with an air-to-air refuelling boom, underwing hose-drum units (HDUs) for probe-and-drogue operations, and to be capable of carrying cargo when not employed as tankers.

Whichever aircraft is selected, the conversion is likely to include the involvement of Singapore Technologies Aerospace.

The Airbus proposal is based on the multi-role tanker/transport (MRTT) A310. While Singapore Airlines operates a large number of commercial A310-200/300s, the MRTT version still requires a launch customer to fund initial development.

Boeing's 767-based tanker/transport multi-mission aircraft is similarly in need of an initial buyer to get the programme off the ground. Japan, with its larger requirement is regarded as a more likely first customer.

IAI's Bedek Aviation division, in the meantime, is offering the Boeing 707 as a converted tanker.

MDC has proposed a modified DC-10-30 tri-jet, similar to that supplied to the Royal Netherlands Air Force. The KDC-10 conversion includes installing a flying boom, HDUs, side cargo door and reinforced cargo deck.

The RSAF will use the tankers primarily to support F-16s deployed to Australia and the USA for exercises. Singapore's larger fleet of aircraft and shortage of airspace has made foreign training an operational necessity.

It already operates four Lockheed KC-130As, which are in need of replacement, and a KC-130H. The converted turboprop transports are capable of supporting the RSAF's probe-equipped Northrop F-5E/Fs and MDC A-4S Skyhawks only, and not its F-16s which instead require a refuelling boom.



Pentagon advisory body recommendation could shoot down Hunter

## Hunter becomes the hunted

**T**HE US DEPARTMENT of Defense is deciding whether to follow a Joint Requirements Oversight Council's recommendation to terminate the \$4 billion Hunter Joint Tactical unmanned air-vehicle (UAV) programme.

The view of the influential Pentagon advisory body could be the final nail in the Hunter's coffin. The programme was already under fire from opponents.

The short-range Hunter remains grounded, pending completion of an investigation into three testing mishaps in August.

The US Army may be forced to choose between the Hunter, which fulfils the short-range requirement, and the Maneuver

(close-range) UAV, according to Dennis Reimer, the US Army's chief of staff.

"Whether we have the ability or the money to afford the short-range and close-range, I don't know. I think that's the real issue," he says.

The Hunter is also criticised by US Navy opponents, who favour instead deployment of the General Atomics Predator UAV on USN warships.

The US Army, USN and US Marine Corps are all scheduled to field the Hunter. The current plan calls for purchase of 50 systems, including 18 for the USN. Each includes eight air vehicles and related ground equipment. □

## UK studies GPS jamming

**T**RIALS INVOLVING THE jamming of global-positioning-system (GPS) satellite-navigation signals in the UK are to be carried out from January to April 1996 by the Defence Research Agency (DRA).

The UK military tests involve a Royal Air Force electronic counter-countermeasures device, designed to ensure that RAF strike aircraft can continue to use GPS despite jamming signals.

If the equipment does not work, says the DRA, the other task is to determine the RAF's alternative navigation mode whenever GPS jamming takes place.

The agency says that its tests will be carried out "in the vicinity

of Aberporth [Wales]", and that the interference will be propagated using a beamed antenna to minimise the area of GPS signal disruption. It will take place for only about five days during the four-month period for 2h a day.

The US Department of Defense (DoD) carried out GPS signal-jamming tests in April, but for the opposite reason (*Flight International*, 5-11 April). The DoD's purpose was to check that GPS wide-area augmentation systems could be disabled locally, to deny a potential enemy access to augmented civil-GPS accuracy "within the theatre of operations", whenever GPS jamming takes place. □

### NEWS IN BRIEF

#### ■ NON-ACTIVE F-15B

Pratt & Whitney says that the delayed first flight of a McDonnell Douglas F-15B equipped with the company's axisymmetric thrust-vectoring nozzles is now expected before the end of the year, under the NASA/US Air Force advanced control technology for integrated vehicles programme. P&W also says that its F100-229 engine and production-configured vectoring nozzle, with fail-safe dual-redundant actuation system, will be installed on the USAF's Lockheed Martin NF-16D variable-stability in-flight simulator test aircraft in 1996.

#### ■ Y-7 FOR CHINESE NAVY

Xian Aircraft (XAC) has converted two Y-7 turboprop transports into aircrew avionics trainers for China's naval air force. Modifications include the installation of a new radar, displays and reconfigured cabin for training.

#### ■ LORAL FLIR FOR LAMPS

Loral will begin providing the Sikorsky Aircraft SH-60B LAMPS anti-submarine and airborne surveillance helicopter with forward-looking infra-red (FLIR) systems under US Navy contracts totalling \$35 million.



# P&WC makes plans to offer growth variant of Cessna VII

GUY NORRIS/LOS ANGELES

**P**RAIT & WHITNEY Canada is studying a new growth variant of its PW500 engine family, aimed at the Cessna Citation VII and potential business aircraft in planning or under study.

The engine maker is helping to unseat the AlliedSignal TFE731 on the Citation VII with a new engine combining elements of the 13kN (3,000lb)-thrust PW530A being developed for the Citation Bravo, and the more powerful 20kN PW545A, planned to power the Citation Excel.

P&WC chairman and chief executive David Caplan confirms that "...we are also looking at the PW500 for other variants".

Engineers plan to test-run a PW500 core at higher speed, to produce the extra power needed to drive the engine up to 22kN. The study is expected to recommend an additional low-pressure compressor stage and an increase in fan diameter, which will boost mass flow.



P&WC has its eye on the Citation VII, which is powered by AlliedSignal's TFE731

The company's immediate priority, however, is certification of the PW530A, which is "on course" for approval in December. Eight development engines have amassed more than 4,000h, of which 230h have been carried out on the company's Boeing 720 testbed. Around 170h have also been built up on Cessna's Citation Bravo prototype, which was first flown on 19 April,

in addition to around 100h on Cessna's T-47 testbed.

Five development engines are now being run in the PW545A programme, which is aimed at certification for the Excel in December 1996. The PW545A is fitted with a single-channel full-authority digital engine-control system, but will be operable when manual control only is available. □

## FlightSafety boosts business training

**F**LIGHTSAFETY International (FSI) is to build and operate 14 additional business-aircraft flight simulators in a major initiative to expand and upgrade its fleet. Rival SimuFlite Training International is also acquiring additional business-aircraft simulators.

FSI cites the number of new business-aircraft programmes, coupled with advances in simulation technology, as reasons for its decision to upgrade existing simulators and build additional devices. Corporate-aviation customers are demanding the level of technology already available to airlines.

Most new FSI simulators will be built to the Level D training standard, the highest recognised. The new devices will cover virtually the complete range of new business jets, including the Cessna Citation Bravo/Ultra and Citation X, Dassault Falcon 2000 and 900EX, Gulfstream V, Learjet 45, and Raytheon Premier I and Hawker 800XP.

Most are being built under exclusive training agreements which require the simulator to be available when the aircraft enters service.

Also under construction are additional simulators for the Challenger 601-3R, Gulfstream III and Raytheon Beech King Air 200 — all Level D — plus a Level C simulator for the Cessna Caravan I.

The Gulfstream V is a lead aircraft for development of FSI's advanced qualification programme, a proficiency-based training system, and for the company's new computer-based classroom training.

SimuFlite, meanwhile, has acquired a Reflectone-built Hawker 800/1000 simulator from British Aerospace. Based at the Reflectone Training Center-Dulles, it will be Dallas/Fort Worth, Texas-based SimuFlite's seventeenth business-jet device.

The company has teamed with Bombardier to offer Challenger training at Dallas/Fort Worth and Montreal, where CAE Electronics-built simulators for the 601-3A/3R and new 604, respectively, will enter service in 1996. SimuFlite is also upgrading to computer-based training. □

## NEWS IN BRIEF

### ■ MAINTENANCE SOLUTION

Business JetSolutions, the Bombardier/AMR Combs joint venture, has selected Chicago, Illinois-based Jet Support Systems to provide engine maintenance for corporate aircraft in its FlexJet fractional-ownership and Alliance charter-management programmes.

### ■ CHALLENGER SATCOM

KC Aviation is to install a Collins SAT-906 six-channel satellite-communications (satcom) system in a Canadair Challenger 601-3R owned by US agricultural-equipment manufacturer Deere, with multiple cabin-telephone handsets, a dedicated facsimile line and personal-computer dataports.

## Lord quietens Cessna and Beech

**L**ORD, THE Pennsylvania-based noise-control specialists has confirmed major contracts received from Cessna for its Citation X, and from Stevens Aviation, which will act as US distributor for its NVX active noise system, on the Raytheon Beech King Air 200 and 300.

Lord has worked with Cessna for some time to develop a hybrid noise-control system for the Citation X, and recently announced a contract for 106 shipsets of its active isolation-control equipment.

The system introduces electro-mechanical actuators between the engine mounts and the airframe, helping to cut noise introduced into the fuselage through vibration. At the same time, some of the vibration will be absorbed through the company's more traditional passive dampers. Lord

says that the reduced vibration in the airframe will help cut the Citation X's interior noise level by up to 86%.

The second major contract is from Stevens Aviation, a multi-site US fixed-base operator with its headquarters in Arkansas. Stevens was granted a supplemental type certificate for the NVX modification on the King Air 200/300 series in the middle of September.

NVX cuts cabin noise by recording and analysing noise before outputting an equal and opposite noise through speakers mounted throughout the cabin.

During flight tests on King Air 200s, the NVX system has produced interior-noise reductions of up to 70% (10dB) and noise at blade passage frequencies (by the plane of the propeller) by as much as 90% (20dB). □



# Latest *Galileo* failure threatens the *Cassini*

TIM FURNESS/WASHINGTON DC

A FAULTY TAPE recorder aboard NASA's \$1.4 billion *Galileo* spacecraft could prevent much of its data and images being returned from the planet Jupiter this December, after its protracted six-year journey across the solar system.

Should it prove impossible to correct the fault, the political repercussions may force the cancellation of NASA's last large planetary exploration project, the *Cassini*, which is already under threat from Capitol Hill.

The *Cassini* — equipped with the European-built Huygens lander to explore the Saturnian moon, Titan — is planned for launch in October 1997, becoming the first craft to orbit the ringed planet in June 2004.

The *Galileo* mission, which began with deployment from the Space Shuttle *Atlantis*/STS34 in October 1989, has already been hit by the failure of the craft's high-gain antenna to deploy fully and by a stuck valve in the oxidiser system of the propulsion module (*Flight International*, 18-24 October).

NASA says that the data-storage tape recorder "...did not stop as expected after rewinding", following a picture-taking session on 11 October of Jupiter and its four major moons from a distance of 35.2 million kilometres. It is not clear whether the fault lies with the recorder hardware or software.

## NEWS IN BRIEF

### ■ LAUNCH TIMING

A McDonnell Douglas Delta 2 will launch NASA's X-Ray Timing Explorer from Cape Canaveral, Florida, on 6 November. The spacecraft, described as the "...most advanced observatory of its type flown in space", will be used to study black holes, neutron stars and quasars.

If it is the latter, then a major recovery effort may save the mission. Otherwise, only digital data will be returned and a "minimal number of images", using the limited amount of data and information which can be stored directly on the craft's main computer rather than on the recorder.

The number of images has already been reduced from a planned 50,000 to 1,500 by the high-gain antenna failure. Only the *Galileo*'s low-data-rate low-gain antenna is usable.

The faulty recorder was placed on standby while engineers at NASA's Jet Propulsion Laboratory (JPL) started to analyse the problem, while avoiding sending unnecessary commands to the *Galileo*. JPL does not expect to know the outcome until about 28 October, says William O'Neal, *Galileo* project manager.

The spacecraft enters orbit around Jupiter on 7 December. At the same time, an instrumented capsule will plunge into the Jovian atmosphere. The tape-recorder problem will not prevent digital-only data from the capsule being returned to Earth.

NASA's last major planetary mission, the *Mars Observer*, failed as the craft suffered a propellant leak and went out of control just before entering orbit in August 1993.

A major *Galileo* failure will therefore raise questions over the survival of the *Cassini*. It has already cost about \$1.4 billion, and the total cost will be \$3.4 billion by 2008 when the mission is complete.

"Congress cancelled the *Super-collider* when \$8 billion had already been spent on the project, so you can never say that *Cassini* is safe," says Peter Ulrich, chief of the flight-programmes branch of the NASA Solar System Exploration division.

NASA has already embarked on "a series of faster, better, cheaper" planetary missions, costing about \$500 million each, under the *Discovery* programme. □

## Martian air-bag tested

PROTOTYPE air bags designed to cushion the impact as the NASA *Mars Pathfinder* lands on the Red Planet on 4 July, 1997, are tested against a rocky surface inside a vacuum chamber at NASA's Lewis Research Center, Plum Brook Station, Ohio. The *Mars Pathfinder* Discovery mission will include the landing of an instrumented spacecraft, equipped with a camera and a small roving vehicle on the Martian surface — the first landing on the planet since that of the NASA Viking 2 on 3 September 1976 (*Flight International*, 28 June-4 July).



## Egypt selects Matra Marconi

MATRA MARCONI Space has been awarded a \$158 million contract to build and launch Egypt's Nilesat direct-broadcast television satellite. The deal was clinched despite competition from Aerospatiale and Lockheed Martin.

The contract with Egyptian Radio and Television Union provides for the supply of a telecommunications satellite in orbit, components of an on-the-ground spare satellite and a satellite-control system with a primary satellite-control centre in Cairo and a

back-up centre in Alexandria.

The Nilesat 1 is due to be launched by Arianespace's new Ariane 5 at the end of 1997. The satellite will deliver up to 56 channels of direct-to-the-home television in Arab-speaking countries, extending eastwards from Morocco to the Arabian Gulf states.

The Nilesat will be based on Matra Marconi Space's successful Eurostar, which has already been selected for 14 other satellites, including France's Telecom 2, Hispasat and Inmarsat 2. □

## P&W test fires Russian rocket engine

PRATT & WHITNEY has successfully test-fired an RD-120 rocket engine on a test stand at the firm's Government Engines & Space Propulsion rocket test site in West Palm Beach, Florida. It was the first US test firing to be made of the flight-qualified Russian-made rocket engine.

The RD-120 is manufactured by NPO-Energomash (NPO-EM), Russia's rocket engine manufacturer. It provides upper-stage propulsion for the Russian/Ukrainian Zenit rocket. The liquid-oxygen and kerosene-fuelled rocket engine delivers 830kN (187,400lb) of thrust.

NPO-EM and P&W are forming a joint venture to modify the RD-120 for use on small Western-made launch vehicles capable of placing satellites into low-Earth orbit. The major change is the addition of a gimbal system for thrust-vector control. The powerplant, designated RD-120M, will be made in Russia and Ukraine.

The test demonstrated the engine's ability to use US fuel and be integrated into a US launch vehicle. The venture's immediate hopes are to offer the engine for the X-34 reusable small-launch vehicle being developed in the USA. □



# Meggitt displays Gulfstream deal

ANDREW DOYLE/FAREHAM

GULFSTREAM HAS selected Meggitt Aerospace's secondary flight-display system as an option for its GIV and GV business jets, following the completion of flight trials earlier this year. The deal follows Cessna's recent decision to include the system in the Citation X business jet.

The Fareham, UK-based company claims to be the first in the world to have integrated attitude, altitude and airspeed instruments into a single secondary display unit, using solid-state sensors instead of conventional mechanical gyros.

"Nobody in the world has flown a solid-state standby attitude indicator contained in a single box," says Peter O'Sullivan, marketing director at Meggitt. Although the Boeing 777 has electronic secondary displays on the flightdeck,

the instruments are located separately in the aircraft's avionics bay.

"We have achieved something which we and the industry at large thought was impossible: ie, the packaging of the avionics and display into a single 3 ATT-sized instrument," says O'Sullivan. "It was an intellectual challenge."

O'Sullivan says that the device's air-data unit — which feeds pressure readings from pitot tubes on the aircraft exterior to the airspeed/altitude databus — has not been integrated in the box, although it is technically possible.

He says that this is to avoid feeding the pressure pipes through to the back of the cockpit display panels so that "...leaks and lags in the pitot system can be minimised". The air-data module can be located as close to the external sensor as possible, with only electrical connections to the



Meggitt's solid-state secondary flight display is "first in a single box"

secondary flight-display unit.

Meggitt claims that using solid-state technology boosts total reliability to 12,000h mean time between failures, compared with 2,000h for conventional devices, and that repair costs are reduced because the device can be handled more ruggedly than delicate electro-mechanical equipment.

The secondary display can also be linked to the aircraft's flight-data recorder, increasing the quality of data recorded. Meggitt believes that the unit will help

many carriers achieve the accuracy of altitude data necessary for the reduced vertical-separation minimum (RVSM) requirements on transatlantic operations. "There is an opportunity to sell the device as part of an RVSM solution," says O'Sullivan.

The UK company says that it is "...talking to all major aircraft manufacturers — civil and military. We are also having dialogue with Boeing about including the secondary display on the new-generation Boeing 737."

## IR energy to be used for de-icing

AN AIRCRAFT DE-ICING system in which infra-red (IR) heaters are used instead of environmentally damaging glycol-based fluids is ready to become operational at airports at Rheinland, Wisconsin, and Rochester, New York.

A prototype, developed by Process Technologies of Cheektowaga, New York, has already been tested at Greater Buffalo International Airport, New York, under the supervision of the US Federal Aviation Administration. If funding can be found, Rheinland and Rochester hope that the system, known as Infratek, will be installed in time for the North American winter.

"Clean-burning" propane is used to power the IR heaters, which are designed to reduce significantly the cost of de-icing an aircraft, compared with using conventional glycol sprays. De-icing 3mm (1/8in)-thick clear ice from

the surface of a Boeing 737 can cost up to \$3,500 and take 15-20min when using glycol: the Infratek is claimed to perform the same task for \$110 in 15min.

Each Infratek installation includes an array of energy-process units (EPUs) set above the aircraft, which taxis into position. IR energy is an electromagnetic wave form released from a hot surface.

The wavelength of the IR energy released depends on the surface temperature of the emitter — the higher the temperature, the shorter the wavelength of the IR energy.

The EPUs are designed to provide maximum possible IR energy output via electromagnetic wavelengths which are absorbed by the ice which covers the surfaces of an aircraft without warming the aircraft structure or fuel.

Primary heat-exchange surfaces are heated to 1,092°C, releasing

IR energy at around 75% efficiency. The electromagnetic wavelength of the IR energy is then controlled by using a larger, secondary, heat-exchange surface.

To offer a suitable building to house the de-icing system, Process Technologies has formed an alliance with Ventura, California-based Clamshell Buildings.

The so-called Clamshelter is constructed from a series of aluminium "arches" and PVC panels, is fully relocatable, and is designed to withstand wind speeds of 95kt (170km/h) and a snow load of 125kg/m<sup>2</sup>.

The largest buildings so far are 48m (160ft) wide and 17m high, but their modular design allows them to be built up to 300m long. According to Barry Sottak, vice-president of Clamshell Buildings, units some 85m wide and 25m high — capable of accommodating a Boeing 747 — will be available in six to nine months' time.

### NEWS IN BRIEF

#### ■ CONFLICT AVOIDANCE

Thomson-CSF is to supply short-term conflict-alert devices for Swiss air-traffic-control (ATC) centres at Geneva and Zurich. It is designed to help controllers assess the risk of potential traffic conflicts, and has already been ordered for ATC centres in Belgium, Bulgaria, Denmark, Finland, Greece, Ireland and Singapore.

#### ■ MINI DATA RECORDER

Aydin Vector has introduced a miniaturised device for aircraft digital flight-data recording, called the MiniAMOR-700. The asynchronous real-time multiplex and output reconstructor system is designed to combine a range of analogue and digital signals into a single high-speed digital datastream for digital recording.



# C A L L F O R

The search is on to find winners within the world aerospace and airline industry. Your company should be among them! The Aerospace Industry Awards 1996 have been launched to recognise those companies that have achieved excellence over the last year in each of the following categories.

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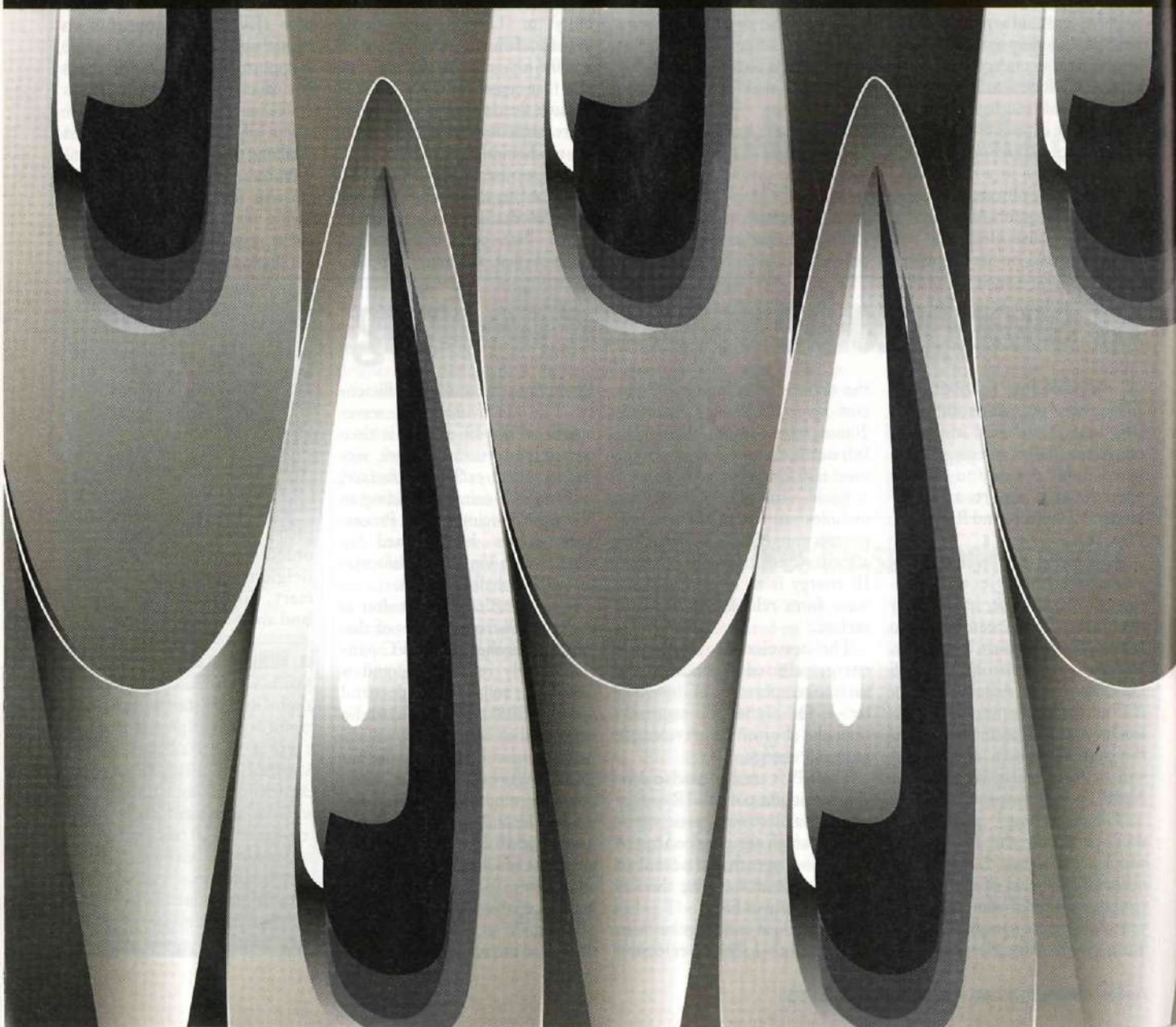


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A special award for Aerospace Personality of the Year, will also be presented to the individual who has made the greatest personal contribution to the industry. The awards are to be judged by an independent panel of industry experts. The winners are to be revealed during the Asian Aerospace

exhibition, at a gala banquet, in the Shangri-La hotel, Singapore, on the 8th of February. To ensure that your achievements are fully recognised by the aerospace community, make sure that your company submits an entry. To obtain your copy/copies of the official entry form simply complete and return the coupon below.



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# Indecision rules in Asia

**China and South Korea must overcome major stumbling blocks if they are to realise their ambition of building a 100-seat aircraft.**

PAUL LEWIS/BEIJING

**T**IME IS RUNNING out for two of Asia's aspiring aviation nations. One year after announcing ambitious plans to share the building of a new 100-seat aircraft by the end of the decade, China and South Korea have still to clear their first major obstacle. The selection of a supporting Western partner will prove to be a critical test of Asia's ability and resolve to lead an international aerospace programme.

Teams of negotiators from seven US and European airframe manufacturers have been shuttling to and from Beijing and Seoul since August to court Aviation Industries of China (AVIC) and the Korean Commercial-Aircraft Development Consortium (KCDC). A decision was due by the end of September, but has been delayed until the end of the year (*Flight International*, 18-24 October).

Key members of the South Korean consortium, in the meantime, are growing impatient with China's snail-like and heavily politicised decision-making process. South Korean private industry, which is underwriting half of the country's 35% stake in the \$1.5 billion project, is pressing for speedier progress. "We're spending money by the day, and want a decision soon," says a South Korean source.

The 100-seat programme, tentatively designated the Airexpress AE100 by AVIC, is not expected to enter service until at least 2002-3. Both Boeing and Fokker are pro-



*"MDC made a late entry into the Airexpress competition, hoping to capitalise on its MD-90 TrunkLiner co-production programme with China."*

jecting a requirement for around 3,000 regional aircraft over the next 20 years. The bulk of those aircraft are replacements for ageing McDonnell Douglas (MDC) DC-9s and Boeing 737-200s, leaving room for two or three competing aircraft types.

With MDC working hard to launch its 105-seat MD-95, and Indonesia's IPTN having already announced plans to go ahead with its similar-sized N-2130, any further delay to the Airexpress project could prove fatal.

"If there is not a decision by the end of the year, we risk missing our chance," confirms a KCDC member.

Other, more fundamental, differences between China and South Korea are beginning to show. Despite AVIC president Zhu Yuli's assertion that the selection criteria of a Western partner will be on the basis of technology transfer, South Korean officials are privately voicing concern that China's wider political agenda is increasingly becoming a factor.

Boeing has sold \$7 billion-worth of aircraft to Chinese carriers over the past four years, accounting for some 15% of its total production,

and is mounting a determined campaign to keep European industry out of China. Beijing, in turn, has taken full advantage of its importance to US aerospace manufacturers to lever political concessions out of Washington.

Competition between European and US manufacturers has intensified over the past two months, partially contributing to AVIC and KCDC's delay in choosing a partner. Moves in July by Aerospatiale, Alenia, British Aero-

space, Daimler-Benz and Fokker to form one competing European consortium spurred Boeing into action (*Flight International*, 6-12 September).

A common European approach proved too difficult to cement, and by late September, AVIC and KCDC were in receipt of four separate proposals from Aero International (Aerospatiale, Alenia and BAe), Boeing, Daimler-Benz (with subsidiary Fokker) and MDC. Not one appears to comply fully with the Chinese and South Korean need for a 20% risk-sharing partner.

"What does 20% mean, when the size and shape of the aircraft is still being determined?" asks one competing manufacturer.

The variation in proposals reflects the state of flux of the Airexpress programme. AVIC is pressing for a 115-seat baseline configuration, while KCDC places the emphasis on 100 seats.

As alternatives to 20% risk-sharing, Aero International is instead pushing to be put on a more equal footing with AVIC and KCDC, in return for access to key European technology, including fly-by-wire systems. "We're talking about the most modern technology, and training people to use the technology," says Aerospatiale senior executive vice-president for the New Small Airplane team Yves Michot.

Boeing is similarly emphasising the technological benefits of a tie-up, along with marketing and after-sales support. Boeing has ruled out any direct infusion of funds into the programme, but is asking for cash payments and a share of profits in return for its engineering and management input.

Daimler-Benz and Fokker have also offered to share technology with China and South Korea, but as part of a proposed "twin programme/single-source supply" concept, supporting production lines in Asia and Europe. The proposal, based on the FA-X 120, includes common definition, development and certification.

MDC made a late entry into the Airexpress competition, hoping to capitalise on its MD-90 TrunkLiner co-production programme with China. Its offer of technology would be funded by compensation to cover its costs, combined with royalty payments on aircraft produced. To avoid competing with the MD-95s, markets would be divided.

For AVIC and KCDC, there is now the difficult job of evaluating the four proposals, reaching a consensus on a winner and hammering out a collaborative agreement with the new partner.

Says a South Korean official: "We must maintain a momentum and avoid this project being talked to death." □



Nordam hushkit on a Boeing 737-200



# Smoothing the flow

**The approach of stricter noise-control legislation means good business for engine hushkitters.**

ANDREW DOYLE/LONDON

**T**HE CONCEPT OF hushkitting has been around for almost as long as the civil jet-engine itself. Recent legislation, however, has forced airlines to reconsider this relatively primitive approach to reducing the noise emitted by their aircraft as an alternative to the much more costly options of re-engineing them or acquiring brand-new airliners.

Many airlines really have no choice other than to hushkit — either they cannot afford to re-engine or buy new aircraft, or there is no re-engineing option available for many of their types, or there are no obvious replacement aircraft. Other carriers, such as Northwest Airlines, have taken the hushkitting route

because they consider it to be the most cost-effective option in the long term.

Some hushkit manufacturers have targeted specific types — such as Nordam with the Boeing 737-200 — where there are large numbers of relatively young aircraft still in operation. Other hushkit makers have concentrated on what are generally much older aircraft — Quiet Nacelle (QNC) and Burbank Aeronautical, for example, are focusing on the Boeing 707 and McDonnell Douglas (MDC) DC-8. The predominantly cash-strapped operators of these aircraft have not been offered a re-engineing option for many derivatives and cannot see an obvious replacement for these types, or are unable to afford new aircraft.

The AvAero (737), ABS (MDC DC-9) and

Burbank Aeronautical (707/DC-8) programmes are all backed by Pratt & Whitney, which is anxious to see the huge installed base of JT8Ds and, to a lesser extent, JT3Ds, continue in operation, as it does not have an equivalent powerplant to offer for new-build aircraft. For example, it is likely that, if 737-200s were withdrawn from service in large numbers, many would be replaced by new-generation 737s or Airbus A320s — the former powered exclusively by CFM International CFM56s — denying P&W significant revenue from spare-part sales.

"We got into these hushkit programmes because we were concerned about keeping the JT8D flying," admits David Sheppard, P&W JT8D programme manager. "Our philosophy when we started in 1988 was to ensure that there was at least one hushkit programme for each JT8D-powered aircraft. We want to keep as big an installed engine base as we can."

Apart from the capital cost of hushkitting, several other factors make the equation more complex. Many operators of non-Stage 3 machines have sold their aircraft and leased ►





QNC believes there is potential for up to 200 C/KC-135s to be hushkitted

them back, opening up the question of whether the operator or the lessor should fund the modification. In addition, there is likely to be a last-minute rush as those operators which have delayed hushkitting for as long as possible try to meet the Stage 3 deadlines (see box, P26).

Also to be considered is the inevitable thrust loss, extra weight, or increased fuel consumption associated with hushkitting. Airlines in Europe face the additional problem of significantly inflated landing fees for non-Stage 3 aircraft.

## STAGE 4 SPECULATION

There is speculation that tougher, so-called "Stage 4", noise regulations may be on the horizon, with the Committee on Aviation Environmental Protection, a branch of the International Civil Aviation Organisation, due to meet in December to discuss the latest proposals. Regulations governing exhaust emissions may also be introduced.

QNC, in common with most other hushkit manufacturers, plays down the impact of its hushkits on the performance of modified aircraft. The company is focusing on the market for the 707 and the US Air Force's "open-skies" derivative of it, the OC-135B, and is developing a Stage 3 hushkit concurrently for the P&W JT3D and TF33, which power the two types, respectively. Ground acoustic and performance testing was completed earlier this year, and production of the first shipset of components has now begun.

According to Martin Gardner, QNC's OC-135B project manager, the thrust loss and increased fuel consumption associated with the hushkit will be "marginal". In fact, adds chief engineer Terry Marshall, as far as the OC-135B and 707-100 are concerned, there will be no thrust loss at all and the hushkitted aircraft will consume less fuel than they did when fitted with QNC Stage 2 hushkits. Gardner also maintains that there will be no payload restrictions, as the 707-300 will meet Stage 3 requirements even at

maximum gross weight.

This performance has been achieved using "applied, proven, technology", says Marshall. "The biggest benefit is lighter-weight materials — acoustic technology hasn't changed," he adds. The kit includes an inner acoustic ring at the engine intake, and is constructed from acoustically treated carbon-reinforced-plastic honeycomb.

The potential market for hushkitting 707s is substantial — QNC claims that there are 154 (almost exclusively cargo) 707s on the civil register worldwide, plus a further 40-45 aircraft in the VIP/corporate role. Of these, the company is expecting 100-150 aircraft to require hushkitting, with the break-even point, according to Gardner, being for only 20 aircraft shipsets. The USAF could require up to 200 C/KC-135Bs to be hushkitted, he adds.

The USAF has re-engined a large number of KC-135s with the CFM56 turbofan, but Gardner believes that re-engineing commercial 707s will never be a viable proposition. "It's purely expense," he says. "The cost of re-engineing [with the CFM56] is over \$30 million per aircraft — only the US Government has got that kind of money."

He also argues that, for airlines operating 707 freighters, "...there is no kind of equivalent aeroplane". The cost of hushkitting a 707 with QNC equipment, says Gardner, is only \$2.75 million, including installation.

QNC's first 707/OC-135B hushkit should be installed on the number two engine of a USAF-owned WC-135B test aircraft by the end of November, with first deliveries of hushed OC-135Bs scheduled to take place early in 1996. According to QNC, this should be closely followed by an application for a supplemental type certificate for the commercial 707-100 series, which is almost identical to the OC-135B airframe, with deliveries to airlines commencing soon after. The 707-300-series hushkit should be certificated later in 1996.

The company has also been selling hushkits

for the DC-8-50 and -61 for several years, having been established in 1984 to develop a Stage 2 hushkit for the DC-8. Flight-testing of a Stage 3 hushkit for the DC-8-50/61 is under way, and the first flight of an aircraft with a production kit fitted to the number two engine should take place in November, says QNC.

Much of the potential market for hushkitting DC-8-61s (and -63s) was pre-empted in the early 1980s, with a substantial number of aircraft being re-engined with CFM56s, although Marshall sees around 90 candidate -50s and -61s. "We're really only targeting around 50 aircraft," he says, with orders so far from two US operators. The cost of the upgrade, including installation, would probably be higher than for the 707 because there is a smaller overall market for this aircraft, he adds.

Burbank Aeronautical II (BAC II) also believes that many 707 and DC-8 operators will opt to buy hushkits, and the company has decided to join QNC in this market by offering a modification for the 707-300 and the DC-8-50/-61.

According to Ken McGuire, president of BAC II, a market for around 100 Boeing 707-300 Stage 3 modifications and 70 DC-8-50/61 shipsets exists, as well as for potential military sales. The kits will add about 900kg and cost around \$3.25 million an aircraft.

BAC II expects to complete "baseline" 707 flight-testing this year, achieving certification of the engine test-cell in the first quarter of 1996, followed by flight-testing of a modified 707 in the second quarter. US Federal Aviation Administration certification and initial production is planned for mid-1996.

BAC II certificated a Stage 3 kit for the DC-8-62/-63 in 1990, but claims that it will be "a far more difficult effort" to design a hushkit which will allow the 707 or the DC-8-50 and -61 to comply with Stage 3 requirements.

## LOWER THRUST SETTINGS

This is because the DC-8-62/-63 has a larger wing span and more aerodynamically efficient engine pylons than those of the -50/61, and longer fan-exhaust ducts than either the -50/61 or the Boeing 707, which allows lower thrust settings to be used for approach or take-off at a given weight, and gives a greater fan-duct area for acoustic treatment. "In addition, the DC-8-62/-63 fan-exhaust air exits just upstream of the turbine exit, which substantially reduces sideline noise," adds BAC II.

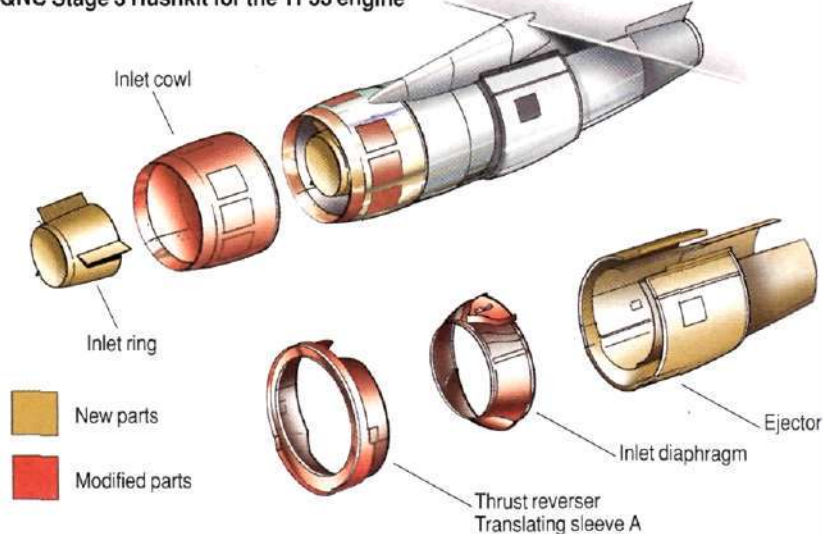
"This is not true of either the DC-50/-61 or 707, and results in starting sideline noise levels several decibels higher than those of the DC-8-62/63," says BAC II.

Following an agreement earlier this year, P&W will develop and manufacture a re-spaced inlet guide-vane for the JT3D, and assist BAC II in the development of an internal exhaust-gas mixer for these engines.

P&W claims that, because of revised aerodynamics around the engine and nacelle and improved thermodynamic performance, there



QNC Stage 3 Hushkit for the TF33 engine



## QNC's route to Stage 3

**Q**UIET NACELLE'S (QNC's) earlier JT3D Stage 2 hushkit for 707-100s and OC-135Bs forms the basis of its Stage 3 upgrade package. To achieve Stage 3 compliance, an inner acoustic ring is located co-axially within the engine intake. The inner ring will be fully anti-iced and certificated for birdstrikes. Additional

acoustic changes are included at the fan-exhaust ejector shroud, and the thrust-reverser translating sleeve and engine diaphragm are also modified. To provide maintenance access, the ejector shroud consists of two hinged doors, which can be opened to allow access to the standard engine-cowl doors.

will be "no degradation in fuel burn, and a possible improvement of up to 2% in the BAC II Stage 3 hushkits for the DC-8-50/-61 and 707". A retrofit programme is planned, to incorporate these improvements in BAC II Stage 3 kits for the DC-8-62/-63.

An affiliated company, Burbank Nacelle, is part of the ABS partnership, which is the sole producer of hushkits for the DC-9. Burbank Nacelle also manufactures acoustic inlets for the FedEx Stage 3 727 hushkit and the ABS DC-9 programme.

The third project on which QNC is working involves hushkitting the British Aerospace One-Eleven, powered by Rolls-Royce Spey engines, following the signing of a memorandum of understanding with European Aviation earlier this year.

Marshall admits that the type will suffer a more significant thrust loss and increase in fuel consumption than the 707 or DC-8, because of the "...extensive noise reduction that has got to be accomplished". He adds: "There will be a thrust loss associated with that engine of 4.5% due to the noise attenuation that is required."

Nordam also became active in the hushkit market several years ago, starting its Boeing 737-200 hushkit programme in 1987 in conjunction with P&W and Boeing, leading to certification in 1992. Major customers to date include Air New Zealand (ANZ), Lufthansa, USAir and General Electric Capital Services.

The Tulsa, Oklahoma-based company's

first offering was the so-called high-gross weight (HGW) hushkit configuration, which was purchased by ANZ and Lufthansa, and was designed to offer Stage 3 compliance at the 737's maximum gross weight of 58,150kg.

The HGW has been largely superseded by the low-gross weight (LGW) configuration, which covers weights up to 57,660kg, or those 737s powered by the P&W JT8D-7, -9 and -15. Nordam is planning soon to gain LGW approval for the -17 derivative, which powers the 58,110kg HGW version of the 737-200.

While the HGW aircraft offers noise levels some 30% below those of the LGW machine, probably taking it inside any eventual Stage 4 requirement, the LGW aircraft weighs around 450kg less and is \$1 million cheaper per aircraft than the HGW version.

## ECONOMICS

Jack Arehart, director of marketing at Nordam's manufacturing division, says that the LGW is designed for "...carriers merely trying to meet the noise rules and be legal, and get the best operating economics out of the aircraft".

Arehart says that, from a total of around 1,000 737-200s in service, 501 were manufactured in 1980 or later, indicating a substantial fleet of aircraft which are relatively young, at around 15 years old. Nordam has so far sold kits for a total of 139 aircraft.

Of those 139 commitments, nine aircraft

built in 1970 or before have been hushkitted. "No-one would have predicted that," says Arehart, pointing out that it is not only the youngest aircraft which operators are prepared to hushkit.

List price of the LGW kit is \$1.8 million per aircraft, although they normally sell for around \$1.5 million, says Arehart. The HGW kit costs around \$2.5 million per aircraft. Although the Nordam 737-200 hushkitting programme is one of the most successful to date, that success did not come cheaply, with around \$75 million having been spent on research and development.

Although hushkits are expected to have a detrimental effect on the performance of an aircraft, in terms of weight, thrust and fuel consumption, Nordam's hushkit is claimed by Arehart to help yield increased thrust during the take-off roll through to V<sub>2</sub>, or the safe climb speed.

There is indeed a thrust loss during the climb, and then weight and drag become the most important considerations, Arehart says. The LGW kit results in an increase in fuel consumption of about 1%.

Arehart believes that Europe will be a major market for the 737-200 hushkit even before Stage 2 aircraft have to be phased out, as landing fees are higher for aircraft which do not meet Stage 3 requirements. "Studies have shown that, on typical European routings, landing-fee surcharges total \$175,000 to \$200,000 per aircraft per year," he says. In Germany, the additional annual charges amount to around \$500,000, one of the main reasons for Lufthansa being among the first customers for the 737-200 hushkit.

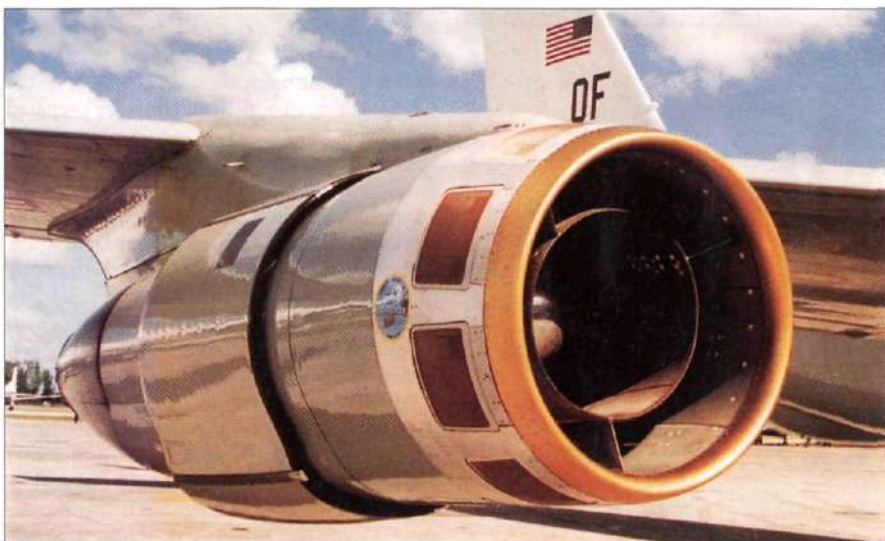
Another factor with which Nordam is having to cope in its marketing efforts is the trend for airlines to sell fleets of aircraft and then lease them back. "Many carriers have chosen to do sale lease-backs, and it is very difficult as an operator to carry out a major capital modification on an aircraft you do not own. The lessor might not want to do it if no-one is going to pay for it," says the company. The result, says Arehart, is often a complex three-way negotiation which can hinder the timing of a deal.

Rod Muddle, head of planning at British Airways, points out that the lessor would be rewarded through an increase in the residual value of the aircraft it owned. BA has itself sold and leased back 23 of its 737-200s.

"We would probably instigate that [hushkitting] in co-operation with the lessor," says Muddle. "That is one of the solutions. We are currently reviewing whether and to what extent we should hushkit [the 737-200s]."

Some 737 operators are waiting for Nordam's LGW kit for the JT8D-17 to become available before making a decision. "Everyone is waiting to see how the medium-range 737 kit turns out," says Ed Searle, manager of sales and marketing at HeavyLift Engineering, which is about to start modify- ►





QNC's OC-135B kit will also be offered for the 707-100

ing 727s with FedEx kits and 737-200s with Nordam's kit.

Nordam also expresses concern that a surge in demand for hushkits may occur towards the end of the century, as some airlines delay hushkitting as long as possible. Arehart says: "We cannot produce the world's requirements in one month. It is an issue we are trying to convey with the industry — we've got to spread this thing out."

## 727 KITS OFFERED

While Nordam has attempted to corner the 737 market, it is FedEx Aviation Services which has targeted the 727, with Stage 3 kits certificated for all 727-100s and -200s, supporting take-off weights of up to 90,570kg.

It offers two basic versions of the kit: a "light take-off-weight kit" for 727-100s and JT8D-7-powered -200s, and a "heavyweight kit" for -200s fitted with more powerful versions of the JT8D. The programme is well advanced, with 38 customers — including FedEx itself — having ordered 291 shipsets, of which 181 have been delivered. Delta Air Lines is one of the biggest customers, with

58 firm orders and a further 52 options.

Phillip Blum, manager of marketing at FedEx Aviation Services, believes that the programme's success to date is because 727s are still economic to fly when the cost of new aircraft is taken into account. "It's really driven by the economics of the 727," he says. "Comparing the operating and ownership costs with a new aircraft, the 727 will provide unit capacity at a lower cost," he adds.

Blum also believes that many operators are not hushkitting just to satisfy the regulatory requirements. "Some operators are choosing to hushkit early because of noise curfews at airports," he says.

List prices, excluding installation, are \$1.8 million for the 727-100 kit, \$1.9 million for the 727-200 light take-off-weight kit and \$2.5 million for the -200 heavy-weight kit.

FedEx claims that, for both kits, there is "no change in thrust performance at any throttle setting". Extra airframe weight totals 240kg for the light kit, and about 410kg for the heavy kit.

The heavyweight kit may lead to higher fuel consumption on shorter flights, however. FedEx says: "A block fuel-burn increase of 0.5%

## Stages in US law

US legislation requires that all Stage 2 aircraft be replaced, hushkitted or re-engined by the year 2000 and, in addition, US carriers had to ensure that 55% of their fleets were Stage 3 compliant by the end of 1994. Further deadlines call for 65% compliance by the end of 1996, followed by 75% at the end of 1998.

According to US Federal Aviation Administration figures, at the end of 1994 there were 4,427 Stage 3-compliant aircraft in the US fleet, compared with 3,943 a year earlier. The number of active Stage 2 aircraft was 2,250, compared with 2,372 at the end of 1993.

Under European Union noise rules, all Chapter 2 aircraft more than 25 years old were supposed to have been phased out by 1 April this year. Waivers were granted to some operators, however, because of economic hardship, with the fact being taken into consideration that no Stage 3 hushkits for the 707 and DC-8-50/-61 are available for delivery yet.

may be encountered on stage lengths under 500nm [925km]."

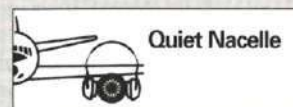
Meanwhile, there is an increasing amount of interest in hushkitting emerging from the corporate-aviation sector. According to Heavy-Lift's Searle, it is the company's existing corporate customers which are "indicating most interest" in hushkitting, and the company has won commitments for the modification of two corporate 727s and three 737s. Although there are relatively few 727s still flying with Europe's major airlines, "...there are quite a number of executive and passenger 727s operating in Europe", says Searle.

Searle has also held discussions with airlines, however, and sees a "very large" potential market for 737 hushkits, particularly from charter operators. "Nearly all larger operators are leasing aircraft these days," adds Searle. "It is the leasing companies I'm talking to as well as the operators." □

# THE QUIET 1-11

Quiet Nacelle and Aravco have signed an agreement with European Aviation to supply 20 sets of Stage 3 Hush Kits for the European fleet of BAC 1-11 500 series aircraft. First deliveries of the Stage 3 Hush Kits are scheduled for late 1996.

European Aviation is appointed as the Installation Centre for BAC 1-11 475/500 series aircraft, as well as for 400 series aircraft registered in Europe. Dallas Airmotive is likely to be appointed as the US installation Centre.



Tel: (305) 593 0731  
Fax: (305) 592 8265



Tel: (44) 1252 554000  
Fax: (44) 1252 377709



Tel: (44) 121 557 8111  
Fax: (44) 121 557 4479





Searcher UAV in squadron service



Inside the Searcher ground-control system



External operator conducts checks

# Overhead protector

## Political change highlights Israel's use of sophisticated UAVs

ARIE EGOZI/TEL AVIV

**T**HE POSSIBLE Israeli withdrawal from the Golan Heights as part of a peace deal with Syria has put unmanned platforms high on the list of substitutes for the ground-based intelligence sensors which Israel now operates along this border. Its perceived need to look into surrounding Arab countries has made Israel a world leader in developing and operating intelligence-gathering systems based on unmanned air vehicles (UAVs).

The Israeli air force and intelligence corps operate third-generation UAVs in a variety of missions. One such squadron, operating the Israel Aircraft Industries (IAI) advanced Searcher system from an air force base, has most of the characteristics of an operational squadron. That the flying platforms operated by the squadron are small and unmanned has become a mere technical fact. "We are considered a fully operational squadron and the demand for our services is growing constantly," says the squadron commander.

The short-range Searcher was procured by the Israeli defence forces in 1992, to replace the Scout UAV. It has an average endurance of 12h, and an optical payload which enables clear day and night images of the survey area. It has been developed to Israeli defence forces requirements.

The Searcher is 4.07m long and has a wing span of 7.2m. Maximum take-off weight is 318kg, and a 64kg payload can be carried internally and externally. The range of the advanced UAV is 150km (80nm). The maxi-

mum speed is 110kt (200km/h).

The optronic payload is also the result of the vast experience gathered in years of operational use. The payload, the datalink and the ground station all contribute to an excellent result, which is relayed to users in the air force chain of command. During a raid, commanders can make on-the-spot decisions based on real-time images.

### TYPICAL MISSION

The Searcher's SACHS 26kW (35hp) engine is started by an external electrical starter. The small craft is cleared for take-off only after an external operator has completed routine systems checks, and technicians have pushed the UAV to a nearby tarmac strip. The take-off operator stands beside the external operating pedestal and revs up the engine. The pedestal has two parallel, almost identical, control boxes. Both are connected to the main mobile ground-control station parked near the strip.

Using the right control lever, operating the aileron and elevator, and the left one, operating the rudder and the throttle, the operator brings the Searcher to the air, from time to time touching the third lever, which operates the UAV's flaps. After a "safe" altitude of about 1,000ft (300m) is reached, control is handed to the internal operator in an air-conditioned ground control station (GCS). The datalink, which, until that point, uses an omni-directional antenna located on the roof of the mobile GCS, is then switched to a special directional antenna.

The directional antenna is used to control the UAV and its payload during the mission, and to receive the images from the optical sensor. Automatic pilot is used in sections of the flight-path, but the internal operator takes over when certain manoeuvres are needed to allow the payload a better angle on the target area.

Normal flight altitude is 7,000-10,000ft. Over the target area, the UAV is placed in loiter mode, enabling the payload to focus on details.

The landing procedure is conducted by the external operator. In case communication with the craft is cut, a special return-home mode in the autopilot will bring the Searcher back to the landing area, where the crew can try to renew the uplink and bring it down safely.

The Searcher GCS is manned by three — the internal operator, the payload operator and a technician who keeps the directional antenna locked on the UAV in the mission duration. The Searcher is operated by a new type of GCS and, according to one squadron commander, its systems, and especially the very powerful computers, "...improve the mission quality".

With a 26kW engine, the Searcher is underpowered, and maximum take-off weight is limited. IAI is testing a more powerful UEL (formerly Alvis Engines) rotary engine as a possible replacement. Improved reliability and manoeuvrability have enlarged the flight envelope.

Searcher availability is high, mainly because of the easy maintenance. One squadron technical officer says that the accessibility to each system is easy because the panels are closed with latches. He adds that the size of the fuselage also improves accessibility. "It is also good when we want to upgrade. There is enough room for more systems," he says. □



# Refined simplicity

**Cessna's Ultra has all of its family's virtues, and more.**

HARRY HOPKINS/WICHITA

**F**LIGHT INTERNATIONAL, over the years, has flown several members of Cessna's family of straight-winged business jets, including the Citation II, IIS and V. The latest member of that family is the Ultra, a higher-powered, value-for-money, derivative of the Citation V. It incorporates as standard many of the most popular optional extras offered on that model, along with an improved electronic flight-instrumentation system (EFIS) and a myriad of detail improvements.

Single-point refuelling had already been made standard on the Citation V this year (from airframe 307 on); now the vapour-cycle cooling unit is standard, too.

The Ultra has the first application of the Honeywell Primus 1000 EFIS. Each Pratt & Whitney Canada JT15D-5D engine delivers 13.53kN (3,045lb) thrust to 27°C; the -5A variant powering the Citation V delivering 12.89kN to 15°C. The nose section is manufactured to a closer fit and better finish. Cockpit-voice recorders and in-flight telephones (Flitephone VI — two handsets) are standard, as are a radio-altimeter, dual altitude reporting and dual distance-measuring equipment (DME). A flight-data recorder is optional. The optional 5,540kg maximum zero-fuel weight is now available using the normal VMO of 292kt (540km/h), without the previous 276kt restriction, after a little local wing strengthening.

## CABIN LAYOUT

A typical layout for the 5.18m-long cabin is a club four with two forward-facing single seats behind. There is room for a seventh seat or second refreshment centre against the right cockpit bulkhead. The lavatory, behind sliding doors at the rear of the cabin, has a toilet unit, the top of which can be used as an extra seat. The seats have recline, sideways and 30°-swivel controls and retractable headrests, and there is a storage drawer underneath each seat. Regular options, such as a deep carpet from sunken aisle up the side panels, hardwood veneer and gold-plated metal fixtures, create a most agreeable atmosphere. Nose and aft bag-



*EFIS displays dominate the Ultra's modest-sized cockpit*

gage compartments provide 1.16m<sup>3</sup> (41ft<sup>3</sup>) of space, and up to 390kg in weight. A further 0.74m<sup>3</sup>/270kg space can be fitted in lieu of the lavatory unit.

The cockpit bulkhead has been moved back just 75mm, but this makes a lot of difference to getting into the pilot's seat and gives noticeably better foot-room in flight. Cessna demonstration pilot Leroy Herrman and I went through the cockpit changes before start-up.

The simple, old-fashioned trim indicators — white pins running in slots — are retained. An angle-of-attack (alpha) indicator for the pilot and extra pitot/static sensors are standard.

The three 200 x 180mm EFIS displays are more exotic, and dominate the modest-sized cockpit. There are obvious similarities with the Primus 2000 system fitted to the Dornier 328 and similar displays will also be fitted to the Citation X. Appropriately, the three previous separate avionics units have been replaced by a dual-channel integrated avionics centre.

Each pilot has a comprehensive primary flight display (PFD) with attitude, airspeed, altitude, vertical speed and heading. The barometric setting control is neat — in the lower frame under the altitude tape. Engine data are separately displayed as vertical strips on three mechanical displays.

The central multi-function display (MFD) is used mainly for large-scale display of route

and navigation data. An optional checklist display is available. Its controller, immediately behind the engine control's quadrant, and ahead of the control panel of the Global GNS-X/ES advanced navigation and flight-management unit, includes a joystick for cursor control. The Primus 650 (or optional 870) colour radar display can be overlaid on any of the three screens.

## GLOBAL NAVIGATION

The Primus and Global, which incorporate both global positioning and Loran-C (Omega is an option), operate closely with the MFD. Navigation functions include DME/DME position calculation in the global-navigation system (GNS), Mode S responder capability and an emergency-location transmitter.

In the aircraft flown, six separate Collins navigation and communications frequency controllers were grouped to the right of the MFD. A Primus II integrated radio tuning system, as fitted to the Dornier 328, is optional.

After a simple push-button start, the engines idled at 28.8% N<sub>1</sub> (low-pressure rotor speed) 320/360°C ITT (inter-turbine temperature), and 51% N<sub>2</sub> (high-pressure rotor). Each was consuming 110kg/h. On moving off, I used the useful switch which reduces idle thrust on the ground for taxiing at lower weights.

As I steered the nose-wheel with the rudder pedals, the rudder/aileron coupling showed up



in sympathetic movement of the control wheel. This device is used in several medium-sized business aircraft, to counter any adverse bank upon initiation of yaw.

The new digitally controlled brakes start operating at a light touch on the pedals, which do not release so much pressure in the anti-skid operation, which becomes effective at 12kt, so improving runway performance.

Hydraulically powered flap (less usual in lighter aircraft) was lowered to 15°, while 7° flap can be used to improve the climb-out gradient after take-off from longer runways, with the penalty of a 4kt increase in take-off reference speeds. Reference speeds are selected using a knob at the left base of the MFD. Selection of cleared altitudes is dialled in on the right knob — a neat arrangement.

## TAKE-OFF

At 6,200kg, with 1,800kg fuel, the aircraft was 1,200kg below maximum take-off weight. Reference speeds were: decision speed ( $V_1$ ) 88kt, rotation speed (VR) 93kt and safety speed ( $V_2$ ) 105kt. It took just 9s to reach 70kt and 11s to VR. After 30s, flap was selected up at 145kt.

The airspeed tape on the PFD leads with a speed vector, showing speed change over 6s at the current rate, rather than the more common 10s interval. A very nice addition is a similar altitude vector, with the same lead.

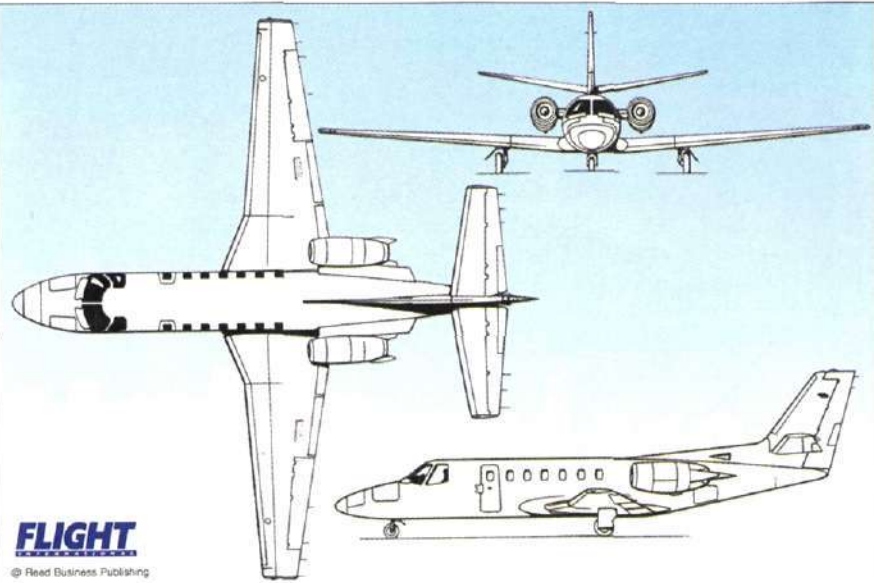
On the altitude scale, the selected altitude changes to amber at 1,000ft (300m) before cleared altitude, and the whole scale is made especially clear by marking it with large single notches at 500ft intervals and double ones each 1,000ft.

Wichita is 2,000ft above sea level. We reached an altitude of 14,000ft in 6.5min, climbing at 250kt indicated airspeed (IAS) and 18,000ft in 8.5min; 42,000ft was passed after 24.5min, to reach 45,000ft in 27min, burning 370kg fuel. In the climb, ITT was kept at 600°C. By the top of the climb  $N_1$  had risen from 95% to 99%, and  $N_2$  decreased from 91.5% to 89%. Fuel flow, shown both on the engine instruments and a page of the GNS unit, reduced from 440kg/h each at 20,000ft to 260kg/h at 40,000 and 210kg/h at 45,000.

The autopilot mode indications at the top of the PFD, with lateral modes to the left and vertical modes to the right, are clearly readable — and well coded for the selection, capture and hold phases. At altitudes above 34,000ft, available bank through the autopilot is reduced by half, but full bank is still available on the flight director for manual flight.

The GNS, as good as an FMS in cruise on autopilot, set up precise leads into the turns for two 140° changes of track. Go-direct selection does not cancel any part of the flight plan, so bypassed way-points can be simply re-instated.

With all fan engines, acceleration to cruise speed can be slow at high altitudes. It was



Many of Cessna's optional extras have become standard on the Ultra

worth waiting 10min to reach cruise speed. Once the wing was over a sort of "step" and the nose angle came down to 1°, 45kt was gained in true airspeed (TAS). Even in light turbulence (noticeable with the stiff wing) cruise settled at 192kt IAS (Mach 0.721) 408kt TAS, with fuel flow 185kg/h per engine.

The Ultra, like the Citation V, is cleared to operate to 45,000ft, but its best high-speed cruise at mid-weight is at 35,000ft instead of 33,000ft and 5kt faster, at around 430kt TAS.

The supplementary air cooling can be used in the air, but it automatically shuts down on climb through 17,500ft. When I selected one air bleed "off", the cabin altitude rate of climb reached 1,500ft/min (2.5m/s) and fell back to normal in 15s.

Alpha changed quickly in turns, and the straight wing "started to talk" at 35° bank. Roll-reversal through 70° was timed at a fairly fast 4s. With IAS now 175kt in descent, extending the air-brake caused a slight rumble. A slam acceleration from flight idle to full power at altitude took 10s — a time halved at lower altitudes.

Air-traffic control required us to drop from 37,000ft, to cross 33,000ft in 1min. Accelerating in descent, with air-brakes out, we were through 33,000ft in 35s, and passed 29,000ft in 70s. At 45° bank, still using air-brake, the Ultra could be flown at 220kt hands-off.

In a clean stall at 15,000ft, the stick-shaker operated at 10° alpha, and the Ultra stalled at 85kt with the right wing slightly down. Recovery took just 400ft. Rapid rolls were made at 110kt, and turns at just 30° bank pulled the alpha indication into its amber sector.

Landing reference speed (VREF) was set at 97kt, for approach at 107kt. Speed can easily rise with the low drag, and control is slippery until full flap is selected. I used airbrake once or twice, until "in the slot".

The generous window area, which is a feature of the series, is ideal for tight turns in the circuit, but I needed to re-adjust to the wide vision angles in feeling for the right approach attitude. I tended to duck under at first and needed to trim more nose-up.

My first touchdown was solid — I simply did not pull enough on the control column in the flare. Herrman re-selected flap and trim as I wound up power and, in 6s we reached VR, the right engine being idled back after lift-off.

## THE APPROACH

For a single-engine landing, approach speed was 117kt at 15° flap, with a weight of 5,500kg. This time I was ready for the increasing nose-heaviness as speed bleeds off in the flare — and used the electric trim right through the flare, to counter the quite rapid change in trim.

The undercarriage is quite stiff. It gives a good ride on taxiing, but reminds you if the touchdown is other than feather-like. The rudder-pedal steering took the nose smoothly round the taxiway corners, which can be tightened up with a dab of (snatch-free) inside brake.

This satisfying evaluation confirms that, after nearly 20 years, the Ultra is still an economically sized business jet with a well-provisioned cabin, whose appeal is enhanced by a relatively high-technology cockpit. It keeps the good low-speed qualities which allow it to use the shorter runways of local airfields. (In sea-level standard conditions it requires a field length of just 970m for a maximum-weight take-off and a landing distance of 855m, without credit for the reverse thrust.) It can transport five passengers 3,330km (1,800nm) in just over 4h 30min — carrying maximum fuel, with a reserve at destination of 45min — gaining two passengers and 185km over the Citation V. □



*A Mikoyan Mig-31 proves Ahktubinsk's promise of testing anything that flies or rotates in the air*



# Key location

## Russia's Ahktubinsk flight-test centre is crucial to its testing capability.

ALEXANDER VELOVICH/MOSCOW

ONE OF RUSSIA'S most sensitive air bases celebrated its 75th anniversary in September, against a background of economic turmoil and serious doubts about many of the programmes in development at the Ahktubinsk State Flight Test Centre. GLITs, to use its Russian acronym, lies at the heart of the air force's weapons test and integration capability.

### KEY CENTRE

Built in 1960 on the steppe of the lower Volga near the village of Vladimirovka in southern Russia, Ahktubinsk remains one of the key centres for the air force.

It has gained in importance since the collapse of the Soviet Union, because many other former test ranges are no longer within Russia's

borders. Important ranges at Turgiy, Suyunduk, Terekta and Guryev in Kazakhstan, and the naval-aviation site in Feodosia — which has become the indigenous flight-test centre for Ukraine's air force in the Crimea — are no longer available.

In replacing these ranges, the Russian air force has set up a weapons-test range in North Caucasus, near Nalchik, while a naval-aviation centre has been established at Gelendjik.

Summing up the scope of the work carried out by GLITs, its commander, Maj Gen Yuriy Klishin, says: "We test anything that flies, separates or rotates in the air." The air force says that GLITs, despite financial difficulties, continues to work on programmes such as the Sukhoi Su-27M (also known as the Su-35), Su-27IB (Su-34) and Su-25T, Beriev A-40 Albatross, Mikoyan MiG-31M and the Myasishchev M-55 reconnaissance aircraft. Flight-testing of the Mikoyan MiG-29M is also expected to resume soon. Many of these projects have been in test at the centre for years, although there are few signs that service entry is imminent for them.

The trajectory-measurement site, equipped with a myriad of data-gathering and telemetry systems connected to the main computer centre servicing the Groshevo weapons-test range associated with Ahktubinsk, is something of



*Shown in public for the first time, the Tupolev Tu-22MR reconnaissance aircraft. In the foreground is a mix of air-launched weapons*

which the GLITs commander is proud. "We have had the opportunity to visit the US Air Force's Edwards flight-test centre in California and we discovered that we are not inferior to them," claims Klishin.

The collapse of the Soviet Union has seriously affected the way in which GLITs is operated. The average flying time logged by test pilots at Ahktubinsk in 1994 was only 45h; less than one-third of the number of being flown in the late 1980s. The reduction is in part the result of fuel and spares shortages.

### PILOTS LEAVING

Inadequate funding has also seen many of GLITs military pilots leave, primarily because of the low salary level. Col Vladimir Kachanov, the head of fighter flight-test programmes and lead pilot on the Su-27M, says that the number of his subordinates has fallen from 52 to 32.

Along with the need for investment in the software at Ahktubinsk, much of the centre's hardware infrastructure is badly in need of renovation. The site's two runways, its engineering and communications and the road network are described as being "in a very sad state".

Despite the day-to-day problems of operating Ahktubinsk on a shoestring, training and education programmes continue at the centre. In 1994, a specialised school, which included basic pilot training, was established at the base. □



*One of several upgraded Mikoyan Mig-31Ms at Ahktubinsk*



TransAsia's A320 acquisition pushed up its fare to Taipei



# Island of change

**The growth of civil aviation in Taiwan has been phenomenal — and expansion looks like continuing.**

BRENT HANNON/TAIPEI

**S**INCE DEREGULATION in 1987, the growth of aviation inside Taiwan has been rapid. By historical coincidence, the opening of the skies came in the same year that the Taiwanese were allowed to travel to China. This combination sparked an aviation boom, as a half-dozen airlines began domestic routes, eagerly awaiting the start of direct flights to China.

The resulting high frequencies and low prices turned many of Taiwan's 21 million people into air travellers almost overnight. Nine airlines now fly the domestic skies, including international carriers Eva Airways and China Airlines. The Taipei/Kaohsiung route, with 88 return flights a day, is the busiest city pairing in the world, by frequency. In all, the nine airlines fly 32 sectors, land at 16 destinations, and operate more than 20 different aircraft types.

The prospect of direct flights to China has faded recently because of Chinese missile tests and escalating political tension. The four largest domestic carriers are profitable, but face increasing capacity problems, a shortage of slots at Taipei's domestic airport, a new noise tax,

implemented in August, and increasing regional and domestic competition from Eva.

At Kaohsiung International Airport, 15 min by road from Taiwan's second-largest city, the spirit of competition is on full display. Six airlines have flights to Taipei between 12:00 and 13:00, and they are hunting for customers. A man from TransAsia Airways presses frequent-flyer cards into the hands of passers-by. Ticket counters are alive with offers: all the airlines are willing to discount tickets, some by up to 10%.

## TYPE DIFFERENCES

Aircraft type matters. When TransAsia upgraded in July from an ATR 72 to an Airbus A320, it added NT\$198 (\$7.33) to the price of the 350km (190nm) trip to Taipei. "The competitors are all using jets," says TransAsia. Eva flies a Boeing 767, while Far Eastern Air Transport uses a McDonnell Douglas MD-82. Formosa Airlines, with a Saab 340, charges the least. Prices range from NT\$1,320 for a one-way trip aboard the newest jet-powered airliners, down to NT\$1,000 for a flight with Formosa. Makung Airlines, which operates an older British Aerospace 146, charges NT\$1,191.

The aircraft are flown north to Taipei up the west coast, and return a few kilometres inland, creating a circular pattern. Out of the cabin windows, passengers can see one aircraft after another flying the return leg.

Taipei/Kaohsiung is not the only unusual route. According to a database compiled by Jerome Cheung, senior aircraft analyst at Saab Aircraft International, the shortest sector is just 20km from Chimay to Wunan, operated by Taiwan Airlines. Four sectors are shorter than 45km, while 11 are shorter than 185km. Matsu Island, off the China coast, has a runway so small that only the Dornier 228 can be landed there.

Domestic air travel reached critical mass two years ago, says Great China Airlines vice-president Charles Wu. The Civil Aeronautics Administration's pro-competition stance, steadily rising incomes, and clogged highways have caused the airline boom.

As the airlines have increased frequencies, flying has become more convenient. In addition to Kaohsiung, most of the local airports are easy to reach. Taipei Domestic Airport (often called Sungshan) is in the centre of the city, 10min from the business district.

The fleet expansion of Taiwan's airlines has been breathtaking, given the country's size, the presence of two well-equipped international carriers, and the shortage of profitable overseas routes. Behind the growth is the prospect of direct flights to China. Flights have been banned since the late 1940s. Most Taiwanese ►



travel to China via Hong Kong. Far Eastern, TransAsia, and Formosa are gearing up for China, and Makung, with its BAe 146s, has also expressed interest. Only Great China considers itself an exclusively domestic carrier.

"Everybody is betting on direct flights, on the opening of the Taiwan Straits," says Jean-Luc Valerio, Aerospatiale general representative. Valerio's choice of words summarises the roll-of-the-dice mentality of the airlines. Optimism prevailed earlier this year as relations between the two countries warmed. Offshore trans-shipment centres, seen as a prelude to direct shipping and air links, sparked a surge of excitement. That excitement has vanished, as President Lee Teng-hui's June visit to the USA has drawn a prolonged angry tirade, and two series of missile tests, from China.

Asked about flights to China, managers at the domestic airlines express resignation and complain about politics interfering with business. Most now think that the first direct flights to China will actually be to Hong Kong, after the 30 June, 1997, handover. Meanwhile, doubts remain that there are enough passengers in the domestic market to justify the new capacity.

"It should be no problem," says Great China's Wu. Ford Chang of Formosa Airlines echoes the same sentiment. "There are enough passengers. The market grows very quickly," he says. Aerospatiale's Valerio expects the market to grow from 17 million passengers in 1994 to 25 million in 1996.

Nonetheless, TransAsia's aircraft on the Taipei-Kaohsiung route are less than half full. The airline says that it cannot break even at that level and hopes to increase the number of passengers. Formosa is running a load factor of between 60% and 70%.

## PROBLEMS TO COME

Other problems lurk on the horizon, including a new noise tax, pressure on slots, and competition from Eva. The new noise tax, stricter than Stage 3 standards, was implemented on 1 August. Aircraft are taxed by a formula: the number of decibels over the permitted 73, multiplied by a dollar figure, the weight of the aircraft, and the number of take-offs. The resulting penalty is expected to average about NT\$50 per passenger per flight.

Slots at Sungshan Airport in Taipei are increasingly hard to obtain. They are controlled by the military, which is conservative in parcelling them out. Eva's purchase in April of 20% of Great China, and its purchase in May of a controlling share of Makung, were inspired by the shortage. "Now we have great access to time slots in Sungshan Airport," says Daniel Wu, Eva's senior vice-president of corporate planning.

Eva spells trouble for the domestic airlines. Although it operates at a loss, it has the backing of shipping giant Evergreen Group, and its regional-route network limits the smaller airlines' overseas expansion. Eva has ordered six McDonnell Douglas MD-90s, five of which will

## Taiwan's domestic airlines jockey for position

**F**ORMOSA AIRLINES, with 23 aircraft, has the largest fleet of Taiwan's domestic airlines. It has two Saab 340As, six Saab 340Bs, three Fokker 50s, seven Dornier 228s, and two Pilatus Britten-Norman BN-2 Islanders. Another Fokker 50 will be delivered in November. Two Fokker 100s will be delivered, one in December and one in January, 1996, while the first of four Dornier 328s will arrive in January.

The Fokker 100s will be used initially on the Taipei-Kaohsiung route, completing the switch on that route to jet aircraft. They will later be used on any overseas routes Formosa decides to pursue, including, possibly to China. Formosa carried 1 million passengers in 1994, and plans to carry 1.3 million this year. It provides 8% of the available seats on Taiwan's domestic routes.

Far Eastern Air Transport has a fleet of 14 aircraft, including four Boeing 737-200s, two 757-200s and eight McDonnell Douglas MD-82s. Two more MD-82s will arrive by the end of year. The airline plans to lease an additional 757. Those aircraft will be used on domestic flights and overseas charters. It carried 4.5 million passengers in 1994, and has set a target of 5.3 million passengers this year. It supplies 32% of Taiwan's domestic seats.

Great China Airlines has an exclusive Bombardier de Havilland fleet: four Dash 8-100s and ten larger Dash 8-300s, with one more due to be delivered by the end of the year. It plans to double its fleet, and signed an order for 12 additional Dash-8s at the Paris air show in June. It has launched three new routes from its base in Taichung, and added frequencies to existing routes. Great China provides 10% of Taiwan's seats.

be operated by Makung between Taipei, Kaohsiung, Tainan, and other big cities.

Max de Nijs, Fokker Aircraft account-development manager marketing and sales Asia, foresees more mergers and take-overs. "The airlines won't go bankrupt," says de Nijs, who has been based in Taiwan since 1988. "The rich partners will eat them. Watch Eva."

Eva's MD-90s will make regional expansion difficult for the other carriers. The domestic airlines are always looking for suitable overseas destinations. In August, Far Eastern launched a series of charter flights to Subic Bay in the Philippines, and another series to Palau, the world's newest country, some 800km off the east coast of Mindanao.

Under civil-aviation authority regulations, if an airline flies 120 overseas charter flights in two years, it is allowed to fly scheduled overseas routes. The first airline to qualify was TransAsia, which launched three weekly scheduled flights from Taipei's Chiang Kai-shek

TransAsia Airways is the most ambitious. It now flies 23 aircraft: three ATR 42s, 12 ATR 72s, six Airbus A320s, and one A321. The A320s have all been added this year, and TransAsia plans to add five more A321s by the end of 1996. The second A321 was scheduled to arrive on 23 October. TransAsia's share of seats is 27%.

Even little China Asia Airlines, which now operates a single Shorts 360, is expanding. It has a new owner, a new name and big plans: it is now called U-Land Airlines, and will take delivery of two MD-82s in November. Rounding out the list are Makung Airlines, which flies five BAe 146s and two BAe 748s; and Taiwan Airlines, which flies five Pilatus Britten-Norman BN-2 Islanders, and two BN-3 Trislanders. They supply 11% and 1% of Taiwan's seats, respectively.

Formosa, Great China, Far Eastern, and TransAsia operate 71 of the 84 aircraft which criss-cross the 395 x 120km island, not counting China Airlines and Eva, which provide 7% and 5% of domestic seats. Despite fierce competition and unorthodox marketing, these four are making money.

The most profitable is Far Eastern, which reportedly earned NT\$1.3 billion in 1995. The airline will not confirm the figure, but Ong Liu of the planning and development department affirms that the airline is making money.

Formosa Airlines will not offer a dollar figure, but Ford Chang, vice-president of procurement and international development, says that the airline is in the black. Great China made NT\$140 million in 1994, while TransAsia made NT\$500 million. Neither is satisfied, but TransAsia expects NT\$750 million profit for 1995.

International airport to Surabaya, in eastern Java, on 5 October.

TransAsia is scouting other destinations in South-East Asia, and is interested in Macau and Hong Kong. The profitable Hong Kong route typifies the problems faced by the small airlines: after months of negotiation, Hong Kong agreed to give each country a second airline on the route. While TransAsia has expressed interest, the money-making route will almost certainly be awarded to Eva.

Meanwhile, aircraft manufacturers are looking for the next Taiwan-style aviation market. They think it may be South Korea. The country is twice as big as Taiwan in size and population, is equally prosperous, is building a series of new airports, and apparently wants to open its domestic skies. Best of all, says Martin Craigs of Saab Aircraft International in London, its roads are clogged with traffic. If gridlocked roads were the only consideration, most of Asia would look like Taiwan. For now, it remains unique. □



# International tactics

**Taiwan's international carriers are engaged in a bitter battle for market share.**



PAUL LEWIS/TAIPEI

**C**OMPETITION IS heating up between Taiwan's two established international players, flag carrier China Airlines (CAL) and four-year-old Eva Airways. Ambitious fleet-expansion plans, the opening up of profitable trunk routes to Hong Kong and long-term prospects of direct flights to China, have put Taiwan's two largest airlines on a collision path.

Civil aviation in Taiwan has undergone a radical transformation since deregulation of the domestic airline market in 1987, but it was not until 1991, and the diversification of shipping giant Evergreen into aviation, that CAL's 32-year monopoly on international services ended.

Many observers initially dismissed Eva, and its green-adorned aircraft, as less than serious. The last four years, however, have proved the sceptics wrong. The carrier is now firmly established on the world scene. Its success, furthermore, is encouraging other aspiring Taiwanese carriers to step into the international arena.

Increased competition over the last two years could not have come at a worst time for CAL. The carrier has suffered from a succession of major aircraft accidents, compounded by a large downturn in profitable tourist traffic to China (via Hong Kong), and culminating in its worst financial performance in years.

The recent run of misfortune can be traced back to November 1993 and a new Boeing 747-

400 running off the end of a runway into Hong Kong's muddy harbour. While there were no fatalities, CAL was forced to write off \$150 million worth of airframe and engines, and an invaluable amount of company credibility.

CAL's reputation was further tarnished in April 1994 with the crash of an Airbus A300-600R at Nagoya, killing 264 passengers and crew. Further damage was done in March with the murder of 24 Taiwanese visitors to China and subsequent tourist boycott of the mainland.

The carrier's 1994 net profit plunged by 82%, to NT\$600 million (\$21.8 million). It is hoping for better things in 1995 and, based on its monthly performance to date, is confident of doubling its profit by the end of the year.

## EVERGREEN CONTRAST

Evergreen, in contrast has still to see a return on the considerable sums poured into building up Eva. Capital expenditure has included \$4 billion on new aircraft, \$120 million on a new three-bay maintenance and overhaul hangar and over \$100 million on one of the region's best-equipped training bases.

Despite its heavy outlay on new equipment, Eva's financial performance has been gradually improving. While no official figures are ever released, analysts expect it to cut its losses, estimated at \$32.7 million for 1994, to just over \$3 million by the end of this financial year.

In the wake of its recent setbacks, CAL has

## Eva's expansion continues unabated

embarked on a wide-ranging programme to restore confidence in the carrier, such as a more flexible approach to marketing and sales, a new corporate image and a series of improvements to safety and training. Measures include a new A300-600 simulator, the establishment of an independent safety department and the creation of a flight-operations data-analysis system.

More ambitious and expensive is a \$4 billion ten-year plan to modernise and expand CAL's fleet. It calls for the purchase of 46 new jet-powered aircraft, to enlarge the carrier's existing fleet from 40 aircraft to 67 by the year 2003.

Topping the airline's lengthy list of planned acquisitions is a new 150-seat passenger aircraft for use on domestic and short-haul regional routes from CAL's second hub at Kaoshiung. Six aircraft are initially needed to replace three Boeing 737-200s and two wet-leased Airbus A320s, with a further four required after 1998 to meet anticipated traffic growth.

A combination of A320s and A321s is thought to be CAL's preferred choice, but it has yet to formally rule out either the 737-800 or McDonnell Douglas MD-90-30ER. A final selection, expected earlier this year, has been pushed back for "technical reasons." Any further delay could result in CAL's A320 lease agreements being extended for another year after the end of 1996.



"The 150-seater is the first issue we need to finalise in our fleet plan. After that will come the 300- to 350-seater. We need up to ten aircraft, but may adjust that from time to time," says Sherman Yeng, CAL deputy director for corporate planning.

A range of options has been under study for the last two years to try to rationalise the replacement of CAL's mixed fleet of six A300B4s, three 747-200s and four 747SPs.

"Currently, we've a very complicated composition of aircraft, as well as engines types," says Yeng. "One of the major targets of our fleet programme will be to simplify our fleet. We therefore need an aircraft that is suitable for both short-haul and long-haul routes."

Despite its continuing aircraft evaluation, CAL signed a letter of intent (LoI) earlier this year for four Boeing 777s during Taiwanese President Lee Teng-hui's controversial visit to the USA. Rival manufacturers have claimed that the LoI was *quid pro quo* for President Lee being granted a US visa and is designed to create political goodwill in Washington.

The airline has denied any connection between the LoI and Lee's ground-breaking US trip, and insists that it is still reviewing other types, such as the Airbus A330/340.

Another option under consideration is to replace the 747SPs with additional McDonnell Douglas MD-11s and select a new type of aircraft to replace the 747-200s. "We currently have four MD-11s and their capacity is about the same," says Yeng. He adds: "We don't rule out the possibility of a new type coming in and also replacing the MD-11s."

## EVA EXPANSION

Eva operates a fleet of 25 aircraft and, with the delivery of two more 747-400 combis by February 1996, the first phase of its equipment plan will be complete. With the average age of its fleet of ten 747-400s, nine 767-200/300ERs and six MD-11s no more than one year, Eva's 1996-8 phase is geared more towards expansion than replacement.

The carrier, like CAL, is giving priority to the purchase of new 150-seat narrowbodies and has ordered six McDonnell Douglas MD-90-30s, plus six options, for delivery from late 1996. The MD-90s will be used for domestic services, with five of the aircraft going to associate carrier Makung Airlines.

Next in line are three to four additional freighters and a new regional passenger aircraft to replace Eva's 767s. A decision is expected in 1996 between purchasing additional MD-11Fs or 747-400Fs. The carrier is heavily geared towards cargo and already operates three MD-11 freighters and eight 747-400 combis.

Eva has also signed a LoI with Boeing, for four yet-to-be-launched combi versions of the 777. The aircraft would seat 220 passengers and accommodate up to 38,000kg of freight, or seven pallets. As with CAL's 777 LoI, Eva has since sought to play down the significance of its



China Airlines' new plum-blossom corporate identity graces one of its Boeing 747-400s

accord (*Flight International*, 23-29 August, P13).

"We've only expressed our intention: there is no obligation," says Eva senior vice-president corporate planning Daniel Wu. "We're also considering similar size and performance aircraft. The A330 is a very good aircraft that can compete with the 777 on regional routes."

Eva's fleet plans remain fluid beyond the 1996-8 period. "This very much depends on our service expansion, whether we get the routes we need and whether there will be direct services between Taiwan and mainland China," says Wu.

## HONG KONG AND BEYOND

Eva's long-term goal of gaining access to Hong Kong came a step closer in late July, when it was agreed that the highly prized route could be geared up to two additional carriers to compete with Cathay Pacific Airways and CAL. While Dragonair is likely to be designated as Hong Kong's second carrier, Eva faces a fight with up-and-coming local carrier TransAsia Airways.

"This is one of the busiest traffic routes in the world, and one that needs competition in order to balance it," argues Wu. "TransAsia cannot be expected to compete against Cathay Pacific and CAL. We're the carrier that can compete with these two major airlines and make it a much better service."

A full agreement between Hong Kong and Taiwan has not yet been reached, with some important issues yet to be resolved, including increased frequencies and fifth-freedom rights for the new carriers. The most critical hurdle still to be cleared, however, will be obtaining China's approval for any new bilateral agreement.

Beijing's blessing will also be needed to ratify any new air-services agreement between Taiwan and Macau, which is due to open to international air traffic in November. While progress has been made with preliminary agreements on multiple destinations and a weekly capacity of 4,200 seats, no overall deal has yet been struck.

"All three carriers are eyeing Macau, as well as Hong Kong, and so it's going to be a very tough job for our authority," predicts Yeng. Eva in the meantime, is hoping that its earlier \$10 million investment in terminal operations at

Macau Airport will stand it in good stead.

Beyond Hong Kong and Macau, there is the much more difficult issue of direct flights between Taiwan and China. The hopes and wishes of every Taiwanese carrier to fly across the straits appear once again to be on the wane, with continued recent vitriolic exchanges between Beijing and Taipei and heightened military tension.

Taiwanese carriers have nevertheless continued to prepare for the eventual start of direct links, by building contacts with Chinese airlines and providing some technical assistance, such as with the Abacus reservation system. CAL recently joined with seven mainland carriers to introduce a through check-in service for passengers travelling between Taiwan and China via Hong Kong.

CAL and Eva are increasingly coming into direct and indirect competition on long-haul routes to North America. CAL, along with its Mandarin Airlines subsidiary, already operates services to seven US destinations, including Los Angeles, San Francisco and New York via Anchorage, and wants to add passenger and freight services to Atlanta, Chicago and Miami.

Eva, similarly, operates to San Francisco, Los Angeles and New York via Seattle, and is looking to add Chicago and Washington and to extend its Los Angeles service to Panama by the end of the year. "We're considering using Panama as a hub to extend our services from North America to Central and South America," reveals Wu.

Services to Europe remain largely complementary, with CAL serving Amsterdam, Frankfurt, Rome and Zurich, and Eva concentrating on London, Paris and Vienna. According to Yeng, CAL is targeting new routes from Moscow, possibly in partnership with Transaero Airlines and, in the longer term, Scandinavia and southern Europe. Eva's European plans centre instead on new flights to Amsterdam and Brussels.

Wu explains: "Our policy is not to focus on CAL, but focus on winning over passengers and cargo on service." Yeng has no doubts about where the threat lies. "Competition is getting keener and Eva is our major competitor," he says. □



# Spacewalk challenge

**The STS69 spacewalk has paved the way for assembly of the international Space Station.**

TIM FURNESS/LONDON

**A** 6H 46MIN SPACEWALK BY two astronauts on 16 September, during the STS69/*Endeavour* mission, has given NASA more confidence in the ability of crews to assemble the international Space Station during arduous spacewalks.

James Voss and Mike Gernhardt assessed the performance of several power tools and restraints designed to help with Space Station assembly. The astronauts conducted typical Space Station chores, such as removing debris and insulation shields and working on equipment boxes, wires and an antenna boom. An arm-sleeve strap-on computer, with a touch-sensitive screen, designed to display construction checklists and other technical information, was also evaluated.

## FINGERTIP HEATERS

More importantly, however, modified Shuttle spacewalking suits passed an important test. Space Station assembly will involve astronauts spending long periods in shadow, in temperatures as cold as  $-90^{\circ}\text{C}$ . Suit modifications to counter the low temperatures did not work during an earlier evaluation by the STS63 astronauts in February. They were ordered back inside the *Discovery* 3h short of a planned 6h sortie, suffering from cold. The modifications did not allow them to turn off their suits' liquid-cooling systems. Their fingertips grew uncomfortably cold, especially when they touched metal objects, such as handling fixtures, during planned long periods in shadow.

Voss and Gernhardt tested suit refinements, including battery-powered fingertip heaters in the spacesuit gloves and a system which enabled them to close down totally the liquid-cooling system and rely on body heat to warm the suits. Voss and Gernhardt also assessed their suits while in shadow for 1h at the end of the Shuttle's remote-manipulator system.

Space Station assembly will begin in earnest



NASA's Voss rides the robot arm

in November 1997 and, by 1998, NASA astronauts will be conducting regular spacewalks, as the pace quickens towards a Space Station completion date of June 2002. By then, the station will span the size of a football field. Spacewalks will not last longer than 6h.

NASA estimates that 650h of spacewalking will be required for the assembly job — 200h more than estimated originally — plus an additional 170h a year for maintenance and operations after 2002. Russian cosmonauts will also need about 240h during assembly work. While Russian cosmonauts have exceeded this required experience level, both astronauts and cosmonauts lack experience of conducting tasks similar to those needed for Space Station assembly.

Of the 125 walks so far conducted since Alexei Leonov's first exploit on 18 March, 1965, 63 have been completed by the former Soviet Union and Russia, all of them in Earth orbit, amassing about 256h of spacewalking time, or 518h man-hours. US astronauts have also performed 63 walks, including 14 lunar walks and three midway between the Earth and the Moon, gaining a total of 307h experience and 609 man-hours, but only 224h experience or 410h man-hours during the 46 Earth orbital spacewalks, of which 30 were from the Space Shuttle. Shuttle spacewalks account for only

176h, or 360 man-hours.

During Space Shuttle missions, early spacewalks were seen as exercises to be conducted for specific tasks, such as satellite retrievals and repairs, and only recently have they been added to missions to give astronauts experience. To increase its cadre of experienced spacewalkers, NASA is spreading spacewalk assignments and planning sorties during several missions before 1998. Clearly, some of the Space Station assembly crew have already been selected.

The next walk will be conducted by two STS72/*Endeavour* astronauts in January 1996, while two more are planned for the STS76/*Atlantis* and STS79/*Atlantis* Shuttle Mir Missions (SMM) 3 and 4 in April and August 1996. The SMM 4 will be another demonstration of the vital Safer backpack which will enable a stranded astronaut to manoeuvre back to base if he or she were to lose physical contact. The SMM 5 and 7, involving STS81 and STS86 — both with the *Atlantis* — may also conduct walks. The SMM 5, in December 1996, may feature a US astronaut joining a routine Russian spacewalk.

## FOUR-PERSON OUTING

The SMM 7, in September 1997 — two months before the first US Space Station mission — could see the two US and two Russians walking together in the first four-person spacewalk in history, possibly with one of each country's spacewalkers wearing his counterpart country's suit. The STS82/*Discovery* mission in February 1997 will also involve four spacewalking astronauts servicing the Hubble Space Telescope. In addition, every Shuttle mission carries two crew members trained to conduct contingency walks if required.

Spacewalking is not a glorious sightseeing trip in open space. It is gruelling and tiring. One astronaut has likened working on the Hubble Space Telescope to hanging upside down over the engine of a car trying to change the spark plugs wearing mittens. That analogy does not include the effort it takes to counteract the tendency to float away from everything, especially the counterforce after touching a surface. Every movement has to be accompanied by the fixing of restraint anchors, like a mountaineer using crampons.

It did not take NASA long to realise the value of placing an astronaut at the end of a remote-manipulator system, which is clearly destined to play a major role in Space Station assembly. It will be equipped with the necessary tools for the spacewalker before an excursion is made. □





John Baldwin

### ■ HAWKER

John Baldwin has been appointed general manager of Hawker de Havilland's maintenance and service division in Perth, Australia. Baldwin, formerly marketing manager, succeeds Richard Whiting, who has retired, but will return as a marketing consultant.

### ■ BAE AUSTRALIA

Robin Southwell, managing director of British Aerospace Asset Management Organisation (AMO), is to become group chief executive at BAe Australia. Tony Rice is appointed to the new position of chief executive at AMO, with responsibility both for AMO and JSX Capital operations.

### ■ ROCKWELL

Newly appointed managing director of Rockwell Systems Australia (RSA) is David Grey, formerly managing director of GEC-Marconi Australia. Grey will be responsible for RSA's defence business, replacing Donald Boyce, who will return to the USA after more than five years in Australia.

### ■ EMBRAER

Brazilian airframe manufacturer Embraer has appointed Mauricio Botelho president and chief executive. He replaces Juarez Wanderley, who was the interim president during the transition

period which followed the carrier's privatisation. Wanderley becomes vice-president of industry under a new management structure. Botelho has held management positions in engineering, telecommunications, automation systems and finance.

### ■ MESABA

Carl Pohlada becomes chairman of Mesaba Holdings, parent of Northwest Airlinck carrier Mesaba Airlines; Bryan Bedford is named president and chief executive; John Fredericksen is appointed vice-president for finance and general counsel; and William Dolan becomes secretary. Newly elected to the Mesaba Holdings board are Northwest Airlines managers Richard Hirst, senior vice-president, corporate affairs; Donald Washburn, executive vice-president for customer service and operations; and Christopher Clouser, senior vice-president, communications, advertising and human resources. Mesaba Airlines has named Darrell Richardson vice-president and chief operating officer. He takes over from John Fredericksen, who becomes vice-president for administration and general counsel for the airline and Mesaba Holdings. Richardson was formerly senior vice-president of operations with Express Airlines I, another Northwest Airlinck carrier.

### ■ ACI

Willi Hermesen president and chief executive officer of Munich Airport, has been appointed deputy president for one year at the Europe board of European commercial airports' representative body Airports Council International (ACI).

### ■ AIR JAMAICA

National carrier Air Jamaica has appointed Tony Cowles general manager for the UK and Europe. He was most recently general manager for the UK and Europe with Caribbean carrier BWIA International.

### ■ EMERY

Maurizio Pavan has been appointed manager of Palo Alto, California-based international freight carrier Emery Worldwide's new office at Vicenza, Italy.

### ■ AOPA

Stacy Hamm has been named regional representative for Arizona, Utah and Nevada by the US Aircraft Owners and Pilots Association (AOPA), of Frederick, Maryland. Hamm, who replaces Carl Smith, was formerly an aviation-insurance agent and is a member of the Arizona Aviation Safety Advisory Group.

### ■ JET AVIATION

Jack Brooks has become sales manager for maintenance and modifications at service company Jet Aviation of West Palm Beach, Florida. He was most recently manager of corporate sales for aircraft maintenance and modifications at Page Avjet.

### ■ FAA

Steven Brown senior vice-president for Government and technical affairs at the US Aircraft Owners and Pilots Association, has been appointed vice-chairman of the US Federal Aviation Administration's Aviation Rule-making Advisory Committee. He will hold the position for 1995-6 and will become chairman for 1996-7, succeeding Sarah MacLeod of the Aeronautical Repair Station Association.

### ■ MDC

John Steurer has been appointed vice-president and general manager of the Joint Advanced Technology programme at McDonnell Douglas (MDC) of St Louis, Missouri, succeeding Donald McGovern, who is to retire at the end of the year. Steurer, with MDC for 25 years, including being vice-president for integrated product definition, was formerly with the US Air Force's Aerospace Research Laboratory at Wright Patterson AFB, Ohio.

### ■ SCHOLARSHIP

Martyn Steele has won the 1995 *Flight International* Barnett and Piercy Flying Scholarship. Steele, in his second year at the University of Plymouth, Devon, won a Royal Air Force Flying Scholarship in 1994 and has some 21h of powered-flying experience. He hopes to fly with the RAF after he has graduated.

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## Please explain the plane in Spain

Sir — In June, I saw a large ruined castle on a hill above the village of Coruna del Conde, Spain, on the battlements of which, mounted on a plinth and visible from more than a kilometre away, is a full-size jet fighter with a Spanish roundel.

The village is on the road which runs north-east from Aranda de Duero (on the N1 Burgos-Madrid road) towards the 234, and is about 30km (18 miles) from Aranda. On the main road through the village is a memorial, which appears to

have been erected in 1973 by the Spanish air ministry. The inscription claims that one Diego Marin Aguilera was the first man to fly, but the method is not stated.

Perhaps a *Flight International* reader may know something of this gentleman's history?  
**MARCUS CHAMBERS**  
*Banbury, Oxfordshire, UK*

*Inscription translates: "In homage to the first man who flew, Diego Marin Aguilera La Cofradia Nuestra Señora Virgen de Loreto de Aranda de Duero. Sponsored by the Ministry of Aviation in collaboration with this council 1793 1973"*



## Enough is enough for falling economy-class standards

Sir — I congratulate Mr Bamberg on his letter about British Airways' expenditure on first-class improvements (*Flight International*, 11-17 October, P49). I frequently fly London-Sydney (in economy and business class). BA and Qantas offer poor long-haul economy class and the seats are no better than a London Hyde Park deck chair with buttons.

The first leg is 12h, the second 9h, and I shudder to think what the economy section would be like on the proposed Boeing 747 700-seater.

Recently, I flew Virgin/Ansett via Hong Kong. The Ansett sector was great, but Virgin appears to be remodelling itself on BA, Qantas, Singapore Airlines, or Cathay Pacific. Virgin used to be "user friendly for price and service".

Such airlines owe long-haul economy passengers more room.  
**TIM MAY**  
*London, UK*

...I would like to offer another perspective on the challenge for air transport. Having used cross-channel ferry services and British Rail Intercity services, my family and I have found the ease and speed of access and general convenience of service to be high. Service information is good.

I flew for the first time only this year. I did not object to more than 4h of economy-class travel, or the severely restricted service provision. What I found unacceptable, however, was the length of time taken from arrival at Heathrow to departure. A 2h flight delay produced nothing more than a "not yet boarding" sign on the departures display.

I can see how direct competition between rail and air on short-haul routes can work against the air-transport industry. Could it be that British Airways' £500 million could be better spent on improving overall journey time? Is less than 1h an achievable target for airport arrival to flight departure?

I appreciate the business logic which targets high-yield customers, but, without buoyant sales in the leisure sector, the industry will face problems. Will the customer continue to put up with less than high-technology overall service?

**GREG HERDMAN**  
*Retford, Nottinghamshire, UK*

## Indirect routeing should be cheaper

Sir — Mr Jeandrain's letter (*Flight International*, 4-10 October, P69) leaves me confused.

He tells us that ticket prices are on the decline, then he says that it is cheaper to fly indirectly to one's

destination. Finally, he concludes that it is all happening because of government subsidies.

As a former member of AEROPA, Mr Jeandrain should know that indirect routeings are intentionally priced lower, to compete with direct ones. It is also evident that, if one's spare time is plentiful, one can take a train or bus, which are priced lower still.

**ALEXANDER MAROUDIS**  
*Glyfada, Greece*

## CL-44: putting the record straight

Sir — In your Ageing Airliner Census (*Flight International*, 4-10 October, P49), you do not mention the Canadair CL-44 turboprop freighter. There are still five in active service in the USA, one with Buffalo and four with Tradewinds (formerly Bluebell), now trading under US Federal Aviation Regulations Part 121. We have also heard that a further two aircraft are to be restored.

**MALCOLM PORTER**  
**PHIL BROWN**  
*Sevenoaks, Kent, UK*  
*[At the time of publication Flight International was informed that there were still nine CL-44s in service. We mentioned this in the notes to the tables, published on P50 of the issue. Ed]*

## WHAT'S ON

**The Latin American Aviation Conference '95**, presented by SH&E and *Airline Business* 2-3 November, Miami, Florida, USA. Contact: Conference Manager, David Price & Associates, 7487 SW 50th Terrace, Miami, Florida 33155, USA; tel: +1 (305) 663 6777; fax: +1 (305) 663 7244.

**Cranfield Short Courses: Accident Investigation for Aircrew and Operations Executives** 30 October-10 November; **Airline Finance for the Non-Specialist** 30 October-3 November. Contact: Lesley Roff, Short Course Manager, Cranfield University, Cranfield, Bedford MK43 0AL; tel: +44 (1234) 750111, ext 2564; fax: +44 (1234) 751206.

**National Transportation Safety Board/NASA, Transportation Fatigue Symposium** 1-2 November, Tysons Corner, Virginia, USA. Contact: tel: +1 (202) 382 0660; fax: +1 (202) 382 6609.

**Aircraft, Engines and Equipment Finance and Leasing in Central and Eastern Europe** 1-2 November, Prague, Czech Republic. Contact: Conference Administrator, ICBI, 8th Floor, 29 Bressenden Place, London SW1E 5DR, UK; tel: +44 (171) 915 5103; fax: +44 (171) 915 5101.

**RAeS November events: A Helicopter Site Planning Policy for Europe** 2 November; **Brabazon Lecture** 14 November; **John Shepherd Lecture** (Medway Branch) 15 November; **Engineering Simulation Devices Used in Training - Two-Day Conference** 15-16 November; **One Day Conference** (Structures & Materials Group) 21 November; **Concurrent Engineering/CALS** 23 November; **Historical Group Evening Lecture** 28 November. Contact: The Conference Office, Royal Aeronautical Society, 4 Hamilton Place, London W1V 0BQ; tel: +44 (171) 499 3515; fax: +44 (171) 493 1438.

**Theatre Missile Defence** 2-3 November, London, UK; 6-7 November, Paris, France; **Digital Battlefield** 6-7 November, London, UK. Contact: HSA/TMD, H Silver and Associates (UK), 2nd Floor, Africa House, 64-78 Kingsway, London WC2B 6AH, UK; tel: +44 (171) 413 0936; fax: +44 (171) 413 0937.

**89th Entry Royal Air Force Halton Apprentices Reunion** 4 November, Ripley, UK. Contact: R.K. Gulliver, 6 Home Close, Eastcote, Towcester, Northants NN12 8NZ, UK; tel: +44 (1327) 830880.

**10th Annual Airfinance Legal Conference** 6-7 November, Washington DC, USA. Contact: Suzette Castle, *Airfinance Journal* Conferences, Nestor House, Playhouse yard, London EC4V 5EX, UK; tel: +44 (171) 779 8575; fax: +44 (171) 779 8603.

*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

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### 75 YEARS AGO

Extracts from *Flight*, October 20, 1920

#### New Speed Record

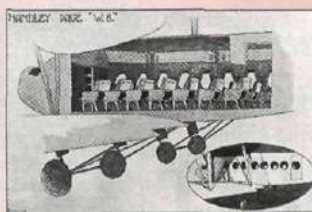
Flying the 13m<sup>2</sup> Nieuport (300hp Hispano engine), piloted by Kirsch in the Gordon Bennett race, Sadi Lecoq has achieved his ambition of being the first to officially attain a speed of over 300kph (186mph). He covered the kilometre in one direction in 12 $\frac{1}{2}$  secs, and coming back did the distance in the reverse direction in 11 $\frac{1}{2}$  secs, making his average time 11 $\frac{1}{2}$  secs, the speed working out to 302.325kph.

#### Kaiser's Envy

Berlin to London, 670 miles, by a Handley Page aeroplane in six hours 10 minutes, with one stop only, at Cologne, is a worthy achievement for a commercial plane. It must make the exiled Kaiser green with envy, as the time taken is not very much longer than he expected to do the job himself in August 1914.

#### Modern Cabin Machines

There is a marked tendency in the design of modern passenger-carrying aeroplanes to provide cabin accommodation for the passengers so as to



The Handley Page W8

protect them against the rush of air and to relieve them as much as possible to the noise of the engines... In the matter of single-engined machines there are two general schemes in use. In one the pilot is placed ahead of the cabin, in the other he is seated aft of the cabin. In twin-engined machines, it appears that the standard arrangement is to have the large cabin more or less between the wings, and to place the pilot and engineer in an open cockpit in the nose of the body.

#### The Problem of the Helicopter

Louis Damblanc, who has recently been carrying out some experiments with a full-size, direct-lift machine under the direct auspices of the French Government, is to read a paper on this subject before the members of the Royal Aeronautical Society at 5pm on November 18.



Boulton & Paul Sidstrand

■ A \$360 airport is to be built in Mandalay, Myanmar (Burma) within the next five years by Singapore Technologies.

#### Airports International

◆ Southwest Airlines has ordered so many 737s from Boeing that when the odd 737 for somebody else moves down the Renton line, the on-site Southwest tech reps ask: "What's this airplane doing in our factory?"

#### TEST-PILOT SPECIAL

Lancer test pilot: "Our ECM system is so powerful it can even jam...er...our own terrain-following radar."

Goshawk test pilot: "T-45" *The Times, London*

spins are like a box of chocolates — you don't know what you're going to get..." Eagle test pilot: "We requested deployment to Rio de Janeiro to see if we could get the Coriolis

Richard Draycott, 21, of Birstall, Leicester, on a flight from France to Birmingham, began flicking his cigarette lighter and accidentally set fire to another passenger's newspaper. It produced so much smoke that the captain of the British Airways 737 feared an engine was on fire.

force to help persuade the aircraft to spin to the left... but for some reason we did not receive the funding."

◆ The Old Flying Machine Company's Duxford-based Spitfires are in big demand for filming, but they have to change their livery all the time so they look like lots of different machines. Water-based paints caused problems, so they changed to stick-on vinyl letters. Bill Stickers says: "There were worries that the vinyl would just peel off at the speeds Spitfires fly at, but this has proved not so, even using ordinary stock vinyls." Try telling that to Plum Blossom Airways, whose new livery proved too complicated to paint on to the tails of its Megajets, so they used the dreaded vinyl. Their first Vinyltail ended its first flight as a white-tail, which just goes to show how slow Spitfires must have been...

Max Loadfactor: "What more can I do? I cutta the cost, I cutta the services, I cutta the fleet, I cutta the jobs..."

Chorus: "Just cutta one more job..."



Lady Heath arrives at Croydon after her solo flight from Cape Town by Avro Avian.

*Logo*



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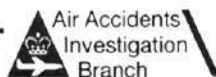
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If anyone has information which they believe may relate to the circumstances or causes of the incident they should write to the Chief Inspector of Air Accidents, Air Accidents Investigation Branch, Department of Transport, DRA, Farnborough, Hants GU14 6TD as soon as possible and should quote the reference EW/C95/9/4.

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