AIRBUS HIT BY A318 DISPUTE ● UK HEADS FOR JSF DECISION

FLIGHT INTERNATIONAL

2-8 JUNE 1999 £2.20
A Reed Business Publication
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Germany **DM13** ● Greece **Dra1300**
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NUMBER 4679 VOLUME 155

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For a full listing of RBI magazines http://www.reedbusiness.com

Qualified Subscription Rates:	1 year	2 year	3 year
Europe	£75/$125	£130/$217	£168/$281
All Other Countries	£84/$140	£147/$245	£192/$321

Only paid subscriptions available. Cheques made payable to *Flight International*.

Newstrade Distributed by Marketforce (UK) Ltd

Flight International is a weekly news magazine for professionals working in all sectors of the aerospace industry worldwide, serving all branches of airframe systems, support equipment and component manufacture and all sectors of operation, including air transport, general aviation, defence, spaceflight and regulatory and other authorities.

REED BUSINESS INFORMATION BPA INTERNATIONAL **ISSN 0015-3710**

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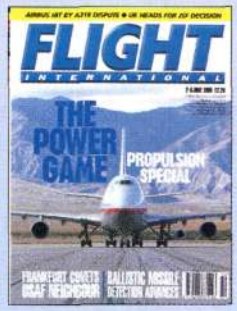

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Flight International/Mark Wagner

An in-depth look at the Dassault Rafale launches *Flight International's* Paris air show special.

the countdown begins...

By the year 2000, according to Airbus Industrie, airlines from the Asia-Pacific region will have more seat capacity than Europe; by 2012, the

region will overtake North America. Boeing forecasts that Asia-Pacific will continue to enjoy the highest GDP growth in the long run; and more

airports are being built here than anywhere else. To protect this growth and prosperity, the need for defensive upgrades and additional defence

equipment will continue. Asia-Pacific is still the fastest growing aerospace market in the world. And the marketplace is Asian Aerospace.

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*Sources: Global Market Forecast 1998-2017, Airbus Industrie; Current Market Outlook – Air Travel and The Economy, Boeing.

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Flightline

The text of *Flight International* and *Airline Business* can be found on the following databases: Lexis-Nexis, Knight-Ridder DataStar, FT Profile, IAC/Predicasts, and Reuters. Details from: tel: +44 (181) 652 8721.Published by Reed Business Information, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS, UK

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MIR MEASURES

A SIMPLE TAPE measure could have saved Russian space officials from embarrassment. Having ousted UK businessman Peter Llewellyn from the Star City cosmonaut training centre because he could not pay his bill to fly a Soyuz to the Mir space station, officials later covered their tracks, saying that the main reason for his departure was that he was too tall to fit in the Soyuz.

The businessman's inability to pay for his mission by whatever means had been exposed much earlier. Russia, however, will grab any opportunity it can to keep the Mir in orbit, much to the chagrin of NASA which is managing the International Space Station (ISS), the biggest international co-operative enterprise in history involving NASA, the European Space Agency, Japan, Canada and Russia.

Corbis

"There is good reason to keep the Mir in space rather than consign it to the scrapheap, for Russia and the ISS partners."

Whatever NASA may feel about the Mir and Russian delays in the delivery of vital ISS modules – which have delayed the project for over a year and grounded several Shuttle missions, as well as the first manned occupation of the space station – Russia's dilemma is understandable. This once great space pioneering nation, the first to launch a satellite, the first to land a spacecraft on the moon and the first to launch a human into orbit, has run out of money and feels it is being treated as a second class partner by NASA.

Yet the Mir has enabled Russia to gain more experience in long duration manned spaceflight and space station operations than NASA will in another five years. The Mir, the latest in a line of space stations that began with the Salyut 1 in 1971, has been an extraordinary success story since the launch of the first module in 1986. And, despite over-dramatised reports of fires and collisions – which were nonetheless serious – the Mir is not like a used car. In recent times, and with very little publicity because there have been no major malfunctions and no Americans have been on board to focus the Western press on the event, the Russian station has been home to several crews who have amassed routinely flight times of 200 days in orbit or more. Moreover, the Mir does comprise modules which were launched as recently as 1995, so parts of it are not so old. But the Mir is also a national asset and one the proud space nation will not give up without good reason and Russia is resisting hard calls to de-orbit its pride and joy amid suggestions that NASA just wants it out of the way.

And there is good reason to keep it in space rather than consign it to the scrapheap, especially for Russia, but also for the ISS partners.

While Russia has been criticised for delaying the ISS, NASA has been able to underplay its own problems, which have also caused delays.

All it takes for the ISS assembly to come to a complete halt is for the Space Shuttle fleet to be grounded by a problem, or for a key module to break down, or partners to pull out.

With the Mir still in orbit, there is at least a back-up. But something needs to be done about resolving Russia's inability to contribute to the ISS and its continued attempts to keep the cash-intensive Mir up and running. The options are clear-cut. Either Russia de-orbits the Mir – and safely – and concentrates its attention on the ISS, all of which still runs the risk of an enormous research asset being lost without a fully operational ISS being ready to take its place, or the Mir becomes part of the ISS itself.

Integrating the Mir into the ISS as a co-orbiting research base which can be used in the interim while the ISS is being built will at least insure against further delays with the ISS construction programme. How this could be paid for and who would pay remains problematic, however. Russia needs about $250 million just to keep the Mir in space for a year, but this could be paid for formally by ISS members using the Mir as a jointly run auxiliary base. (Russia charges about $15 million for a week-long stay on the Mir, including training, launch and return).

How this would go down in the US Congress is open to conjecture. Ironically, it was the Congress which saved the ISS from cancellation in the first place because Russia said it wanted to get involved. ❑

Engine-makers submit 777X bids

GUY NORRIS/**LOS ANGELES**

GENERAL ELECTRIC, Pratt & Whitney and Rolls-Royce have submitted bids to Boeing covering the development of 115,000lb-thrust (510kN) engines to power the long-delayed, ultra-long range 777-200X and -300X derivatives.

Details remain confidential, but GE is pushing for exclusivity, while its rivals are thought to be offering business cases for multiple source solutions. GE is bidding an engine in the 110,000-115,000lb-thrust range, dubbed the GE90-11XB, P&W is offering an effectively new design, loosely dubbed the STF (study turbofan), while R-R is proposing a Trent 800 growth derivative, called the Trent 8115.

P&W's bid is the most surprising. It is offering a new-generation engine based on core technology developed for the smaller PW6000 under development for the Airbus A318. It had been widely circulated that P&W's experience with the delayed PW4098 for the 777-300 had forced it to reconsider the 777X market.

"I want to put all the misinformation straight, and confirm we are in the bidding for the 777X," says P&W executive vice president engine programmes, Bob Leduc.

Boeing is "driving for a conclusion sooner, not later" says Leduc. All three "have to pull the trigger" on their development programmes no later than the first quarter of next year to meet Boeing's proposed entry-into-service target date of September 2003. Boeing is optimistic that the programme could even be accelerated slightly to offer an earlier target date around April 2003, but the engine-makers believe this is unlikely.

The estimated market size for the -200X/300X is between 450 and 500 aircraft, leading GE to push for exclusivity. "We are not going to build an engine like this to be in another three-way race. We are going for a sole-source investment," it says. P&W's Leduc says "three engines [offered] on a wing does not make economic sense", but will not specify whether the company is bidding for exclusivity. Instead, he hints that P&W is taking the same approach as R-R. "With the A340-500/600 we had the same discussions. The guys who demanded exclusivity lost, and the ones that didn't [R-R] won exclusivity de facto".

R-R says it is "working off a strong market share" and feels comfortable not demanding exclusivity. "We are happy to compete on traditional terms," says the company, which adds that it would be "dangerous to set off on a near-term [exclusive] solution to suit one or two customers, and compromise the longer-term situation".

Boeing Commercial Airplanes president Alan Mulally says: "We'll continue to work with the engine companies and ask them: 'What do you want to do for a technical solution? And then, what do you want to do as far as a business arrangement?' Then we'll talk to the airlines and then we'll decide what to do". Mulally adds: "We're getting more demand for some more range on the 777-200 and 777-300."

Both aircraft have been refined with maximum take-off weights of 750,000lb (340,500kg), which requires thrust of at least 110,000lb. The drive for the higher thrust limit of 115,000lb is being predominantly driven by the need to reduce take-off field lengths to around 3,350m (11,000ft) at maximum take-off weight and in hot conditions. The target field performance is westerly take-offs from Los Angeles International. The -200X is defined with a range of 16,280km (8,800nm) and capacity for 301 passengers in a tri-class layout, while the -300X is configured for up to 359 passengers and a range of around 13,400km. ❑

HOW THE ENGINES COMPARE

	GE GE90-11XB	P&W STF/PW4000*	R-R Trent 8115
Fan diameter	Up to 3.25m**	3.2m	3.05m
Compressor configuration (number of stages)			
Low pressure	3	4	-***
Intermediate pressure	-	-	8
High pressure	10	8	6
Turbine configuration (number of stages)			
Low pressure	6	6	5
Intermediate pressure	-	-	1
High pressure	2	2	1
Take-off thrust rating	110-115,000lb	115,000lb	110-115,000lb

Notes * Designation TBD **Studies of several fan diameters up to 3.25m. 777-200X versions limited to 110,000lb thrust *** Fan is LP compressor on Trent.
250lb thrust = 1kN

CRJ-700 flies ahead of roll-out ceremony

BOMBARDIER'S 70-SEAT stretched derivative of the Canadair Canadair Regional Jet (CRJ), the CRJ-700, made a 2h test flight before its formal roll-out ceremony at Canadair's Montreal plant on 28 May. The prototype is undergoing around 25h of local flight testing before being ferried to Bombardier's flight-test centre at Wichita, Kansas. Five test aircraft will take part in the 15-month flight test and certification programme, with the other aircraft joining the programme between July and November. Certification is expected by October next year.

Embraer assesses ALX potential

CHRIS JASPER/**SAO JOSE DOS CAMPOS**

EMBRAER ESTIMATES a potential export market of about 200 aircraft for the ALX trainer/light combat aircraft, the first production version of which was rolled out on 28 May.

The Brazilian manufacturer's senior manager for defence market strategy, Anastacio Katsanos, says there is unlikely to be a mass market for the ALX, since most air forces have fulfilled their training requirements. He believes, however, that up to 200 aircraft could be sold as advanced trainers able to perform operational roles.

Brazil has ordered 99 ALXs, also known as the Super Tucano. Forty-nine single seaters will be used for daytime policing of the Amazon by the Brazilian air force. Twenty twin seaters will provide night time cover. A further 30 of the twin version will be used for training.

Embraer also rolled out the EMB-145SA airborne early warning and surveillance aircraft, a variation of its ERJ-145 regional jet. Brazil has ordered five and Greece four. Katsanos says it has been shortlisted for three other bids.

Embraer is also exploring the export potential of the EMB-145RS remote sensing variant, for which it envisages a maritime patrol application. Roll-out of the -145RS is due in November. ❑

Decision day gets nearer for UK on JSF design participation

GRAHAM WARWICK/**MONTREAL**

THE UK MUST decide before the middle of next year whether it wants to remain in the US-led Joint Strike Fighter (JSF) programme, if it wants a say in selecting the winning design. The UK Ministry of Defence is looking at doubling the number of aircraft it originally intended to purchase, following changes to its operational doctrine.

UK JSF project manager Capt Simon Henley says that, if the MoD wants to participate in source selection, it must confirm the JSF as its Future Carrier Borne Aircraft (FCBA) before requests for engineering and manufacturing development (EMD) proposals are issued to Boeing and Lockheed Martin in the middle of next year.

Studies of four "fall-back" options are under way: the Boeing F/A-18E/F, British Aerospace Harrier 3, Dassault Rafale M and a navalised Eurofighter. These studies, and a cost and operational effectiveness analysis of the FCBA and planned future aircraft carrier (CVF) planned to begin in August, are timed to allow a decision by the deadline, Henley says.

"We have contributed $200 million to the JSF concept demonstration and are spending $20 million on studying alternatives, so you can see where our emphasis is," he says. But a formal UK decision to participate in the JSF EMD, which would require substantial funding, has not yet been taken.

After the creation of the Joint Force 2000, combining the Royal Navy BAe Sea Harrier FA2 and Royal Air Force Harrier GR7 fleets, UK participation in JSF development and production would be based on a requirement for 150 aircraft – up from the 60 needed when the JSF was viewed solely as a Sea Harrier replacement.

Despite the fact that the two planned CVFs will be large-deck carriers, the UK is still interested in the short take-off and vertical landing variant of the JSF, Henley says, because of its higher sortie-generation capability and the increased basing flexibility.

Under Joint Force 2000, he says, the UK's three GR7 and two FA2 frontline squadrons will be replaced from 2018 by four co-located squadrons operating a common multirole aircraft. Two of the 12-aircraft squadrons will be "dark blue", and spend most of their time on the CVFs. Two will be "light blue", operating from land, or from the carriers in certain conditions.

Speaking at the American Helicopter Society Forum in Montreal, Henley said that the CVFs will also carry two other new aircraft: the Future Amphibious Support Helicopter, for which the Bell Boeing V-22 tiltrotor and EH Industries EH101 are contenders; and the Future Organic Airborne Early Warning aircraft, for which the V-22 and a compound-wing EH101 are contenders. Adding a wing and thrusting engines to the helicopter would provide the speed and altitude capability required for the airborne early warning mission, he says. ❑

See Defence, P16.

Northrop Grumman scoops up Ryan

NORTHROP GRUMMAN has purchased Ryan Aeronautical for $140 million in cash, in an unexpected move aimed at bolstering its unmanned air vehicle (UAV) activities.

Ryan Aeronautical, a division of Allegheny Teledyne, is developing the Global Hawk long endurance surveillance and reconnaissance UAV for the US Air Force. It is in the initial stages of testing the Miniature Air Launched Decoy – a small low-cost UAV that can be launched from aircraft. Ryan also continues to produce the Firebee target for the US Navy, USAF and other international customers.

Northrop Grumman chairman, president and chief executive Kent Kresa says the acquisition "is an excellent strategic fit with many of Northrop Grumman's business areas and strengthens our surveillance and precision strike capabilities". The buy-out is to be completed "around July-August", says Ryan, which will become an operating element of Northrop Grumman's Integrated Systems and Aerostructures sector in its Air Combat Systems business unit. Ryan's UAV expertise will be used to strengthen Northrop Grumman's UAV studies. ❑

ALPA hits out at lobby group report

A REPORT FROM the Proposition RJ lobby group calling for a relaxation of current scope clauses has drawn a sharp response from the US Air Line Pilots Association (ALPA), marking the opening arguments in a growing debate over US carrier restrictions on the use of regional aircraft.

Proposition RJ, which comprises airports, regional aircraft manufacturers and consumer groups, contends that local communities, airlines and labour unions stand to benefit from a lifting of "artificial limits" on the use of 50-seat or smaller regional jets.

It estimates that there are 1,452 unused "spoke-to-hub" routes that could support regional jet services and generate nearly half a million passengers a day each way. Five of the top seven US airlines have scope clause agreements with pilots capping the number of regional jets they can operate (*Flight International* 5-11 May).

The report commissioned by the coalition, produced by consultancy GKMG, adds that this would not only secure 1,350 mainline pilot positions it considers are at risk from competition from airlines unconstrained by scope clause, but would create more jobs.

ALPA International president Capt Duane Woerth claims the report is "technically flawed" and accuses the study of greatly inflating the potential for regional jet services by "double and triple counting" route opportunities that are only large enough to support one carrier at most. ❑

COPA 737-700 sports new livery

COPA AIRLINES HAS unveiled its new corporate livery to coincide with the delivery of its first Boeing 737-700 and ahead of the launch this month of its international codeshare alliance with Continental Airlines. The US carrier, which has acquired a 49% holding in the Panamanian airline, will codeshare with COPA on services to the Caribbean, Central and Latin America and the USA. COPA will also join Continental's OnePass frequent flyer programme, as well as co-ordinate ground handling, customer service and training.

Dispute threatens A318 start

JULIAN MOXON/**PARIS**

PRODUCTION start-up of the recently launched 107-seat Airbus Industrie A318 is being threatened by a dispute over workshares in the programme.

The argument centres on Aerospatiale's complaint that it is paying more into A318 development than its 37.9% share in the Airbus Industrie consortium.

An industry source says that the French company's financial stake in the aircraft – a shortened, re-engined derivative of the A320 family – is "closer to 60%".

Aerospatiale says it has an unreasonable financial commitment to the A318 because the aircraft – the smallest in the Airbus range – is unlikely to generate adequate returns to cover its investment in the fuselage modifications. In compensation, Aerospatiale wants a slice of the cabin completion work for the 150-seat A320, carried out by Germany's DaimlerChrysler Aerospace (Dasa). A Dasa source says the issue is an "internal matter that will be resolved", but declines further comment.

Industry sources suggest the dispute should have been settled before the A318's commercial launch at the Farnborough air show last September. Airbus says, however, that such last minute negotiations are "normal", pointing to the argument over A340-500/600 workshare, which was resolved "without affecting the programme timescale".

The A318 was launched in April with commitments for 109 aircraft. Service entry is planned for late 2002. Flight testing and certification starts a year earlier. ❑

Brymon switches to Embraer for jets

BRYMON AIRWAYS has switched allegiance for its new jet fleet, placing an order for up to 21 50-seat Embraer RJ-145s, rather than the rival Bombardier Canadair Regional Jet (CRJ).

The Plymouth-based UK regional airline, a wholly owned subsidiary of British Airways, has an all-Bombardier fleet of 16 Dash 8-300 turboprops and had been seen as a serious candidate to place orders for the 70-seat Dash 8 Q400 and similarly sized CRJ-700. The airline, which operates all its services under the BA brand, had held options on two each of the Bombardier 70-seaters.

"The 70-seat options have lapsed and we have since identified a new requirement for a 50-seat jet," says Brymon managing director Gareth Kirkwood. The ERJ was selected as Embraer offered better price and delivery schedule package.

Brymon has placed seven firm ERJ-145 orders, and taken options on an additional 14. "The options can be taken up as the smaller ERJ-135 or the larger, 70-seat, ERJ-170," says Kirkwood. Deliveries will begin early next year, with five ERJ-145s being delivered during the year on operating leases, followed by the final two firm orders in early 2001.

Brymon says it will use the aircraft to supplement its Dash 8s on its network from Bristol, but will return at least three older Dash 8s by early 2001 as more ERJs are delivered. The new jets may also take over routes operated by Dash 8s from Manchester.

The ERJs will also be used to create a base at Birmingham, where they will be deployed on flights to Brussels, Edinburgh, Frankfurt and Munich, operated under short term contract by Maersk Air and British Regional Airlines. Birmingham-based Maersk Air's BA franchise expires during 2001, and negotiations are under way for its renewal. Kirkwood says that "he does not know" whether BA is considering using Brymon to replace Maersk at Birmingham if a franchise deal is not hammered out. ❑

Better weather helps NATO sortie rate

IMPROVED WEATHER over Yugoslavia has allowed NATO to step up its daily sortie rate to 650-750 in every 24h, about half of which are strike missions. The rest are support flights.

NATO is reported to have hit the defence procurement building in Belgrade. The last time the alliance targeted the building, it hit the Chinese embassy in error.

The US Secretary of the Air Force, Whitten Peters, has signed off plans for the Stop Loss programme. This will prevent around 120,000 active-duty US Air Force personnel with certain specialist skills – including pilots – from leaving the USAF or retiring while the reserve call-up is in place. ❑

Kosovo notes

■ Improved weather conditions have increased Serbian air defence activity. As well as heavy anti-aircraft artillery fire, 33 surface-to-air missiles were launched against NATO aircraft on day 64 (26 May).

■ Maj Gen Charles Wald, vice-director of strategy and policy US Joint Staff, says in the first 57 days of the NATO air campaign, 42% of efforts focused on Serbian military and special police in the field, 26% has been aimed at air defences, 15% at command and control systems and 11% at mobile targets.

■ 717 US aircraft are in theatre, while other NATO countries have sent 324 aircraft. ❑

Indian air force attacks insurgents

THE INDIAN air force launched a series of air strikes in late May against insurgents in the disputed Kashmir region, close to the line of control which marks the border with Pakistan.

Insurgents have occupied locations in the mountains around Drass-Kargil-Batalik, north of Srinagar in Indian-administered Kashmir, says the Indian Ministry of Defence, which claims that they are backed by Pakistan army regulars. The two nuclear powers have fought three wars over Kashmir. There are fears this latest action could escalate into a wider conflict.

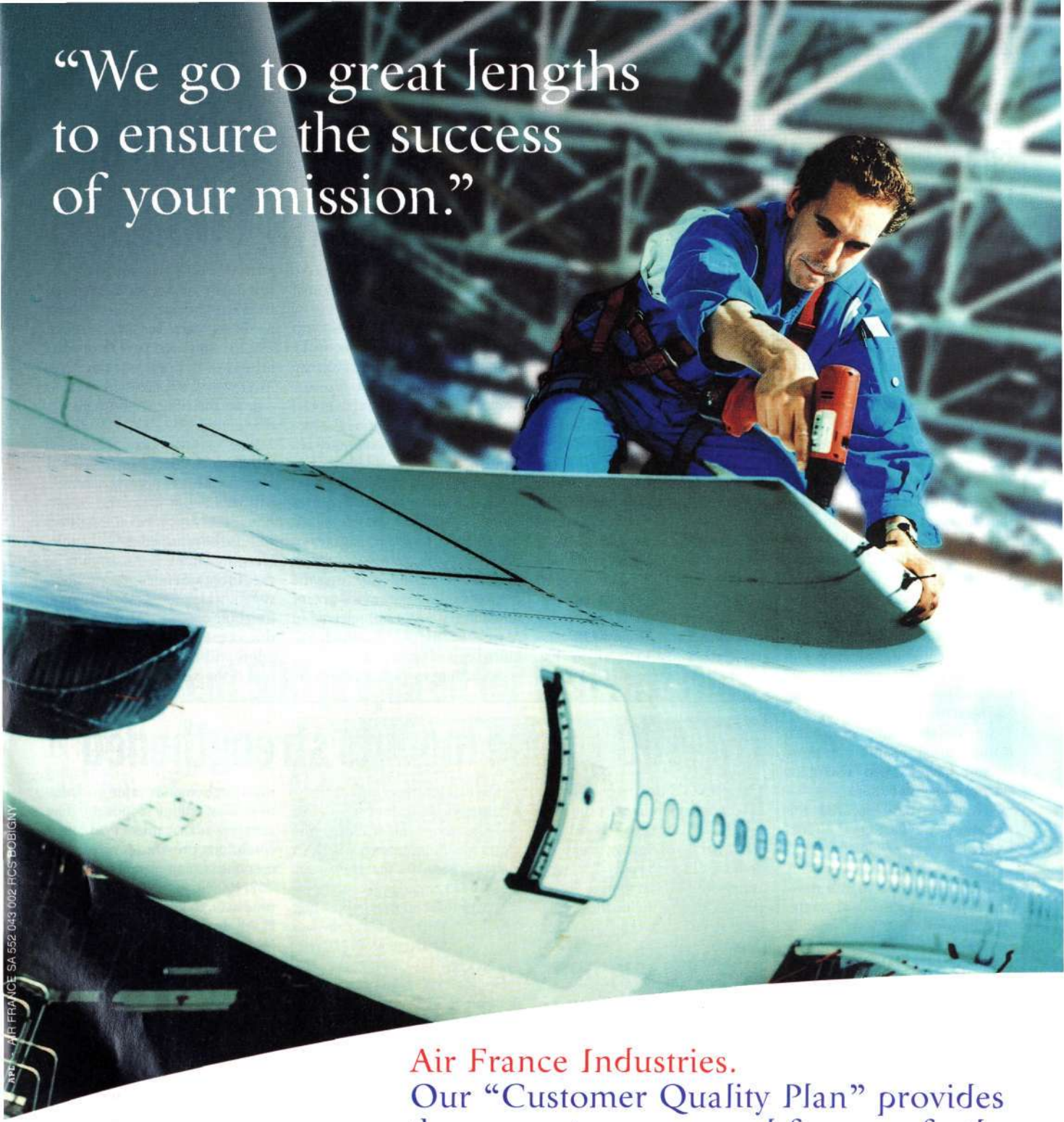
By 28 May, the third day of the strikes, India had admitted to losing two aircraft: a Mikoyan MiG-21 Fishbed and a Mikoyan MiG-27 Flogger. India claims the MiG-27 was lost following engine failure and that the MiG-21 was shot down by a surface-to-air missile on 27 May. Pakistan claims to have destroyed both aircraft after they strayed across the border. It also says both sets of wreckage are within Pakistan-administered Kashmir and that one pilot was captured and the other killed.

SIMON WATSON

India has lost a MiG-21 to ground fire during its raids in Kashmir

As *Flight International* closed for press, it was reported that India had lost a helicopter. Its armed forces used rocket pod-equipped Mil Mi-17 Hips in early strikes. Indigenous Hindustan Aeronautics Cheetahs and Chetaks are also routinely based in Kashmir.

Indian newspaper reports suggest that Mikoyan MiG-23s also took part in early strikes, with MiG-29s providing cover. ❑



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AIR FRANCE INDUSTRIES

China order prompts Britten Norman to resurrect Trislander

MAX KINGSLEY-JONES/**LONDON**

BRITTEN NORMAN (BN) has relaunched production of its 16-seat Trislander commuter aircraft, following an order from China for three aircraft.

Shenyang-based China Northern Airlines has selected the tri-piston-powered aircraft to upgrade its regional services, with deliveries due between September next year and January 2001.

The airline has a need to replace its 15 ageing Harbin Y-5 biplanes – the Chinese version of the Antonov An-2 – deployed on its short-haul services, which include operations from semi-prepared grass strips.

The Trislander, a stretched three-engined derivative of the twin Lycoming O-540-powered Islander, entered production in 1970, but the programme was terminated in 1984 after 80 aircraft had been built.

Subassembly kits were also manufactured, resulting in more aircraft having been assembled since production ceased.

"Now we have secured this order, we are putting the Trislander back into production," says BN commercial manager Guy Palmer. "We hope to sell more Trislanders in China, both to this airline and other carriers," he adds. BN believes there are good prospects for more sales worldwide.

The first of the three new Trislanders will be assembled at BN's site in Bembridge, Isle of Wight, from a kit supplied by BN Romaero, its recently acquired manufacturing plant in Bucharest, Romania. The second and third aircraft will be built in Romania and ferried to Bembridge "green", for completion by BN.

"We have manufactured brand-new kits for China Northern," says Palmer. Further production will be undertaken when more orders are received for the $1.6 million aircraft, he adds.

"We have a 15-month lead time on deliveries, but this will come down to about 12-13 months once production builds up," says Palmer. ❑

Cathay pilots start to disrupt services as pay talks collapse

ANDRZEJ JEZIORSKI/**HONG KONG**

CATHAY PACIFIC Airways pilots have begun to disrupt scheduled services after the collapse of pay talks between airline management and unions.

Three flights were cancelled on 28 May, when "a higher than average" number of pilots called in sick. Although airline management says it does not officially see this as industrial action, it is implementing strategies to handle further disruption. The airline has frozen bookings for the next two weeks.

The latest management pay offer has been roundly rejected by the Hong Kong Aircrew Officers' Association (AOA), which has labelled the offer and 11 June acceptance deadline as "colonial arrogance at its worst".

Cathay pilots are faced with accepting substantial pay cuts by 11 June or losing their jobs. Cathay corporate development director Tony Tyler says that they have been given a choice of accepting the current offer or taking voluntary redundancy. "We have made it clear there is no third option," he says.

The Cathay offer requires senior "A-scale" pilots, hired before 1993, to accept pay cuts of up to 22% in return for stock options. The airline says that the offer is a significant improvement on its initial proposal, rejected in March by the AOA, which required cuts of up to 27%.

According to Cathay, the average salary concession required from senior aircrew in Hong Kong has been lowered to an average of 7%, to be phased in over two years instead of the previous one year. Aircrew will also have 10 years to exercise their stock options, rather than eight.

The offer proposes "B-scale" salary increases of 7.1% to 10.2% over the next two years. Aircrew will be offered improved conditions of service. Jobs on freighters will also be returned to Cathay aircrew, signalling the scrapping of the Aircrew Services recruitment system which introduced separate freighter crews. The airline adds that, even after the pay cuts, Cathay pilots will be among the highest paid in the world. ❑

767-400 engine mounts strengthened

BOEING'S design of different engine mountings for the 767-400ER, compared to other members of the 767 family, has been vindicated by a US Federal Aviation Administration proposal to accept the new design under the special conditions clause of its regulations.

On 767-200 and -300 models, damage to the aircraft structure from the high torque forces induced by a catastrophic engine seizure is limited by "fuse pins" in the engine mount, which allow the engine to separate from the wing.

The manufacturer has anticipated the rule change for the 767-400 and the design incorporates the required strengthening. The FAA guidance indicates that the torque would be absorbed by "some deformation in the engine supporting structure". Boeing has already met the new requirement in its 777, 737NG and 757-300.

Boeing says: "We performed a dynamic model analysis and finite element evaluation of the 767-400ER structure to show that the design meets these special conditions [high engine torque loads due to sudden engine stoppage]. The tests proved that, under load failure conditions, the stresses will not exceed the structural strength." The 767-400ER is to fly for the first time in October.

■ All Boeing 727 fuel tanks are to be checked urgently for damage by electrical arcing to wiring conduits which pass through the tanks, says an FAA airworthiness directive. Two 727s had been found to have holes burned in the conduits by arcing from chafed wiring. ❑

Paul Duns

Western company buys Yak-42s for Moldova lease

A NEW IRISH-BASED leasing company, Corvette Aviation, has bought two Yakovlev Yak-42Ds from Russian financial group Interros. The two secondhand aircraft are on short-term lease to Moscow-based Bykovo Avia *(pictured)*. After refurbishment and overhaul, they will be leased to Air Moldova International, with delivery of the first aircraft slated for June and the second for July.

Shuttle war gathers pace

RAMON LOPEZ/**WASHINGTON DC**

THE AIR WAR over Washington DC has escalated with US Airways announcing plans to introduce new Airbus A320s. The move comes as it expands its lucrative shuttle operation in competition with Delta Air Lines and United Airlines.

US Airways will replace 12 Boeing 727-200s operated by US Airways Shuttle with single-class 154-seat A320s from October. US Airways says it hopes the new aircraft, "with its wider cabin and more space between rows", will attract additional passengers.

The expansion of the shuttle services and the A320 introduction follows US Airways' tentative pilot deal to merge the US Airways mainline and Shuttle seniority rankings. It enables the noisy, inefficient 727s to be phased out before the end of the year deadline.

US Airways holds commitments for 400 A320 family aircraft, including 120 firm orders. Eleven A319s and A320s have been delivered to the airline so far and another 27 are due this year. The carrier says it has not yet decided how many A320s will be dedicated to the expanding Shuttle operation.

The US Airways Shuttle flies 15 round trips daily between Washington Reagan National Airport and New York LaGuardia, and 17 round trips between LaGuardia and Boston Logan. From July, the hourly US Airways service between Boston and Reagan National will become part of the Shuttle system. Before the end of the year, US Airways' current hourly services between Washington Dulles and Boston Logan and LaGuardia will also become part of the US Airways Shuttle.

The US Airways Shuttle operates on the hour, while Delta flies every half-hour, also using 727-200s. Delta says no plans have been announced to change aircraft.

Meanwhile, Delta plans to use Comair's 50-seat Canadair Regional Jets (CRJs) on its new Boston-Washington shuttle from June, unless prohibited by a court injunction. In May, United and its regional affiliate, Atlantic Coast Airlines, began offering Dulles-LaGuardia shuttle service, also using 50-seat CRJs. ❑

Airbus Trent 500 prepared for first test runs

ROLLS-ROYCE'S Trent 500 turbofan for the Airbus Industrie A340-500/600 was expected to begin runs at the company's test site at Derby, UK, as *Flight International* went to press. The run marks the start of a test and certification programme involving seven test engines, which is due to be completed in December 2000.

To ensure a smooth introduction into service and high reliability, Rolls-Royce plans to run 2,000 simulated extended range twin engined operations (ETOPS) cycles. The tests are still being conducted, despite the fact that the A340 is a four-engined application, and therefore does not require ETOPS qualification.

"We are doing it because the Trent 800 has been doing really well in terms of disruptive reliability related delays," says Trent 500 head of marketing Robert Nuttall.

The engine has a 2.46m (97in) diameter wide-chord fan and an eight-stage intermediate pressure compressor with three-dimensional (3D) aerodynamic design. It also incorporates a six-stage high-pressure (HP) compressor with 3D design, an annular tiled combustor and a single-stage HP turbine. The Trent 500 features a five-stage low-pressure turbine section.

R-R is a big fan of ETOPS testing, despite the four-engined application

The fan combines aerodynamic refinements of both the Trent 700 and 800 designs, but does not feature the Trent 8104's swept blade design. The compressor system is a 20% scaled version of the Trent 892, while the combustor is scaled for the airflow of the Trent 500 from the 800 version. The turbines are also scaled from the Trent 800, generating an "advantage in terms of aerodynamic loading", says Nuttall, which increases overall efficiency and "gives us about a 1.5% improvement in specific fuel consumption", he adds.

The engine is due to be certificated at a thrust rating of 60,000lb (267kN), but will enter service at 56,000lb. "Most operators will derate from that level," says Nuttall, to increase temperature margin and life on-wing. The powerplant will be flight tested on the A340-300 development aircraft next year, and will enter service on the A340-600 in March 2002. ❑

Government blocks UK safety extension

THE UK Civil Aviation Authority has been given the go-ahead to conduct more spot checks of foreign airlines operating into the UK.

But there are no plans to extend formally the monitoring of foreign aircraft safety. The move follows further investigation of Malaysia Airlines (MAS), which has flouted fuel safety regulations at London Heathrow Airport for years (*Flight International*, 19-25 May).

The CAA says it has no powers to require reporting outside the mandatory occurrence reporting system, which applies to UK-registered aircraft only. Any such requirement would have to be initiated by the Department of the Environment, Transport and the Regions (DETR), says the CAA.

The DETR, which handles all issues concerning foreign operators, repeats that the safety practices of an airline are the responsibility of the state of registration, and "that's not about to change". Although the DETR has provided the CAA with the resources to carry out more spot checks on foreign airlines, it has not confirmed whether this is a temporary or permanent arrangement. The CAA reports any malpractices to the DETR, whose task it is to liaise with the state concerned.

No reports about the MAS fuel shortage problem reached the CAA until a Confidential Human Factors Incident Report was filed in February, says its group director safety regulation, Richard Profit. But British Airways, MAS' London Heathrow engineering service provider, claims to have given the CAA at least six reports detailing MAS Boeing 747-400 arrivals with dangerously low fuel levels. It was from BA's engineering records that the CAA was able to uncover the extent of the MAS fuel policy malpractice.

Malaysian transport minister Seri Ling Liong has admitted through the state news agency that the confidentially reported incident was accurate, but insists that the 3.6t fuel remaining met International Civil Aviation Organisation minimum requirements, if not UK CAA ones. ❑

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MARKETPLACE

++ Airbus Industrie received its first firm contract for the new 107-seat A318 in April, when an undisclosed customer placed orders for 57 A320 family aircraft, including 30 A318s, 14 A319s, three A320s and 10 A321s. **++ COPA Airlines** of Panama has taken delivery of the first of 12 Boeing 737-700s it has on order, or will lease. The first aircraft, leased from **Tombo Aviation Services,** features the carrier's new colours, introduced after Continental Airlines took a 49% stake in the carrier. COPA holds firm orders for eight 737-700s, and three more will be leased – one from Tombo and two from **GECAS. ++ Brussels International Airlines** has taken an ex-Onur Air Airbus A321-100 on five-year lease from International Lease Finance. The International Aero Engines V2500-powered aircraft will be operated by Red Air on Mediterranean charter flights. **++ Transavia** has placed orders for four new Boeing 737-800s, two of which will be delivered next year, with the other two due in 2002. The deal will boost the airline's 737-800 fleet to 12, and the four additional -800s will replace Transavia's four oldest Boeing 737-300s. **++ Northwest Airlines'** cargo division has acquired a ninth Boeing 747-200 freighter, which will be put into service on transpacific routes in September. **++ Great Western Aviation** has acquired an ex-WestAir Commuter Embraer EMB-120RT Brasilia from **Dana Commercial Credit** in a deal arranged by **Northstar Aviation Services. ++ CIT Group** has taken delivery of a new Airbus A320 from Airbus and placed it on lease with **China Northwest Airlines.** CIT has also acquired an Icelandair Boeing 737-400 from **Wing Aerospace 5. ++** Orders for five more Embraer RJ-145s, along with five options, have boosted the **British Regional Airlines (BRAL)** deal for the 49-seater to 25 aircraft. Ten ERJ-145s are operated by BRAL and five of the 10 outstanding orders will be delivered over the next nine months, with the last five due by 2002.

China Airlines awaits approval to wrap up 747-400F contract

BRENT HANNON/**TAIPEI**

CHINA AIRLINES (CAL) is preparing to conclude a deal with Boeing for 12 747-400 freighters, but is awaiting Taiwanese Government approval before it finalises the order.

"We will replace our whole freighter fleet with the one aircraft type," says the airline, adding that fleet commonality is the reason for the purchase. Taiwan's Ministry of Transportation and Communications must clear the purchase before the contract can be signed.

CAL's passenger fleet includes 12 Pratt & Whitney PW4000-powered 747-400s, while its cargo services are operated by 10 Boeing 747-200 freighters, six on leases. The 747 Classics will be phased out as the new -400 freighters arrive.

CAL president Sandy Liu has pursued an aggressive fleet rationalisation programme since becoming acting president in November. He became president officially in April. Six Airbus A300B4-200s and two 747SPs have been retired so far.

The expansion of the freighter fleet follows rival EVA Air's deal in May for three 747-400Fs (*Flight International*, 12-18 May). EVA ordered the 747s rather than convert its last three passenger MD-11s to freighters.

CAL's strong first quarter was the catalyst for the freighter order. In the first three months of this year, it enjoyed a cargo load factor of 83.5%, while its passenger load factor was 71.3%. CAL predicts 1999 revenue of $1.89 billion and pre-tax profits of $52 million. The airline made a pre-tax loss of $89 million last year.

CAL's operating income rose by 17% in the first quarter, compared with the same period last year, while pre-tax profit was $24 million. Low fuel prices and interest rates, a gradual recovery in Asian economies, and an increase in passenger yields and cargo tariffs are cited as the reasons for recovery. ❑

US authorities diverge on safety priorities

THE US NATIONAL Transportation Safety Board (NTSB) has published a list of safety policy priorities which differs dramatically from one which was recently released by the US Federal Aviation Administration.

The NTSB's "most wanted list" also includes priority recommendations for other transport modes, but the aviation demands include:

- better flight data recorders;
- use of "the latest human fatigue research" to create "new, meaningful time and duty-hour regulations and educational materials";
- prevention of runway incursion accidents (also listed by the FAA);
- revision of icing regulations, based on recent research into icing weather conditions. Development of onboard systems to detect and protect against freezing drizzle;
- drawing up design and operational modifications to reduce the potential for explosive fuel/air mixtures in fuel tanks.

The FAA's target list includes terrain avoidance warning systems, a more rigorous compulsory turbine engine inspection regime, runway incursion accidents, approach and landing accidents and weather-related accidents (*Flight International*, 22-28 April, 1998).

The FAA and NTSB say the differences arise because the FAA has a strategic remit, while the NTSB's task is more tactical in nature. ❑

Hélène Tiveyr

Western Express expands Fokker F27 freighter fleet

WESTERN EXPRESS AIRLINES (West-Ex) has boosted its Fokker F27 freighter fleet with the acquisition of a Mk400 from Farnair Europe. The aircraft joins two F27s and a Fairchild Metro. It will enable the Vancouver-based Canadian cargo carrier to expand the route network it operates for Canadian express packages specialist Purolator Courier.

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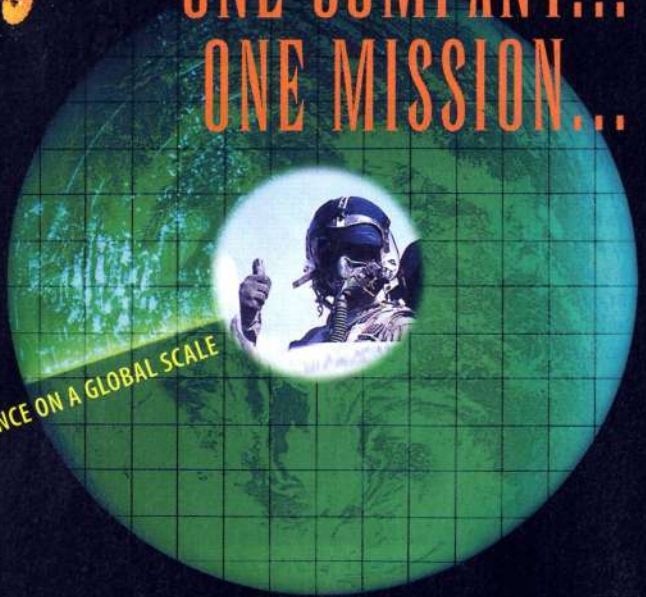

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ROUTES

++ The **USA** has signed an open-skies agreement with the Gulf state of **Bahrain** and hopes to extend the agreement to the other three states that have shareholdings in **Gulf Air**. Discussions have begun with **Oman**, while an outline agreement was reached with the **United Arab Emirates** in April. There have not yet been any negotiations arranged with Qatar. ++ **Delta Air Lines** will begin daily services from Atlanta to Guadalajara in July. It is also increasing services to Mexico City to five daily flights and beginning daily services from Los Angeles to Mexico City. ++ **TACA** is launching non-stop services from New York Kennedy to Guatemala City, Guatemala, and San Pedro Sula, Honduras, using Airbus A320s. The service runs between June and September. ++ **Air Europe** has been given a one-year initial exemption by the USA to begin scheduled services from Pisa and Venice to New York, with flights starting this month. ++ **Aer Lingus** has launched services to Los Angeles, using its new Airbus A330-200. Three flights a week are initially being operated, increasing to five weekly flights by 2000. ++ **United Airlines** is seeking approval to launch daily services from Denver to London Heathrow. The airline wants to launch the new service in April 2000 using Boeing 777s, pending renegotiation of the US/UK bilateral. ++ **British Airways** launches twice weekly services from London Gatwick to Tripoli on 3 June, using Boeing 737s, following the lifting of United Nations sanctions on Libyan flights. ++ EasyJet's Geneva-based division, **easyJet Switzerland**, will launch low-cost services to Amsterdam, Barcelona and Nice from 28 July. ++ **KLM** will elimate the Rio de Janeiro stop on flights from Amsterdam to Sao Paulo in March 2000. Italian partner **Alitalia's** services to Rio from Rome and Milan will be used instead. KLM flights will go directly to Sao Paulo, with an extension to Santiago, Chile. This will replace the extension of the airline's Amsterdam-Buenos Aires services.

Flightlease orders charter 767s

ANDREW DOYLE/**MUNICH**

SAIRGROUP HAS taken a step towards standardising the fleets of its charter airline affiliates on the Boeing 767-300ER after leasing subsidiary Flightlease placed an order for up to eight of the twinjets.

The aircraft will be operated by Balair CTA, Sobelair, LTU and Air Europe, part of the Swiss company's European Leisure Group.

The four firm 767 orders are valued at $450 million and options have been taken on a similar number of aircraft. All will be powered by Pratt & Whitney PW4000s and will share an identical technical specification, although cabin configurations may differ, depending on the operator.

Sobelair, the charter subsidiary of Sabena, 49%-owned by SAirGroup, will receive the first two Flightlease 767s in March and May 2000. These will replace older 767s.

Balair CTA, based in Switzerland and wholly owned by SAir, will take the third and fourth aircraft in the second half of next year.

The Swiss charter carrier operates two A310-300s leased from International Lease Finance but these will be replaced this year by two 767-300ERs from Air Europe, after the Italian carrier takes delivery of two Boeing 777-200s. The Air Europe 767s will be operated by Balair for a year until the newly ordered Flightlease 767s are delivered. The A310s are to be leased to Oman Air from late this year.

Balair CTA's A310s will head out of the fleet as the 767 becomes standard

German holiday airline LTU has transferred its Boeing MD-11s to SAirGroup subsidiary Swissair and has a fleet mainly of 757s, 767s and Airbus A330s. Austrian airline Lauda Air, which uses 767s and 777s for long-haul routes, is also a member of the European Leisure Group, as is Crossair, which operates some short-haul charters.

The 767-300ER will become standard within the group for long-haul charters, particularly to the US East Coast, says SAirGroup. The company says the 757 then becomes a natural choice for shorter, less-dense routes because it shares a common flightdeck with the 767. Air Europe and Lauda will continue to operate their 777s, while LTU has no plans to dispose of its A330s, says SAirGroup. ❑

France changes direction on Orly restrictions

THE FRENCH Government has bowed to pressure from airlines and employees to drop plans to limit the range of flights from Paris Orly – the capital's second international airport.

Transport minister Jean-Paul Gayssot had wanted to cut the maximum distance airlines could fly from the airport to 5,000km (2,700nm), leaving long-range carriers such as AOM and Corsair with no choice but to move to Paris Charles de Gaulle, where major rival Air France has its hub.

Gayssot had watered down the original plan, announcing in December a series of measures, including increased spending on ground infrastructure and ways of securing jobs at the airport. This failed to impress Corsair and AOM, which said the move would cost them Fr420 million ($70 million) and Fr251 million, respectively.

On 21 May, Gayssot withdrew the plan, admitting the move "would have a negative financial impact" on the two airlines, as well as going against their strategies. ❑

Aegean launches with Avros

NEW GREEK DOMESTIC carrier Aegean Airlines has launched scheduled services with its first two British Aerospace Avro RJ100s. The airline is operating from its Athens base to Thessaloniki, Chania, Heraklion and Rhodes and aims to add international destinations next year. Established air taxi operator Aegean Aviation decided to launch the airline to take advantage of the deregulated Greek domestic market.

Syrianair thinks over 747SP role as new A320 fleet expands

SYRIANAIR IS considering the launch of new long-haul routes for its two Boeing 747SPs, as new Airbus A320s replace them on many services.

The Damascus-based carrier has operated the 23-year-old, 320-seat 747s since they were delivered new in 1976. The airline ordered six 150-seat A320s in 1997 to update its fleet, which also includes six ageing Boeing 727-200s and seven Tupolev Tu-134s and Tu-154s. Two A320s have been delivered, and the rest are due this year.

According to Syrianair's commercial director Safaa Alkhayer, the new A320s can reach all the carrier's European, Middle Eastern, Indian and African destinations where the 747s are deployed. New points in North and South America and the Far East are being considered as possible applications for the Boeing 747s. Potential long-haul destinations include Rio de Janeiro and Kuala Lumpur.

"Traffic is very good to other Arab countries, particularly to the Gulf, and to Moscow, and there is good tourist traffic from Western Europe to south Asia and the Indian subcontinent," says Alkhayer.

Syrianair has seen some 20% annual growth in its passenger traffic, supporting revenue gains of 6-10%, while load factors are running at around 65%. Some services to eastern Europe have been dropped under the airline's policy of suspending services where traffic is low. ❑

Chicago Express finalises fleet expansion plans

CHICAGO EXPRESS is poised to decide on its fleet expansion strategy as the US regional airline moves to bolster its position at Chicago Midway Airport.

The wholly owned subsidiary of American Trans Air's (ATA) parent AmTran Holdings uses its fleet of nine leased British Aerospace Jetstream 31s on feeder services for ATA from Midway and for point-to-point services from the Chicago airport.

According to ATA treasurer and director aircraft programmes Charlie Cleaver, Chicago Express is experiencing "extremely high" load factors across its network and is in urgent need of a larger aircraft. "We are in the final analysis of used 30-seaters, including the BAe Jetstream 41, Bombardier Dash 8-100, Embraer [EMB-120] Brasilia and Saab 340, and there are plenty of aircraft available," says Cleaver.

The airline is studying offers for a "one-for-one replacement" for the J31s, says Cleaver, who adds that the decision should be made by the end of June.

"We hope to begin rolling over to the new aircraft by the end of the year, but we will have to co-ordinate the return of the J31s to lessors," he says. ❑

Geoffrey Jones

Aurigny introduces first Saab 340

AURIGNY AIR SERVICES has introduced the first of two Saab 340As for its new services to London Stansted and Amsterdam. The Channel Islands-based carrier will launch flights from Guernsey to Stansted on 4 June, while flights to Amsterdam will begin in July when the second Saab will have been delivered. Until now Aurigny has focused on inter-island services within the Channel Islands, but is expanding to fill the void left by KLM uk, which recently pulled out of Guernsey.

L'Aeropostale plans express cargo network

FRENCH company L'Aeropostale is discussing opening a new European express freight network in an alliance with subsidiaries of its two shareholders, La Poste and Air France.

The firm is about to embark on a major expansion of its capacity, replacing its two Boeing 727s with three cargo-configured Airbus A300B4s and four ATR 72 turboprops operating from its hub at Paris Charles de Gaulle Airport.

L'Aeropostale wants to look at combining freight express operations with La Poste's Chronopost and TAT Express subsidiaries along with Air France Cargo. The operation would begin in November, with delivery of the A300s. This would ensure better utilisation of the A300s, says the airline, and increase its freight activity to 70% of its total freight/passenger operation against 62% last year, says president Claude Viet.

Net profits for 1998 stood at Fr800,000 ($133,000) against Fr1.1 million the previous year, while sales fell by Fr1.1 million. ❑

AIRPORTS

++ Bologna's **Guglielmo Marconi Airport** is to spend L380 billion ($207 million) expanding its capacity. A series of projects running up to 2006 will start next year, with the airport lengthening the main runway. Work to follow includes completion of a new terminal, additional taxiways and a bigger ramp. Last year saw the airport increase passenger traffic by 13% to 2.8 million. Sab, the company running the airport, is also working on a project to integrate its activities at Bologna with Forli, Parma and Rimini, three other airports in the vicinity. ++ Continental Airlines has opened a $92 million expansion of its Cleveland, Ohio, hub. The Concourse D at **Cleveland Hopkins International Airport** provides 12 jet gates and 24 turboprop loading positions which can be converted to 12 additional jet gates. ++ **Hong Kong International Airport's** second operational runway opened on 26 May. The 3,800m (12,500ft) north runway is the same length as the operational south runway, but 15m wider. ++ **Minneapolis-St Paul International Airport**, Minnesota, has begun construction of a fourth runway, which will increase capacity by 25% when it becomes operational in 2003. The airport is also adding 20 new jet gates by 2002 and expects traffic to increase from 1998's 30.3 million passengers to more than 40 million by 2010. ++ The South African National Defence Force staff council has agreed in principle to open the **Waterkloof Air Force base** to civilian traffic to fund operations. The air force has recently upgraded runways, taxiways and movement control buildings at the base. The airfield is capable of handling Boeing 747-400s, vying with **Johannesburg International** as the only airfield in the Gauteng region able to handle large aircraft. Go-ahead is subject to an environmental impact study. ++ Air France has moved into the second half of Terminal 2F at **Paris Charles de Gaulle Airport**. The first section was opened last year. The terminal can handle 42% of the carrier's traffic at the airport.

JSF demonstrators swapped to cut costs

GRAHAM WARWICK/**MONTREAL**

LOCKHEED MARTIN has switched the roles of its Joint Strike Fighter (JSF) concept demonstrators to offset cost overruns on the programme.

The company had planned to fly its first X-35 concept demonstrator aircraft (CDA) in US Air Force conventional take-off and landing (CTOL) configuration, then convert it to US Navy carrier-capable (CV) configuration to demonstrate commonality between variants.

Now, to save money and compress the schedule, CDA number one will be converted to short take-off vertical landing (STOVL) configuration after initial flights as the CTOL demonstrator. This will avoid the time and expense required to fit the CV variant's larger wing control surfaces, fins and tailplane, says deputy programme manager David Palmer.

CDA 2, which was planned to be the STOVL demonstrator, will be completed in the CV configuration. The change is possible because both X-35s were always intended to be able to accommodate the shaft-driven lift fan and other lift system hardware, in case the STOVL demonstrator were to crash, says Palmer. Construction of CDA 2 is now about four months behind that of CDA 1, but the CV X-35 will fly only two months after the CTOL demonstrator because of the extensive ground tests planned for the first aircraft.

The lift system will be installed in CDA 1, and STOVL ground "pit" tests performed, before its first flight. After two months of testing in CTOL configuration, with the STOVL hardware disconnected, the aircraft will be grounded and the lift system reconnected. This will take only about a month, Palmer says, less time than it would have required to convert the X-35 to CV configuration.

The disadvantage of the new approach, says Palmer, is that the CTOL aircraft will be "about 4,000lb [1,800kg]" heavier than planned because of the lift system hardware. "We will have to extrapolate the results of flight testing to the lower weight of the CTOL JSF," he says.

In another move to offset cost overruns, some technology maturation work has been delayed. At the start of concept demonstration, Palmer says, 16 critical technologies and processes were identified that needed to be reduced to low risk by entry into engineering and manufacturing development (EMD). Now only 13 will be reduced to low risk when EMD proposals are submitted next year.

Palmer says the firm has agreed with the JSF programme office that it will complete the risk reduction work in the remaining three areas between submitting its proposal and the EMD shortlist, due in mid-2001. "We have not delayed any of the really critical technologies, such as the lift fan," he stresses. ❑

Elta radar pod cleared for F-16

ELTA'S EL/M-2060P synthetic aperture radar (SAR) pod for fighters has been certificated for use on the Lockheed Martin F-16. An unnamed air force has signed a contract for the radar and it has been offered for a Royal Air Force requirement to equip Panavia Tornados and Eurofighters. Built into a F-16 standard 1,140litre (300USgal) drop tank, and carried on the centreline hardpoint, the system is an autonomous, all-weather, day and night high-resolution reconnaissance SAR. Radar imagery is transmitted to a ground exploitation station via a bi-directional datalink. Israel Aircraft Industries subsidiary Elta says the SAR can cover 50,000km² (19,305nm²)/h.

Italian army A129 update is given go-ahead

ANDREA NATIVI/**GENOA**

ITALY'S PARLIAMENT has approved an army plan to upgrade its Agusta A129 Mangusta anti-tank helicopter fleet to widen its combat role.

Italian army aviation (AVES) has 45 Mangustas delivered and another 15 to be delivered with the improved avionics and sensor package, 20mm nose-mounted cannon and five-bladed main rotor of the 'International' export-standard A129. It also has an air-to-air missile capability for which the AVES has selected the Raytheon Stinger.

The army has launched a L378 billion ($205 million) programme to upgrade the 45 helicopters. It starts next year and lasts until 2006. The move has been driven by a desire to standardise the small fleet and give the anti-tank-dedicated A129 a wider combat capability.

The decision to update the helicopter is likely to lead to contractors mounting bids to unseat existing equipment suppliers. Lockheed Martin Electronics & Missiles has declared its hand, offering its Target Sight System (TSS) in an effort to replace the current electro-optic system.

Lockheed Martin's TSS is part of the Bell AH-1Z sensor upgrade. The AVES has been briefed on TSS, which incorporates a third-generation forward looking infrared, has a range of 8km (4nm) and is compatible with the Boeing AGM-114 Hellfire missile. The unit is mounted in a double gimbal system, a three-axis system internally and a two-axis unit externally.

TSS has been developed as an off-the-shelf, low-risk system using experience gained during development of the LANTIRN targeting and attack pods, the Boeing AH-64 Apache Targeting Acquisition and Designation Sight (TADS) and Lockheed Martin P-3 Orion upgrades. TSS options include the TADS tracker and a colour television sensor.

Lockheed Martin claims it is offering the system for Agusta's shortlisted Mangusta bid in Turkey, even though Israel Aircraft Industries' Taman has a memorandum of understanding to offer its electro-optic system . The system allows the helicopter to use Hellfire and TOW anti-tank missiles.

Mangustas and Agusta Bell AB412s have been deployed to Macedonia as part of the NATO-led Kosovo peace process. ❑

Additional reporting by Arie Egozi in Tel Aviv and Paul Lewis

Italian army wants wider combat capability for the A129

Victor Drapkin-Velov

The Su-33KUB could be the first in a line of two-seat naval Flanker derivatives

Twin-seat naval Flanker flies

ALEXANDER VELOVICH/**MOSCOW**

THE SUKHOI Su-33KUB made its first flight at the LII flight test centre at Zhukovsky on 29 April. The aircraft flew for about 40min with Sukhoi test pilots Victor Pougachev and Sergey Melnikov at the controls.

The Su-33KUB ("Korabelny Uchebno-Boevoi", or carrier combat trainer) side-by-side twin-seat naval Flanker variant is designed as a trainer, but is reported to be the basis for a family of multirole naval aircraft for fleet defence, attack, reconnaissance, electronic warfare and possibly early warning radar missions. All will require two crew.

Although the cockpit is similar to that of the Su-27IB strike aircraft, the nose has a circular rather than oval cross section and houses a Phazotron N-014 radar similar to that of the Su-35/37. An infrared search and track sensor is placed ahead of the centre canopy.

Wing span and area are 12% larger than those of the single-seat Su-33, while the foreplanes and tail surfaces are also enlarged. Wing leading- and trailing-edge high-lift devices provide direct lift control. The leading-edge slats have an adaptive fairing which encloses the slot behind the slat to maintain aerodynamic efficiency.

Sukhoi says weight saving measures, including the greater use of composite materials and the removal of the tail fold mechanism, keep the Su-33KUB's weight to about the same as the single-seat aircraft.

The pace of development will be determined by the availability of funds. Sukhoi general designer and general director Mikhail Simonov says private venture funds have been used on the programme.

Top rank Russian naval officers, including the commander-in-chief and the aviation commander, saw the maiden flight. ❑

E-2C technology part of AEW offer to Australia

NORTHROP GRUMMAN is including electronically scanned technology from the planned E-2C radar modernisation programme (RMP) as part of its airborne early warning (AEW) offer to Australia for the soon-to-be decided Project Wedgetail.

Australia is expected to finalise its choice of AEW systems from three competing systems within a month. Northrop Grumman is competing with the Advanced UHF Radar (AURA) in a dorsal-mounted rotodome fitted to the Lockheed Martin C-130J.

The mechanically scanned AURA includes a 360° electronically steered array capability, the core of which has been adapted from the next generation RMP planned for the Future Hawkeye, says Ken Tripp, Northrop Grumman AEW business development manager. AURA is designed for small target detection and tracking in high clutter overland environments.

RMP will replace the E-2C's mechanically scanned APS-145 radar, which originally formed the basis of the Northrop Grumman/Lockheed Martin C-130J AEW proposal to Australia. The two other Wedgetail contenders, the Raytheon/Elta Phalcon-equipped Airbus A310 and Boeing/Northrop Grumman 737 MESA, are electronically scanned systems.

Northrop Grumman plans to demonstrate a RMP system in 2001-2 using a C-130. The system consists of a space/time adaptive processor, solid-state transmitter, high dynamic range receivers, 18-channel rotary coupler and ADS-18S antenna.

Future Hawkeye is intended as a follow-on package of improvements to the latest Hawkeye 2000 standard aircraft, 21 of which were recently ordered by the US Navy for delivery in 2001-6. Northrop Grumman sees a second requirement for an extra 15-20 new aircraft, which could incorporate elements of Future Hawkeye.

"Our goal is not to have a break in production," says Northrop Grumman AEW senior vice-president Lou Carrier. The company anticipates a US Navy contract by the end of 2003 to upgrade at least 45 Group 2 E-2Cs to Hawkeye 2000s. ❑

Israel, France and USA join for training

ISRAEL'S BVR Systems has teamed with Sextant Avionique of France and Flight Visions of the USA to offer the Advanced Training Avionics Suite (ATAS). The system allows pilots to train on fighter-type avionics while flying low-cost trainers.

Sextant is offering ATAS on the MiG-AT trainer. The French company provides navigation/attack systems for the Russian aircraft. ATAS replicates systems on front-line aircraft, such as multifunction and head-up displays, radar and radar warning receivers. Using pre-programmed scenarios these simulate an engagement without requiring a second aircraft to act as an aggressor. The pilot fights the action against a virtual target while receiving typical cockpit cues such as radar and missile warnings. ❑

NEWS IN BRIEF

■ BELGIAN AMRAAM

The Belgian air force has declared operational its first squadron with the Raytheon advanced medium range air-to-air missile (AMRAAM). An initial batch of 34 missiles was delivered this year following a September 1996 order. The $30.6 million deal was for 72 missiles and 16 captive training missiles.

■ IRIS-T CLARIFICATION

Bodenseewerk Gerätetechnik has asked us to correct two points in an article in *Flight International*, 24-30 March, concerning development of the IRIS-T short-range missile. IRIS-T development began in January 1998 and is to end in 2002. The Italian Government funded project definition work but Alenia did not contribute funds to the programme. The article had said development "begins this year and is due to finish in 2004" and that "Alenia Difesa has contributed L6.4 billion" to the work.

NEWS IN BRIEF

■ ORION UPGRADE
Raytheon has flown the first Royal Australian Air Force Lockheed Martin P-3C to be upgraded to AP-3C Sea Sentinel standard with new navigation, communication, radar and acoustic systems. The aircraft will complete three months of acceptance flights at Raytheon System's Greenville, Texas, plant before delivery to RAAF Edinburgh for operational evaluation and crew training.

■ TEXAN OPTION
The US Air Force and Navy have exercised an option for 22 additional Raytheon T-6A Texan primary trainers, taking the number ordered to 69, of over 700 planned. Bombardier has ordered 24 for its NATO Flying Training in Canada programme, and Greece is negotiating for 45 T-6s.

■ THIRD F-22 APPEARS
Lockheed Martin has rolled out the third F-22 Raptor. It will be equipped with structural instrument calibration.

Quad TiltRotor under study

GRAHAM WARWICK/**MONTREAL**

BELL BOEING is studying a four-proprotor tiltrotor aircraft as a potential replacement for both heavylift helicopters and tactical transports.

The initial concept for the Quad TiltRotor (QTR) is to use the wing, nacelles, engines and proprotors from the Bell Boeing V-22, mating them to a modified Lockheed Martin C-130-30 fuselage to produce an aircraft that could be developed "within a few years".

The resulting tandem-wing aircraft would have a vertical take-off gross weight of over 45,500kg (100,000lb) – twice that of the V-22 – and a maximum take-off weight of more than 63,500kg. Compared with a V-22, payload could be more than doubled, to 36,000-40,000kg.

Using existing components would reduce development and production costs. One set of V-22 wing/nacelle sections would be attached to the top of the forward fuselage. Another would be attached to a stub wing mounted over the rear fuselage, extending span. Using a stretched Hercules fuselage would allow the resulting aircraft to carry C-130-compatible payloads. Talks have been held with Lockheed Martin, but no agreement is in place, sources say.

Bell-Boeing could produce a Hercules-sized tiltrotor within a few years

The QTR is in conceptual design, with watertunnel testing under way to visualise the complex flow around the two wings and four proprotors.

As four propellers are not required in the cruise, a more advanced concept would fold the blades of the rear pair of rotors back along the nacelles after the transition from vertical to forward flight.

Bell is considering modifying its Eagle Eye tiltrotor unmanned air vehicle to flight test the folding-proprotor concept. In this case, the blades would be folded flat along the nacelles and jet thrust used for forward flight, to produce a high-speed convertible tiltrotor.

Work on the QTR is company-funded, but sources claim there is considerable interest in the concept from potential customers. These could include the US Marine Corps, which is in the early stages of looking for an advanced rotorcraft to replace both its KC-130 tankers and Sikorsky CH-53E heavylift helicopters. US Special Forces also have a long-standing requirement for an "ultra-short take-off and landing" advanced tactical transport. ❑

THAAD test delayed as Hera malfunctions

A CRITICAL TEST of the US Army Lockheed Martin Theater High Altitude Area Defence (THAAD) was aborted on 25 May after the Hera target missile malfunctioned because of an attitude control problem before the hit-to-kill missile was launched from the White Sands Missile Range, New Mexico. The test has not been rescheduled.

The THAAD missile has failed to intercept targets in all six flight tests since 1995. Lockheed Martin agreed to a $15 million penalty for the last test failure in March. The pact calls on Lockheed Martin to score two test successes by 30 June or lose an additional $20 million. In all, the US aerospace firm could face $75 million in penalties by the end of the year. ❑

Boeing joins EH101 team for Canadian bid

BOEING HAS JOINED the EH Industries-led team planning to offer the EH101 for the Canadian Forces' Maritime Helicopter Programme (MHP).

Boeing will supply the maritime patrol mission system for the Cormorant version of the EH101 that will be offered to meet the 35-aircraft Sikorsky Sea King replacement requirement. The system will be derived from that under development by Boeing for the UK Royal Air Force's upgraded British Aerospace Nimrod MRA4.

Team Cormorant is already under contract to build 15 search and rescue versions of the EH101 for the Canadian Forces. The first is to be handed over in Italy in October next year, and the Cormorant is scheduled to enter service in Canada early in 2001.

Industry sources believe Canada is close to launching the C$2 billion ($1.4 billion) MHP competition. The Government has been provided with a "menu" of procurement options by the Canadian Forces. These include: directed procurement of entire programme from a single prime contractor; directed procurement of the aircraft and a mission system competition, and vice versa; and a contest to select a prime contractor for the overall programme.

Team Cormorant is backing the latter option with its selection of Boeing as mission-system-integrator. None of the other likely bidders has declared its hand yet, although a Team Canada consortium led by Lockheed Martin has been pushing for directed procurement of the entire programme. Other potential bidders are Eurocopter with the Cougar 2 or 3, and Sikorsky with the SH-60 or S-92.

■ Three EH Industries Merlin HM1s, operated by the UK Royal Navy, have completed a series of trials at the Atlantic Undersea Test and Evaluation Centre in the Bahamas.

The tests formed part of the Operational Performance Acceptance Procedure and concentrated on the Merlin's anti-submarine warfare capabilities. ❑

NATO directors split decision on ground surveillance needs

STEWART PENNEY/**LONDON**

THE NATO Conference of National Armaments Directors (CNAD) has agreed on a twin-track approach to satisfying the Alliance's air-to-ground surveillance (AGS) requirement.

A US-led group, including Canada, Denmark and Norway, will move ahead with a two-year project definition phase for a system based on the Northrop Grumman/Raytheon Radar Technology Insertion Programme (RTIP) while France, Germany, Italy and the Netherlands will continue with the Stand-Off Surveillance Target Acquisition Radar programme.

CNAD's decision moves forward a programme which had stalled, with European nations keen to maintain national radar capabilities and the USA willing only to fund a programme based on its own Joint Surveillance Target Attack Radar System for which the RTIP is an ongoing upgrade. A NATO source describes the decision as "a sensible divorce", which removes the problems caused by NATO members progressing at different speeds.

The UK is acquiring its own AGS and is close to a decision on awarding a contract for its business jet-based Airborne Stand-off Radar (ASTOR) competition. BAe is offering an RTIP-based system as part of Team Wizard with Northrop Grumman.

Raytheon and Lockheed Martin are also competing for the ASTOR requirement. ❑

Boeing and Elbit sign MoU to link on Polish helicopter bid

BOEING AND Elbit Systems have signed a memorandum of understanding (MoU) to co-operate on upgrading Polish air force PZL-Swidnik Sokol helicopters.

Last year, the two Western companies argued over the controversial decision by the Polish Government to award the Israeli company prime contractorship on a deal to upgrade the avionics and supply weapons for an attack version of the Sokol.

Late last year, the Polish Government backed out of an agreement signed in October 1997 during the last few days of the outgoing government's term of office, following a general election defeat.

The Israeli deal was to provide systems and weapons for 100 Huzars. Elbit led the consortium and was to have supplied the avionics suite, while Rafael was supplying its NT-D anti-tank missile, with El-Op providing the night vision system.

The Polish Government recently decided to split the requirement, issuing a request for information for 50 dedicated attack helicopters and the upgrade of a similar number of PZL-Swidnik Sokol helicopters for the support role (*Flight International*, 19-25 May). ❑

Airbus' on-board cargo lifter makes the Beluga self-loading

Airbus develops cargo lifter

AIRBUS IS DEVELOPING a novel on-board cargo lifter for its A300-600ST Beluga outsize-freighter as part of its proposal to meet the Royal Air Force Short Term Strategic Airlifter (STSA) requirement.

The cargo lifter allows freight to be loaded and unloaded without the need for ground support equipment, says Airbus director of transport operations, Arnaud Martin. Built into the front of the Beluga's cargo hold, the cargo lifter is compatible with all STSA essential loads, including the Boeing CH-47 Chinook and AH-64 Apache helicopters and the Warrior armoured fighting vehicle.

Martin says Airbus has completed modelling work that proves the cargo lifter concept, but it has not selected the mechanical systems.

Airbus' STSA bid is based on one Beluga and four A300-600F freighters. Martin says that all will be new-build aircraft, which will need a sixth A300-600ST to be produced.

He adds that the bid could be modified to two Belugas and three A300-600Fs if the RAF is concerned about having only a single large-volume aircraft.

Other STSA bidders include Boeing and Airbus Industrie partner British Aerospace offering four C-17 Globemasters, while Air Foyle is proposing Antonov An-124s, re-engined with Rolls-Royce RB211s, and IBP is offering unmodified An-124s. ❑

Marconi wins laser demonstrator deal for RAF's DIRCM

MARCONI Electronic Systems has won a £2 million ($3.2 million) technology demonstrator contract to develop a laser for Northrop Grumman's AAQ-24(V) Nemesis Directional Infrared Countermeasures (DIRCM), being fielded by UK forces.

Last month, Marconi delivered a mid-infrared wavelength, single-band, solid-state laser to the UK Defence Evaluation and Research Agency (DERA), which has been working with the company on the technology for several years.

Flight trials will be flown later this year, using a DERA-operated Westland Sea King helicopter. At the end of the trials, the UK will decide whether to fit Nemesis with a laser.

Northrop Grumman and Marconi are supplying Nemesis for 14 helicopter and large fixed-wing types operated by UK forces. British Aerospace Systems and Equipment and Rockwell are also team members.

The Ministry of Defence will not name aircraft, apart from the Lockheed Martin C-130 Hercules and the Sea King, but its is known that the Boeing Chinook, British Aerospace 125 and BAe 146s used for VIP and Royal flights will have the system.

The turret-mounted DIRCM has the capacity to accept a laser as an additional method for defeating infrared-guided missiles. The baseline unit relies on a flashing high irradiance arc-lamp to blind approaching missiles.

A DIRCM-equipped helicopter has been awarded its military aircraft release (MAR) and fielded. An MAR for a fixed-wing type was due by the end of May, while another two are close to completion.

Fitting a laser to Nemesis makes it possible to develop a system compatible with fast jets. The two current turrets produce too much drag for fast-jet applications.

DIRCM relies on data from an missile warning system to steer the turret towards threats. Having acquired the approaching threat, it jams the missile until it runs out of energy and falls away. ❑

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MERGERS

++ **Aircraft Service International Group (ASIG)** has acquired **Elsinore Airport Services,** which provides ground handling at 23 sites in the USA and the Caribbean. ASIG has ground-handling and fuelling operations in 56 cities in North America and Europe. ++ UK engineering group **McKechnie** is to acquire US aerospace parts company **Walker Sky Industries** for £162 million ($260 million). ++ **Sabreliner** is to sell its commercial aviation maintenance repair and overhaul operations to a group led by **Aviation Management Systems.** ++ Toronto-based **Magellan Aerospace** has agreed to buy **Ellanef Manufacturing** of the USA, a specialist in high-heat and special metals manufacture for various aerospace applications. ++ Germany's **Liebherr Aerospace** completed its acquisition of **ZF Luftfahrttechnikwerk Friedrichshafen's** *airliner flap system gears business* on 1 June. The latter will continue to manufacturer drive shaft gears for helicopters. ++ **Aeromaritime Mediterranean** of Virginia, USA, has bought **Heliwork Services** of the UK for an undisclosed sum. Heliwork specialises in helicopter service and refurbishment, while Aeromaritime operates as a Rolls-Royce Allison 250 maintenance provider from its principal facility in Malta. ++ Electronic and aerospace products specialist **Ametek** has acquired **Gulton-Statham Transducers**, which makes electronic pressure components for commercial and military aircraft climate control systems and door sensors, for $23 million. ++ **Heico** has bought Miami-based avionics repair specialist **Air Radio & Instruments** *for $3.5 million. Both companies* are based in Florida. ++ **Northrop Grumman** is boosting its information technology activities with a $33 million purchase of **Data Procurement**, an outsourcing company with a $60 million turnover. The operation will become part of Northrop Grumman's **Logicon** information technology business.

Poland and Bulgaria prepare to privatise national carriers

ANDREW DOYLE/**MUNICH**

PLANS BY Poland and Bulgaria to sell off major stakes in their state-owned flag carriers are gathering pace. A strategic partner is being sought for LOT Polish Airlines, while Balkan Bulgarian Airlines is set to get a new majority shareholder.

The Polish Government is preparing to sell 38% of LOT to an airline partner by the end of this year to integrate the carrier into a major global alliance. Leading potential investors are oneworld founder British Airways, which already has an extensive alliance with LOT, and Star Alliance member Lufthansa.

Though the German flag carrier has traditionally shied away from taking equity stakes in its alliance partners, it confirms a "general interest" in co-operating with LOT. But it declines to comment on whether it would consider an equity stake.

The privatisation will also see LOT's employees taking 10% of the airline. The Government plans to dispose of its remaining 52% stake through a public offering. The bulk of the 38% stake being offered to a strategic airline partner will comprise newly-issued shares, allowing the Polish carrier to be recapitalised.

Poland's LOT is searching for a strategic partner

Poland's state treasury is due to issue "invitations to negotiate" to several major airlines imminently, says LOT. The airline made a small profit in 1998 and says it expects to remain in the black this year.

Meanwhile, Bulgaria's privatisation agency is drawing up a shortlist from five bids received for a 75% stake in Balkan Bulgarian. The sell-off is proceeding, it says, despite the disappointment of no bids from European airlines.

The five bidders are Israel's Zeevi Group, which includes Arkia Airlines, German investor Ulrich Behdeler Atakan, a Russian consortium including Tupolev and several regional airlines, Luxembourg-registered Data Control Holdings and Air Rent, also based in Luxembourg.

The lack of interest from European carriers may stem from the fact that the Bulgarian Government last year blocked at the last minute a bid by a management-led consortium, backed by Lufthansa, to take control of the airline.

Romania is also looking at privatising flag carrier Tarom and is recruiting consultants to advise it on the sell-off, which could take place early next year. ❑

Vnukovo acts to stem losses

VNUKOVO AIRLINES, Russia's second-largest airline in terms of passenger numbers, has changed its general director and several of its senior management following several years of heavy losses.

The new general director is Vladimir Roubtsov. He was a senior official in the Soviet Ministry of Civil Aviation and was with Aeroflot's International Commercial Department before becoming deputy director general of Alak, Russia's first leasor. He then became director of transport at Intourist, the Russian state-owned tour operator. Roubtsav has begun reorganising schedules and routes since he was appointed, on 19 May.

Tateros Surinov, the former general director who has control of a substantial shareholding in Vnukovo, has become chairman in a non-executive role, although this is believed to be a short-term move. Vnukovo is a member company of Surinov's Russian Aviation Consortium formed to promote the Perm PS-90A-engined version of the Tupolev Tu-204.

The losses resulted from Vnukovo's efforts to increase passenger numbers by undercutting rivals. ❑

UPS boosts II Morrow

UNITED PARCEL Service (UPS) has committed new financial and management resources to its II Morrow subsidiary and changed the name of the Salem, Oregon-based company to UPS Aviation Technologies.

The former II Morrow's Apollo brand avionics line has been expanded to a full-product system that includes new navigations/communications, a new transponder, two new audio panels, a colour multifunction display, complementing its global positioning system range. UPS Aviation Technologies products will retain the Apollo brand for its products. ❑

BA to cut European short-haul routes

CHRIS JASPER/**LONDON**

BRITISH AIRWAYS is planning to axe 25% of its short-haul routes within Europe as part of a radical approach to a growing crisis centring on declining yields. The UK flag carrier saw pre-tax profits plunge more than 61% to £225 million ($360 million) for its financial year to 31 March – and though much of that decline is attributable to fallout from the East Asian crisis, BA admits that the slump is not solely to blame for its stuttering performance.

The downward trend in yields is an ever-present problem for airlines worldwide, but BA's has been especially steep, largely because of the carrier's commitment to taking premium class passengers at premium prices. When the transfer of spare Asian capacity led to overcapacity in the transatlantic market, BA was inevitably hard-hit as business travellers took advantage of cheaper fares offered by its rivals.

BA half-heartedly responded by cutting some fares, but the airline sees its long-term salvation in the overhaul of its business-class product to combat the perception that it no longer represents value for money, while addressing "structural" concerns in a way that should help to boost yields.

BA's decision to cut 20 of its 80 European routes was disclosed by chief executive Bob Ayling, just after the airline revealed its drop in profits. He added that the slots freed up through the move would be used to increase frequencies on the routes that BA is retaining, so the carrier is effectively concentrating more of its resources on services which are most profitable.

In a further structural move, BA confirmed it will switch to smaller aircraft for many of its European services, a strategy that will increase the proportion of business- to economy-class passengers on its flights, thus increasing yields. The switch will see BA withdraw some of its London Heathrow-based 200-seat Boeing 757s, and replace them with Boeing 737s or Airbus A320-family aircraft (*Flight International*, 12-18 May).

EMMA DE MAUGANE

BA is hoping to stop premium passengers leaving for less expensive rivals

The carrier has instituted a similar policy for its long-haul fleet, with its 380-seat Boeing 747 Classics to be replaced by 270-seat 777s, of which BA has 23 in service and 22 due for delivery, some of which were ordered instead of 400-seat 747-400s. BA has cancelled its nine orders for the latter type, and will cap its -400 fleet at 57 aircraft.

As part of the same yield-focused initiative, BA sources suggest the carrier may also farm out further services to franchise operators. Some of the routes BA may discard include those which are popular with passengers feeding on to other short-haul services, rather on to high-yield, long-haul services out of its Heathrow and Gatwick hubs. Losses on European operations rose last year to £166 million from £127 million.

"We want to serve the UK as best we can, but at the end of the day we also want to be profitable," says one source at the airline. "What we don't want is short-haul-to-short-haul transfer traffic. We'd rather try and offer those services point-to-point or not at all."

KEY DATA FROM BA RESULTS TO END OF THE YEAR MARCH 1999

	1999 (£m)	1998 (£m)	% change
Revenue	8,915	8,642	3.2
Operating profit	442	504	-12.3
Pre-tax profit	225	580	-61.2
Profit after tax	206	460	-53.9
Operating costs	8,473	8,138	4.1
Employee costs	2,356	2,211	6.6

BA's radical route and fleet plans will parallel the £200 million introduction of beds for business passengers in what amounts to a relaunch of its Club World branding. The aim is to restore the branding's popularity and hence BA's position as a premium international carrier, allowing it to regain control of its pricing structure, although there are questions being raised internally on how long the carrier can maintain its premium business class fares.

"What they are trying to do is reproduce the success they had in 1986-7 when Club World was launched," says analyst Chris Tarry of Commerzbank. "If you can make yourself the airline of first choice you can then begin to control availability of your product and start to cut out price discounting."

He adds: "Having decided to go down the point-to-point route for their long-haul network, capacity is going to come right down and the City will now be watching each month when the traffic figures come out."

There are, nevertheless, inherent dangers to BA's strategy. The airline could have opted to reduce frequencies in Europe and operate larger aircraft, but having pledged itself to the alternative approach it must make sure it gets the frequencies right. In the long-haul market, the purposeful surrender of low yield market share also carries risks, but so long as traffic is shed only from the back of its aircraft, BA's yields can only improve.

The strategy of capacity reduction is tied closely to BA's problems at Heathrow, which is already groaning under the weight of traffic. While the carrier may have opted to reduce dependence on transfer traffic under other circumstances, the Heathrow problem has certainly forced the issue.

BA's moves contrast markedly with those announced by its biggest European rival, Lufthansa. It is planning a sharp increase in capacity and seeking market share, having claimed that it lagged behind other airlines in increasing capacity over the last few years.

The UK carrier's turnover rose 3.2% to £8.92 billion last year, but available tonne kilometres (ATK) increased by 12.1%. It says: "The general economic slowdown, coupled with relatively weak demand in the premium passenger market and industry-wide price discounting, produced an operating profit of £442 million."

The most worrying trend was the slump in yields. For the year overall yield per ATK was down 8.2%. That slipped further in the last quarter to 10.5%. ❑

PEOPLE

++ **City Bird Cargo** has appointed **Lucien Huesmann** chief executive. Huesmann joins the recently created cargo arm of Belgian airline City Bird from Cargolux Airlines where he was director of the Luxembourg-based carrier's fast-growing Latin American operations. ++ **Bristow Helicopters** has named **Keith Chanter** chief executive. Chanter, who replaces Stephan Palframan, joined Bristow in 1997. ++ **Butch Bouchard** has become president of **Mercury Air Cargo,** having held the position temporarily. Before joining Mercury, he was president and owner of Excel Cargo, the Canadian air cargo handler acquired by Mercury Air Group in 1997. ++ **Ronald Zielinski** has been appointed **Dassault Falcon Jet's** vice-president of marketing for the US Western region. Previously international marketing vice-president, he replaces Neil MacDonald, who is to retire. Zielinski's old position is taken up by **Jeffrey Habib,** now international sales manager for North Asia. ++ **Visionaire,** the US company pioneering development of the Vantage single-engined business jet, has strengthened its management with four senior appointments. **Don Kozlowski** becomes president and chief operating officer, from executive vice-president, and Vantage programme manager, while **Fred Miller** steps up from acting president to vice-chairman. **Gregory Bubb** becomes chief financial officer and senior vice-president and **Joseph Furnish** vice-president engineering. **James Rice** remains chairman and chief executive.

EC rebuff forces KLM to drop bid for total Martinair control

KLM ROYAL Dutch Airlines has dropped plans to acquire the 50% holding in Dutch operator Martinair that it does not already own. The news comes after KLM failed to reach agreement with the European Commission (EC) over the conditions required to let the deal go ahead.

In the face of an expected formal rejection of the deal from the EC, KLM abandoned the Fl350 million ($170.7 million) purchase of shares from Nedlloyd, its partner in Martinair.

Martinair operates scheduled, charter and cargo flights with Boeing 747s, 767s and MD-11s in passenger and cargo configurations.

Martinair president and chief executive Aad van Bochove says the decision is a "major setback in our efforts to streamline our operations with KLM and Transavia [the Dutch airline owned 80% by KLM]". Although it had failed to win the argument on this occasion KLM suggests it has not entirely given up on the take-over. "Later, under different circumstances, determination on this matter can be carried out easier without a formal rejection from the EC," it says.

MICHAEL KELLY

Martinair's MD-11s will stay in the same colours

EC Competition Commissioner Karel Van Miert says the take-over foundered on the fact that competition in the Dutch leisure market would have been eliminated. There were complaints from the only non-KLM owned charter operator, Air Holland, and from Dutch tour operators, on market dominance. The deal would have given the flag carrier control over 65% of the Dutch charter market to the Mediterranean and 75% of the market to other European markets.

Following the decision, Nedlloyd said it had "the situation under discussion, but sale of Martinair shares to other parties is a non-issue". But Dutch financial analysts forecast that Nedlloyd may be sold to an independent investor, such as the Dutch National Investment Bank, which also owns 20% of Transavia's shares. ❑

Bombardier loses Canadair Regional Jet partner

BOMBARDIER HAS lost one of its key risk-sharing partners on the Canadair Regional Jet (CRJ) Series 700 programme, although the company concerned will continue as a subcontractor.

Vancouver-based Avcorp Industries says increased non-recurring costs on its contract to design and develop the horizontal and vertical stabilisers for the stretched CRJ have forced the company to write off C$8 million ($5.5 million).

Bombardier has agreed to accelerate payment of C$15 million to Avcorp for transfer of the intellectual property rights on the components. The manufacturer will be responsible for test and certification of the CRJ-700 tail.

"We could not afford to continue to spend to completion," says Avcorp, which blames design changes "beyond that anticipated" for the increased costs. Avcorp will supply production horizontal and vertical stabilisers as a subcontractor. The company supplies Bombardier with horizontal stabilisers for the CRJ-200 and Challenger.

Participation in further risk-sharing projects is "questionable", admits Avcorp. It has submitted a bid to supply the tail section of Bombardier's planned Continental mid-size business jet. ❑

Precision Castparts leaves Scaled Composites on tenterhooks

PRECISION CASTPARTS (PCC) says that it has yet to decide whether to keep Wyman-Gordon's Scaled Composites subsidiary once its acquisition of the forgings specialist is complete. Senior PCC executives visited the Burt Rutan-run prototyping operation at the end of May.

PCC, which produces structural and airfoil castings for gas turbine engines, announced last month that it is to buy Grafton, Massachusetts-based forgings specialist Wyman-Gordon for $825 million cash in a deal that will strengthen the Oregon-based company's position in the aircraft engine and airframe structural components markets.

Wyman-Gordon owns Scaled Composites, based in Mojave, California, and its Colorado-based Scaled Technology Works production arm.

The company acquired Rutan's operation in the 1980s, but it accounts for only a "few per cent" of Wyman-Gordon's revenues, according to PCC.

Wyman-Gordan achieved sales of $753 million and profits of $33.9 million ,while PCC reported profits of $103 million on sales of $1.4 billion. The figures were a record for both companies. ❑

Eagle gets Texas training

GRAHAM WARWICK/**WASHINGTON DC**

FLIGHTSAFETY International is to build a new training centre at Dallas/Fort Worth airport in Texas. The facility will be near the FlightSafety Boeing simulator centre.

The new building will accommodate 16 full-flight simulators for corporate and regional aircraft. It is just one of several new centres being built by the company. The Dallas/Fort Worth site will provide training coverage for regional airline American Eagle.

The FlightSafety/Boeing joint venture provides training for aircraft with 100 or more seats and has either taken over existing FlightSafety centres or is building dedicated facilities.

FlightSafety, meanwhile, is building its own new centres. In addition to Dallas/Fort Worth, it is to construct a regional airline training base near Memphis airport in Tennessee. This will open within a year and will be equipped initially with Level D simulators for the Saab 340 and Bombardier Canadair Regional Jet (CRJ), to provide training for Northwest Airlink carrier Express Airlines I.

Meanwhile, the company's Cincinnati, Ohio, training centre is being relocated adjacent to Delta Connection carrier Comair's headquarters at the airport. The facility will be equipped initially with an Embraer EMB-120 simulator and two CRJs, with space for a third to be installed within a year.

The popularity of regional jets is helping drive FlightSafety's expansion. The company plans to operate 16 Level D simulators for the CRJ and Embraer RJ-135/145 by the end of next year. Its third CRJ machine has just been installed in Louisville, Kentucky. Its third ERJ-135/145 is operational in Paris.

FlightSafety's fourth CRJ simulator will be installed in Salt Lake City, Utah, later this year. Its fourth ERJ-135/145 machine has been delivered to Houston, Texas. An ERJ-135/145 simulator is to be installed in the company's new training centre in Manchester, UK, at the end of the year.

■ FlightSafety's new Bell 430 helicopter flight simulator has received Level C certification. The device is based at the company's Bell training centre in Fort Worth alongside a Model 412EP machine, the first helicopter simulator to be certificated to Level D. ❑

Q400 simulator ready for airline crews

BOMBARDIER AND FlightSafety (FSC) have completed the relocation and reconstruction of the Dash 8 Q400 simulator from Tulsa to the FSC training centre at Bombardier's Downsview, Toronto, plant. Interim level C approval is expected next month, when launch customer pilot training is to begin. Level D approval of the FlightSafety Millennium Series Vital 8 simulator is targeted for July 2000.

CAE to supply weapons trainer for USAF crews

CAE ELECTRONICS is to supply an eighth Lockheed C-5B weapon system trainer to FlightSafety Services, for training US Air Force crews.

The contract is worth C$26.5 million ($18 million). The Level C-standard simulator will be delivered in early 2001. CAE supplied all seven C-5B trainers in service.

FlightSafety was awarded a 10-year extension of its C-5 aircrew training system contract in May. The deal, worth $240 million, includes an extra C-5B simulator for the US Air National Guard.

CAE, meanwhile, has received a contract from American Airlines for the third Boeing 737-800 simulator to be ordered under 1997's long-term supply agreement. ❑

NASA launches virtual control tower

NASA HAS PLACED into service a full-scale virtual reality air traffic control tower, which will be used to study ways of improving airport capacity and safety. The virtual tower is installed at NASA's Ames Research Center at Moffat Field in California.

"With runway accidents growing 15% a year and passenger traffic expected to double by 2015, this research facility allows airports to widen the safety envelope and push the capacity envelope," says Yuri Gawdiak, aviation safety programme project manager.

The two-storey facility uses a Silicon Graphics Onyx2 workstation to process real-time graphics, imaging and video data. Using sources such as satellite imagery, digitised photographs and architectural drawings, the system can portray any airport in the world on a 360° outside-world display.

The top floor is a 7.3m (24ft)-diameter tower cab with 12 air traffic control positions. The wrap-round display allows controllers to move around as they would in a real tower, while the image generator can simulate up to 200 moving aircraft and vehicles. The lower floor can house up to eight ramp control and airport operators and up to 13 "virtual" pilots.

The virtual tower is initially being used to study San Francisco airport, the US leader in ground delays caused by weather. A new runway is planned and a computer model of the airport is being used to determine placement for the best air traffic flow. ❑

NEWS IN BRIEF

■ LOW-COST WORK

Wicat Systems, with Faros, Airbus and Aerospatiale, has introduced a maintenance training device (MTD), which is being offered as a low-cost alternative to simulators used for Airbus A320 cockpit-based maintenance procedures training. Derived from Wicat's flight management system trainers, the MTD uses full-flight simulator software.

■ REGIONAL TRAINING

Camber Flight Simulation has purchased two Concurrent Power Hawk computers for use in development of flight simulators to train pilots for small/medium-sized regional airlines. After the development phase, Concurrent says, Camber will buy three systems a year.

■ C-130H AGREEMENT

Raytheon and the US Air Force have agreed jointly to sell aerodynamic data packages for Lockheed Martin C-130H2/3 simulators. This will allow other operators to upgrade or buy simulators to Level D certification standards. Raytheon says it has built the only C-130H2 simulator with certificatable aerodynamic fidelity.

■ DUTCH TRANSPORT

A consortium led by Siemens Nederland is to upgrade the Netherland's National Aerospace Laboratory's Research Flight Simulator with a generic transport aircraft cockpit. Elan Training Equipment will supply simulated instruments, panels, pedestals and sidesticks for two-, three- and four-engined configurations.

■ CHINESE IN DAKOTA

China Xinhua Airlines is to train flightcrews at the University of North Dakota's UND Aerospace. An initial 12 pilots will begin the six-month course in June.

ONLY ONE INTEGRATED STANDBY UNIT CAN DISPLAY THIS.

It's a reassuring sight for anyone who flies. Having been awarded Federal Aviation Regulation 25 certification, the Integrated Standby Instrument System from Smiths Industries is the first to be cleared for use in Air Transport aircraft. The system is a highly accurate solid-state unit displaying all standby flight and air data.

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Our standby system has already been installed on MD-90s, and is standard fit on the Boeing 717.

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Pressure builds for single-engine change

DAVID LEARMOUNT/**LONDON**

TEN JOINT Aviation Authorities (JAA) countries, plus Canada and the USA, have submitted proposals to the JAA in favour of reducing restrictions on single-engine turboprop commercial operations. Only the UK has filed against the proposals.

The Joint Aviation Requirements Operations (JAR Ops) on the subject will be implemented on 1 October. JAR Ops forbid commercial single-engined operations at night and in instrument meteorological conditions (IMC).

The Scandinavian countries and France have indicated that they would ignore the JAR Ops as they stand.

This act of defiance would be the first overt challenge to the JARs, which are not legally binding. National regulations in France, Ireland and Scandinavia allow single-engined commercial IMC operations.

To prevent any countries defying the JAR Ops, and because the JAA study into the rule change is expected to go beyond the implementation date, the countries concerned have requested that JAR Ops' wording allows for the application of individual JAA nations' own rules until the notice of proposed amendment study has produced a verdict.

Submissions to the JAA from 55 operators and service companies are unanimous in backing JAR changes. Nine out of 10 associations which filed comments support the proposals, with the British Airline Pilots Association dissenting. Five out of six aircraft manufacturers are in favour. Britten-Norman dissents.

Bob Crowe, chairman of UK-based Bob Crowe Aviation Sales, says the applicants for change are not expecting JAA clearance "for a few years yet" for single-engined night/IMC passenger operations, but they believe that winning approval for cargo operations is feasible. ❑

New Piper is gearing up for a flood of Meridian orders

New Piper stays on target for Malibu Meridian certification

ORDERS FOR New Piper Aircraft's Malibu Meridian single-turboprop business aircraft have passed the 100 mark, according to the manufacturer. Deliveries of the machine are scheduled to begin in mid-2000.

The backlog topped 100 with an order from Flightline Group of Tallahassee, Florida, which has been appointed the Piper dealer for that region of the USA.

The manufacturer says it has 82 Meridian orders from US customers and 19 from customers outside the USA.

A Meridian prototype has been in flight testing since August last year and has logged over 250h in 200 flights.

Three conforming pre-production prototypes will join the flight test programme later this year, and will be used for powerplant, systems and handling qualities certification. A fifth prototype will be used as a static test article, the company says.

New Piper says the programme is on schedule for US certification and first deliveries in mid-2000, after a 1,500h flight test effort. ❑

Ultra quietens Global Express cabin

BOMBARDIER IS installing Ultra Electronics' active noise and vibration control system on its Global Express ultra-long range business jet. The $180,000 system will become an option following certification early next year.

Ultra, based in Cambridge in the UK, clinched a deal with the Canadian manufacturer last year to supply its "Ultra-quiet cabin system" on the Challenger 604 stablemate.

"We have installed seven systems since the Challenger system was certified last October," says Rob McDonald, Ultra's director of marketing.

The first Ultra Quiet cabin will be installed on Global Express number four at Learjet's Wichita plant. Ultra expects orders from about half of Bombardier's 80-plus Global Express customers. ❑

FAA approval clears way for Boeing to extend BBJ range

THE BOEING Business Jet (BBJ) has been cleared for long-range flight following the award of a supplementary type certificate (STC) for the auxiliary fuel tank system from the US Federal Aviation Administration.

The STC was originally due earlier in the year, but was delayed because of integration problems with the flight management system and existing aircraft fuel system.

The STC for the fully operational fuel system, involving up to nine tanks holding more than 14,400 litres (3,800 USgal) was awarded on 20 May. A BBJ equipped with the full tank capacity recently completed an 11,580km (7,200nm) flight lasting 13h 51min.

Boeing has delivered its 20th BBJ out of a planned 29 due for handover this year.

The first BBJ is expected to enter service around mid-July and Boeing's own demonstrator is due to begin touring in September. The aircraft's first mission will be to take the Boeing board of directors to a meeting, followed soon after by a visit to the US National Business Aviation Association (NBAA) gathering in Atlanta, Georgia, in October.

The BBJ is also due to put in an appearance at the Dubai air show in November when Boeing expects to receive an FAA STC for the winglets.

The first winglet-equipped BBJ will be delivered to fractional ownership company NetJets at the turn of the new year. ❑

Zenith moves Zenair production to USA

SOARING DEMAND for the Zenair CH2000 two-sea multipurpose trainer has driven Canadian manufacturer Zenith to transfer production across the border to the USA.

"The Midland, Ontario, site will now become a dedicated research and development shop where we will work on new designs and ideas. A 30,000ft² [2,800m²] plant is being built [to house the new production line] in Eastman, Georgia," says Zenair owner Sebastian Heintz.

Zenair has sold more than 80 CH2000 trainers since production began in 1995 and demand continues to grow. "With half the Ontario space also being used for Zenith research and development projects, the space available for producing the CH2000 was too small," adds Heintz. ❑

Cessna may axe AlliedSignal as sole-source supplier

DAVE HIGDON/**WICHITA**

CESSNA AIRCRAFT is reviewing AlliedSignal's sole-source avionics contract for its single piston aircraft. Neither company will comment, but it is believed that Cessna told the avionics manufacturer recently that its contract to supply its Bendix/King products, standard in in Cessna's Skyhawks, Skylanes and Stationairs, was under review.

The Wichita-based company is understood to be considering Garmin International and UPS Aviation Technologies (formerly II Morrow) as likely replacements.

Garmin and UPS Aviation Technologies confirm their executives, at the aircraft manufacturer's request, have made extensive product presentations to Cessna.

Sources claim that Cessna's decision is prompted by problems with the initial quality of the avionics delivered to Cessna in Independence, Kansas. A growing gap between the capabilities of Bendix/King products and the capabilities of other avionics was also a factor.

"Between the problems on the newer boxes and the inability to meet customer demands with AlliedSignal equipment, Cessna thought it was worth taking a look at a change," says a source.

Changing suppliers would incur considerable expense for Cessna, given the need to certificate new equipment in its 172 Skyhawks, 182 Skylanes and 206 Stationairs.

In addition, the manufacturer has spent considerable sums covering the cost of a long series of airworthiness directives and service bulletins issued against the aircraft over the last two years.

Cessna is expected to announce its avionics decision at the forthcoming Experimental Aircraft Association convention in Oshkosh, Wisconsin, from 28 July-3 August. "The current leaning is toward keeping just one avionics supplier, regardless of which company that may be," concedes a source.

Meanwhile, Cessna has issued a service bulletin for the Stationair models 206H and T206H after the manufacturer found that the aileron stop bolts on some of the aircraft had been installed incorrectly. The service bulletin orders the inspection of more than 50 aircraft delivered to date.

The US Federal Aviation Administration is also expected to publish an airworthiness directive that will require the work before any further flights. ❑

Mission 212 prototype poised for assembly

LAMBERT AIRCRAFT Engineering plans to start building the proof of concept Mission M212-100 prototype this month. It is also awaiting certification of the air-cooled Zoche ZO 01A engine to kick-start flight testing next year.

The manufacturer, based in Kortrijk, Belgium, has completed destructive wing tests on the single-engined Mission M212-100 aircraft at its factory in Geluveld, Western Belgium, under the supervision of the UK Civil Aviation Authority.

Lambert is aiming to receive both US and UK approval for the two-seat aircraft, which has been designed around the Zoche diesel engine.

The German-built 110kW (150hp) Zoche powerplant, which is scheduled for certification in the fourth quarter of the year, is designed to run on low-cost jet and diesel fuel and offer a cost-efficient alternative to existing engines. ❑

Future 609 tiltrotors will include Kawasaki-made components

Kawasaki partners on civil tiltrotor

KAWASAKI Heavy Industries (KHI) has signed an agreement with Aerostructures of Nashville, Tennessee, to manufacture components for the Bell Agusta BA 609 civil tiltrotor aircraft.

Aerostructures is responsible for the aircraft's fuselage development. KHI says it will develop the cabin doors and fuselage tailcone under subcontract. KHI is the first Japanese manufacturer to participate in the programme, which will lead to the first civilian tiltrotor.

The aircraft will be powered by two Pratt & Whitney Canada PT6C-67As, and will have a gross takeoff weight of 7.3t, carrying up to nine passengers.

US Federal Aviation Administration certification is targeted for mid-2002. ❑

NEWS IN BRIEF

■ SJ30-2 TOOLS UP

Sino Swearingen has installed the assembly mate tool for the SJ30-2 business jet. The tool is the precision fixture where the SJ30-factory 2 wings and fuselage will be attached. The empennage will be joined to the aircraft in the mate jig, which will initially be used to assemble three SJ30-2s for certification flight testing, as well as two airframes – one static and one fatigue. The tool will then be relocated to Sino's production base in Martinsburg, Virginia, USA. The manufacturer has 140 orders for the seven-seat SJ30, which is scheduled for certification in late 2000.

■ RVSM ALLIANCE

A US team specialising in certificating business aircraft for reduced vertical separation mimima (RVSM) operation has joined forces with a German company to offer its services to European corporate operators. Kohlman Systems Research and Aero-Mech, which formed an alliance in 1997 to provide turnkey RVSM solutions to US business aircraft operators, have teamed with Aeroflight Service, a flight inspection specialist based in Braunschweig, to tackle the European market. RVSM procedures will be implemented in European airspace in January 2002, after which only appropriately certificated aircraft will be allowed in RVSM airspace above 29,000ft (8,850m).

■ AASI SELLS PLANT

Advanced Aerodynamics & Structures (AASI) has completed the sale and lease back of its manufacturing facility for $9.8 million. The company plans to use the proceeds to complete development and begin production of the single turboprop JetCruzer 500. AASI says it has orders for 172 of the business aircraft.

India launches commercial satellites

TIM FURNISS/**LONDON**

INDIA ENTERED the commercial satellite launch market on 26 May, when a Polar Satellite Launch Vehicle (PSLV) was fired from Sriharikota. It carried an Indian 1,050kg (2,300lb) Oceansat 1 monitoring satellite and two sub-satellite payloads from South Korea and Germany into a 727km (450 mile) polar earth orbit. It also marked the first launch by India of three satellites on one flight.

This was the fifth flight of the four-stage PSLV rocket, designed to carry a payload of up to 1,200kg into an 817km polar sun-synchronous orbit, but the first carrying foreign commercial satellites.

Indian Space Research Organisation (ISRO) officials say that the PSLV performed with copybook precision. ISRO officials hope to use the PSLV to offer commercial launches at prices 20-30% cheaper than those of competitors. With a lift-off weight of 294t, the PSLV has alternate solid and liquid stages, including a 139t first stage, one of the largest solid boosters in the world.

The launch of the 107kg South Korean Kitsat 3 and the 45kg German Tubsat minisatellite payloads were paid for by customers. The launch price has not been revealed. "We're willing to consider future launches from India," says the Korean Satellite Technology Research Centre.

India has been exporting spacecraft components, hardware and satellite imagery since 1992, but this triple launch marks ISRO's entry into commercial satellite launches. "This success will give us more confidence for the future," says a senior official of Antrix, the commercial wing of ISRO. A Belgian 100kg PROBA microsatellite is scheduled to be carried as an auxiliary payload on a future PSLV flight.

Last year, Arianespace and ISRO signed a deal to evolve a common launch vehicle-satellite interface so that small satellites can be launched either on Ariane or the PSLV. India also hopes to launch its first experimental Geosynchronous Satellite Launch Vehicle, carrying a 2500kg satellite into geosynchronous transfer orbit within the next year.

India's entry into the commercial space business has reached another milestone, with the agreement to lease 11 transponders on its Insat 2E satellite to Intelsat, which will pay $10 million a year for 10 years. ❑

NEWS IN BRIEF

■ LUNAR IMPACT

NASA is considering targeting its Lunar Prospector at a specific site on the moon before it makes a natural descent, so that it can investigate the existence of water ice. The controlled crash into the Mawson crater at the moon's south pole in July/August will be observed by telescopes, focusing on the debris cloud for signs of water ice. Evidence has been collected that water ice lies beneath the lunar surface.

■ ILS LAUNCH

ILS International Launch Services lifted a Russian Proton K booster from the Baikonur Cosmodrome on 20 May. The booster placed the Lockheed Martin-built Nimiq 1 direct broadcast communications satellite, to be operated by Canada's Telesat, into geostationary transfer orbit. It was the third commercial ILS Proton launch this year. The launch of the first Proton K, with the new Russian Breeze M multiple-restart upper stage, carrying a Raduga 1 domestic communications satellite, is due on 21 June.

Israel supports launcher plan

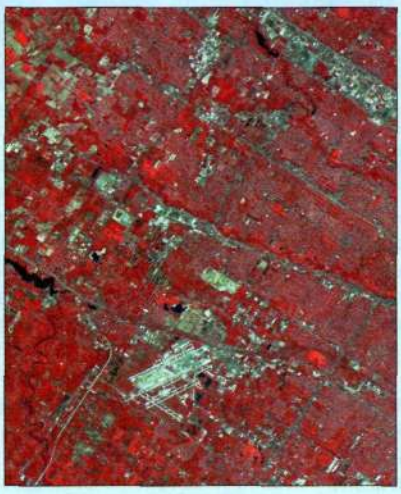
THE ISRAELI Ministry of Defence is supporting efforts to develop a satellite launcher based on a design of Dov Raviv, who was responsible for the development of the Arrow missile.

The Israeli Government is not contributing funding to the programme, so Raviv is seeking private investment to start the STAR-460 launcher programme.

Raviv was general manager of the MLM division of Israel Aircraft Industries (IAI), where the Arrow is being developed. After leaving IAI, Raviv formed his own company, Modular Space Transportation, to implement his design of an efficient satellite launcher.

The STAR-460 launcher will be capable of lifting a cluster of satellites, weighing up to 25t, into low earth orbit, and a payload of 11t into geostationary orbit. It will be powered by two Russian engines, with the first stage to be powered by the RD-171 and the second stage by the RD-0124. ❑

Detroit Airport pictured by UK satellite



THE UK'S SURREY Satellite Technology has been buoyed by the success of its first Minisatellite, the UoSat 12, launched aboard a Dnepr booster from Baikonur on 21 April. The spacecraft's latest success has been the return of spectacular 10m resolution panchromatic and 32m multispectral images from low earth orbit, including this one of Detroit city, and its airport.

Mir August mission likely to be scrapped

THE RUSSIAN Energia company, which manages Soyuz and Mir missions, looks likely to cancel the Mir mission planned for August, because of funding difficulties.

The move comes as Russian President Boris Yeltsin has instructed his space officials to concentrate on the International Space Station (ISS) rather than the Mir.

Yeltsin supports plans to extend the life of the Mir, but only if it is funded privately. The Russian Space Agency says the Mir space station will fly until next February, "regardless of the money issue".

The August Mir mission is unlikely to go ahead following the loss of private funding from UK businessman Peter Llewellyn. Russian officials had started to train Llewellyn, who was due to fly with cosmonauts Sergei Zaletin and Alexander Kaleri on the Mir commercial mission in exchange for payment. Llewellyn said he was paying for the $12 million mission outright from his own income, but Energia had received no guarantee that he could provide funding.

■ Russia's ISS Service Module Zvezda is at Baikonur being prepared for its launch in "four and a half months". This date could be difficult to meet, however, because of budget problems. ❑

Taiwan investors get go-ahead to board K-1 reusable vehicle

ANDRZEJ JEZIORSKI /**SINGAPORE**

THE TAIWANESE Ministry of Finance has given several Taiwanese banks the green light to invest in the Kistler Aerospace K-1 reusable launch vehicle.

The ministry is understood to support the plan primarily because of commitments made by Kistler to offer parts supply contracts to Taiwanese firms and to transfer technology when its partners pledge $50 million to the programme.

According to local press reports, Kistler has agreed to transfer technology and to set up a joint venture with Taiwan.

Taiwanese banks have invested in the project, and the local press has reported that Kistler hopes to raise a further $50-200 million in Taiwan this year.

The Kistler K-1 may fly in 2000 from Woomera in Australia

The government-run Chiao Tung Bank is understood to be ready to invest $8 million in the project, while others, including First Commercial Bank, International Commercial Bank of China and the United World Chinese Commercial Bank, will each invest from $6 million upwards. The Shin Kong Group has reportedly decided to pump $50 million into the project, while, in mid-May, Taiwan's China Development Industrial Bank received board approval to invest $8 million. The bank says its board agreed to back the two-stage-to-orbit vehicle once Kistler raises $142 million in the USA and Taiwan.

Kistler, based in Kirkland, Washington, needs $750 million to build five K-1 vehicles and two spaceports. According to Kistler chief executive George Mueller, the company has secured $450 million in funding. Kistler had initially hoped to carry out the firs t flight of a K-1 last year, but funding difficulties delayed this.

The vehicle's maiden flight is scheduled for next year. The US company has gained approval to build the world's first commercial spaceport at Woomera, Australia, for the launch. ❑

Provisional date set for Ariane 5 flight

THE MUCH DELAYED first fully commercial launch of the Ariane 5 will take place on 8 July at the earliest, according to Arianespace. Ariane 504 will carry the Asiastar and Telkom satellites for WorldSpace and Indonesia, respectively.

Ariane 504 was delayed from late last year by the failure of Aerospatiale to deliver its Eutelsat W4 satellite, originally meant for the mission. The rescheduled March launch was delayed by the late delivery of Matra Marconi Space's (MMS) Asiastar.

Arianespace has been frustrated by satellite delivery delays. It has only launched two Ariane 4 missions so far this year, but is aiming to launch seven more Ariane 4s and three Ariane 5s before the end of December.

Ariane 505 is to carry Eutelsat's W4 satellite and India's Insat 3B in mid-October, while the 506 in December will carry the European Space Agency's X-ray Multi Mirror space telescope.

The next Ariane 4 launch, scheduled for early June, is due to carry the MMS-built K-TV spacecraft for Intelsat. ❑

VentureStar fails to attract private interest

LOCKHEED MARTIN has failed to attract private investment for its proposed VentureStar single-stage-to-orbit (SSTO) reusable launch vehicle. The company says it will need government funding or loan guarantees to allow development.

Without this, the project will not go forward, says Peter Teets, Lockheed Martin president and chief executive, who adds that the company will not invest in the project.

Lockheed Martin, with $1 billion aid from NASA, is developing the X-33 sub-orbital technology demonstrator for the VentureStar, but has hit technological problems, delaying its first flight until the middle of 2000.

Lockheed Martin had conceded that, for the fully fledged SSTO VentureStar to reach orbit, it would need assistance from strap-on boosters. The VentureStar was originally seen as a potential replacement for the Space Shuttle. ❑

Titan IVB avoids hat-trick of failures

LOCKHEED MARTIN launched a Titan IVB booster, with no upper stage, carrying an unidentified National Reconnaissance Office satellite, from Vandenberg AFB, California, on 22 May.

The success of the venture breaks a sequence of two failed Titan IVB launches carrying inertial upper stages and Centaur upper stages in April. This resulted in the grounding of Titan IVBs equipped with upper stages.

The satellite payload separated from the Titan 12 min after launch. The payload was previously thought to be a Lacrosse radar reconnaissance satellite, but the Titan carried a payload shroud that was too small for the craft.

The launch was the first of the IVB without an upper stage. ❑

S Korea's KAISAT-4 will carry Australian payload

SOUTH KOREA'S KAISAT-4 microsatellite, scheduled for launch in 2002, will carry an Australian-developed communications package. This is part of a new two-nation agreement intended to explore common payload applications for remote sensing and space-based rural area communications.

The payload is a derivative of a combined UHF, S band and Ka-band system being developed for Australia's FEDSAT microsatellite programme. South Korea plans to use the UHF link to support research into animal tracking and traffic monitoring.

Australia and South Korea will use the Ka-band link to explore the provision of rural area Internet services. Professor Soon Dai Choi, director-general of the Korean Advanced Institute of Science and Technology's Satellite Research Centre, says the common payload concept has a range of potential applications, and will be a catalyst for collaboration in space science and technology in the region. ❑

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Powering ahead

A new generation of engines are battling it out for market share. *Flight International* assesses some of the key players

GUY NORRIS/**LOS ANGELES**

MOJAVE AIRPORT, in California's high desert, is well known for unusual sights. Among stored airliners, experimental prototypes and rare warbirds, General Electric's Boeing 747 testbed rarely merits more than a second glance. It is only in recent weeks that sharp-eyed observers may have caught a glimpse of something out of the ordinary – a fifth engine nestled between the 747's fuselage and number two engine.

The engine is the relatively diminutive General Electric CF34-8C1 – the latest member of the company's increasingly successful regional jet engine family. The engine may be little, but GE is under no illusions about the growing size of the regional business at which it is aimed. "I'm right in the middle of a booming market," says Frank Klaus, general manager of small commercial engines for GE. The -8C1 is in development for Bombardier's Canadair Regional Jet Series 700 (CRJ-700) regional jet which, by the time of its roll-out at the end of May, had accumulated 96 firm orders and 137 options.

Added to the existing orders for the CF34-3-powered CRJ200, and the recently launched -8D-powered Fairchild Aerospace 728JET, total orders for the regional jet engine family have soared to almost 700 shipsets. This does not include engines operating on almost 300 aircraft in service and a further 450 CRJ 100/200/700 and 728JET options.

This is a far cry from the original market aims of the TF34, the CF34's predecessor, which began flight tests not far from Mojave, at Edwards AFB, on a leased US Air Force Boeing B-47 in 1972. Aimed at the US Navy's S-3A Viking, and later the USAF's A-10, the high bypass TF34 was first proposed to the US Navy in January 1968. It went on to enter service six years later. Its low fuel consumption and noise provided a perfect foundation for the first commercial derivative, the CF34-1A, which entered service on the Canadair Challenger in 1983. By the 1990s, the relationship with Bombardier and the business jet unexpectedly flourished into the current regional jet combination.

"We were either lucky or as smart as hell, but either way when we launched the -8C it gave us a big advantage, particularly since the -3 has been so reliable," says Klaus. Whereas the engine had experienced relatively modest thrust growth over the first 20 years of its operational life, the launch of the -8C1 derivative committed GE to a more dramatic thrust boost of around 50% to 14,000lb (60kN). The extra power, which is required by the bigger CRJ700, is largely achieved by increasing the size of the fan by 56mm (2.2in) to 1.12m and moving to a wide chord fan blade. The bigger fan pumps more airflow through the engine and increases pressure ratio.

Downstream changes include a 10-stage high pressure (HP) compressor, based on the F414 developed by GE for the Boeing F/A-18E/F, in place of the original 14-stage HP compressor in the -3B1. The first three stages of the new compressor are blisks, which minimise inter-stage leakage and reduce weight. The jump to F414 technology cuts compressor part count by 50% and stages by 23%. It also introduces a machined ring combustor based on a mixture of F414, CF6 and earlier CF34 designs. It also introduces a dual channel full authority digital engine control (FADEC). This forms a crucial element of the new engine as it is designed to improve operability, reduce maintenance and increase life in the harsh, rapid cycle environment of short-haul regional transport.

The HP turbine is externally indistinguishable from the -3B1, but on closer inspection reveals new three-dimensional aerodynamic design refinements and directionally solidified second-stage vanes. The second-stage turbine

blades also feature cooling to cope with the higher operating temperatures of the larger engine. It also has boltless blade retainers, derived from similar technology adopted for the growth CF6 models, which increase component life. The low pressure (LP) turbine is similar to the -3A/3B1 rotor structure, but is otherwise different on the -8C1. The turbine consists of four stages, each designed using three-dimensional aerodynamic techniques. The oil cooling for the local bearing sump, is also redesigned to avoid coking, which troubled earlier engines.

"We were either lucky or as smart as hell, but...the -8C gave us a big advantage" – Klaus

DEVELOPMENT TIME

GE began a protracted propulsion system development effort in early 1996, with engine certification targeted for November 1999. The company opted to reduce the risk by running up-front demonstrations of redesigned modules and the all-important fan containment system in rig tests. Core engines were separately developed to map the HP compressor, combustor and HP turbine performance.

The value of this approach was proved, regrettably for GE, with the failure of the containment system. Although this was strengthened with extra wraps of Kevlar composite to cope with the higher energy of the heavier fan blades, the rig tests revealed basic weaknesses in the design which led to fragments penetrating the casing. Several redesigns were subsequently tested, before GE settled on a strengthened containment system consisting of thicker Kevlar and steel.

Windtunnel tests were also performed on the nacelle, which was designed in consultation with several key regionals including Air Littoral, Britair, Comair, Lufthansa CityLine, Lauda Air and SkyWest. With maintainability and service readiness identified by the group as the major requirements, GE adapted the design for easy access to line-replaceable units and even engine change-out in one shift. The company took responsibility for the entire propulsion system while the UK's Shorts designed and manufactured the inlet, fan cowl, reverser, core cowl and engine build-up units.

To make the engine more accessible, the inlet, fan cowl doors, reverser halves and aft core cowl were designed to split wide open along a hinge line at the pylon. The nacelle, which has 30% fewer parts than previous designs, is of a "jam-tolerant" design and can be opened by one mechanic without using tools. Although tests on the nacelle, LP turbine and HP compressor rigs went well, the problems with fan containment dogged the development programme, forcing a delay of several months to the first flight on the testbed. This took place on 10 March instead of early October last year as originally planned. The test team has, ▶

"We have done lean blow-outs, wind-up turns, operability transients, inlet stability and icing tests" – Klaus

nonetheless, worked hard to make up for lost time and is expected to have completed the basic flight test effort by the time this article appears. First flight of the prototype CRJ-700, expected around late March, took place in late May, although little of this postponement was attributable to the earlier engine delays.

The flying testbed programme was expected to be completed after around 27 flights and 150 flight hours. Thanks to the endurance of the 747 and its large capacity for test equipment, test flights were averaging 6-7h. "We're getting a fire hose of data," says Klaus, who adds that the sophisticated tools on board have allowed the FADEC schedules to be changed in flight on some sorties.

"We have done lean blow-outs, wind-up turns, operability transients, inlet stability, starting and icing tests, the latter of which we did in the Aleutian Islands near Alaska. We also travelled up to Casper, Wyoming, for high-altitude lapse rate take-offs," Klaus says.

FLYING THE ENGINE

Unusually for this stage in an engine development effort, guest test pilots from the airframe manufacturer have also been invited to "fly the engine" on the 747. "We want to make sure they [the Bombardier test pilots] have the right production configuration, so they use the same throttle system and gauges as in the CRJ-700. Obviously they won't feel the power of the engine in the seat of their pants, but they will get a feel for how it responds. It will be like a simulator," says Klaus. For the tests, the engine is mounted on a slaved pylon attached to the inboard, under-wing skin of the 747. The engine itself is cantilevered away from the strut on a Bombardier designed and built CRJ-700 pylon.

Two flight-compliant engines, numbers 101 and 102, are mounted on the initial CRJ-700 and will be modified with "things we've learned from the flying testbed", says Klaus. This mostly involves FADEC software changes. "You learn things when you put an engine on an aircraft, such as the stator scheduling on the compressor, which is optimised in flight for stall margin and specific fuel consumption."

Another, perhaps more unexpected, lesson was learned during the hail ingestion test. "This dinged up the noise suppression panels in the inner flow path," says Klaus, who likens the event to "having your car in a hailstorm". The resulting damage was surprising, but not bad enough to warrant an immediate redesign. "The question is...is that acceptable, or do we strengthen it? We have Shorts' people looking at the hardware," he says.

Some discoveries have led to pleasant surprises, he adds. "One of the things we were concerned about was the air start envelope because the core is somewhat hidden." Although the deliberately "hidden" splitter affords better core protection from foreign object damage, dirt and hail, it also threatened to make the

NEW BEGINNINGS FROM ALLIEDSIGNAL

IN JULY, AlliedSignal engineers will start a new engine for the first time. This is a critical milestone for any engine maker, but more particularly for AlliedSignal, which plans to make the AS900 turbofan a pivotal powerplant in its strategic plan for the 21st century.

The AS900 is a next-generation engine aimed at both the regional and corporate markets. It has won business as the AS907, on Bombardier's Continental super mid-size business jet, and in its AS977 form has been selected for the yet-to-be-launched Avro RJ-X. British Aerospace plans to make a formal go-ahead decision on the re-engined Avro RJ family by the end of September, but Dominique Hedon, AlliedSignal Engines and Systems' commercial propulsion vice-president, says, "the technology is fully ready" for service as early as 2001.

"We will have 10,000h on test and 50,000 cycles before it enters service," says Hedon. The full-scale development programme for the initial AS907 variant involves 11 test engines, three of which will be dedicated to accelerated mission testing and some substantial airborne tests on the company's Boeing 720 flying testbed. The first development nacelle and thrust reverser is to arrive at the company's main site in Phoenix, Arizona, from GKN Westland in the UK next February. Initial test flights are to begin later that quarter with US Federal Aviation Administration certification due a year later.

The AS900 represents a new approach for AlliedSignal, which is taking a clean-sheet design and developing it for a raft of potential applications across different markets. In the past it has followed a more traditional methodology and developed derivatives for use in discrete market sectors. The recently developed TFE731-20/40/60 series, for example, is tailored to the business jet market, while the LF507 – an engine acquired with the 1994 Textron Lycoming takeover, is used only on the Avro RJ application. The long-term plan is for the AS900 to be a common solution for as many requirements as possible, although AlliedSignal remains busy with its existing products. It is making close to 200 TFE731-20/40/60s a year, for example.

To this end, the engine is an intriguing mix of advanced but rugged design with

Engine accessibility is dramatically improved by the design of the inlet, fan cowl, reverser and aft control – all of which split wide open. There is a slaved pylon and cantilevered testbed strut

engine harder to re-start after an in-flight shut down. "It has not been an issue," says Klaus. "We have also been pleasantly surprised at the lapse rate of the engine," he adds. Based on initial results, cruise specific fuel consumption is estimated to be between 1% and 1.5% better than expected.

Other tests are also under way with another five ground-based engines. Crosswind tests on one engine were recently completed at GE's Peebles test site in Ohio. A 150h block endurance test, due to begin within a few weeks, has also been preceded by an "unofficial" 150h test. "We did it to see what we needed to change, and we were fairly happy with the durability of the hot section," Klaus says. There were, however, minor cracks on the shroud, which GE says will be avoided on production engines, with additional cooling added as a result of the test. "Overall we are very happy, and we are contemplating running at an even higher redline temperature as a consequence."

Major hurdles still standing in the way of certification include the full engine fan blade-off test, as well as the large bird strike and water ingestion tests. Although Klaus admits that the re-run of the containment test, due around late August, is "still risky", he believes that, with the many modifications already verified in earlier rig tests, the actual milestone should pass "like a dress rehearsal".

FAMILY PLANNING

In the midst of flight tests on the CF34-8C1, GE was making plans for the next family member, the -8D, following the official launch order from Lufthansa CityLine for the Fairchild Aerospace 728JET fleet. The engine will be rated at the same 14,000lb thrust level as the -8C1 and shares 100% common turbomachinery and 87% overall parts commonality with the CRJ-700 engine.

As it is wing mounted however, the -8D will have a different mounting and rearranged accessories. In the case of the -8D, the thrust reverser, nacelle and engine build-up units are being designed and built by a newly formed partnership between Hurel-Dubois of France and Aermacchi of Italy. The first -8D goes to test in June 2000, followed by first flight of the 728JET in the second quarter of 2001. Engine certification by the US Federal Aviation Administration is targeted for September 2001, with 728JET entry into service scheduled for May 2002.

A more ambitious, but closely related development, is the proposed follow-on 17,000-18,000lb thrust -8XX derivative for the 928JET. GE's plan calls for the engine to begin flight tests in mid-2003, with FAA certification as early as the fourth quarter of 2003. "It will have a similar core to the other -8C/D derivatives, but with a new fan and low pressure system," says Klaus. The new LP system, with three stages, will be driven by a 1.34m diameter fan and a scaled-up, four-stage LP turbine section.

GE should also know by mid-June if its bid has been successful to power Embraer's proposed ERJ-170/190 family with yet another derivative, the CF34-8E. Broadly similar in size and configuration to the -8XX, the -8E faces stiff competition from Snecma and Pratt & Whitney Canada with their SPW16 and SPW18, as well as from a proposed hybrid engine from BMW Rolls-Royce called the BR715-50.

With or without the Brazilian regional jet, the CF34 is already destined for the record books. Production of all -8 series engines is ramping up at a new line at the company's Durham site in North Carolina, while the -3 line remains at Lynn, Massachussetts. ❑

conventional technology. AlliedSignal has deliberately "dumbed down" the AS900 in specific areas, such as turbine materials, to reduce cost. At the same time, it has introduced a new wide chord fan and blisks in the compressor. The result is expected to be a highly efficient, low-cost engine that will provide adequate performance without necessarily incurring the higher level of operating and maintenance expenses sometimes seen with current business jet engines. The spin-off is a dependable, high-performance engine equally well suited for the rigours of the regional market.

"The engine is a balance of performance and operating economics," says Hedon. "We looked at total fuel burn and weight as a threshold and kept them at the same level as today, and the surplus of technology we have left over, we have put into the production of the engine. It will therefore be cheaper to make and run. We also use ordinary materials in the engine and do not have things like single crystal turbines."

The wide-chord fan, provided by AlliedSignal's International Turbine Engine partner AIDC of Taiwan, is made up of 22 inserted blades. In the AS977 this will be direct drive, and not gear-driven as in the current LF502/507. Aft of the fan is a four-stage axial compressor, two variable geometry stators and a single-stage, centrifugal compressor. The design also incorporates an effusion-cooled, straight-flow combustor, which Hedon says will "reduce cost by 30%". Aft of the combustor is a two-stage high pressure (HP) turbine and a three-stage low-pressure (LP) turbine. International partners for the LP turbine are still being sought as part of the company's overall goal to see global participation at 35% for the AS900. "We are also talking with several potential partners on the gearbox for the RJ-X," adds Hedon.

Dual-channel electronic control is standard to both AS907 and AS977 and is part of the drive to reduce operating and maintenance costs, as well as to improve performance. Both variants are designed with on-wing, hot-section maintenance in mind. The fan, LP turbine, accessory gearbox and even main shaft bearings and seals are also designed to be replaceable on-wing. The company plans that operators will be able to swap out line-replaceable units in as little as 15min on the AS977 and within 20min on the 907. The maintenance burden is also expected to be generally lower, thanks to several design initiatives. These include the reduced part count in such elements as the blisk axial compressors, and the reduced number of lubrication sumps – of which there are only two. These sumps are also located in cool zones. Spinner anti-icing is also eliminated from the design, removing another area of headaches traditionally found on the older engines. The discs in the AS977 are also designed for a long life of 25,000 cycles while those on the business jet engine are planned for 15,000.

Take-off rating for the AS977 is 7,000lb (30kN) with a planned 10% growth margin in the same installation, and up to 25% growth overall for later derivatives. Cruise rating is expected to be around 1,480lb at 35,000ft (10,600m) and Mach 0.7. The slightly more powerful AS907, which will have a take-off rating of 7,595lb, is expected to have a cruise rating of 1,108lb at 45,000ft and M0.8.

The engine series is initially likely to grow upwards rather than downward. "It is easier than shrinking, which is bigger investment," says Hedon.

European powerhouse

BR700-powered Bombardier Global Express

BMW Rolls-Royce is poised for new growth as it enters the commercial engine world with the BR715

ALL PHOTOGRAPHS: MARK WAGNER

GUY NORRIS/**BERLIN**

WITHIN FOUR months, the first BMW Rolls-Royce-powered Boeing 717-200 will enter service with launch customer AirTran Airways. It promises to be a major event, particularly for an engine company that did not run its first core powerplant until August 1993.

Since then, BMW Rolls-Royce has seen year-on-year growth. By early this year it had accumulated firm orders for more than 900 engines worth over DM3 billion ($1.5 billion). Production of BR710 and 715 engines is being ramped up rapidly to meet demand and will see annual deliveries virtually double from a combined tally of over 100 engines last year to almost 200 this year. Production next year is forecast to be around 260 engines, prompting the company to sanction a major expansion of capacity at its Dahlewitz site south of Berlin.

The production ramp-up will see assembly of up to 140 BR710s and 120 BR715s a year from 2000 onwards. The number of BR715s could rise, depending on the sales success of the 717 and Boeing's willingness to increase the production rate. "It's a big challenge," says BMW Rolls-Royce chairman Dr Klaus Nittinger. "Boeing intends to produce five aircraft a month, so we have to supply 10 engines a month. We can adapt up to 15 engines a month, and if needed, we have the ability to assemble engines in Derby [at Rolls-Royce in the UK], because they have the capability and have worked on the V2500, which is a similar engine in some respects," he adds.

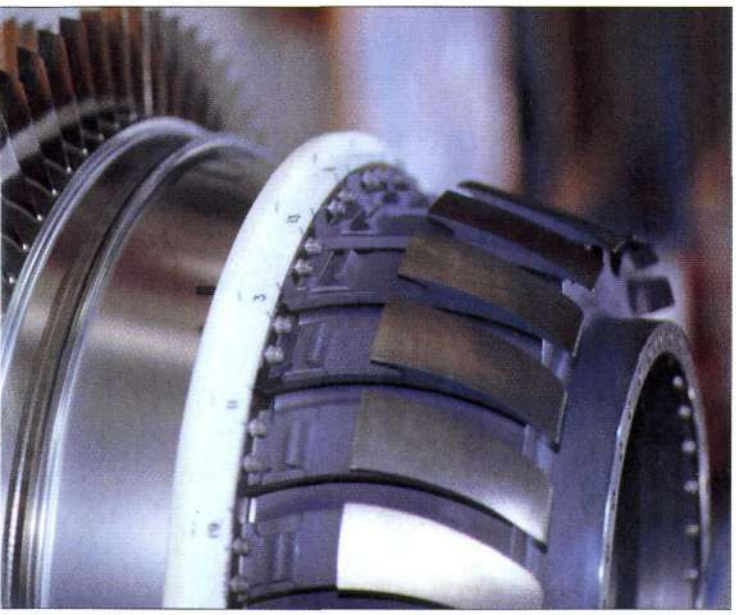
The bulk of the order book is made up of the BR710, which powers Bombardier's Global Express business jet as well as the GV built by its arch rival, Gulfstream. It was also selected in 1996 to power the British Aerospace Nimrod MRA4 maritime patrol aircraft and up to 88 engines are to be produced for this programme. The Global Express order book stands at more than 160 engines, while that for the GV is at 400 units, taking firm orders for the BR710 to more than 650 engines. The BR715 order book stands at just over 230, with the company hoping for new orders to materialise later this year.

LONG-TERM PROSPECTS

In many ways, the long-term success and much of BMW Rolls-Royce's credibility is expected to rest on the BR715. Launched with McDonnell Douglas' MD-95 project in October 1995, the engine first ran in April 1997 and powered the prototype 717-200, as it was by then called, into the air in September last year. After overcoming initial problems with containment and turbine blade cracks, the engine has earned a reputation at Boeing as a trouble-free and fuel-miserly performer. "We are very pleased that not only the engine performance, but also the performance of the whole aircraft, is beyond expectations in terms of fuel burn," says Nittinger.

"Cruise specification range has

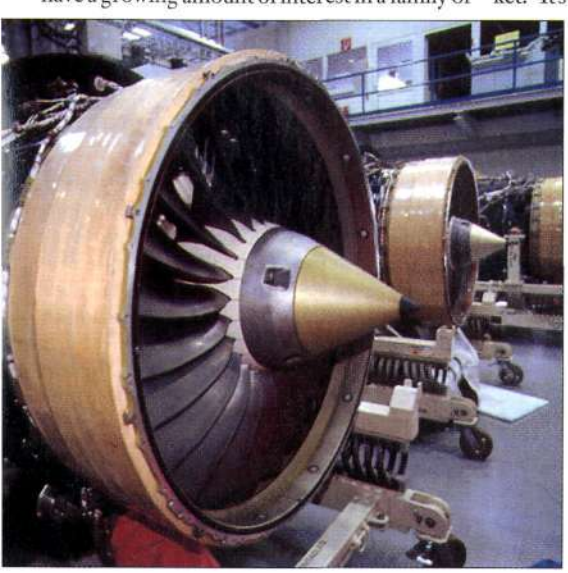
BMW Rolls-Royce plans to expand capacity at Dahlewitz, where about 260 engines are to be manufactured (below and right). *Orders for the BR710* (far right) *stand at more than 650*



Advanced design features such as the BR715's blisk (top) *and BR710's compressor are tested at Dahlewitz's Adam test cell*

improved by 5% against block value [which is nominal], and against guarantees. Of this, around 1.5% is due to the engine, which we estimated as a result of test cell results". Nittinger says the company was not surprised "because based on BR710 experience, we predicted its performance pretty closely". Now Nittinger is conscious of the all-important entry into service phase, when airlines will be watching how the engine stands up to the wear and tear of daily operations. "We have to get the product to market and make sure it is rugged and reliable. That's the next aim. If we demonstrate that, then we can have the basis for improvement."

Much of this could be concentrated on further versions of the 717 line, namely the proposed shorter 90-seat -100 and its stretched stablemate, the heavier gross weight -300. "We have a growing amount of interest in a family of 717s, particularly in Europe for the 90-seater," Nittinger says. "Even though the -100 would be economically more difficult that the -200, it would provide easier access to the market, which is below the league of the aircraft such as the 737 and [Airbus] A319 flying it today." BMW Rolls-Royce will certainly stick to simple BR715 derivatives, both derated and uprated, for any new 717 applications, but is awaiting Boeing's lead on the next move. "We want them to define the launch conditions, the number, the customers, the price and the time," says Nittinger.



Despite its open enthusiasm for possible new BR715 business at the top end of the regional business, BMW Rolls-Royce is under no illusions about the pressures on the 100-seater market. "It's a very tough market because most of the aircraft will be purchased by the established airlines and they have price expectations. The problem for Airbus is to get a real price for the A318 and Boeing for the 717, because sister airlines are willing to pay much more per seat for 50- or 70-seaters. You are in the middle, so therefore there is a tremendous price pressure on 100-seaters," says Nittinger.

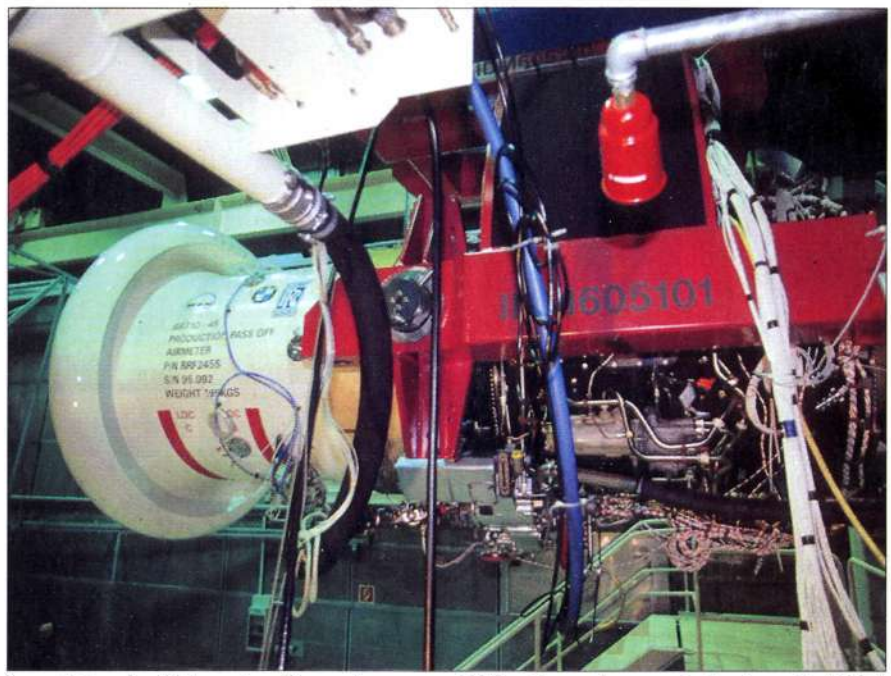
Reflecting on the company's failure to secure a place on the A318, Nittinger adds: "The whole decision for us was driven by economics. We would have liked to have increased our market share, but not at any price. It was insane business, and the people pushing the [Pratt & Whitney] PW6000 were desperate."

Further off, Nittinger suggests that BMW Rolls-Royce could provide a standalone successor to the International Aero Engines (IAE) V2500. Rumours circulating at the 1998 Farnborough air show suggested that Rolls-Royce was keen to buy out Pratt & Whitney's stake in IAE, following the US engine maker's openly revealed intent to develop the geared fan PW8000 as a direct competitor to the GE/Snecma CFM56, and by default, the V2500. At the time, BMW Rolls-Royce was also mentioned as a possible vehicle for this development, although nothing was said definitively at the time.

"We have the potential to grow the 715 and we have the technology to further develop the high-pressure [HP] compressor. We can go to 22,000lb thrust [98kN] with no changes, and then to 25,000lb with some material changes," says Nittinger. He adds: "We have not applied any exotic materials or sophisticated cooling to our designs. All of that represents opportunities up our sleeves". One potential upgrade under study is the addition of an advanced first-stage HP cooling system, as well as new thermal barrier coatings. This could generate up to 1,000lb additional thrust, taking overall maximum power levels to 23,000lb.

REGIONAL PROPOSALS

In the near term, BMW Rolls-Royce has proposed the BR715-50 to Embraer for the ERJ-170/190 regional jet family – a decision on which was due to be announced as *Flight International* went to press. Embracing the low-pressure system of the BR710 and the high-pressure elements of the BR715, the -50 is "not just a minor tweak, and would be considered the first major new derivative", says head of ▶



BR715 **(above)** *is assisted by a former military test cell at MTU's Ludwigfeld site* **(right)**

concepts and technologies, Dr Helmut Richter. The same concept, which involves a "full LP [low-pressure] system redesign", according to Richter, is also being proposed for other regional jet projects including Bombardier's BRJ-X family and Fairchild Aerospace's 928JET.

The major difference in the proposed -50 rests with the fan, increased in diameter to 1.12m (50in), compared to a diameter of 1.08m for the BR710. The -50 would generate more than 18,000lb thrust without significantly increasing engine size and compromising the ground clearance of the designs, which all have under-wing mounted engines.

The fan size change was needed because "the BR710 begins to run out of thrust at around 90 seats, and issues of time on wing may suffer", says Nico Bucholz, senior vice-president, commercial. "The BR715 would be complete overkill for a 70-seater. So we are proposing this blend of the BR710 and BR715." Despite the challenges, Bucholz adds, "we are very confident we can meet Embraer's entry-into-service target of 2003".

BMW Rolls-Royce is also awaiting a response from Airbus for bids made with another proposed derivative – a 6,700-9,000kW (9,000-12,000shp) turboprop dubbed the BR700-TP. The engine is competing against a combined Snecma-MTU engine called the M138 and a "twin-pack" (two engines driving a single propeller) solution from Pratt & Whitney Canada based on the PW150 and aimed at the A400M, or European FLA (Future Large Aircraft) military transporter.

"We are well in the race," says Nittinger who adds that its partner on the project, Rolls-Royce Allison, could be changed for another European-based propeller-gearbox specialist if its bid is selected. The first engine run is provisionally scheduled for mid-2000, with certification in 2002 and entry into service by the end of 2004.

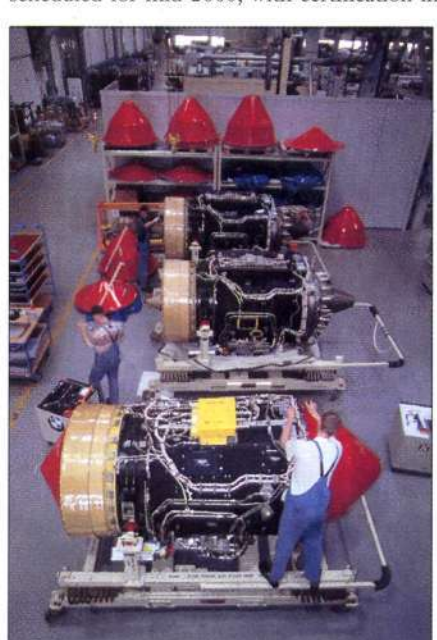
For the more distant future, BMW Rolls-Royce is involved in the German E3E (economy, efficiency and environment) core demonstrator programme with MTU. Although aimed initially at reducing emissions and improving efficiency, the E3E could provide a platform for an all-new BR700 derivative from 2007 onwards.

An early version of the proposed E3E core has just made its first run at a test stand at the University of Stuttgart and, pending successful results, will be used to help define the remaining design of the new core which will run in late 2000. The E3E is a follow-on effort to a joint industry, Government research effort which ended last year with the running of a low-emission combustor on a BR715.

"Noise and emissions are the key," says Nittinger, who adds that a production version of the staged combustor could be retrofitted into existing BR700 engines from 2002 onwards. The new combustor reduces emissions of nitrous oxides by 20% compared to the current BR715, therefore making it around 50% below current standards.

A follow-on test phase, later this year, is expected to see testing of an advanced, nine-stage HP compressor developed using three-dimensional aerodynamic design techniques. The new compressor could result in pressure ratios as high as 25:1, producing stage loadings similar to those of the P&W PW6000. MTU is contributing to the design and test of the HP compressor. The combined effect of these programmes and developments is a sensation of quiet optimism at BMW Rolls-Royce. With expansion under way, and several irons in the fire, it seems certain that the fledgling and ambitious engine maker is set to celebrate its 10th anniversary in July 2000 in style. ❑

BR710s for the corporate market take shape on the factory floor



Family power

IAE's Phoenix upgrade development for America West underscored its service commitment

IAE has come of age thanks to the growing success of its V2500 on the Airbus A320 family of aircraft

GUY NORRIS/**LOS ANGELES**

BUSINESS IS booming for International Aero Engines (IAE), which last month celebrated the 10th anniversary of entry into commercial service of the V2500. "It's an important milestone for us, and we have come a long way," says Mike Terrett, IAE's newly installed president and chief executive.

Terrett took over the helm from outgoing president Barry Eccleston who presided over the most rapid phase of expansion in the company's 16-year history. Virtually all of the success is attributed to the growing boom in Airbus A320 "family" sales, to which the company's V2500 engine is intimately linked. The first V2500-powered A320 flew in July 1988 and was certificated the following year. Since then the orderbook, including options, has grown to around 3,000 engines worth more than $18 billion. Almost 470 V2500-powered aircraft have been delivered and more than 9 million engine hours accumulated.

"We think we have really come of age, and we have got a product that is a perfect fit for the A320 family. It is still modern, and although it is not brand new, it has all the latest technology in it," says Terrett. Reliability problems, once a major issue with the earlier engines, is a thing of the past, he adds. "The initial problems have been shaken out and now we are selling reliability, and the reliability is good".

CHANGE IN FORTUNES

The change in fortunes for IAE is reflected in the orderbook, and in a series of big victories notched up in recent months against CFM International. The most significant of these includes last year's selection of the engine by British Airways to power 59 A319/A320s on firm order and 129 A320 family aircraft on option. Big wins in 1999 have, so far, included Spanair's selection of the V2500 to power up to 45 A320 family aircraft, a contract potentially worth $540 million, and an order from New Air which could extend to 75 aircraft in a deal worth up to $900 million to IAE. The company's share of the A320 market leaped to 55% last year, thanks mainly to the British Airways order and an earlier victory with the TACA Group of airlines in Latin America. With the succession of selections so far this year, IAE claims a 68% market share for this year. Significantly, CFM International sets IAE's market share for the same period at 69%. Overall, IAE has a claim to 41% of the A320 family.

Against this rosy picture there are inevitable concerns. IAE has tried, and failed, to find alternative applications for the engine. It succeeded with the McDonnell Douglas MD-90, achieving exclusivity on the twinjet, but saw the line closed prematurely by Boeing following its takeover of the rival manufacturer in 1997. The last MD-90 is due to be handed over in 2000, marking the end of a short production life. To date, some 98 MD-90s have entered service, but only a further 16 are scheduled to be built.

IAE's attempt to secure a position on the A340 ended with the SuperFan fiasco of 1986/7, as Airbus was preparing to launch its four-engined, long-range airliner programme. IAE promised Airbus significant range and effi- ▶

Boeing's decision to discontinue the MD-90 was a blow to IAE, which had exclusivity on the twinjet

ciency gains by using a geared, ultra-high bypass derivative of the V2500 on the A340. Airbus quickly adopted the V2500 SuperFan in favour of a conventional derivative of the CFM56, only for IAE to suddenly cancel the engine after recongising that the development timescale was unrealistic, given the technical challenges it faced. This was an embarassing incident at a critical time in the A340 programme, and left Airbus with no choice but to switch back to the CFM56. That engine has since powered every one of the 160 A340s delivered to date.

The sheer marketing and financial inertia of CFMI overwhelmed its attempts to get a place on Boeing's Next Generation 737 family. While other projects, such as a V2500 re-engined 727-200 have come and gone, IAE has focused all its energies on the Airbus narrowbody twins. The results have been rewarding, with more than 500 A320s ordered, almost 280 in service and 225 on backlog. The A319 looks equally promising, with more than 200 V2500-powered versions on order, around 30 in service and almost 180 on order. Even the substantially larger A321 provides significant business with more than 110 on order, 61 in service and 51 on backlog.

BUSY FUTURE

It was IAE's failure to win a place on the 737 that finally pushed one of its major partners into the development of a new, independently developed engine to challenge the CFM56. Pratt & Whitney, which holds a 32.5% stake in IAE, is working on the PW8000, a geared fan powerplant based on the core of the PW6000 which is in development for the A318. Despite the development of what amounts to a V2500 successor, the IAE partnership remains firm – at least on the surface.

The other partners, which include Rolls-Royce with a 32.5% share, Japan Aero Engines with 23% and MTU with 12%, have voiced some concern but for moment appear to be continuing with "business as usual". P&W says it does not wish to sell its part of the programme, particularly now that sales are booming and money is coming in at a valuable time when research spending is high, and sales in other engine programmes are suffering.

Terrett remains philosophical about both the near and longer term prospects. "Our focus is obviously on the current A320 family, and we don't see how we could get into any immediate Boeing application. Beyond the A320 and 737 is really a hard call. We keep trying to look beyond that horizon and see what might be required". He remains sceptical about the PW8000 and says: "Pratt & Whitney does not have any applications for that so far and, as far as we can see, the A320 family will be selling for many years yet. Any developments planned for that airframe we believe we can match for at least the next 10 to 12 years," he adds.

In the nearer term, IAE's plan continues to be a focus on implementing the latest technology where it makes the most business sense. The Phoenix package, for example, brought the hot and high performance benefits of the V2500-A5 to the earlier -A1 powered A320.

"That won't be the end, although there is nothing firm planned at the moment. We need to follow what the market and airframes need, and our tentacles are always out there looking for guidance. Pratt & Whitney and Rolls-Royce have the biggest portfolio of modern developments under way in the industry. We plan to flow down technology from the Trent and PW4000 families and continue to pour it into the V2500".

In the meantime, Terrett is dealing with the welcome problem of meeting demand. "So far we have 68% of the market. If we continue at that rate we will have to increase production gently over the next few years," he says, adding that the annual tally could rise from around 250 to 300 engines "depending on how active Airbus is, and how successful". ❑

The success of the A321 could be lucrative for IAE

Early warning

Electronically scanned radar promises anti-ballistic missile solutions

STEWART PENNEY/**LONDON**

PROLIFERATION OF weapons of mass destruction and their delivery vehicles has forced the topic of ballistic missile defence (BMD) to the forefront of military research, development and requirements. So it is perhaps timely that British Aerospace Land & Sea Systems is about to test a multifunction active array radar. Its Multifunction Electronically Scanned Adaptive Radar (MESAR) 2 is a technology demonstrator programme that builds on nearly 20 years' work by BAe Land & Sea Systems and its predecessor companies.

Conventional radars suffer from limited power, are vulnerable to jamming and are restricted to a single function at any one time, such as surveillance or tracking. Many are also bespoke designs built with small numbers of high-value components, which make them expensive to procure and keep operational.

The air defence threat is becoming more sophisticated and the changing nature of military operations – such as the deployment of land forces out of area and the use of naval forces for coastal operations, rather than out at sea – promise to overwhelm conventional radar technology. Multifunction electronically scanned radars promise to be less expensive, with improved performance and the ability to counter emerging threats.

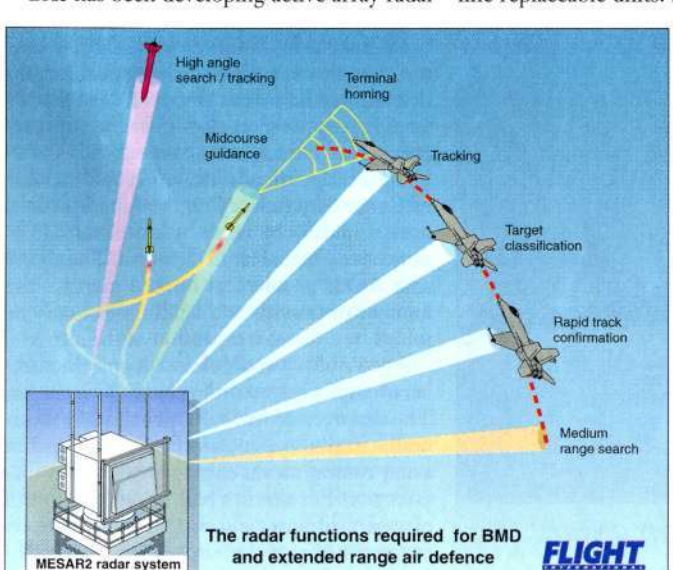
BAe has been developing active array radar since the late 1970s. Between 1982 and 1996 it worked on MESAR 1 with UK research and development contractors Roke Manor and the UK Defence Evaluation and Research Agency (DERA). Between 1989 and 1994 the system underwent trials against airborne targets. It led to Sampson, the multifunction radar selected by the UK Royal Navy for its next-generation air defence frigate (*Flight International*, 5-11 May).

In the BMD role, a MESAR 2-derived radar would provide long-range surveillance to detect missiles as they are launched. It would then automatically generate and maintain target tracks while using wideband waveforms to generate a high resolution image of the target to aid discrimination between the warhead and the less lethal missile body and motor. It would also be used as a fire control radar for anti-ballistic missile surface-to-air missiles.

MESAR 2 performs only a single task at any given time – like other multifunction radars – but it switches rapidly between functions while the array, or elements of it, can be "steered" to study a specific area. In rotating arrays a target can be held in the radar's view by steering the beam rather than it looking straight ahead.

Les Gregory, BAe Land & Sea Systems head of business development, says MESAR 2 has 10W transmit/receive modules – 1,264 of them – while MESAR 1 had 156 modules rated at 2W. Modules are grouped in sets of four which form line replaceable units. Despite the number of heat-generating electronic components, BAe retains air cooling of the array, rather than resorting to more complex and costly liquid cooling. MESAR 2 is instrumented to 400km (215nm) range and 90° elevation.

Gregory says an operational BMD radar would have "3,000, 4,000, 5,000 and 10,000 module versions". Radars with fewer modules stop scanning if the array "stares" at a target. Having more modules allows scanning to continue while part of the array locks on to the target, he adds.



MESAR 2 is operational at BAe's Cowes site on the Isle of Wight

MESAR 2 is operational at BAe's Cowes site on the Isle of Wight, south of the UK mainland, and has been "tracking targets at very long range" for some time, says Gregory. It is readily transportable, non-rotating and will deploy with display and processing cabins. UK trials late this year will be followed by US trials early next year.

Trials at DERA's ranges in the Hebrides Islands off Scotland's west coast will be divided into two parts, explains trials manager Jonathan Bluestone. If successful, MESAR 2 will acquire and track small bombs dropped from an aircraft while jamming is aimed at the scanner from comparatively close range. This will test the radar's ability to track "fairly small targets in clutter". BAe will also aim to "de-risk" US BMD trials by using MESAR 2 against ballistic targets fired at long range.

Gregory says trials at the White Sands Missile Range in New Mexico will "piggy back" US Ballistic Missile Defense Organization tests. BAe wants to track missile intercepts while MESAR 2 is at White Sands. This gives an understanding of how the radar would guide an interceptor if configured for missile control.

MESAR 2 uses commercial off-the-shelf components for processing and display, which provides part of the cost savings, says Gregory. The electronics use gallium arsenide semiconductors – a "fundamental technology" acquired with BAe's acquisition of the Siemens Plessey Systems company.

BAe "wants to move to a position where the system is a high capable radar antenna connected to a bespoke computer to meet [the customer's] requirements", says Gregory.

Results generated by MESAR 2 will be fed into a BMD dedicated radar system. Any development could be based on a rotating or non-rotating scanner. The USA and some Gulf states have ongoing BMD requirements. ❑

Main chance

The expected exit of the US Air Force from Frankfurt opens options for the airport

ED REAVIS/**FRANKFURT**

STATE AND LOCAL officials in Germany say they expect the US Air Force to vacate some of the world's prime airport territory within the next three to five years, opening a range of expansion options for Frankfurt International Airport.

Occupied by US forces since the final stages of the Second World War, the 160Ha (420 acre) Rhein-Main AB handles about 3,000 movements a year, mainly by large cargo and aerial refuelling aircraft. The base has been handling 60 to 100 support flights a day since the NATO air war over Yugoslavia began.

Frankfurt's airport and Rhein-Main share two runways that are used for take-offs and landings and a third that is used only for take-offs. The commercial airport's air traffic controllers manage airborne traffic for both, but military controllers take over the military aircraft once they move on to their own ramp area.

The cost of moving the USAF's existing operations at Rhein-Main, known as the "Gateway to Europe", to Ramstein and Spangdahlem air bases in the state of Rheinland-Pfalz is estimated at $400 million. The German Government, the states of Hesse and Rheinland-Pfalz, NATO and Flughafen Aktien Gesellschaft (FAG), the organisation that administers Frankfurt's airport, would all contribute to the moving costs, according to Rheinland-Pfalz state secretary Klaus Rütter. He says: "We've been negotiating with the Americans since April 1998. We expect to sign an agreement before summer and the Americans will start to move shortly thereafter. The move is expected to take three to five years."

US officials are cautious about commenting on the reported agreement. The US Air Force in Europe (USAFE) says: "We cannot confirm or deny any details of an agreement because there hasn't been one yet. Nothing has been finalised nor signed. But negotiations with the Germans are moving forward."

Frankfurt Mayor Petra Roth told a television audience that her city will contribute $30 million and FAG between $80 and $100 million to the move. FAG says, however, that "some politicians and the media have jumped the gun. There are negotiations and they are progressing to the satisfaction of both sides, but it's anybody's guess when we reach an agreement."

News of the move gave hope to citizens in a large number of communities bordering the international airport that have been fending off attempts by FAG to build another runway. FAG's chief executive, Wilhelm Bender, says the airport sorely needs the capability of handling 120 take-offs and landings an hour to keep pace with Paris' Charles de Gaulle and Amsterdam's Schiphol airports. Frankfurt Airport handles 76 take-offs and landings an hour, increasing to 87 an hour in the summer.

FAG says the acquisition of Rhein-Main will not solve the international airport's space problem, but will help develop the airport's Cargo City, which it opened on property relinquished by the USAF several years ago. It will also allow construction of additional administration buildings, commercial offices and aircraft parking. "A new runway on the American side would only hinder current operations," FAG says.

Lufthansa, Frankfurt airport's largest user, says the take-over of the US base would have little effect on the airline. "It could mean that we would have a few more slots – a fraction of a percent more – but no more," it says.

According to the airline, FAG could increase its Cargo City capacity on the American side, but it would not be usable by Lufthansa with its cargo area situated far to the north. The airline adds: "Our problem of how to increase the number of takeoffs and landings can only be solved by a massive expansion of the airport."

A new runway would almost double the number of employees, according to a FAG manager. The airport employs 58,400 people in 430 businesses, institutions and in official capacities. But a new runway means cutting into a nearby forest region. For almost a year, an ongoing forum of expert witnesses and citizens from towns on the perimeter of the airport have been discussing the pros and cons of airport expansion.

Rolan Bossu

"Rhein-Main AB handles about 3,000 movements a year, mainly by large cargo and aerial refuelling aircraft."

The additional land would allow Frankfurt's airport to expand its ramp area rather than be used to provide additional slots

The most recent expert report on expansion to the forum was provided by the US Federal Aviation Administration at a cost of several hundred thousand dollars.

The FAA looked at 16 possibilities and concluded that a new runway on the air base side would not solve the airport's problem because it would geographically hinder and thus reduce traffic on existing runways. The study showed that up to 98 take-offs and landings would be possible from the current airport with a different radar system and altered take-off and landing procedures. The report also says the use of the US Army air base in Erbenheim 18km (11 miles) away would not be viable because of the distance from the runway to the two main terminals.

Rheinland-Pfalz's Rütter sees the move as a boon to local business and jobs for a region dubbed "America's largest aircraft carrier" because of the number of nearby US air bases.

Despite the move, Rhein-Main will continue to play a role in NATO and US strategy. "There are multilateral treaties between Germany and other NATO states that will allow US aircraft to use their bases in times of crises," a FAG manager says. In an extreme case, NATO may occupy the base for the duration of a crisis. ❑

FROM ZEPPELINS TO THE BALKANS

RHEIN-MAIN AB was opened on 8 July, 1936, mainly for use as a port for zeppelins. During the Second World War, Rhein-Main was used to launch German air attacks on France and other points. A branch of the Auschwitz concentration camp was erected on the southern end of the base, just outside the base perimeter.

US occupation began in March 1945 when the 10th Infantry Regiment arrived. Within weeks, the 831st Flight Engineering Battalion operated Allied support flights during the remaining weeks of the war. In June 1948, the base near Frankfurt am Main captured worldwide attention as the home base for what became known as the Berlin Airlift.

For 15 months, Douglas C-47s and C-54s flew tons of food, coal and other necessities from Rhein-Main and two other bases into the city that had been isolated by the Soviet Union. As many as 635 take-offs and landings were launched a day during the airlift. Total tonnage transported by the airlift amounted to 2,325,000. A monument to the airlift – a twin to that standing in front of Tempelhof Airport in Berlin – was erected near the front gate of Rhein-Main AB in June 1985.

As a US Air Force base, Rhein-Main has been the primary port of arrival and departure for US military personnel in Europe.

The airport's history under US control has included:

- **a bomb blast that destroyed the base officers' club in December 1976;**
- **deploying 240,000 US military personnel and equipment to the Gulf for Operation Desert Shield, from August 1990;**
- **serving as home base for Operation Provide Hope in which 65 Lockheed C-141s and C-5s delivered more than 2 million kg (4 million lb) of food and medicine to 24 destinations in the former Soviet Union in February 1992;**
- **supporting various humanitarian, peacekeeping and warfighting missions in the Balkans since July 1992.**

WHAT'S ON

ASME Turbo Expo '99
7-9 June Indianapolis, Indiana, USA
Contact ASME International Gas Turbine Institute, Atlanta, Georgia, USA
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Fax +1 (404) 847 0151

Unmanned Vehicles' 99
10-11 June Paris, France
Contact Shephard Conferences & Exhibitions
Tel +44 (1628) 604311
Fax +44 (1628) 669734

Air Crew Training 2000 plus
10-11 June Brussels, Belgium
Contact International Seminars & Symposia Centre, Bonn, Germany.
Tel + 49 228 6483168
Fax +49 228 6483106
E-mail 101336.245@compuserve,com

Paris Air Show
13-20 June Paris le Bourget, France
Contact SIAE
Tel +33 (1) 5323 3333
Fax +33 (1) 4720 0086

Joint Avionics and Weapon Systems Conference and Exhibition
14-17 June San Diego, California, USA
Contact National Defense Industrial Association, Arlington, Virginia, USA
Tel +1 (703) 522 1820
Fax +1 (703) 522 1885

ACI Europe Annual Assembly
23-25 June Nantes-La-Baule, France
Contact Martine Suain, Airports Council International
Tel +32 (2) 552 0980

Biggin Hill International Air Fair
26-27 June Biggin Hill, Kent, UK
Contact Air Displays International
Tel +44 (1959) 540959

Canadian Business Aircraft Association Annual Convention
6-8 July Calgary, Alberta, Canada
Contact Janet Maslin, Administration Assistant
Tel +1 (613) 236 5611
Fax +1 (613) 236 2361
E-mail cbaa@istrar.ca

Royal Air Force Red Arrows Hotline:
information on show dates and venues
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Fax +44 1451) 810050
Tel (UK): 0891 664424. Calls charged at 60p/min
E-mail airsound@btinternet.com

***Flight International's* "Beneath the skin" exhibition of cutaway drawings has transferred from London's Science Museum to Royal Air Force Museum Cosford, Shifnal, Shropshire TF11 8UP, UK. The exhibition runs until September. For further information contact: Tel +44 (1902) 376200**

Hushkit argument: trade, rather than noise, barrier

I cannot say that the Comment "Disquieting move" (*Flight International*, 5-11 May) on the European hushkit issue showed your usual clear and objective reporting of the facts.

You state that it is not coincidental that the objectors are all US hushkit manufacturers, implying that they are the cause of noise issues in Europe for their own gain. It seems clear to me that the issue is precisely that. US aircraft with hushkits will be denied entry and operation into European airports, not because of their noise levels, but because they are US aircraft with hushkits.

It is true that only US manufacturers have achieved Stage III/Chapter 3 acceptance for their hushkits, which are flown by almost every airline in the world. It is also a fact that the rules are internationally accepted for the time being as the criteria for acceptable airport noise levels. It is true, too, that only US aircraft have hushkits that meet these rules. So why in the world should they be denied entry, if the noise is acceptable?

Or are Stage III/Chapter 3 noise levels no longer the acceptable criteria? Perhaps this is a more sensible position for the European Commission to propose to the aviation community to solve. US manufacturers would probably solve it.

But it is clear that this is not what the EC wants. It wants to ban US aircraft because they have hushkits, ignoring the fact that they meet, and could continue to meet, the noise rules of the rest of the world.

Then, whose aircraft will be allowed? Expensive new aircraft, manufactured in the USA and Europe, so that the inexpensive solution, economically and environmentally acceptable, is eliminated from the market.

This sounds to me like a trade barrier, not a noise barrier. The airport community has nothing to gain by this rule, but some aircraft manufacturers do.

JOHN DUGAN
DuganAir Technologies
Bellevue, Washington, USA

Morrisby tests are to be relied upon

Having been involved with pilot selection for more than 10 years, the letter from George Wilkie (*Flight International*, 19-25 May, P51) was of particular interest to me because of my active role in the British Aerospace/Airtours sponsorship scheme.

The problem centred on the Morrisby psychometric tests and the fact that a moderate performance was not enough for a candidate to continue to the next phase in the selection procedure, in this instance conducted by the Guild of Air Pilots and Air Navigators (GAPAN) with the pilot aptitude department of the Officer and Aircrew Selection Centre at RAF Cranwell.

Since 1995, the Guild has provided a facility for budding self-sponsored trainee pilots to undergo aptitude testing at Cranwell, followed by a debriefing session with a Guild expert, when the implications of the candidate's performance can be discussed and advice provided.

The extension of this scheme to test potential sponsored candidates was initiated over two years ago and includes a 45min-1h structured interview. The results of the aptitude test and the interview are sent, in this case, to BAe Flight Training at Prestwick.

Our experience this year is that the Morrisby test is screening out a remarkably high percentage. It is broad based, testing, among other things, mental agility.

The successful candidates at this stage have mostly impressed us when they come to Cranwell, with over half achieving a high standard in aptitude and interview, thus providing the sponsoring airline with just the material it is seeking.

Far from being a "disservice to the flying industry", this scheme has proved successful in selecting only the best candidates to go forward to expensive training, leading to a highly responsible role in commercial aviation.

CAPT CLIVE ELTON
(GAPAN)
Guildford, Surrey, UK

Smoke: settings are important

I read with interest "Smoke study reveals safety advantages of head-up display" (*Flight International*, 19-25 May, P4).

There are points that are overlooked, however, yet which play a crucial role in the solution of the cockpit smoke problem.

All of the information presented on the flight instruments or the head-up display is of little use unless the pilots are aware of the settings that led to those readings. For instance, an altitude reading is useless unless one predials the correct pressure setting; a localiser deviation is useless, unless the correct localiser frequency and course is predialled; airspeed readings during an approach are useless unless one knows the flap setting; a tower cannot provide a radar vector unless one dials the correct frequency first; an approach cannot be planned and executed unless one can clearly see the approach charts; and so on.

The conclusion can be drawn that it does not suffice to be able to see the flight instruments. One needs to see the pedestal, the mode control panel, the approach chart and more if one is to bring down the aircraft down safely.

This is especially true during abnormal conditions when instruments are most likely to be providing unreliable information.

ALEXANDER MAROUDIS
Athens, Greece

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.*
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Extracts from Flight, June 12, 1924

Mr. Grindell Matthews' 'Death Ray'

The Air Ministry makes the following statement regarding the negotiations which have taken place with Mr. Grindell Matthews, the inventor of the so-called Death-Ray: –

The Air Ministry, as long ago as February last, offered Mr. Grindell Matthews an opportunity to give a demonstration of his apparatus to their representatives... No arrangements for a demonstration were made, however, by Mr. Grindell Matthews until an interview took place between himself and Air Vice-Marshall Sir Geoffrey Salmond at the Air Ministry on Saturday, May 24. The demonstration, actually proposed by the inventor, and shown on May 26, consisted in lighting an "Osglim" electric lamp, and in stopping at will a small motor-cycle engine from a distance of about 15 yards. The demonstrations were carried out in the inventor's laboratory, all the apparatus being provided and arranged by him. The departmental representatives were shown nothing which would lead them to credit the statements which have appeared in the Press as to the possibilities of the invention, and the conditions under which the demonstrations were made by Mr. Matthews were such that it was not possible to form any definite opinion as to the value of the device. Mr. Matthews was accordingly offered an immediate opportunity to demonstrate the stopping, by means of his ray, of a small petrol motor (such as an ordinary motor-cycle engine) to be provided by the Government. He was not asked to disclose any information as to the means by which the rays were produced or the nature of the rays themselves. If this test proved successful, he was to be paid £1,000 immediately, the only condition being that he would allow the Government 14 days to consider the basis of further financial negotiations for the purchase or development of his invention. Mr. Grindell Matthews has refused this offer, and it is understood that he has left the country.

◆◆◆

Notice to Airmen

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The attention of all pilots and owners of aircraft is directed to Article 9 (2) *(c)* of the Air Navigation (Consolidation) Order, 1923, which prohibits the carrying out of any flying which, by reason of low altitude or proximity to persons or dwellings or for any other reason, is the cause of unnecessary danger to any person or property on land or water.

The Hon Lady Bailey & Simmonds Cirrus-Spartan, 1929

Capt Birdseed: "Sorry for giving you a fright the other day – have a box of chocolates as a little gesture of regret."

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■ Brian Jones, who shared the non-stop *Breitline Orbiter* circumnavigation with fellow baloonist Bertrand Picard tells the GAPAN livery dinner of "a few golden CRM moments" during the flight. Next time you are about to call the grumpy old tribute to the inequities of seniority in the left-hand seat a grumpy old tribute to the inequities of seniority, just pause and think: you too may be having a golden CRM moment, and treasure it...

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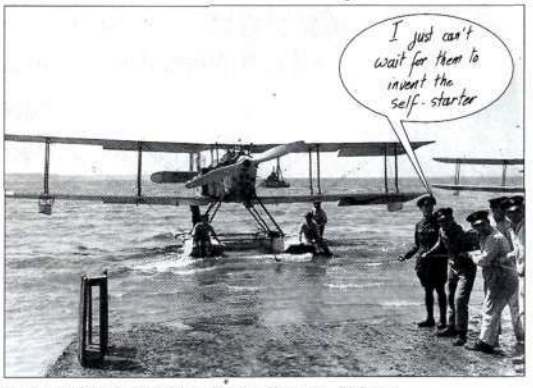

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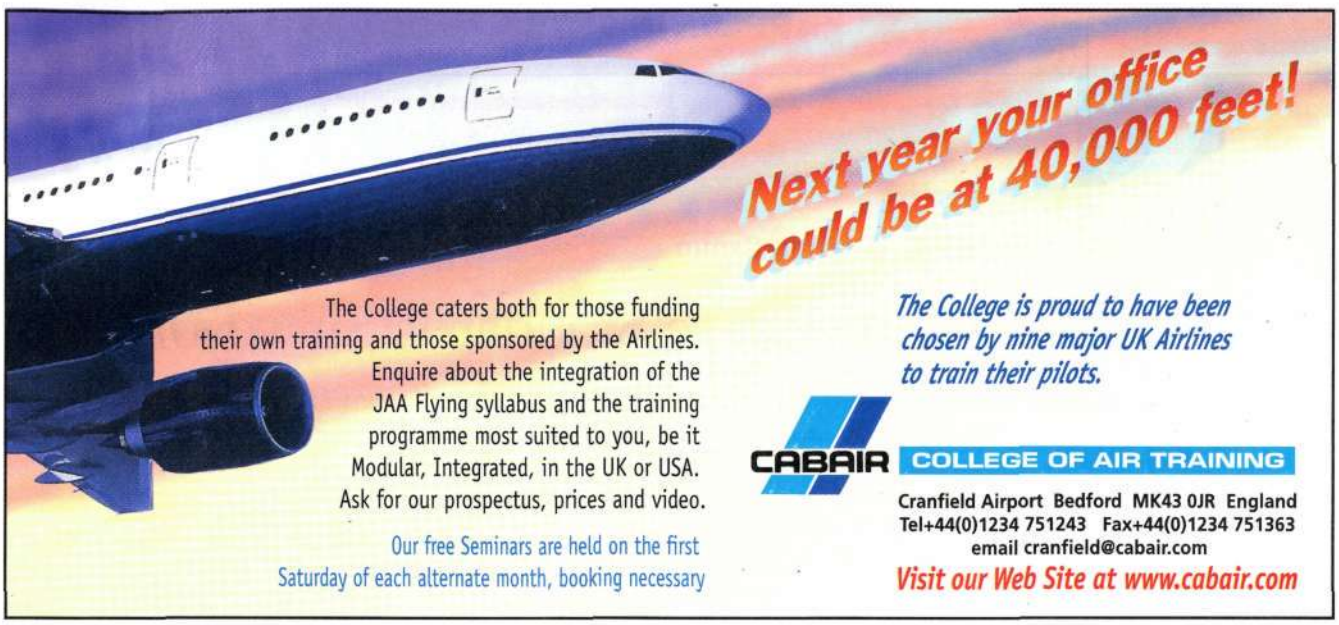

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- ideally have experience and understanding of aircraft systems.

For Pilot vacancies, write with full details of flying experience to Captain Paul Blackiston GMFO.

For Engineering vacancies, please write to Suzannah Ellison, Bristol International Airport, Lulsgate, Bristol BS48 3DY.

Please state clearly which position you are applying for and quote the relevant reference number on the outside of the envelope.

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Applicants should send a detailed resumé giving clear evidence of how you meet our requirements within 15 days of publication of this advertisement quoting the reference code "OE/FLI" to:

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Please fax, mail or email your CV and copies of Licence, Company Approvals and Course Certificates to: Ace Aviation Services, Serco House, 11 Bartley Way, Bartley Wood Business Park, Hook, Hampshire RG27 9XB.

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With the recent expansion of the Group and our ambitious growth plans, we are providing excellent opportunities for personal advancement through our firm commitment to the training and development of our employees.

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e-mail rosieb@flsaerospace.com

Closing date: 25th June 1999.

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You will be a business graduate with several years commercial experience with:–

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- an understanding of the needs of airlines, and
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The role is to:–

- identify new opportunities whether charter, scheduled or freight,
- raise the profile of the Airport within the industry,
- develop relationships with the airlines, and
- follow through and achieve growth.

The successful applicant will be a key member of the Management Team and will report directly to the Managing Director. For the right person this could lead to an appointment as a Director of the Airport Company.

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The successful applicant will be a graduate, probably with a statistical/business background, interested in a challenging career in the airports industry.

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Other work will include liaison with the travel trade and contributing to the day to day marketing of the Airport and its services, as required.

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For the above posts please reply enclosing full CV and current salary details to:–

Managing Director
Liverpool Airport PLC
Liverpool L24 1YD

For an initial **confidential** discussion with the Managing Director, Rod Hill please telephone 0151 288 4210 week commencing 7th June.

Closing date for receipt of applications: 14th June 1999.

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At Litton Aero Products, we understand the relationship between keeping your planes in the air and your company's bottom line. To keep your aircraft flying, Litton has developed a revolutionary upgrade from mechanical Vertical Gyro (VG) and Directional Gyro (DG) systems: The LTR-97 Fiber Optic Gyro (FOG) VG/DG System. With its enhanced reliability, the LTR-97 dramatically reduces expensive ground delays.

The LTR-97 continues Litton's excellence in Fiber Optic Gyro technology. Litton's system is not only smaller and lighter than its predecessor, it also provides superior aircraft attitude and heading. Its many advanced precision features create a new level of aviation reliability and low maintenance costs.

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