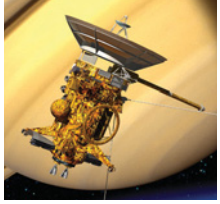

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Italian aerospace giant begins turnaround plan, but analysts worry things are moving too slowly **20**

DEADLY THRUST
Pilots of ill-fated Tu-204 unwittingly accelerated under high power as they tried to halt **11**

FLIGHT INTERNATIONAL

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5-11 FEBRUARY 2013

787 CRISIS

ELECTRICAL STORM

Sparks fly over Boeing battery strategy

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Christian McGowan

COVER IMAGE
This 787 superimposed on a lightning-strafed sky illustrates a story on Boeing's controversial choice of lithium-ion batteries for the Dreamliner's electrical system, and historical precedents. See Cover Story P22

PIC OF THE WEEK
YOUR PHOTOGRAPH HERE

AirSpace flyvertosset posted this shot of a Chance Vought F4U-5 Corsair in action. The aircraft is owned by Galveston, Texas-based Lone Star Flight Museum, which hosts an Air2Air Workshop for aviation photographers. Open a gallery in flightglobal.com's AirSpace community for a chance to feature here

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flightglobal.com/imageoftheday

Tu-204 accelerated despite crew selecting maximum reverse, after light touchdown failed to trigger landing-gear sensors P11. Fast moving Y-20 makes first flight P14

Rex Features/Xinhua

NEWS

THIS WEEK

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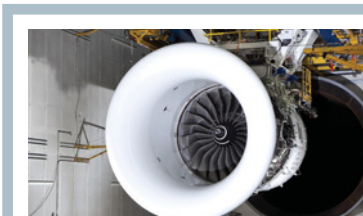

Rolls-Royce

NEXT WEEK COMMERCIAL ENGINES
In a powerplants special, we bring comprehensive updates both on CFM's Leap programme and on Rolls-Royce's Trent XWB (*above*) for the Airbus A350

IN THIS ISSUE
Companies listed

BEHIND THE HEADLINES

Max Kingsley-Jones (*below*), Olivier Bonnassies, Laura Mueller and Alex Thomas were out and about conducting interviews with bankers, airframer executives and analysts for an **Airline Business** interactive magazine about the **finance** issues facing carriers. Among those **critical questions** to which they sought answers was one on the **economic life** of airliners.

Is it **shrinking**? For a précis of the findings, turn to P7; and visit **flightglobal/ifinance13** to view the full **multimedia** analysis of this and other money matters.

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THE WEEK ON THE WEB
flightglobal.com

Our **Image of the Day** blog carried a US Marine Corps shot of a Boeing AV-8B Harrier preparing for take-off from USS ***Kearsarge*** (*below*). The aircraft is assigned to the – deep breath – "Marine Medium Tiltrotor Squadron (VMM) 266 Reinforced, 26th Marine Expeditionary Unit (MEU)".

Space blog **Hyperbola** ran a video clip beneath a headline that said it all: "Iran releases television footage of **monkey's suborbital launch**." On **Asian Skies**, Greg Waldron analysed a trailer for South Korean movie *Soar Into The Sun*. "Although I've become used to **inaccurate depictions** of military equipment – aircraft especially – over the years, this video really takes the cake," he wrote. "That said, I'd love to see a **T-50** – or any jet, for that matter – do a last-minute tail stand in the middle of a city, blowing **women's skirts** all over the place. I've also never seen a jet's afterburners shred an office building's windows. That would be a **neat trick** at an air show."

Find all these items at **flightglobal.com/wotw**

QUESTION OF THE WEEK

Last week, we asked for your views on the **AgustaWestland, Embraer tie-up**. You said:

Local tactical play	Step to global alliance	Eventual merger
48%	31%	21%

Total votes: 724

This week, we ask for your take on: **Boeing's battery strategy on the 787: ❑ Took too big a risk with lithium-ion ❑ Still the right choice ❑ Too early to say**

Vote at flightglobal.com/poll

HIGH FLIERS

The top five stories for the week just gone:

1 Elon Musk: Boeing 787 battery fundamentally unsafe
2 **Pictures:** Bombardier final assembly progress on CSeries revealed
3 Crashed Tu-204 powered forward as pilots tried reversing thrust
4 China's Y-20 transport conducts maiden flight
5 NTSB finds signs of short circuit… in JAL 787 battery failure

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US superiority at risk

With its aggressor aircraft needing investment if they are to properly model modern combat, a budget-constrained US Air Force could see its dominance under threat from emergent rivals

The US Air Force must invest in technologies if its fleet of aggressor aircraft is to accurately replicate the air forces of potential adversaries. History shows that air combat skills are highly perishable, and constant vigilance needed to maintain fighter pilots' skills.

During the Korean War, a veteran force of USAF pilots flying the North American F-86 Sabre achieved a lopsided 10-to-one kill ratio against the Soviet-built Mikoyan MiG-15. The Sabre pilots racked up that impressive kill ratio not because the Sabre outclassed the MiG-15 – in many ways, the MiG was the superior aircraft – but because the US pilots had superior training and experience compared to the rookie North Korean and Chinese aviators flying the Soviet machines.

However, over the skies of Vietnam two decades later, the USAF slipped to a dismal record, with a kill ratio only slightly better than two to one. Over Vietnam, much more sophisticated US fighters were being shot out of the sky by comparatively simple Soviet-built MiGs. This was partly attributable to a lack of realistic training against a representative threat, particularly for within-visual-range combat. The US Navy rectified the problem by introducing dissimilar air combat training. By the war's end, its kill ratio had climbed to 8.33 to one, while the USAF continued to wallow.

Pilots need to train in realistic scenarios to ensure no repeat of the Vietnam debacle

After Vietnam, the USAF instituted a number of initiatives to ensure its aircrews were ready to take on enemy aircraft. These included the Constant Peg programme, for which Russian-built MiGs were acquired to train US pilots using real Soviet tactics. The service also stood up conventional Aggressor squadrons using US-built aircraft to train friendly forces more broadly to face enemy aircraft using enemy tactics.

US Air Force

Unready for tomorrow's battles

Those efforts paid dividends over the skies of Iraq, where the USAF achieved a record of 39 kills for no losses against relatively modern Soviet-built jets. This suggests that pilots need the opportunity to train against realistic threat presentations using real enemy tactics – or the Vietnam debacle could be repeated.

The Lockheed Martin F-16 airframe is able to provide a reasonable facsimile of threat aircraft such as the Russian-built Su-30 Flanker series, but the older Block 30 and 32 versions used as aggressors do not have the equipment to accurately simulate the current-generation enemy weapons. To change that, the USAF needs to fund upgrades, as well as to think about how to train pilots to face emerging threats such as Russian and Chinese stealth fighters. ■

See Defence P15

Reverse psychology takes a tragic toll

Pilots have a loose term – "get-down-itis" – for the creeping desire to push an unstable approach when procedures, meteorological consideration or sheer common sense would normally demand a go-around.

However, preliminary information from the Red Wings Tupolev Tu-204 accident in Moscow might lend itself to a related strain – "stay-down-itis" – given the prolonged, and ultimately unsuccessful, attempt to stop on Vnukovo's runway.

Russian investigators have detailed the aircraft's behaviour but revealed only a scant overview of the pilots' behaviour as they tried to comprehend why an aircraft commanded to slow was instead powering towards a rapidly approaching ditch.

From a purely aerodynamic point of view, the aircraft, in the simplest terms, never stopped flying.

During take-off pilots are trained, arguably against intuition, to commit to rotating and climbing as the safer option once an aircraft accelerates past certain threshold airspeeds.

One crucial unanswered aspect of the Vnukovo accident is whether, during the long ground roll, the crew ever considered this possibility, or whether some psychological trigger – such as the activation of reverse-thrust – served to fixate their attention on completing the landing, to the exclusion of every possibility that didn't involve staying firmly on the ground. ■

See Air Transport P11

For commentary on the latest developments in US Air Force capability, consult our defence blog The DEW Line:
flightglobal.com/dewline

For a round-up of our latest online news, feature and multimedia content visit flightglobal.com/wotw

BRIEFING

RUSSIA AIDS KAZAKH CRJ200 CRASH INQUIRY

INVESTIGATION Russia's Interstate Aviation Committee is to analyse flight-recorder information from a Kazakh-operated Bombardier CRJ200 that crashed outside Almaty on 29 January. None of the 21 occupants of the twinjet survived after it came down about 5km east of the city. Domestic flight DV760 from Kokshetau, conducted by local carrier SCAT, had been approaching Almaty in freezing fog. The airline has not confirmed the type of approach being performed but says the captain had just over 1,000h on the CRJ200, having logged almost 18,200h total time. "This is the first emergency involving a SCAT aircraft in 15 years in the skies of Kazakhstan," it adds. "Our airline has always paid special attention to safety."

P&W WRAPS UP GEARED-FAN CERTIFICATION WORK

PROPULSION Pratt & Whitney has completed the airworthiness certification programme for the PW1524G engine to power the Bombardier CSeries. "I'm proud to say that, just last week, we completed the final certification test of the first new geared turbofan," P&W president David Hess said during a 31 January ceremony marking the start of construction for a new Singapore facility. "The engine testing and certification programme is 100% complete and successfully passed. We're working on the paperwork with Transport Canada to obtain formal certification for the engine, but all tests have been completed," he adds. The PW1524G, which will debut on the CS100, was originally scheduled to receive certification by late 2012.

BOEING STARTS BUILDING 737 AT HIGHER RATE

AIRFRAMES Boeing has launched the next step in a broad production ramp-up by inducting the first Boeing 737 into the assembly process at a rate of 38 aircraft per month. The new output level increases the monthly rate by three and is a step towards reaching 42 per month in 2014. Boeing also plans to open a third assembly line for the re-engined and updated 737 Max in 2015, but has yet to commit to a further rate increase beyond 42 per month. Boeing builds commercial 737s on two lines. One is producing 737s at a maximum rate of 21, while the second is being augmented to deliver 17 per month. Four more will be added to the latter line during the next two years.

FRESH SLIP FOR INDIAN CARRIER

DELAY The Indian navy expects to put its delayed aircraft carrier the INS *Vikramaditya* into active service by December 2013, following delivery acceptance trials due to commence from Severodvinsk, Russia, in June. Formerly the Soviet vessel *Admiral Gorshkov*, the ship underwent 100 days of sea trials in 2012, including flight trials involving RAC MiG-29K/KUB aircraft. Its planned handover in December 2012 was deferred because of a propulsion system problem.

SLEEPING CO-PILOT SHUTS OUT CAPTAIN

OPERATIONS Dutch investigators are probing an incident on a Transavia Boeing 737-800 in which a pilot left alone in the cockpit fell asleep. The Dutch Safety Board says the captain left the cockpit for the lavatory 2.5h into the flight on 20 September 2012. When he returned he used the intercom to call for the cockpit door to be opened. But the safety board says there was "no reaction". The captain informed the cabin crew and, when he was able to gain access to the cockpit, he discovered that the first officer was sleeping. While the incident had "no direct influence" on the flight, the airline reported it to the safety board. Transavia declines to disclose its cockpit occupancy policy or comment on the incident.

Tranche 2 and 3 Typhoons will be brought fully into service

BUDGET **CRAIG HOYLE** LONDON

UK defence spend backs air projects

Fighter aircraft and helicopter programmes get guaranteed funding – but money for future enhancements may be short

UK defence spending for the 10-year period until 2021-2022 will total just over £159 billion ($240 billion), of which the Ministry of Defence is planning for around £60 billion to be spent on procuring new equipment. Some £86 billion will be allocated to supporting the operation of new and existing systems, according to its Defence Equipment Plan report, published on 31 January.

A combined £44.5 billion will be spent on air-related projects, with "combat air" activities to account for £18.5 billion. These will include "continuing investment to bring [Eurofighter Typhoon] Tranche 2 and 3 aircraft fully into service", "increasing investment in the [Lockheed Martin F-35] Lightning II" and more spending on unmanned air vehicle projects, some through co-operation with France.

However, further investment to develop and enhance the Typhoon's multi-role and ISTAR capabilities are "priorities for use of unallocated headroom in the plan budget", the report says. The equipment plan contains £8 billion that could be used to fund additional programmes.

Royal Air Force transport, tanker and air support projects including Airbus Military A400M, AirTanker-provided Airbus A330 Voyager and Airseeker electronic intelligence aircraft will value £13.9 billion, while rotorcraft programmes will cost £12.1 billion. The latter includes buying 62 AgustaWestland Lynx Wildcats and 14 additional Boeing CH-47 Chinooks, upgrades to existing Chinooks and Eurocopter Pumas and a capability sustainment programme for the British Army's Boeing/Westland Apache AH1 attack helicopters.

While a plan to "address obsolescence and ship optimisation" for in-service AgustaWestland AW101 Merlin HC3/3As is "a high priority for future investment later in the decade", no money has been allocated.

Some £8.4 billion of "risk funding" is also contained within the spending plan, along with £4.8 billion "to manage cost variation and protect existing projects", the MoD says.

The UK National Audit Office says the MoD "has taken significant positive steps designed to deal with the accumulated [£74 billion] affordability gap in the equipment plan 2012 to 2022", but cautions that "its approach to risk is still over-optimistic". ■

To download our World Air Forces Directory go to flightglobal.com/waf2013

Eurocopter shrugs at rivals' potential alliance in Brazil
THIS WEEK P8

CRISIS ZACH ROSENBERG WASHINGTON DC

787 batteries are 'inherently unsafe' says SpaceX chief

Grounded type faces further problems, predicts Elon Musk, thanks to a design that does not prevent thermal runaway

The lithium-ion batteries installed on the Boeing 787 are fundamentally flawed, says Elon Musk, founder of SpaceX and owner of electric car manufacturer Tesla.

"Unfortunately, the pack architecture supplied to Boeing is inherently unsafe," writes Musk in an email to *Flight International*.

"Large cells without enough space between them to isolate against the cell-to-cell thermal domino effect means it is simply a matter of time before there are more incidents of this nature," he adds.

Boeing and Tesla both use batteries fueled by lithium cobalt oxide, which is among the most energy-dense and flammable chemistries of lithium-ion batteries on the market. While Boeing elected to use a battery with a grouping of eight large cells, Tesla's batteries contain thousands of smaller cells that are independently separated to prevent fire in a single cell from harming the surrounding ones.

"Moreover, when thermal runaway occurs with a big cell, a proportionately larger amount of energy is released and it is very difficult to prevent that energy from then heating up the neighbouring cells and causing a domino effect that results in the entire pack catching fire," says Musk.

An aerospace-capable version of Tesla's battery has been developed for use in SpaceX's Falcon 9 space launch vehicle. Boeing has so far declined offers of assistance from Tesla and SpaceX, says Musk.

Boeing

Seattle stands by its choice of battery for the Dreamliner

Musk's assessments of battery cells were confirmed by Donald Sadoway, a professor of electrical engineering at the Massachusetts Institute of Technology. "I would have used the same words. I'm glad someone with such a big reputation put it on the line," he says.

Mike Sinnett, Boeing's 787 chief project engineer, explains the careful design philosophy employed for the 787's battery system: "I design a cell to not fail and then assume it will, and then ask the next 'what-if' questions.

"And then I design the batteries that if there is a failure of one cell it won't propagate to another. And then I assume that I am wrong and that it will propagate to another and then I design the enclosure and the redundancy of the equipment to assume that all the cells are involved and the airplane needs to be able to play through that." ■

See our timeline showing the Dreamliner's nightmare
flightglobal.com/787woes

STRATEGY STEPHEN TRIMBLE WASHINGTON DC

Lithium-ion woes fail to dent Boeing's production plans

Boeing's chief executive says he stands by the 2005 decision to install lithium-ion batteries on the 787 as he pledges to keep production ramp-ups and planned aircraft development programmes on track, despite the uncertain timing of the twinjet's return to flight.

"Nothing we've learned has told us yet that we have made the wrong choice on the battery technology," said Jim McNerney during a 30 January earnings call.

Speaking to analysts and reporters, McNerney adopted a "business-as-usual" attitude, even as Boeing and federal investigators scramble to understand reasons behind the battery failures which have grounded the 787 fleet since 17 January.

Although "good progress is being made" in the search for a root cause, McNerney and chief financial officer Greg Smith could provide no clues or promising leads in the battery investigation, nor offer any guidance on the timing or cost of the process for returning the 787 to operational service.

Meanwhile, Boeing plans to launch the first 787-9 into final assembly and take Dreamliner production to 10 per month by the end of the year. Formal launch of the 787-10 is also likely some time during the next 12 months. Boeing will additionally freeze the configuration of the 737 Max in the first half of 2013. ■

See Feature P22

FINANCE MAX KINGSLEY-JONES LONDON

Ageing airliners face steeper depreciation curve

Concerns are growing among bankers and analysts that changes to the economic lives of airliners – driven by high fuel prices and the availability of young, efficient types – are accelerating the depreciation of older equipment.

DVB Bank's head of aviation research Bert van Leeuwen believes that while the length of an airliner's life – measured in years – has probably not changed much, values are being negatively affected.

Speaking to *Flight International*'s sister publication *Airline Business*, for its interactive special report on finance, he stated that there were several issues which were changing the depreciation curve.

"The fuel price is now higher than ever, the manufacturers are offering more efficient airplanes and there is a wide availability of aircraft on operating lease, which makes it easier for an airline to change to a new generation," he said. Value depreciation will be steeper in future, he added. Rob Morris, a senior analyst with Flightglobal's Ascend consultancy arm, agrees: "There is evidence that the economic lives of airliners are reducing, but the big issue is depreciation." ■

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SPACEFLIGHT **DAN THISDELL** LONDON

Astrium contract clears path for Ariane 6 lift-off

Rex Features

The European Space Agency deal also covers an improved Ariane 5

Europe's bid for a smooth transition into next-generation rocket technology was put formally into motion on 30 January with the signing of a firm development contract for an improved version of Ariane 5 – and an all-new replacement for the venerable heavy lifter.

With a €108 million ($146 million) European Space Agency contract formally making it prime contractor, Astrium can continue development of the Ariane 5 ME (Midlife Evolution) – intended to boost the rocket's payload to geostationary orbit by a fifth, to 12t, while holding launch costs steady.

Ariane 5s have orbited some half of the world's communications satellites, and the ME version – set to fly from 2017 – is intended to bridge the gap to an all-new Ariane 6, planned for service from 2021. Astrium chief executive François Auque described both programmes as needing to move quickly. ■

CONTRACT

Manila nears KAI FA-50 fighter deal

Korea Aerospace Industries and the Philippines will commence final negotiations during February for the purchase of 12 FA-50 fighters, according to a source close to the deal. Once launched, the process is expected to last for six months, and if discussions are successful, Manila could receive its first aircraft in 2015.

Media reports in the Philippines quoting presidential spokesman Edwin Lacierda also indicate negotiations are set to start. The aircraft will be used "primarily for training, interdiction and disaster response", he says, with the inclusion of a reconnaissance payload to enable the type to support the latter task.

A lack of fighters is a major capability gap for the Philippines, which retired its last Northrop F-5s in 2004. It is especially pressing-given the development of China's air force in recent years, and territorial disputes between Manila and Beijing in the South China Sea.

The Philippine air force could use the FA-50 as a trainer to regenerate its ability to operate fighters, but also as a combat aircraft, if necessary.

In January 2012, Seoul placed a $600 million order for 20 FA-50s, the most advanced variant of KAI's T-50 trainer, with the first examples to be received in mid-2013. ■

ROTORCRAFT **DOMINIC PERRY** PARIS

Eurocopter shrugs at rivals' potential alliance in Brazil

Embraer-AgustaWestland agreement would not harm local subsidiary, says chief executive

A potential tie-up in Brazil between AgustaWestland and Embraer, which could lead to the local assembly of AW helicopters, is not causing concern at rival Eurocopter, which already produces rotorcraft in the country via its Helibras subsidiary.

Speaking at a media briefing on 24 January, Eurocopter chief executive Lutz Bertling revealed the manufacturer had previously discussed a similar proposal with the Brazilian airframer.

He says: "We have talked with Embraer several times in the past about a partnership, but because of the way we are structured in Brazil it would not have made too much sense for the two companies."

He says Eurocopter is unconcerned by the potential alliance, pointing out that its Helibras subsidiary is more of an indigenous manufacturer than simply a local assembly line. With the design capabilities it has recently added, says Bertling, it is a "fully-fledged OEM" in Brazil that will eventually "export helicopters to the world market".

Embraer subsidiary Atech is also a supplier of mission systems to a number of the EC725s Helibras is producing for Brazil's navy, a contract that is unaffected by the proposed partnership.

Elsewhere, Eurocopter is targeting a 15% increase in its deliveries in 2013 to around 550 units, as it begins to ramp up its key programmes.

Bertling described the coming 12 months as a "year of execution" as the company works to bring its super medium-class EC175 into service and increase production rates of the Tiger and NH Industries NH90 military types.

However, Bertling says that special attention must be paid to securing the robustness of Eurocopter's supply chain, particularly for the EC175, given the financial pressures in the market.

It has already been forced to acquire the aerostructures business of troubled French automotive supplier Hueliez, which is now trading as Helicoptère Aérostructure Services.

Eurocopter experienced a record 2012, breaking through the €6 billion ($8 billion) turnover barrier for the first time, to €6.3 billion, up 15% on the previous year. Deliveries stood at 475, down slightly on the 2011 figure, although still some way ahead of rivals Bell and Sikorsky, which handed over 251 and 243 aircraft respectively in 2012.

Net orders stood at 469 units, totalling €5.4 billion. ■

Eurocopter

Helibras produces EC725 transports for the Brazilian armed forces

See Defence P14, Business Aviation P18

A321 strikes ILS antenna as pilots execute a go-around
AIR TRANSPORT P10

COMBAT AIRCRAFT **DAVE MAJUMDAR** WASHINGTON DC

Pilots decry F-35 downgrade

Degraded performance characteristics for Lockheed Martin's new fighter prompt fears of significant operational impact

The Pentagon's decision to reduce the performance specifications for the Lockheed Martin F-35 Joint Strike Fighter will have a significant operational impact, a number of highly experienced fighter pilots consulted by Flightglobal suggest. But carefully crafted tactics could help mitigate some of those shortcomings.

"This is going to have a big tactical impact," one officer says. "Any time you have to lower performance standards, the capability of what the airframe can do goes down as well."

The US Department of Defense's decision to relax the sustained turn performance of all three variants of the F-35 was revealed in January in the Director of Operational Test and Evaluation 2012 report. Turn performance for the US Air Force's F-35A was reduced from 5.3 to 4.6 sustained *g*, with the US Marine Corps' B-model figure cut from 5 to 4.5*g* and the US Navy's F-35C slipping from 5.1 to 5*g*. Acceleration times from Mach 0.8 to M1.2 were extended by 8sec, 16sec and 43sec respectively for the three variants.

"Every second counts in [combat] scenarios. The longer it takes, the more compressed the battle space gets"
FIGHTER PILOT

The baseline standard used for the comparison was a "clean" Lockheed Martin F-16 Block 50 with two wingtip Raytheon AIM-120 AMRAAM air-to-air missiles.

"What an embarrassment, and there will be obvious tactical implications. Having a maximum sustained turn performance of less than 5*g* is the equivalent of an [McDonnell Douglas] F-4 or an [Northrop] F-5," another highly experienced fighter pilot says. "[It's] certainly not anywhere near the performance of most fourth- and fifth-generation aircraft."

Lockheed Martin

Flight testing has confirmed the Joint Strike Fighter's high angle of attack performance

At higher altitudes, the reduced performance will directly impact survivability against advanced surface-to-air missile (SAM) systems, such as the Almaz-Antey S-300PMU2, the same pilot says. At lower levels, where fighters might operate in the close air support or forward air control roles, the reduced airframe performance will place pilots at increased risk against shorter-range SAMs and anti-aircraft artillery.

Worst of all, say pilots, is the carrier variant F-35C's drastically reduced transonic acceleration capability. "That [43sec] is a massive amount of time, and assuming you are in afterburner for acceleration, it's going to cost you even more gas," the pilot says. "This will directly impact tactical execution, and not in a good way."

Pilots typically make the decision to trade a very high rate of fuel consumption for supersonic airspeeds for one of two reasons. "They are either getting ready to kill something or they are trying to defend against something [that's trying to kill] them," the pilot says. "Every second counts in both of those scenarios. The longer it takes, the more compressed the battle space gets. That is not a good thing."

Pilots will have to make extensive use of the F-35's stealth characteristics and sensors to compensate for performance areas where the jet has weaknesses, sources familiar with the aircraft say. In an air-to-air engagement, for example, tactics would have to be developed to emphasise stealth and beyond visual-range combat. If a visual-range engagement is unavoidable, every effort would have to be taken to enter the "merge" from a position of advantage, which should be possible, given the F-35's stealth characteristics.

Once engaged within visual range, given the F-35's limitations and relative strengths, turning should be minimised in favour of using its Northrop Grumman AAQ-37 distributed aperture system of infrared cameras, helmet-mounted display and high off-boresight missiles to engage the enemy aircraft.

If a turning fight is unavoidable, the F-35 has instantaneous turn and a maximum 50° high angle of attack performance comparable to a Boeing F/A-18 Hornet, which means a similar strategy could be adopted in such a situation.

Lockheed maintains that the F-35 has performance superior to that of any "legacy" fighter at high altitudes. "I will tell you the F-35's capability at altitude, mostly driven by the internal carriage of those weapons, as a combat airplane, exceeds the capabilities of just any legacy fighter that I'm familiar with," says Steve O'Bryan, Lockheed's F-35 business development director. ■

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DEVELOPMENT

Stall tests nudge ARJ21 closer to final certification

Chinese airframer Comac has completed crucial stall tests for its ARJ21 regional jet programme. Aircraft 104, one of six airframes undergoing both ground and flight tests, recorded 87 flight hours in a two-month period in late 2012.

It also completed 190 modules under the Civil Aviation Administration of China's certification programme for stall tests. The CAAC confirms the tests were completed successfully and the programme has taken a "critical step" forward. Success of the stall tests also lays a solid foundation for flight tests on performance and control stability, says Comac. The majority of the 292 scheduled ground tests for the ARJ21 have also been completed.

Comac has said that once the aircraft completed critical stall testing, the certification effort for the twinjet programme should accelerate. At Airshow China in Zhuhai in November, Comac said it was aiming to receive certification from the CAAC in the first half of 2013, and to deliver the ARJ21 to launch customer Chengdu Airlines in 2014. Afterwards it could take up to two years before the aircraft is validated by the US Federal Aviation Administration. Delivery of the ARJ21 was initially scheduled for 2007. ■

AirTeamImages

Despite sustaining damage to its fuselage the aircraft landed safely following a second approach

INVESTIGATION **DAVID KAMINSKI-MORROW** LONDON

A321 strikes ILS antenna as pilots execute a go-around

Inquiry opens into low-visibility incident involving Ural Airlines twinjet approaching Kazan

Russian investigators have opened an inquiry after a Ural Airlines Airbus A321 struck an antenna from the instrument landing system while executing a go-around at Kazan.

The aircraft had been arriving on 25 January from the Egyptian resort of Sharm el-Sheikh.

Russia's Tatarstan republic emergency situations ministry states that the aircraft, carrying out flight U63046, had made its approach "in bad weather".

It says visibility was down to 800m (2,600ft), while the cloud base was only 30m. Kazan's primary runway, designated 11L/29R, has ILS installations at both ends.

"The pilots decided to execute a missed approach," says the ministry, after the A321 emerged from the clouds and the crew had analysed the landing position.

But during the go-around, it states, the aircraft's fuselage struck the localiser antenna on the ILS. Russia's federal investigative committee says the aircraft (VQ-BOZ) sustained puncture damage, including four "reach through" holes, to its rear underside fuselage.

While the inquiry has not confirmed which antenna was hit, a NOTAM for Kazan dated 25 January stated that the ILS for runway 11L had become unserviceable.

The ministry says a commission has been established to investigate the collision, and a different aircraft was used for the return flight to Sharm el-Sheikh.

Russian transport supervisory authority Rostransnadzor says there were no injuries among the 220 passengers and seven crew on board. It adds that it has initiated an audit of Ural Airlines, which is based in Ekaterinburg. ■

PRODUCTION **MAVIS TOH** SINGAPORE

Second line at Nagoya could support MRJ demand

Mitsubishi Heavy Industries is studying the possibility of building a second assembly facility near Japan's Nagoya airport to ramp up the planned production rate of its Mitsubishi MRJ regional jet.

MHI already has a plant beside Nagoya airport, where it has said it will assemble the MRJ70 and MRJ90 aircraft. But the company says it is studying "whether it would be possible to secure a plant site adjoining Nagoya airport", in expectation of a production volume increase for the twinjet.

"MHI would conduct final assembly of the MRJ there if the site is secured," the company adds. But details on when construction would begin, should the site be secured, have yet to become clear.

"Initially, MHI will start production of MRJ at a rate of one or two per month, which will be increased later," says the company.

MHI is responsible for manufacturing major parts of the MRJ, including the fuselage, wings and tail, and will take charge of the aircraft's final assembly.

Mitsubishi Aircraft said in December it was studying how to ramp up the planned production rate of its regional jet to meet the delivery targets. It calculates it needs to produce 10 aircraft a month to meet demand.

If a second line should prove necessary, however, it would only be set up after the aircraft receives type certification, scheduled for the third quarter of 2015.

In December, SkyWest Airlines firmed an order for 100 MRJ90s, taking Mitsubishi's MRJ backlog to 170 with 160 options. The MRJ is scheduled to perform its first flight in the third quarter of 2013, with deliveries starting in 2015. ■

Poor de-icing nearly stalled ATR 42
AIR TRANSPORT P12

INVESTIGATION **DAVID KAMINSKI-MORROW** LONDON

Thrust acted against ill-fated Tu-204

Twinjet accelerated despite crew selecting maximum reverse, after light touchdown failed to trigger landing-gear sensors

Pilots of the crashed Red Wings Tupolev Tu-204 twice selected maximum reverse thrust without the reverser system engaging, and unwittingly catapulted the aircraft forward under high power.

Russian investigators have detailed the crew's failed attempts to slow the twinjet before it overran Moscow Vnukovo's runway 19 at 116kt (214km/h) and struck a highway embankment.

The aircraft had been configured for landing – with flaps at 37˚ and slats at 23˚ – and overflew the threshold at a height of 15m (50ft), travelling at 140kt, states a preliminary analysis from the Interstate Aviation Committee (MAK). Operating a ferry flight from Pardubice in the Czech Republic, the jet was relatively light with only eight occupants, all crew, on board.

Rex Features

Five of those on board, including the three cockpit crew, were killed in the 29 December accident

GUSTING WINDS

It touched down long, about 900-1,000m after the threshold, at a speed of 124kt, some 5s after the throttle was reduced to idle thrust. The aircraft took 10s to descend the last 4m before runway contact, a touchdown which registered at 1.12*g* on the flight-data recorder.

The inquiry points out that the Tu-204 landed with winds gusting up to 22kt from the right, and the aircraft was exhibiting a slight left bank of up to 1.5˚.

While the left-hand main landing gear registered a compression signal, the right-hand gear did not. The investigators also note that the Tu-204's spoilers did not deploy, automatically or manually.

As the nose-gear was lowered the pilots moved the reverser control lever to the maximum setting "in one motion", says MAK. But neither of the engines' reverser systems responded.

By selecting maximum reverse thrust, without the reverser system activating, the pilots effectively commanded high forward thrust from the Aviadvigatel PS-90 powerplants. The Tu-204 only slowed to 108-110kt about 7-8s after landing, before it started to accelerate again, reaching 130kt. This acceleration further reduced the weight on the landing gear and, as the aircraft travelled along the runway, it oscillated in the roll axis, from 4.5˚ left to 2.6˚ right.

The result was the left- and right-hand landing gear alternately compressed, says MAK, but simultaneous compression of both main gear "did not occur", rendering attempts to brake "ineffective".

"Pressure in the brakes was applied only when the landing gear compressed," it states.

Maximum reverse remained selected for 8s before the control lever was disengaged. But 5s later the flight engineer called "Reverse!" and the pilots re-engaged maximum reverse.

MAK says this had the same effect as before, powering the aircraft forward. At this point it was about 950-1,000m from the runway end and still travelling at 125-130kt. Reverse thrust was again disengaged, after 4s, and the crew tried resorting to an automatic braking system.

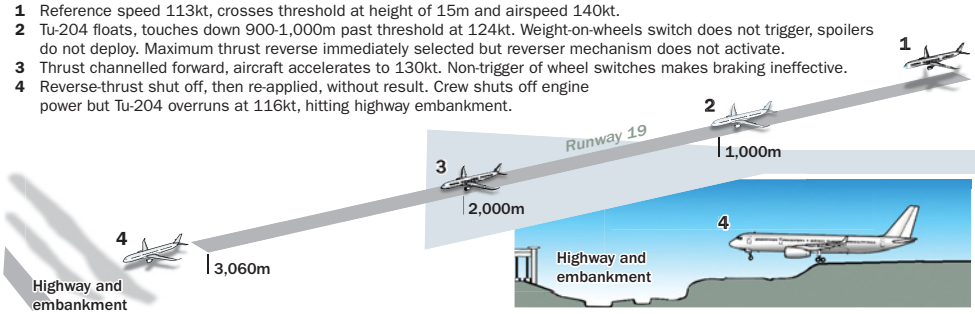
POWER CUT

But 32s after landing, the Tu-204 ran out of available runway. In a last-ditch effort the flight engineer used an emergency system to cut the engine power as the aircraft overran. Ironically, the effect of crossing rough ground and snow caused the aircraft's landing gear to compress, deploying the spoilers and releasing the thrust-reverser mechanism.

Five of those on board, including the three cockpit crew, were killed in the 29 December accident. The crash prompted an airworthiness directive instructing crews to engage reverse thrust in stages, by initially selecting a low-thrust setting and checking the reversers have activated before committing to maximum reverse thrust. ■

MOSCOW VNUKOVO RUNWAY OVERRUN

1 Reference speed 113kt, crosses threshold at height of 15m and airspeed 140kt.
2 Tu-204 floats, touches down 900-1,000m past threshold at 124kt. Weight-on-wheels switch does not trigger, spoilers do not deploy. Maximum thrust reverse immediately selected but reverser mechanism does not activate.
3 Thrust channelled forward, aircraft accelerates to 130kt. Non-trigger of wheel switches makes braking ineffective.
4 Reverse-thrust shut off, then re-applied, without result. Crew shuts off engine power but Tu-204 overruns at 116kt, hitting highway embankment.



Runway 19 length 3,060m. Wind gusting 22kt from right of aircraft.
SOURCE: Russian Interstate Aviation Committee

Flightglobal

INVESTIGATION DAVID KAMINSKI-MORROW LONDON

Poor de-icing nearly stalled ATR 42

Uncommanded pitch-up and stick-shake after departure from Bergen traced to inadequate treatment of critical tail surfaces

Norwegian investigators believe a Danish Air Transport ATR 42-300 entered an uncommanded climb, and came close to stalling, as a result of inadequate de-icing. The inquiry into the event has highlighted the importance of de-icing all critical surfaces.

While departing Bergen, the aircraft lifted off without any control input, 10kt (18km/h) below rotation speed. It continued a shallow, low-speed climb despite both control columns being moved to their full-forward position and the engine power being increased, says Norwegian investigation board SHT.

Airspeed fell away and the ATR's stick-shaker activated, along with an audio alarm, warning the pilots that the turboprop was approaching a stall.

The aircraft eventually began to respond to the pitch-down input. Its nose lowered and its airspeed increased, and the stick-shaker stopped, but the control columns initially remained heavy to operate.

Snow and ice had been present on the turboprop while at Bergen, and it was de-iced with warm water before anti-icing fluid was applied about 8min before take-off. But airframer ATR, which submitted a comment to the inquiry report, questioned the quantity of anti-icing fluid – some 69 litres (18 USgal) of type-2 and 17 litres of type-1 – used on the aircraft. It said the amount of type-2 fluid seemed "to be low" and suggested the level ought to be closer to 120 litres.

ATR says the Bergen event matched the behaviour of an aircraft subjected to "improper" de-icing of its horizontal stabiliser.

"The most probable scenario is that the [aircraft] was either badly de-iced on [the] ground or that the hold-over time was exceeded with subsequent contamination on the horizontal stabiliser [or] elevator," it said.

AirTeamImages

Full-forward control inputs from the pilots had little initial effect

SHT says there was a "real risk" of a stall and the investigators are "uncertain" whether the pilots or the stick-pusher could have prevented it should the nose have risen further.

"It is also uncertain whether it would have been possible to recover in time if a stall had occurred at such a low altitude," adds SHT.

The control columns gradually became easier to handle and the pilots continued to their destination, landing safely. None of the 27 occupants of the 9 November 2007 flight was injured.

SHT notes that Danish Air Transport's empennage de-icing procedure for the ATR gives "special attention" to the area between the horizontal stabiliser and elevator, to prevent the elevator from freezing.

It says it "questions" whether this focus might have led de-icing personnel to "not be sufficiently attentive" to the need to keep the upper stabiliser and elevator surfaces completely free of ice. ■

MODIFICATION

Fuel-quantity indicator change aims to avoid fatal mix-up

ATR 72 turboprop operators are to be instructed to modify fuel gauges to ensure the indicator for the smaller ATR 42 cannot inadvertently be fitted in their place.

Investigators determined that installation of the wrong gauge on a Tuninter ATR 72 resulted in the pilots being misled over the quantity of fuel in the aircraft. The turboprop suffered fuel exhaustion while en route from Bari to Djerba in August 2005, forcing its crew to ditch off the coast of Sicily with the loss of 16 lives.

"Overruling standard operational procedures and maintenance practices have led to this kind of occurrence," says the European Aviation Safety Agency in a directive proposal. "Consequently, additional actions to help avoid maintenance errors… need to be taken."

While the ATR's fuel-indicating system complies with requirements, states EASA, such errors would be "mitigated" by making it "mechanically impossible" to install an ATR 42 gauge in the larger variant. EASA is currently preparing an instruction to operators to modify the indicator on ATR 72-100s and -200s by installing a locking adaptor on the electrical connector.

Aircraft which already have a secondary low-fuel-level detection system fitted will need to be modified within three years; those without in only two.

EASA is still consulting on the proposed directive and is inviting comments until 20 February. ■

Fast-moving Y-20 makes first flight
DEFENCE P14

STRATEGY **DAVID KAMINSKI-MORROW** LONDON

EasyJet's options ease fleet decision pressure

UK budget carrier EasyJet is considering converting additional Airbus A320 options to buy time to complete its assessment of potential aircraft types for its future fleet.

It has finished its technical evaluation but is engaged in commercial discussions with Boeing, Bombardier and Airbus as well as engine manufacturers Pratt & Whitney and CFM International.

But while the talks and evaluation are "well under way", says the airline, it is looking at converting three A320 options to "allow the time necessary to achieve the optimal commercial outcome".

The additional A320s would ensure sufficient capacity for EasyJet to operate its planned summer 2014 network schedule and give time to finalise the new fleet proposal to shareholders.

EasyJet says this proposal will cover not only the new fleet selection – with deliveries starting after 2017 – but also the bridging period from 2015-2017.

The airline aims to introduce more fuel-efficient types as well as 180-seat aircraft to replace 156-seat Airbus A319s.

Its fleet at the end of December 2012 totalled 213 aircraft, comprising 56 A320s and 157 A319s.

EasyJet says its new fleet proposal is intended to support "prudent" capacity increases of 3-5%.

The airline disclosed its latest update on the fleet replacement as it predicted it would keep first-half pre-tax losses to £50-75 million ($80-118 million), far lower than last year's £112 million figure.

EasyJet was originally a Boeing 737 operator before the carrier gradually switched to an all-Airbus fleet, but it is keeping open the possibility of including the Bombardier CSeries as part of its future aircraft strategy. ■

Ryan412 gallery on flightglobal.com/AirSpace

There are plans to replace 156-seat A319s with larger aircraft

Commercial aviation gallery on flightglobal.com/AirSpace

Airbus had previously co-operated with the carrier on test flights

AIRFRAMES **GHIM-LAY YEO** WASHINGTON DC

JetBlue prepares to begin sharklet retrofit on A320s

US carrier details plans to modify older twinjet fleet following airframer's development of wing-tip installation programme

JetBlue will begin retrofits of fuel-saving winglets on its current Airbus A320 fleet during the first quarter of this year, and expects to complete the retrofits by 2017.

While new A320s will be delivered to the airline with the "sharklet" wing-tips, JetBlue expects to retrofit the winglets on five existing A320s during 2013, says the airline's chief financial officer Mark Powers.

Airbus has migrated A320 wing production to a new build standard that allows sharklets to be fitted through a simple procedure. But it has been developing a retrofit programme for the more complex task of equipping earlier-build aircraft, although it has not identified a specific customer.

JetBlue is scheduled to take delivery of three A320s in 2013, as well as its first four A321s, says Powers. JetBlue will also add seven Embraer 190s in 2013, after accelerating the deliveries of some of them to take advantage of 100-seat opportunities out of Boston and San Juan.

Powers says the airline has a lot of flexibility to decide the pace of the sharklet installations on its current A320s, but expects them to be completed in 2016-17.

JetBlue chief executive Dave Barger says the sharklets will result in "significant fuel savings" for the carrier. The airline's larger A321s, slated to arrive in the fourth quarter, will also help reduce unit costs.

"They will accommodate up to 190 passengers and allow us to operate our slot portfolio in New York more efficiently," says Barger. ■

CONTEST **DOMINIC PERRY** PARIS

Eurocopter bullish in face of Kiowa upgrade option

Eurocopter believes the US Army's requirement to replace or upgrade its Bell OH-58 Kiowa Warrior fleet represents the "largest military opportunity in the coming years", amid a global defence market that will remain "slow" for the foreseeable future.

The company is pitching the AAS-72X+, a military version of its EC145 T2, for the prospective Armed Aerial Scout (AAS) contest, but is expected to face rival proposals from companies including Bell, Boeing, MD Helicopters and Sikorsky.

"[The AAS-72X+] would not be significantly more expensive than upgrading the Kiowa"

LUTZ BERTLING
Chief executive, Eurocopter

However, Lutz Bertling, Eurocopter chief executive, says its fiercest competition will come from a proposed upgrade of the existing fleet – the US Army's default position.

"We are ready to provide a solution now which can replace an aircraft which has been in service with the US Army since the Vietnam era," Bertling said during a media briefing in Paris on 24 January. "It would not be significantly more expensive than upgrading the Kiowa. It will offer the best balance of capability, affordability and growth potential," he claims.

Eurocopter is teaming with Lockheed Martin, which will provide the mission system for the type. Bertling anticipates the US Army will issue a request for proposals in late 2013 or early 2014.

The company is banking on the success of its UH-72A Lakota programme for the US Army and Navy helping swing the contest in its favour. It has so far delivered more than 250 aircraft from an order for 309 of the type from its Columbus, Mississippi facility, and would use the same site to produce the AAS-72X+ if selected, says Bertling.

The AAS contest would represent a rare bright spot in an otherwise flat market for military rotorcraft. Bertling says: "There are some competitions here and there, but compared to what we saw before the financial crisis bookings are relatively slow."

Only 31% of the 469 net orders Eurocopter booked in 2012 were for military types, and several existing contracts – such as for NH Industries NH90s and Tiger attack helicopters – are threatened with cancellation or reduction by customers. Progress on improvements to the Tiger continue, however, with the first enhanced HAD variant to be delivered to the French army shortly. ■

Xinhua

Beijing's strategic transport made its debut from Yanlian air base

DEBUT **DAVE MAJUMDAR** WASHINGTON DC **GREG WALDRON** SINGAPORE

Fast-moving Y-20 makes first flight

Chinese state news agency releases images of airlifter's maiden sortie less than a month after internet emergence

China has conducted the debut flight of its Xian Y-20 strategic transport from Yanlian air base, less than a month after first images of the type emerged on the internet in the last week of December, 2012.

Video footage of the milestone event aired on Chinese state television shows the four-engined aircraft, bearing the number 20001, taking off, landing and taxiing. The transport's landing gear was shown in a lowered position throughout the flight, in common with many debuts.

"The successful maiden flight of Yun-20 is significant in promoting China's economic and national defence build-up, as well as bettering its emergency handling, such as disaster relief and humanitarian aid," says Beijing's official Xinhua news agency, which also posted still images of the event. "The giant aircraft will continue to undergo experiments and test flights as scheduled," it adds.

Released images appear to confirm that the first example is powered by Russian-built Soloviev D-30 low-bypass turbofan engines, versions of which also equip the Ilyushin Il-76 airlifters flown by China's air force. A production variant of the type could potentially instead use the nation's developmental WS-18 or WS-20 engines, or a military derivative of the AVIC Commercial Aircraft Engines CJ-1000A designed for the Comac C919 airliner. ■

ROTORCRAFT

Royal Navy Wildcat takes to the air

Operations with the Royal Navy's AgustaWestland Wildcat HMA2 helicopter have moved a step closer, with the service's first production example having been flown for the first time from the airframer's Yeovil production site in Somerset. Previously due to have been accepted in mid-December 2012, aircraft ZZ397 is one of 28 Wildcats on order for the RN, with another 34 to be produced for the British Army under a programme worth more than £1.6 billion ($2.5 billion). To perform anti-surface and anti-submarine warfare, force protection and counter-piracy duties, the new-generation Lynx should enter navy service during 2015. South Korea's navy has also selected the type.

New Sidewinder hits spot for US Navy
DEFENCE P16

TRAINERS **LUCA PERUZZI** GENOA

Alenia Aermacchi offers new-generation SF-260TP

Alenia Aermacchi is to demonstrate the latest version of its SF-260TP primary and basic trainer to potential customers with a new glass cockpit, enhanced vision system and upgraded air-conditioning equipment installed, with the combination now in the final stage of tests.

At the heart of the new package is a digital glass cockpit based on a customised version of US company Avidyne's latest avionics suite. This includes two 6 x 8in (15 x 20cm), high-resolution LCD displays and a single control/display unit.

The two integrated flight displays feature a range of functions, including presenting primary flight data, navigation systems and a digital moving map, plus access to the trainer's flight-management system and checklist. Imagery from an infrared/TV camera installed under the left wing leading edge can also be shown, providing pilots with better visibility at night and in adverse weather conditions.

First flown at Alenia Aermacchi's Venegono production site with these improvements, the latest SF-260TP model also incorporates a new air-conditioning system with a high-cooling capability.

Meanwhile, the airframer has released images showing a disassembled example of the type being loaded into the cargo compartment of a C-27J Spartan tactical transport. The company in November 2012 revealed that an SF-260 with a new cockpit had recently completed a demonstration for a potential customer in the Middle East.

Alenia Aermacchi

Modifications include the addition of a digital glass cockpit

Alenia Aermacchi has produced more than 900 SF-260s, and Flightglobal's MiliCAS database lists 254 of the type as being in current military service in 16 nations. ■

MODERNISATION **DAVE MAJUMDAR** WASHINGTON DC

USAF seeks F-16 aggressor upgrade

Air Combat Command looks for funding to update older aircraft amid concerns that current threat is under-replicated

The US Air Force is hoping to upgrade its fleet of Lockheed Martin F-16 "aggressors" so that the aircraft can better replicate enemy fighters, the service's Air Combat Command (ACC) says.

"To date, generally, it is considered that the aggressors under-replicate the current threat," says Maj Gary Barker, the ACC training operations division's F-16 functional area and realistic training manager. "It's very difficult for the aggressors to provide the threat picture that we think we would see in near-peer combat."

In an effort to rectify the problem, the ACC hopes to upgrade the older Block 30/32 F-16s used by the 18th and 64th Aggressor Squadrons to the System Capabilities Upgrade-8 configuration, which would add the Joint Helmet-Mounted Cueing System and a new centre display unit.

"With that, you can simulate missile weapons employment zones and provide more accurate cueing real-time that can aid in kill removal and weapons assessment airborne," Barker says. The ACC also hopes to incorporate higher-quality training pods which would provide better electronic attack threat replication.

Currently, when an aggressor F-16 is replicating an enemy fighter such as a Sukhoi Su-30, it has no onboard system to simulate an infrared-guided weapon such as the Vympel R-73 air-to-air missile. "So the F-16 pilot will use visual references that he has memorised to determine when the adversary airplane is in range and within the appropriate look angle."

There is also no electronic system that tells the aggressor pilot if he is within the correct parameters for a valid missile shot, meaning this must be reviewed later on the ground. One highly experienced USAF pilot says this process is "so inaccurate that the feedback for training is useless most of the time".

Financing the planned upgrade is a problem for the USAF, Barker concedes. "Securing funding to be able to execute that plan is a separate topic," he says. "Nothing is guaranteed right now."

Longer-term, the USAF's current F-16 and Boeing F-15 aggressor aircraft are unlikely to be able to provide a realistic threat presentation of possible future adversaries such as the Chinese Chengdu J-20 and Shenyang J-31 or Russia's Sukhoi PAK-FA/T-50.

The only real option for a future aggressor aircraft is likely to be the Lockheed F-35, although Barker notes: "It's very difficult to replicate a non-stealthy airplane with a stealthy airplane."

Barker says it is likely that realistic training for the Lockheed F-22 and F-35 will have to be provided in simulators, with some additional live training conducted over ranges. The use of live virtual constructive training could also be possible, once a number of range safety and air traffic management issues have been addressed. ■

US Air Force

Pilots cannot currently replicate near-peer combat during training

For analysis of defence topics, visit our The DEW Line blog: **flightglobal.com/dewline**

MUNITIONS **DAVE MAJUMDAR** WASHINGTON DC

New Sidewinder hits spot for US Navy

NAVAIR insists post-testing software fix for AIM-9X Block II weapon will improve sole off-boresight performance issue

Raytheon's AIM-9X Block II Sidewinder air-to-air missile has performed better than expected so far during its operational testing programme, but with one exception, the US Navy says.

"The AIM-9X Block II missile has accomplished approximately half the planned objectives of operational test [OT] and is on track to complete on schedule" by the end of the third quarter of 2013, says the US Naval Air Systems Command (NAVAIR), which manages the programme on behalf of the US Department of Defense.

"Analysis completed to date indicates that the missile is exceeding performance requirements in all areas, including lock-on after launch [LOAL]."

Incorporating a data-link similar to the one found on Raytheon's longer-range AIM-120D AMRAAM, the LOAL capability will allow pilots to engage enemy aircraft from increased ranges compared to the Block I weapon. By passing target updates from the host aircraft after the infrared-guided weapon has been launched, they will also be able to take advantage of the full kinematic performance of the AIM-9X missile body.

NAVAIR says the new AIM-9X "has performed as designed in 21 of 22 combined developmental test and OT live fire events. Seventeen of those 22 live fire attempts have resulted in the missile guiding to a lethal target intercept in aggressive scenarios, most of which exceeded the previous AIM-9X Block I capabilities." This includes five of the seven live fire attempts made so far during the operational test phase, it adds.

Lockheed Martin

The air-to-air missile will arm types such as the Joint Strike Fighter

But there is one area where a software fix is needed. "Prior to the start of OT, a valid deficiency was identified regarding AIM-9X Block II helmetless high off-boresight [HHOBS] performance," NAVAIR says. "Although HHOBS is functioning well in Block II, its performance appears to be degraded from the superior performance seen in Block I." However, the shortfall "will be improved with a planned software clean-up build at the end of OT," it confirms.

The HHOBS capability is of critical importance to the US Air Force, as its Lockheed Martin F-22 fighters will not have a helmet-mounted cueing system when they receive full AIM-9X capability in 2017, although a "rudimentary" capability is expected to be added in 2015. The Block II weapon will also arm the Lockheed F-35 for the same service, US Marine Corps and US Navy, and other types including the latter's Boeing F/A-18E/F Super Hornets. ■

SAFETY **DAVE MAJUMDAR** WASHINGTON DC

F-35 team blames STOVL grounding on crimping fault

Engineers working on the Lockheed Martin F-35 Joint Strike Fighter have identified the likely culprit behind a fueldraulic line failure on 16 January 2013 that led to the temporary grounding of the US Marine Corps' B-model aircraft.

"Government and industry engineering teams investigating the origins of a failed propulsion fueldraulic line on an F-35B short take-off and vertical landing [STOVL] variant [aircraft] have identified the probable cause," the F-35 Joint Program Office (JPO) says. Design or maintenance problems have been ruled out.

"Evidence revealed a quality discrepancy from the company that produces the fueldraulics line," the JPO says. "The investigation determined the line was improperly crimped."

The investigating team found six other aircraft had the same manufacturing defect, with the faulty parts having been returned to F-35 propulsion system prime contractor Pratt & Whitney for replacement. P&W, along with Rolls-Royce and fueldraulic line supplier Stratoflex, has "instituted corrective actions to improve their quality control processes and ensure part integrity," the JPO says.

Meanwhile, the US Naval Air Systems Command and the JPO are "developing a return to flight plan which details the removal and inspection requirements of currently installed fueldraulic lines on the 25 F-35B variants affected by the [18 January] flight suspension."

The fueldraulic line powers the actuator movement for the F-35B's STOVL vectoring exhaust system, using fuel instead of traditional hydraulic fluid to reduce weight.

Turkish Aerospace Industries

A flight endurance of over 18h was demonstrated during trials

UNMANNED SYSTEMS **CRAIG HOYLE** LONDON

Anka UAV reaches end of TAI testing

Turkish Aerospace Industries has completed a roughly 130-flight acceptance test campaign involving its Anka unmanned air vehicle, with the process having culminated with several long-duration and night-time sorties which were flown between 20 and 22 January.

During an individual flight lasting more than 18h, the Anka demonstrated its "full endurance and 200km [108nm] data link range performances", along with its automatic take-off and landing system, the company says. The Anka has so far accumulated over 140 flight hours and reached a maximum altitude of 26,000ft (7,900m) since making its flight debut in December 2010.

Contract negotiations continue regarding a planned acquisition of 10 Anka air vehicles by the Turkish air force, while Egypt was also in late 2012 reported as having agreed a 10-aircraft purchase. ■

Deadline revealed for Eurocopter range revamp
BUSINESS AVIATION P18

AERODYNAMICS **MICHAEL GUBISCH** LONDON

LHT get its teeth into drag problem

German MRO specialist looks to nature in bid to lower specific fuel consumption via sharkskin texture

The rough skin of sharks has long been known for the low friction of its myriad tiny, sharp-edged scales. Airbus tested aircraft in the 1990s which were partially covered with a foil that mimicked the animals' surface texture. But despite the promise of aerodynamic improvement, the technology has yet to pass the experimental stage.

Lack of durability has been one problem. Another is the fact that while a sharkskin texture can be applied to aircraft or ships, the underlying physics of surface drag is extremely complicated; if nothing else, a shark is far more slippery than a similarly-textured aircraft if only because it is subtly flexible.

However, evolution in paint technology has combined with rising fuel prices to revive interest in transferring the shark's functional surface texture to aircraft.

US Air Force

Shark-based paint schemes have evolved

FEELING GROOVY

Lufthansa Technik (LHT) is testing aircraft paint with a similarly grooved surface in a joint project under Europe's Clean Sky initiative, together with Airbus, Germany's Fraunhofer research institute and Hamburg-based coating manufacturer Mankiewicz.

US coatings specialist PPG is also working on drag reduction surfaces, using paint- and foil-based approaches. Mark Cancilla, global director of PPG's aerospace division, says patterned surfaces can lead to "very significant" reductions in the airframe's drag coefficient, thus lowering specific fuel consumption (SFC).

However, the problem has been to keep the aircraft skin clean without additional washing, so progress depends on developing dirt-repellent coatings. Cancilla says such drag-reduction surfaces could come on to the market during the next four years.

Ultra-smooth surfaces reduce friction at slow speed but at high speed the riblets are more effective, despite increasing an aircraft's surface area because they cut drag by reducing turbulence perpendicular to the airflow.

Fraunhofer's institute for manufacturing technology and advanced materials has devised a process it calls the "simultaneous stamp hardening method", whereby the nanometer-range grooves are embossed into the freshly applied wet paint using a silicon film with inverse riblets, which is later removed.

Application is a challenge. Any practical coating must stay soft long enough to allow the riblets to be impressed into its surface, but then harden rapidly to freeze the delicate texture. This has been achieved with a paint containing only a small amount of volatile solvents, formulated for curing within seconds under ultraviolet light.

Aside from repelling dirt, the coating must also maintain its surface texture during use by remaining resistant over a long time to the abrasion and erosion resulting from the physical impact of dust, sand or hail, or the chemical action of de-icing fluid. And, as with regular aircraft exterior paint, it must be flexible to endure the fuselage's expansion and contraction during flight cycles and withstand intense UV radiation without weathering.

Andreas Ossenkopf, head of Mankiewicz's aviation department, thinks the riblets need to remain intact for at least five years, compared with the eight-year lifespan of the recently introduced base coat/clear coat paint systems increasingly used on aircraft, and on which the low-drag coating is based.

Unlike normal paint systems, the low-drag system's clear topcoat provides all environmental protection, while underlying layers merely provide colourisation and are formulated for fast drying times.

MULTIFUNCTIONAL SURFACE

In conventional systems, each colour layer fulfils all protective functions, leading to longer drying times. But because the low-drag coating is based on the newer base coat/clear coat concept, drying time is reduced, and the new chemistries also allow for modification of the surface properties of the clear topcoat without regard to the formulation of the underlying colour coats. This flexibility could be exploited to create multifunctional surfaces.

LHT has been testing riblet paint on two of its parent carrier's Airbus A340s since mid-2011, in a trial scheduled to run until summer 2013. Eight 10x10cm (4x4in) test patches have been placed on the fuselage and wings of each aircraft to assess the coating's durability in regular flight operations. Ensuring the stamp process can be applied on an industrial scale without prohibitive production costs and turnaround times is another major hurdle. Ossenkopf points out that the riblet paint has so far only been used in small sections in selected areas. While it will not be necessary to apply it to the entire fuselage and wings, he says the aerodynamically relevant sections still constitute a large area that will be "challenging" to cover.

LHT aims for a "highly automated [paint] application process" and might conduct subsequent trials with larger test patches. But the German maintenance, repair and overhaul provider says preliminary evaluations of the riblet paint show potential SFC savings of "more than 1%". If cost of the paint and application process can be kept low enough, even this small gain should prove attractive.

If the grooved lacquer finds application on tomorrow's airliners, however, airline marketing departments will have to gloss over a cosmetic hitch of the "green" coating. A rough surface may save fuel, but these slippery aircraft will have lost their shine. ■

Michael Gubisch writes for our premium MRO channel: **flightglobal.com/mro**

ELECTRICS
STEPHEN TRIMBLE WASHINGTON DC

Cessna backs controversial lithium-ion cells

Cessna intends to requalify lithium-ion batteries in the second quarter of 2013 and make them available to customers buying four of its jet models.

The move underlines its confidence in lithium-ion power sources amid a fleet-wide grounding of Boeing 787s linked to such batteries and only 15 months after Cessna itself issued an emergency recall of lithium-ion batteries introduced on its CJ4.

Upon qualifying the batteries, Cessna will offer them for the light cabin CJ4 and M2, plus the midsize Sovereign and high-speed Citation X.

Lithium-ion was selected to start the auxiliary power unit and serve as an emergency back-up in case of generator failure on the CJ4 in 2007. But a battery fire in late 2011 prompted Cessna to recommend an urgent recall. That was quickly followed by a US Federal Aviation Administration emergency airworthiness directive which made the recall mandatory. It required CJ4 operators to replace the batteries with nickel cadmium or lead acid-based batteries within 10 flight hours or seven days.

Cessna remains the only business or general aviation manufacturer to publicly commit to switching to lithium-ion batteries.

Meanwhile, Cessna parent Textron says the airframer will deliver a "modestly higher" number of business and general aviation aircraft in 2013 despite an unexpectedly slow conclusion to 2012.

Fourth-quarter revenues plunged 10% year-on-year to $901 million as deliveries of its Citation family declined from 67 to 53. Jet deliveries for the full year fell by two to 183 compared with 2011.

Cessna's hopes for a rebound in 2013 are based mainly on arrival of the new M2 and revamped Citation X in the fourth quarter, and the upgraded Sovereign in the third quarter. ■

Eurocopter

The super-medium-class EC175 is on course to make its entry into service later this year

STRATEGY **DOMINIC PERRY** PARIS

End-of-decade deadline for Eurocopter's range revamp

Airframer will add four new models by 2020, with potential for a further X3-based type

At least four new helicopters will be added to Eurocopter's range by 2020, as the airframer works to renew its line-up.

Speaking at its end-of-year press conference in Paris on 24 January, chief executive Lutz Bertling said Eurocopter was progressing as scheduled towards the 2015 first flight of its developmental X4 – a replacement for the venerable 4.5t EC155 Dauphin. Last year saw the confirmation of a substantial proportion of the type's suppliers, including engines from Turbomeca and Pratt & Whitney Canada. Bertling says the supply chain is now "fully locked down and on track" and describes the type as "in full development".

Its arrival will be followed by the introduction "with a minimum of two years delay in each case" by the X6 and X9. Although Eurocopter has revealed little about either programme, the X6 is a replacement for its 11t twin-engined EC225 Super Puma and the X9 is an all-new light twin.

However, the first new model is the super-medium-class EC175, which is on course to make its entry into service later this year.

Bertling says the new product family is "based on what we have done with the X4 and partially on the EC175". He adds: "We will have four new products in the market in a very foreseeable time."

There may also be a fifth addition to its line-up. The airframer is still working on potential applications for the compound helicopter technology it has been evaluating on its X3 demonstrator.

Bertling says: "Clearly we have proven the concept and proven this is not a high-speed but a high-productivity aircraft. We are now going to the first sketches on the drawing board showing how a serial helicopter might look."

Eurocopter is still undecided as to whether it will offer the X3 as a stand-alone product or as an option elsewhere in its range. ■

SAFETY

Fix in sight for grounded EC225 fleet

Returning the grounded EC225 fleets in Norway and the UK to unrestricted overwater flight status is Eurocopter's "highest priority", the company says, as it grapples with a technical issue "more severe than anything in the past".

The airframer's chief executive Lutz Bertling says he is confident the type can be brought back into service by April, via the implementation of "additional safety barriers". This is despite Eurocopter being unable to identify the root cause of the cracks in a component which caused two ditchings of the type in the North Sea in May and October 2012.

The proposed interim solution outlined by Bertling includes increased inspection intervals, tighter monitoring of the EC225's vibration detection system – which can identify the beginning and propagation of a crack – and potentially limiting the power available in certain situations.

"We need to install these additional safety barriers to convince the regulators that we can fly safely," he says. "But even if [the regulators] say they will lift the restriction, we need to convince the oil companies and the passengers that it is safe to fly."

Bertling says talks are ongoing with the safety regulators to get the restriction rescinded. He is confident that this can be achieved by April or even March, "if everything runs perfectly".

In the meantime, bench and flight testing continues as Eurocopter strives to come up with a more permanent fix. ■

For more information and to read our EC225 flight test, visit flightglobal.com/ec225

Debt dogs Finmeccanica
BUSINESS P20

MRO MICHAEL GUBISCH LONDON

FL Technics Jets sets sights high at Baltic base

Lithuanian maintenance provider FL Technics plans to grow its business aviation support division into Europe's largest corporate jet operation via more capabilities and a new hangar in Vilnius.

Between 2013 and 2015, FL Technics Jets wants to triple its throughput and build a 2,700m² (29,000ft²) "comprehensive" maintenance, repair and overhaul centre at its home base in the Lithuanian capital.

The company is an authorised service centre for Hawker Beechcraft jets and supports Bombardier Challenger 800/900s.

However, this will expand to include Challenger 600 series, Embraer Legacy 600 and Cessna business jets.

FL Technics Jets wants to expand line and base maintenance, cabin refurbishment, aircraft conversion and engine technical management services as part of its plans. ■

SALES KATE SARSFIELD LONDON

Nextant eager for European growth

US company says relative value for money of remanufactured Hawker 400A/XP will help it fill niche, despite market fragility

Nextant Aerospace is stepping up its marketing effort for its 400XT light-cabin business jet in Europe following EASA certification of the type late last year.

Despite the fragility of the light business jet sector across the region, the US company says it is confident the remanufactured Hawker 400A/XP will fill the niche for owners and operators in Europe looking for a low-cost, high-quality business jet with a range of more than 2,100nm (3,900km).

Nextant president Sean McGeough points to new research conducted by the Ohio-based company that reveals an installed base of 1,542 entry-level/light business jets in Europe, with a combined value of around $5 billion.

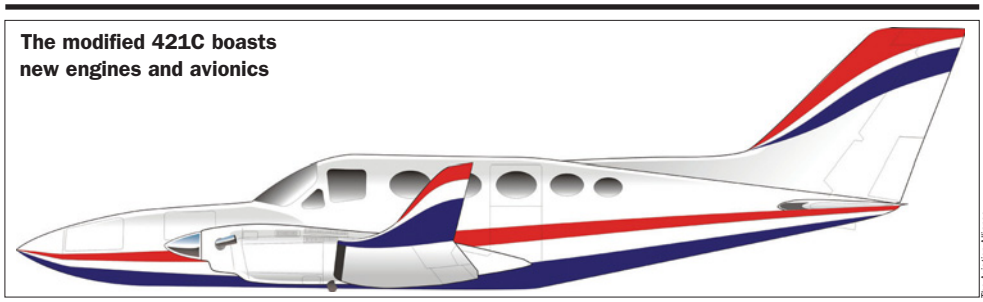
"Many of these owners," McGeough says, "are looking to replace their aircraft with new types that are more fuel-efficient and offer better value for money. That is where the 400XT comes in."

He adds: "The aircraft sells at a base price that is around half that of a comparable [new] aircraft and is equipped with new Williams International FJ44-3AP engines, Rockwell Collins Pro Line 21 cockpit and interior."

McGeough says that while price tags of used aircraft are at an historic low, they "do not come with a two-year full aircraft manufacturer warranty, like the 400XT".

Nextant has already delivered two 400XTs to European customers and is set to hand over a third this month to a Swiss client.

"We are now building our service centre network to support the growing fleet," McGeough says. Nextant already has a facility in Augsburg, Germany, and is poised to add Jet Aviation's Zurich outfit to its maintenance portfolio. ■



The modified 421C boasts new engines and avionics

The Aviation Alliance

REMANUFACTURING STEVE TRIMBLE WASHINGTON DC

Ex-Cessna chief unsheathes Excalibur

Aviation Alliance, a US start-up headed by former Cessna chief executive Jack Pelton, has launched a remanufactured version of the Cessna 421C with upgraded engines and avionics.

The piston twin is the first of a family of revamped legacy aircraft planned by the company, which is headquartered in Paso Robles, California. Remanufactured versions of the Gulfstream GIII and GIV business jets are next in line.

The Excalibur 421 – now undergoing flight testing – is scheduled to enter service by the end of 2013, equipped with Pratt & Whitney Canada PT6A-135A turboprops, Hartzell Q-tip propellers, winglets, Garmin G600 avionics, new tyres and brakes, and new cabin, de-icing, hydraulic and electrical systems.

The $2.5 million, eight-seat aircraft is projected to have a maximum range of 1,420nm (2,630km) and a top speed of nearly 330kt (610km/h). The original 421C had a range of 2,016km and a maximum speed of 258kt.

"The 421C fleet totals 800 and we believe we will convert between 40 and 60% of these," says Aviation Alliance managing director Geoff Miller. ■

IN BRIEF

ITALIAN PIPER

Piper Aircraft has named B&C Piper Sales as its sales agent for Italy. The appointment of the Venice-based company is designed to widen the airframer's penetration of what it calls "a significant European market".

BOMBARDIER SUPPORT

Bombardier has appointed business aviation services provider ExecuJet to provide line maintenance for its Challenger 300, Challenger 60/605 and Global family of business jets in Nigeria. The Lagos facility will complement ExecuJet's centre in Lanseria, South Africa, which has been part of Bombardier's authorised service facility network since 2002.

COLLINS TOOLS UP

Rockwell Collins has introduced enhancements to its Flight Manager web-based application. Changes to the programme include dynamic graphical flight tracking and an electronic advance passenger information system reporting tool for US Federal Aviation Administration regulation Part 91 operators. The flight-tracking tool, accessible via the internet, uses Google Maps to provide the company's datalink subscribers with a worldwide view of their aircraft's position in flight, as well as the flightpath of completed and future flights.

COBHAM APPROVALS

Cobham has clinched European supplemental type certification for its HeliSAS stability augmentation system and autopilot on the Eurocopter AS350B series and the EC130B4. The system has also gained Chinese approval for installation on "hundreds of Bell 407 helicopters in the country". HeliSAS is designed to reduce pilot workload and allow pilots to perform many cockpit functions hands-free, says Cobham, adding that around 100 of the systems have been sold so far.

Good week

RYANAIR The budget carrier lifted full-year profit guidance to €540 million ($726 million) after net profits gained a fifth to €18.1 million for the third quarter to 31 December on revenue up 15% to €969 million; a 3% increase in passengers and an 8% rise in average fares offset an 11% increase in unit costs, mainly driven by fuel. The third-quarter profit gives Ryanair more leeway to lose money during the seasonally weak winter and still beat last year's €505 million net profit.

Boeing

Srikrishna

KAM AIR Afghanistan's largest private carrier angrily rejected a *Wall Street Journal* report alleging it has been banned from receiving US military contracts because it regularly transports "bulk" quantities of opium on passenger flights to Tajikistan. Kam "categorically denies any involvement in such activity and demands that those responsible for such allegations either provide evidence to support their allegations or withdraw them unconditionally".

Bad week

RESTRUCTURING **DAN THISDELL** LONDON

Debt dogs Finmeccanica

The Italian champion's turnaround plan looks solid, but slow delivery worries analysts

Finmeccanica's drive to restore its fortunes after heavy 2011 losses in its rail transport and energy divisions combined with a €750 million ($1 billion) write-down against its Boeing 787 work has received mixed reviews from credit rating agencies, with Standard & Poor's lowering the Italian aerospace and defence industry champion's rating a notch to BB+/B – below investment grade.

S&P, however, does see Finmeccanica's outlook as stable, while Fitch has maintained its investment grade BBB- rating, but sees the group's prospects as negative. Moody's investment grade Baa3 rating, set in November, remains in place, with the caveat that "key credit metrics remain very weak for the rating category".

REFOCUSING

Key to all three Finmeccanica ratings is its progress towards hiving off unprofitable businesses in rail and energy and restructuring the rest of the group. That plan, outlined at the end of 2011 and fleshed out last year, is to refocus on the successful AgustaWestland helicopters business, aeronautics – including a merger of the Alenia Aeronautica and Alenia Aermacchi units – and defence electronics and security, which will operate in the USA under the banner of DRS, a business acquired in 2008 for $4.5 billion just before the financial crisis broke, and elsewhere by combining the various Selex companies.

If the credit rating perceptions are accurate, though, Finmeccanica faces a challenging 2013. S&P's base-case assumption is the group can "slightly improve" its operating profits (2011 earnings before interest and taxes was a negative €2.39 billion including some heavy write-downs, but for the first half of 2012 EBIT stood at less than 5% of revenue, and was all but wiped out by interest and taxes), but it "no longer believes Finmeccanica's credit metrics will improve" this year. Moreover, S&P's downgrade reflects its assumption that Finmeccanica will fail to achieve an investment-grade financial risk profile in the near term.

Alenia Aeronautica

No more late deliveries

Underlying the pessimism is heavy debt and the slow pace of restructuring. As S&P notes, in 2012 the group only achieved the sale of its 14% stake in engine components maker Avio, with €260 million proceeds. The agency was expecting Finmeccanica to net €1 billion from disposals in 2012 and pay down debt.

S&P expects a slight improvement in operating performance in 2013, but not enough to pay down much debt. And, there remains much risk on the downside when it comes to operating performance. Moody's assessment is coloured by the hit to profitability from restructuring-related charges, along with the decline in revenues in the defence electronics division, which accounts for a third of sales but is suffering in the poor defence business environment.

Fitch is concerned about the ongoing Italian government investigation into defence exports corruption involving some senior management. Adverse findings could undermine the company's reputation, and also impact management's ability to focus on delivering the restructuring plan that is so crucial to a turnaround.

Finmeccanica itself, meanwhile, insists it is on track to meet market expectations and reaffirms its 2012 guidance of revenue of €16.9-17.3 billion and EBITA of €1.1 billion. Those numbers would leave it just shy of 2011's revenue performance, although pulling EBITA back into positive territory. The group also stresses it has no significant refinancing needs that will take it to the bond market before 2017.

CASH OUTFLOW

To take a sanguine view of this situation, though, is to presume Finmeccanica's assumptions hold and it does not need to go to the market for cash. Fitch warns that further significant restructuring measures could spark a cash outflow, and it sees material risk in achieving the existing restructuring plan, along with targeted revenue, earnings and cash flow.

Should Finmeccanica fall short of its plan, its credit ratings could suffer. Borrowing would get more expensive – digging the debt hole that much deeper and raising the spectre of comparison with the budget travails of southern European eurozone members such as, say, Finmeccanica's native Italy.

When chief executive Giuseppe Orsi presents the 2012 financials on 12 March he can be sure the number-crunchers will be pressing him for hard timing details of Finmeccanica's disposal plans, not to mention a good explanation for why so little headway was made in 2012. ■

787 battery crisis echoes former industry woes
FEATURE P22

PEOPLE MOVES

BAE, JetSuite, Lockheed Martin, Sabena Technics, Sukhoi

Grossman Jet Service

Ouhrabkova: jet engineering

At **Superjet** maker **Sukhoi Civil Aircraft**, Andrey Kalinovsky is now president, succeeding Vladimir Prisyazhnyuk, and Mikhail Pogosyan, head of parent United Aircraft, has replaced Igor Ozar as chairman. Kalinovsky had been general director of Sukhoi's Novosibirsk Aircraft Production Association unit, better known as **NAPO**. Central European business jet operator **Grossman Jet Service** has promoted Lada Ouhrabkova, an aviation engineering graduate of the Czech Technical University in Prague, to chief operating officer, responsible for maintaining the fleet's Embraer Legacy 600s and Hawker 900XPs. Larry Prior, executive VP and chief operating officer for **BAE Systems** in the USA, will leave the company on 30 March. **Lockheed Martin** veterans Sondra Barbour and Rick Ambrose have been promoted to head their respective divisions, of Information Systems & Global Solutions and Space Systems, on the retirements of Joanne Maguire and Linda Gooden. **Sabena Technics** has appointed former Avtrade marketing head Martin Assmann to the role of executive VP, civil sales. Former XOJet sales boss Chuck Stumpf is now VP sales at **JetSuite**.

Lockheed Martin

Barbour: Lockheed IS&GS

QUOTE OF THE WEEK

"Even a rich boy buying a helicopter has a mission... even if that mission is just to impress his girlfriend"

Eurocopter

As ever, Eurocopter boss **LUTZ BERTLING** knows his customers

BUSINESS BRIEFS

AVIATION FACES TOO MUCH LIQUIDITY: SOURCES

FINANCE After several years of worrying that there may not be enough money available to finance all the airliners scheduled for delivery, lenders may be suffering from the opposite problem – too much cash available for aircraft deals is undermining profitability, with funding rates being set so low they fail to reflect risk or cost of funds. One banker in Dublin, redoubt to many of the leasing companies that own much of the global fleet, says: "This is silly season. Everyone is looking to deploy capital and that is resulting in some crazy deals." The abundance of liquidity has led to rumours of US airlines looking to issue unsecured debt in the capital markets to take advantage of the "hot demand" for aviation – a move the banker source suggests is "irrational if true".

BELL, CESSNA BRIGHT SPOTS AT TEXTRON

AIRCRAFT Textron enjoyed a solid 2012 in aerospace, as its Bell Helicopter and Cessna business jet units posted strong growth. A slight fourth-quarter rise in volume and improved mix helped Bell lift full-year profits by 23% to $639 million on revenue up 21% to $4.27 billion. Despite a fourth-quarter volume dip and unfavourable arbitration award, Cessna's full-year profits rose to $82 million as sales turned in positive growth, up 4% to $3.11 billion.

STRONG YEAR FOR 'BALANCED' HONEYWELL

MANUFACTURING Aerospace segment profit at systems and components maker Honeywell gained 13% to $2.28 billion in 2013 on sales up 5% to $12.04 billion. Fourth-quarter profits improved only 5% to $601 million as sales dipped 1% to $3.02 billion; defence and space revenue declined 6%, partly offset by gains in commercial end-markets. Of the group as a whole, chief executive Doug Cote described a year of "terrific performance [as] our balanced mix of long- and short-cycle businesses and expansion in high growth regions has offset lower demand in some of our short-cycle businesses, European weakness, and foreign exchange headwinds".

ALCOA FORGES LINK TO COMAC

SUPPLIERS Alcoa's fastening systems unit has linked up with Chinese state-owned airframer Comac to make the US-based aluminium major a strategic partner on the in-development C919 narrowbody airliner, providing technical assistance in fastener and assembly tooling selection, joint design consideration and quality system management.

AIRCRAFT COUNTER MOOG 'SLOW START'

ELECTRONICS At electronics supplier Moog, first-quarter aircraft segment sales of $252 million were up 9% from 2012 with gains in both military and commercial markets. Commercial sector sales rose 16%, including a 47% increase to $75 million in sales to Boeing in the three months to end-December. Military aircraft segment sales were up 5% to $150 million. The "strong" aircraft market is helping make up weak industrial markets that have got Moog off to what chief executive John Scannell calls a "slow start in 2013".

MACHINE TOOLS MAKER WARMS TO BENGALURU

EXPANSION Swiss machine tools maker Starrag is to set up its first plant outside Europe, at the Devanahalli aerospace park on the outskirts of Bengaluru. Chief executive Frank Brinken says Bengaluru's climate played a role in the location decision: "Manufacturing of high-precision machines needs stable temperature to keep operational costs lower." The facility should begin production by July.

BATTERIES ON CHARGE

The 787 Dreamliner grounding is not the first time the spotlight has been on new battery technology in aviation

STEPHEN TRIMBLE WASHINGTON DC

A battery scare has gripped the aviation industry. Normally unfamiliar terms such as "over-discharge" and "thermal runaway" are on the lips of industry insiders and the public alike. When aviation executives meet with journalists, the first question is always devoted to which chemistry is inside their aircraft battery. US regulators are deeply alarmed about battery overheating and fires, but do not yet fully understand the problem or what to do about it.

This, by the way, describes the series of battery failures that rocked the aviation industry in the early 1970s, as mostly general and business aviation manufacturers transitioned from lead-acid batteries to more powerful and less mature nickel-cadmium (nicad) power sources.

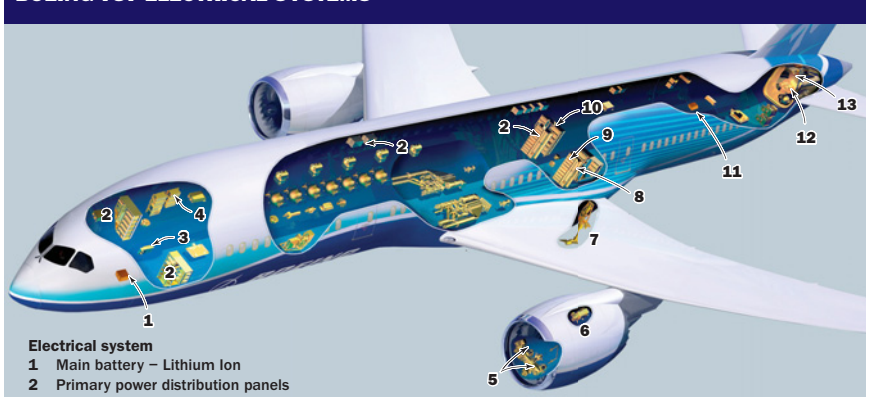
Forty-one years later, there is an echo of the past in the Boeing 787 travails. This time the culprit is lithium ion, the powerful chemistry that eclipsed nicad batteries in consumer electronics at the beginning of the last decade.

The root cause for two incidents of lithium-ion battery failure on the Dreamliner between 7 and 16 January has yet to be discovered. Manufacturing defects appear to have been ruled out and the focus of several, overlapping safety investigations in the USA and Japan are on the battery itself and how it interfaces with

The 16 January main battery failure on JA804A is being investigated by the Japan Transport Safety Board

AirTeamImages

BOEING 787 ELECTRICAL SYSTEMS



Electrical system

1 Main battery – Lithium Ion
2 Primary power distribution panels
3 Ram-air turbine (RAT) generator control unit
4 Remote power distribution units
5 Electric starter generators
6 Electric motor pump
7 Hybrid ram-air turbine
8 Hydraulic pump motor controllers
9 Main engine start controller
10 APU exciter inverter
11 APU battery – Lithium Ion
12 Auxilliary power unit (APU) starter generator
13 APU

SOURCE: Hamilton Sundstrand

Flightglobal

the overall electrical system. It is a mystery that appears likely to keep the 787 grounded for several weeks, if not months, and jeopardises a wider industry transition from nicad to lithium-ion batteries. The US Federal Aviation Administration must now answer to Congress, Boeing customers and passengers about how it could have cleared the lithium-ion batteries as safe in the 787, which may not have been necessary in the first place.

In 2005, Boeing decided to make the 787 a trailblazer in the aviation industry for lithium-ion batteries. It was a curious choice for the normally risk-averse manufacturer.

BLEEDLESS ENGINE

The 787 was already making the leap to a bleedless engine architecture, replacing pneumatics and some hydraulics with a 1.5kVA-sized electric powerplant onboard the aircraft. It includes four engine-mounted generators, each with a 250kVA capacity, and two APU generators producing a further total of 450kVA. Compared with the Airbus A350 electric architecture unveiled four years later, the 787-8's power capacity still has twice the electrical capacity of its even larger rival.

By comparison, lithium-ion batteries on the 787 almost seem like an after-thought of technological innovation. Unlike the fuel-saving premise of the "more-electric" 787 architecture, the efficiency gains offered by the new battery technology appear marginal.

Lithium ion has become a preferred power supply in consumer electronics and electric automobiles, despite widely known risks, because it can produce almost twice the power of a nicad battery using the same comparably sized packages. Yet lithium ion was still an unnecessary risk for the 787.

"The 787's more-electric architecture has very little to do with batteries," Boeing vice-president of marketing Randy Tinseth wrote in a 19 January "Q&A" about the 787 battery failures on his corporate blog.

On 10 January, Boeing 787 chief project engineer Mike Sinnett said the company had other options besides lithium ion, as he spoke to reporters in the aftermath of the JAL battery fire three days earlier.

"The lithium-ion battery was the right choice given the design constraints that we had," Sinnett said. "That doesn't mean that it was the only choice. That means that it was the right choice."

Boeing's options still include switching to less powerful chemistries of lithium-ion batteries or to previous battery technologies based on chemistries such as nicad, says Cosmin Laslau, a Lux Research analyst for the electric car industry. As far as the 787's electric architecture is concerned, the only difference would be the size of the battery and the specific integration with the overall system. »

Gulfstream's G650 had a battery switch

AirTeamImages

» Although switching to less powerful batteries implies an increase in size, the difference is measured in the hundreds or even dozens of kilogrammes – barely noticeable on a 227,000kg aircraft.

FITFUL TRANSITION

The grounding has raised the stakes of Boeing's lithium-ion selection, but in other ways mimic the aviation industry's fitful transition to nickel cadmium in the 1970s. It was part of a new era in avionics, for small aircraft in particular. Aircraft electronic systems were becoming more sophisticated, overpowering the capacity of lead-acid batteries.

But the move to more powerful nicad batteries came with a heavy price. Eight incidents of battery failures were recorded in the first nine months of 1972, adding to a string of nicad battery failures on aircraft stretching back to the early 1960s. One operator attending the 1972 NBAA convention likened the nicad battery to sitting on a "time bomb".

Actually, nicad proved no less safe a chemistry than any other battery – once the industry learned how to design, install and maintain them properly. Any battery can fail if it is over-charged or over-discharges. The FAA was moved to first print an advisory circular for the industry in 1972, suggesting tips to airlines and aircraft owners on how to avoid a dangerous new phenomenon called "thermal runaway" on nicad batteries.

Some aircraft operators also identified a problem with the architecture of the early nicad batteries, which comprised 19 individual cells each rated to a charge of 1.5V. French company Saft introduced a nickel-cadmium battery composed of 20 cells each rated at 1.43V. By even slightly lowering the charge contained in each individual cell, the risk of thermal runaway was reduced significantly.

Nicad batteries quickly became the standard power source in the aviation industry, and the FAA finally adopted two rulemakings for installing them in aircraft by 1977.

It was these rulings the FAA cited when establishing the airworthiness certification standards for the 787's lithium-ion batteries 30 years later. As the previous standard specifically addressed the installation of nicad batteries, Boeing was required to meet new "special conditions" to demonstrate the safety of the 787. Lithium ion was one of 14 such special conditions imposed on the 787 by the FAA's airworthiness authorities.

Boeing was not the first to install lithium ion on a passenger aircraft – that distinction belonged to Airbus with the A380 – but Airbus had limited the application to a non-rechargeable battery for the superjumbo's back-up lighting system.

By contrast, the 787 batteries are more of a leap forward, as they are integral to the twin-jet's super-charged electrical system, starting the auxiliary power unit, backing up critical systems in case of a generator failure and powering the flight-control electronics. Whereas business jet makers were among the first to introduce nicad batteries in the early 1970s, most were content to follow Boeing's lead on the transition to lithium ion. Gulfstream, for example, selected a Meggitt Securaplane lithium-ion unit for the G650 as a main battery in 2011, but appears to have changed course. The G650 no longer includes a lithium-ion battery in the electrical system, a company official says, but does not elaborate on reasons for the change.

Boeing's lithium-ion selection mimics the aviation industry's fitful transition to nickel cadmium in the 1970s

Cessna, meanwhile, remains committed to using lithium-ion batteries in most of its jet models, despite being forced to recall the battery in 2011 after it was introduced on the CJ4.

While a root cause remains a mystery, the 787's problems have raised awkward questions for other manufacturers, including Airbus and Cessna, which also wish to replace nicad batteries with a lithium-ion-based chemistry to start the auxiliary power units and serve as a back-up power supply on their new aircraft models.

However, the hardest questions are still reserved for Boeing and the FAA: both were persuaded by the airworthiness of the now-suspect batteries less than 18 months ago when the 787 achieved type certification. Suddenly, the 787's safety appears compromised not only by a faulty battery, but by the failure of the elaborate protections supposedly able to contain a fire even if the battery alone malfunctioned.

"The expectation in aviation is to never experience a fire onboard an aircraft," says Deborah Hersman, chairman of the US National Transportation Safety Board. "We have to understand why this battery resulted in a fire when there were so many protections that were to be designed into the system."

The ongoing NTSB investigation is one of several. A similar Japan Transport Safety Board inquiry is under way on the 16 January ANA 787 main battery failure. Meanwhile, the FAA is reviewing both the battery and documentation submitted by Boeing to prove the battery complies with airworthiness standards. ■

David Learmount comments on the latest airline operational issues via his eponymous blog at **flightglobal.com/learmount**

PROGRAMMES **DAVID KAMINSKI-MORROW** LONDON

A350 'LESS DEPENDENT ON ELECTRICAL POWER' THAN 787, ARGUES AIRBUS

AIRBUS, WHICH originally intended the A350 simply to be a re-engined A330, has opted not to move entirely away from the conventions on which the older aircraft was developed. The lower-risk philosophy is reflected not only in elements of the A350's construction – such as the use of composite panels – but also in the decision to retain bleed-air functions rather than follow the Boeing 787's leap into bleedless electrical technology.

But the A350 will nevertheless rely on a similar lithium-ion power source, although the chemistry of its battery system remains the subject of a confidentiality agreement, according to French battery manufacturer Saft.

Saft is providing lithium-ion batteries for "starting and emergency power supply", it says, having been selected for the A350 in early 2008. At the time the company said its "innovative" installation would include a proprietary integrated monitoring and charging system.

Airbus, which employed lithium battery power for the A380's emergency lighting, shows no sign of backtracking on the A350 design, highlighting crucial differences between its electrical architecture and that of the 787.

Chief executive Fabrice Brégier says the A350 will not be as dependent on electrical power as the US jet.

"We're much more traditional. We went for a lower-risk approach," he says, adding that he believes the electrical design to be "robust".

"Regarding the A350's electrical architecture, we don't see any reason – until we get additional information – to change our design," he says, although he points out that the aircraft remains in the development phase.

Supply to the A350's auxiliary power unit – the Honeywell HGT1700, generating 150kVA – will involve more cells.

Executive vice-president for programmes Tom Williams indicates that Airbus will use twice the number of cells for the same draw, and says: "We're assuming we'll draw less current per cell."

Airbus puts the A350's overall power requirement at 550kVA, only a third of the 1,450kVA it attributes to the 787, and the airframer also says the A350's three, rather than five, electrical circuits will also reduce complexity.

Toulouse says the A350's three, rather than five, electrical circuits will reduce complexity

Four variable-frequency 100kVA generators – two allocated to each of its Rolls-Royce Trent XWB engines, and lighter than integrated drive generators – will provide the variable-frequency power for the A350's 230VAC electrical network, as well as redundancy to enable dispatch with a single inoperative generator.

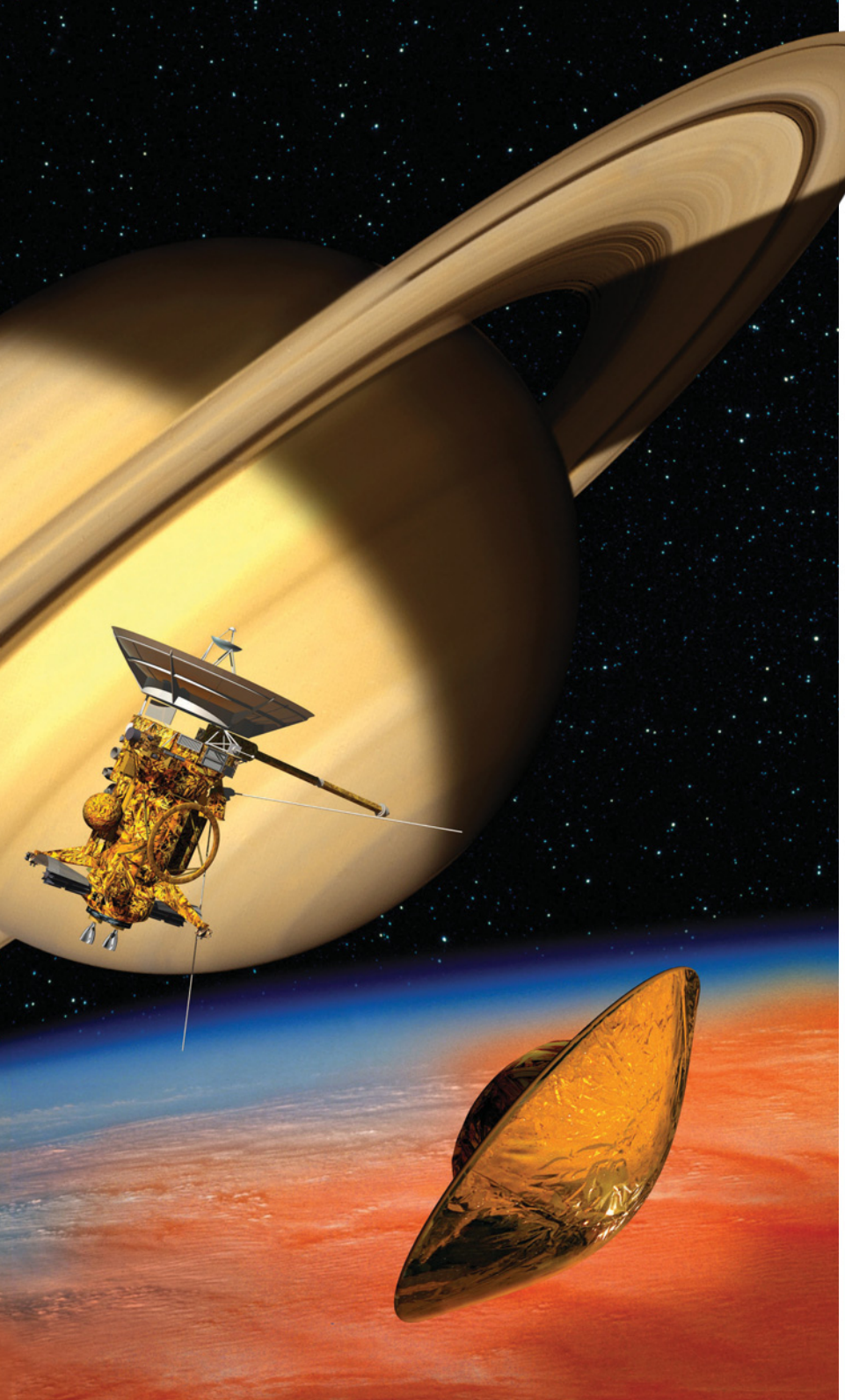
Hamilton Sundstrand is to supply this core power-generation apparatus as well as the 100kVA ram-air turbine, while Thales will provide the electrical power conversion system which will convert the various electrical sources to the standards – both AC and DC – required by the aircraft's equipment.

While the A330 uses a 115VAC electrical network, Airbus says the 230VAC system is "particularly well-suited" for "high-consumption" assemblies, notably the A350's electro-mechanical components.

Intended to save weight by reducing pipework, the flight-control system will employ a "two-hydraulic, two-electric" approach, demonstrated during development of the A380. Local hydraulic energy generation, derived from small electric motors, will power electro-hydraulic actuators, and systems such as the thrust reversers will also be electrically driven. ■

The A350's maker puts its power requirement at about a third of its rival's

Airbus



ESA

LAUNCHING AMBITIONS

Boosted budgets come with raised expectations for the European Space Agency, which is touting economic benefits arising from its busy schedule of missions

DAN THISDELL PARIS

Jean-Jacques Dordain opened 2013 with talk of discontinuity, but the European Space Agency director general is a man at ease in his second home. While maintaining the French tradition of holding a January start-the-year press briefing, Dordain opened by veering into the metaphysical: "Why am I here?" And, answering his own question, he added: "Because my communications director told me to be here."

"Here" was new offices in Paris 12th, which ESA has occupied since late 2012 after it outgrew its main headquarters on rue Mario Nikis some 45min away across the river Seine in the 15th district. With growing membership – now 20 member nations – ESA needs some extra room and it is convenient to have digs adjacent to the launchers directorate of the French space agency CNES. Anyway, added Dordain, refurbishment work at Mario Nikis had displaced this gathering.

So, he concluded: "It is easy to be director general. You just keep doing what people tell you to do."

But it is only "easy" for someone who can keep all the plates spinning and Dordain – a scientist, engineer and one-time astronaut candidate who joined the agency in 1986 and has led it since 2003 – has proved he is also a top administrator and even politician. The discontinuity he was really talking about is economic, and in that regard 2013 began on 22 November 2012, when space ministers from ESA's member states met in Naples to hammer out a five-year budget deal.

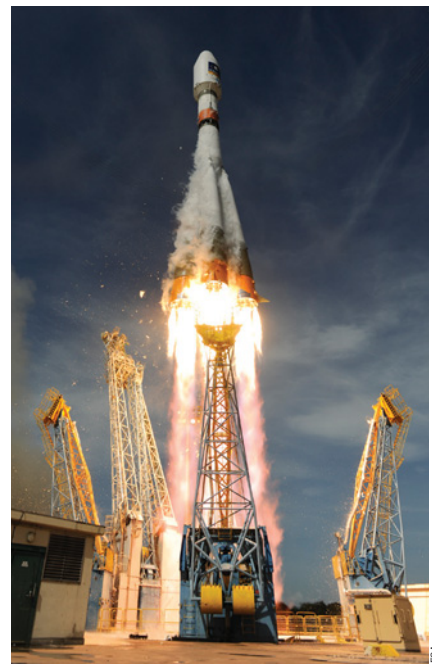
Given the parlous state of Europe's finances, that meeting had loomed large last year. However, after months of some real anxiety, it was arguably an anti-climax; broadly, member states agreed ESA should carry on as it had been planning. The budget for 2013 has even risen by 6%, with member state contributions rising 7-8%, most notably from the UK, which has underscored its determination to be a main player by putting in an extra 25%. But it would be missing the significance of the Naples milestone to suggest it is business as usual. After that ministerial meeting, said Dordain: "ESA was different."

What changed, he stressed, was that Europe has entered an "economic dimension" in

spaceflight. Rising budget contributions come with rising expectations, and Dordain never misses an opportunity to underscore the economic link between ESA's activities, which range from developing launchers, flying sophisticated Earth observation missions and building Europe's Galileo satellite navigation system to exploring deep space, from the Sun to Saturn. As Dordain noted in Paris, he had just come from meeting with ESA's scientific advisers and told them they needed to redouble efforts to explain to Europe just how it is that advancing knowledge leads to economic benefits for states and citizens.

Indeed, he added, that communication challenge represents another form of discontinuity. Where space agencies are understandably in the habit of talking about launches – which, after all, are dramatic events of extreme discontinuity – it is time for ESA to talk much more about results.

Every mission success, he says, represents a step forward – in knowledge and/or technical capability. To Dordain, those steps are discontinuities which should be noted.



ESA

Milestone payloads will be sent via Soyuz

FAST STEPPING

Since the Naples meeting, Dordain and ESA have been taking many steps very quickly. As the director general points out, planning could go on pending ministerial agreement but procurement could not, so the year-end period, when most commercial activities slow down for the holidays, was a busy time for ESA. Following Naples, industrial contracts had to be readied for newly signed-off projects ranging from the Ariane 5 rocket midlife evolution upgrade to the new Vega launcher, the development for NASA of the service module for its Orion crew capsule.

All of those projects are on tight timetables. One of the most dramatic is the bid, given the go-ahead at Naples, to develop a replacement for the Ariane 5 heavy launcher. Already, on 30 January, ESA and launcher prime contractor Astrium signed contracts worth €108 million ($146 million) to get the Ariane 6 project under way, continue development of Ariane 5 ME and find synergies between the two projects. Ariane 5 ME is planned to fly from 2017; Ariane 6 is to fly from 2021 but as yet exists only as a broad concept of a modular rocket with solid-fuel main stages designed to be more flexible than Ariane 5, with much shorter costs and lower lead times.

Also urgent is the Orion project (*see P29*). ESA is to adapt technology from its Automated Transfer Vehicle (ATV) robotic supply ship – the fourth example of which will be launched to the International Space Station (ISS) in April – to Orion, intended to carry astronauts to the Moon and beyond, with test launches from 2017. Dordain promises a contract signing imminently.

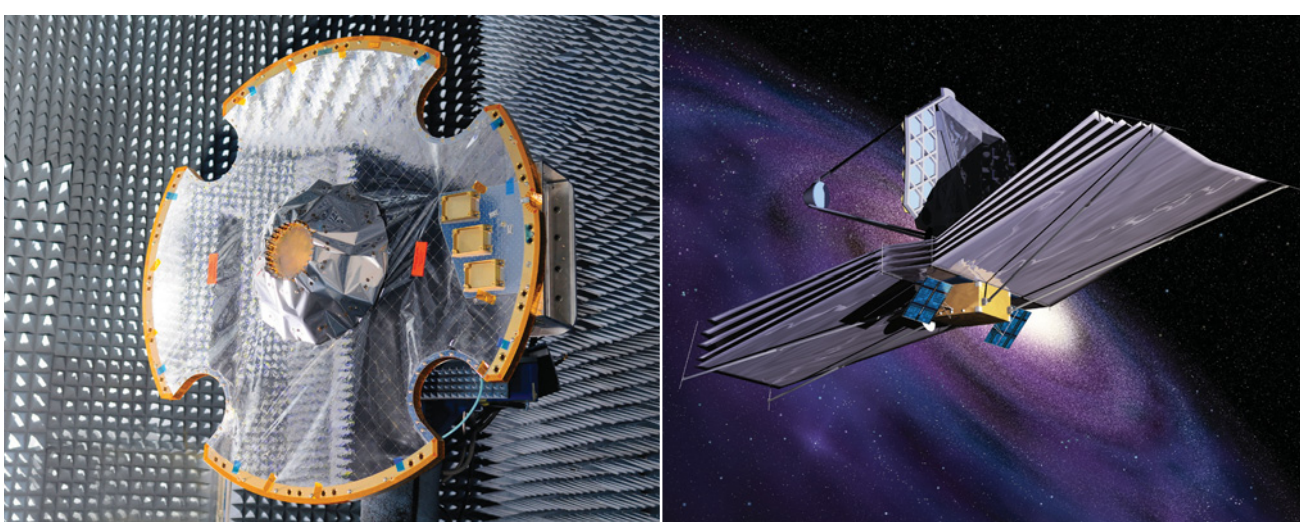
The first test will come in April, when two launches are planned from ESA's space centre in French Guiana

Meanwhile, 2013 is a busy year for operations. With seven launches and 12 missions planned, ESA director of launchers Antonio Fabrizi is having to deal with a new problem for ESA – launch scheduling. Says Dordain: "That's a lot of missions to launch and it will be difficult to get them all up."

He is not too concerned about any appearance of discontinuity should planned missions slip into 2014 – Dordain has said more than once there is no difference between 31 December and 1 January – but the busy launch agenda is evidence of how ESA is changing.

The first test will come in April, when two launches are planned from ESA's space centre in Kourou, French Guiana: the global vegetation monitoring satellite Proba-V, on a Vega rocket, and the Ariane 5 launch of ATV-4. The ATV launch has to dovetail with other traffic to the ISS and may have to take precedence over any Proba-V timetable, but Dordain says he is telling his teams simply to be ready.

In the second half of the year comes a Kourou launch via Ariane 5 of the ESA-Inmarsat joint-venture telecommunications satellite Alphasat I-XL, the first built on Europe's new, multipurpose Alphabus platform. And, Soyuz launches will deliver three milestone payloads. Two launches will orbit the first fully-operational Galileo navigation satellites as »



ESA

Its antenna seen here in a test chamber (*left*), Gaia will use a camera of record size; the James Webb Space Telescope is to launch in 2018

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ESA pushes hard with a fast-track launch programme to orbit a functional constellation by 2014. Also much-awaited will be the launch of Sentinel-1A, the first in a new generation of weather and global monitoring satellites to replace Envisat, which went quiet unexpectedly in 2012 after 10 years of service. Gaia also launches via Soyuz to begin mapping the Milky Way in 3D, using the biggest digital camera ever to fly in space.

Another highlight – literally – of 2013 will be the peak in the Sun's 11-year cycle. ESA spacecraft including the Mars and Venus Express orbiters and the Swarm satellite cluster, set for a Rockot launch in June from Plesetsk in Russia, will be recording the effect of solar activity on planetary magnetic fields.

Other scientific points of interest include the release, in March, of the Planck spacecraft's map of the microwave background leftover from the Big Bang. To close off the year, the Mars Express orbiter will be steered to a hair's-breadth flyby of the planet's moon Phobos, 47km from the surface.

SO MUCH CLUTTER

For many scientists, though, the highlight of 2013 may be an international conference on the problem of orbiting debris, to be hosted at ESA's Darmstadt, Germany ground control centre in April. This event, eagerly awaited for several years, will explore technologies for mitigating a problem which, spaceflight experts routinely stress, threatens to deny access to many valuable orbits – as well as pose a mortal threat to manned missions including the ISS.

Dordain underscores the urgency of the debris problem – and revealed that the newest member of the community of spacefaring nations, North Korea, is not, as of yet, expected to take part. Noting that the first priority is to prevent the creation of new space debris, Dordain observes that all space agencies are working "very hard" to design launchers so the stages reaching the greatest altitudes do not explode – a common source of debris – and can be controlled after payload delivery to ensure they are de-orbited.

North Korea's launch capability, by contrast, is relatively crude and little understood outside of the hermit nation's own scientific circle. Dordain says his dream for the future is of "clean space" – that is, he wants to see his first generation of spacefarers "give back to our children space as we found it". He adds: "They will need space even more than we do."

Of all the discontinuities he can envision, it is a fair guess this is one that would boil even Dordain's sangfroid. ■

For more on ESA's key projects for 2013-2017 in science, space access and services, visit **flightglobal.com/esakey** and see overleaf

ESA is to supply the Orion's service module

ESA

PLANNING **DAN THISDELL** PARIS

NASA TO PUT EUROPEAN TECHNOLOGY TO WORK

WHEN NASA's Hubble space telescope is replaced by the more-ambitious James Webb, it will be thanks in no small part to contributions from Europe.

Astrium in Germany is finishing, for July 2013 delivery, the spacecraft's NIRSpec near-infrared spectrograph. Launch will be in 2018 via an Ariane 5 rocket from the European Space Agency's French Guiana spaceport.

Meanwhile, Astrium has been contracted to build two research satellites for NASA. The GRACE FO mission – Gravity Recovery and Climate Experiment Follow-On – to launch in 2017 will continue the work of the original Astrium-built GRACE mission.

In January, NASA formally joined ESA's Euclid space telescope mission to investigate dark matter and dark energy. When launched in 2020, Euclid will be carrying 20 NASA-supplied near-infrared detectors and have support from 40 US scientists.

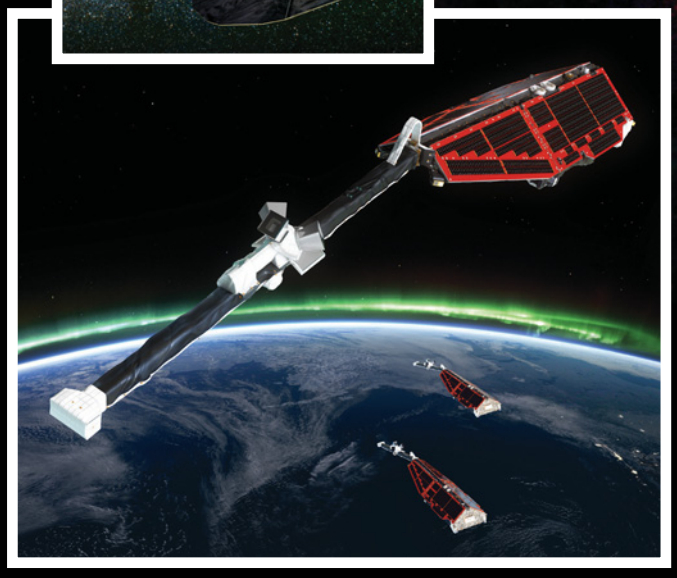
The point is, ambitious projects are increasingly dependent on collaboration. That much is widely accepted at NASA, ESA, Roscosmos and other space agencies, but while budgetary reality and technological complexity demand greater collaboration, it remains a serious challenge to sell such projects to the politicians, taxpayers and industrial partners who have historically thought in terms of "ownership" of glamorous missions.

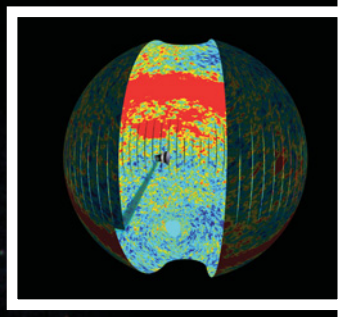
Speaking in Paris in December, ESA director general Jean-Jacques Dordain described ESA's newly signed agreement with NASA to supply the service module for the Orion multi-purpose crew vehicle as "a significant example of a new type of co-operation between ESA and NASA".

ESA's contribution makes perfect technical sense; the Automated Transfer Vehicle robotic supply craft that has been resupplying the International Space Station, particularly after the retirement of NASA's Space Shuttle, features control, docking and propulsion technology well-suited for adaptation to a range of future missions, and it would make no sense for cash-strapped NASA to re-invent that particular wheel.

Ambitious projects are increasingly dependent on partnership – but this is a tough sell

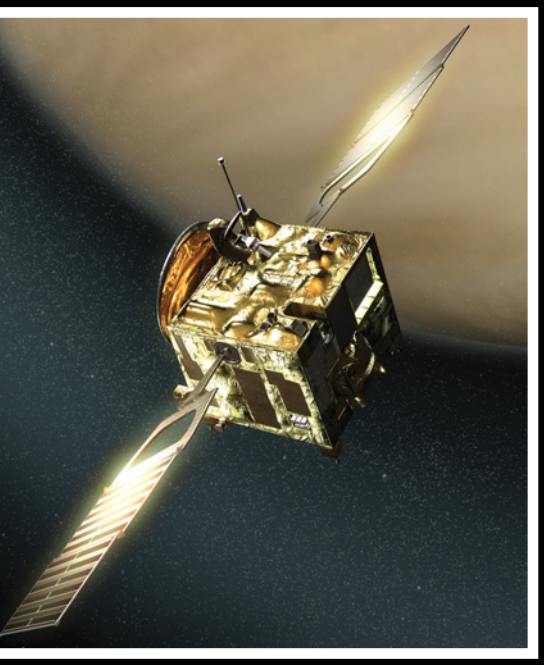
But, Dordain adds, while the two agencies have been working on that project for 18 months: "It was not easy for them. I'm sure American industry would like to have provided the service module." ■

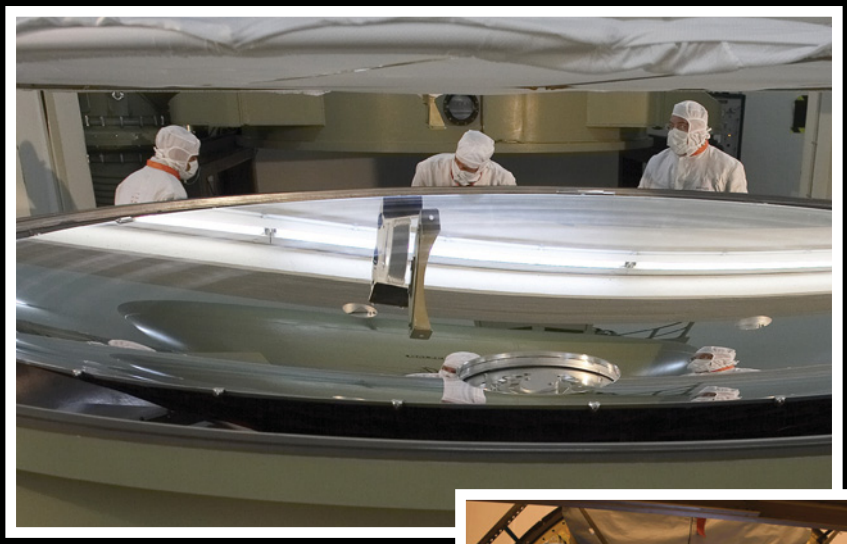


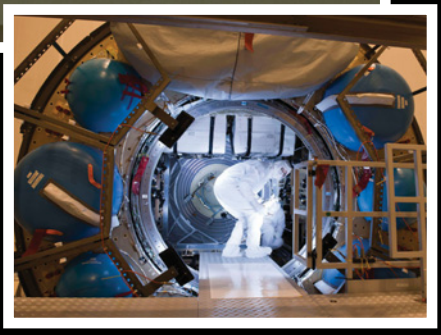


PERSPECTIVES ON SPACE

Four areas command the European Space Agency's attention: access to space, navigation, Earth observation and deep space exploration. Here, we present a visual array of its missions







(*Clockwise from main*) Andromeda, viewed from ESA's Herschel space observatory; the Swarm magnetic field mission; Gaia mapping the Milky Way in 3D; a Planck scan of the sky, aiding study of the Universe's origins; an artist's impression of Venus Express; the Herschel telescope's mirror; loading of the automatic transfer vehicle ATV-4; the Ariane 5 rocket; the red planet's Reull Vallis region, as captured by Mars Express; "neutral buoyancy" training at the European Astronaut Centre

ESA

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Aerodynamics blade clear

In response to Peter Gray's invitation (*Flight International*, 15-21 January), may I say that when I wrote my original letter I felt the typical *Flight* reader understood basic aerodynamics and I did not want to teach anybody to suck eggs. However, if Peter feels an explanation of the Lynx speed record is necessary, who am I to deny him?

For all helicopters, the tip of the rotor has the biggest problem with retreating blade stall and high Mach effects because it is going faster than the rest of the blade. The tip of the rotor fitted for the record run served to reduce the aspect ratio and thickness-to-chord ratio at the tip. Basic aerodynamics teaches us that the lower the aspect ratio of a wing, the higher the angle of attack before it stalls, thus delaying the Lynx retreating blade stall.

A thinner wing-thickness-to-chord ratio delays the onset of compressibility, so this tip also improved the advancing blade aerodynamics at high speed.

John Farley
Via email

Chris Perry

The Lynx speed record explained

AIRPORTS

Bad week for objectivity

The editorial comments added after Jerry Blackett's quote to Parliament ("Bad week: Birmingham", *Flight International*, 22-28 January) demonstrate a lack of impartiality in the debate about UK aviation policy.

If, to quote, that policy is "dictated by the airlines", Heathrow's third runway would be done and dusted by now. Instead, there is a severe policy vacuum that ill-serves the nation, not just Birmingham or any other airport that feels out of sorts.

Birmingham, like any other airport, is free to market itself as the panacea to airlines and their customers. It's not the fault of government that more of them are not tempted to use what is certainly a good airport, so other factors must feature, including location.

More accurate reporting from *Flight International* would help matters all round.

Mike Carrivick
Wokingham, UK

Rex Features

Birmingham: free to market itself to airlines

Handling situation

Richard Chandless (*Flight International*, 15-21 January) makes a valid point that sitting for hours looking at a glass cockpit does not yield experience in how to handle an aircraft – or the unexpected. The FAA would agree with that, judging by its recently issued Safety Alert for Operators (SAFO) reminding crewmembers that too much reliance on the autopilot could lead to degradation of the pilot's ability to recover the aircraft quickly from an undesired state. The safety alert recommends pilots maintain and improve their hand-flying skills by switching off the autopilot every once in a while.

Degradation of flying skills caused by over-reliance on the automatics is nothing new. While operators pay lip service to the need for manual practice, few will encourage their crews to turn off the flight director, let alone the autopilot, in order to improve their instrument scan. Flight-director addiction is here to stay; as is automation dependency. Many pilots are apprehensive of turning off the flight director even in the most favourable weather conditions. They seem to forget that these systems are just another aid to navigation and not necessary for all stages of flight. Yet, in response to numerous handling incidents highlighted in QAR read-outs, operational policy in at least two major Southeast Asian airlines is to ban all take-offs and landings by first officers. What hope is there for these pilots to improve manual flying skills when the airline forbids them from touching the controls on take-off and landing?

John Laming
Tullamarine, Australia

Narrow the focus

You say the 787 grounding "seems unfair", as "with all new aircraft there are problems in service that cannot be anticipated in the controlled environment of a certification trial" (*Flight International*, 22-28 January).

The real trouble and cause for this is that the certification trial process is short-circuited. Instead of just one or two aircraft being used for the trials and thereby getting a true test of reliability, several aircraft are used, with the results being seen now.

Vic Palmer
Via email

787's one under the eight

On the cover of your 22-28 January issue, the photograph of the ANA 787 shows the eighth, rear port-side escape chute NOT deployed. Why not?

Richard Jones
Toulouse, France

Editor's note: ANA confirms that "since the number of passengers was only 129", there was "no need to open all emergency slides".

PA

Counting slides

Delve into an airports special prepared by *Airline Business*, via **flightglobal.com/abairports**

From yuckspeak to tales of yore, send your offcuts to murdo.morrison@flightglobal.com

St Maarten lands best approach

St Maarten in the Caribbean – where airliners cast a shadow over seaside sunbathers as they come into land – has been voted the world's most spectacular airport approach.

The holiday destination beat another island, and last year's winner, Barra in the Outer Hebrides – the only airport where scheduled aircraft land on a beach.

The other top 10 landings in the poll by privatefly.com were Los Angeles, Paro in Bhutan, Las Vegas, Phinda in South Africa, London City, Aruba, Mustique and Nice.

One voter described St Maarten as a "gorgeous approach over the clear blue sea, white sand beach with hills in the background", adding: "The beachgoers can almost touch the landing gear as planes make their landing. It's an aircraft lover's dream."

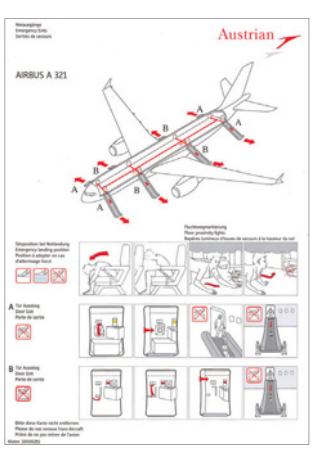
Blind panic

You would think it would be hard to confuse sliding open an aircraft window blind with activating an emergency slide – but that was the mistake made by one passenger on an Austrian Airlines Airbus A321 at Larnaca last month.

Flight OS832 had just landed in Cyprus from Austria on 25 January when the crew instructed those onboard to open the sunshades for arrival. Instead, the traveller, sitting in the second left-hand exit row, pulled the door handle inwards and upwards.

The door – which itself has just a porthole with no sunshade – opened and its evacuation slide deployed. No damage was sustained and the aircraft was able to return to Vienna after removal of the chute. But the number of passengers had to be reduced in line with regulations for flights with an inoperable escape slide.

No word on whether the suitably embarrassed passenger was tempted to make an escape down the chute.



Wrong slide

Rex Features

Coming in to sand: is this the world's best airport approach?

Lear-downed

Investigators believe excessive icing contributed to the crash of a veteran but still fully serviceable Bombastic Learmount 65 on 24 January.

The Learmount – the only one of its type in operation and known for its elegant appearance and distinctive noise signature – had departed from Sutton to its overnight base in Surrey and was reaching cruising speed when it experienced an uncontrolled tumble into terrain, damaging its landing gear and putting it out of action for several weeks. Commenting on the incident from his hospital bed, where he is making a speedy recovery, *Flight International*'s operations and safety editor noted: "Accidents of this sort, while rare, can occur in unfavourable conditions. I'm certainly not blaming the pilot."

Wings clipped

The latest review tome to hit our desk from leading military history publisher Pen & Sword is an authoritative-looking account by Martin Bowman of the US Eighth Air Force in Europe… spoiled only slightly by the glaring proofreading error on the large subtitle: *The Eagle Spreads It's* (sic) *Wings*.

Jumbo Jet

A release from Jet Aviation informs us that its Zurich FBO "handled 747 movements" during the recent World Economic Forum in Davos.

"Yes," asks Ian Goold. "But who handled all those not arriving by jumbo?"

Croaking aside

And finally, is the name of Air France's new airline – Hop – a self-deprecating national joke?

Royal appointment

100 YEARS AGO

What is believed to be the first flight by a British prince was made at Madrid, when Prince Leopold of Battenberg accompanied Mr Howard Pixton during a 20-minute trip on an 80hp Bristol monoplane. The machine is one of a number undergoing tests before being handed over to the Spanish government.

King's inspection

75 YEARS AGO

A feature of King George's inspection of the RAF cadet college at Cranwell was the parade of three Vickers Yalentias, which are used as flying workshops. Each is fitted with 10 wireless sets. Further training in the air is given in Westland Wallaces.

Flying in the dark

50 YEARS AGO

Climatic extremes are the chief drawback to helicopter operations in Norway. Although there is almost constant daylight in the summer, the winter offers pretty forlorn flying hopes and, in the northern regions, no sun at all between mid-December and early January.

BA bargaining

25 YEARS AGO

British Airways, having acquired an order for 10 Airbus Industrie A320s with its takeover of A320 launch customer British Caledonian, is now bargaining with Airbus over guaranteed performance. BA alleges increased weight and drag will increase fuel consumption by up to 9% over planned figures.

EVENTS

25-27 February
Loyalty 2013
Al Bustan Rotana Hotel, Dubai, UAE
Tel: +44 20 8652 8818
lizzie.law@rbi.co.uk
loyalty-conference.com

25-27 February
MRO Africa Conference & Exhibition
Addis Ababa, Ethiopia
conferences@africanaviation.com
africanaviation.com

1-3 March
Australian International Airshow
Avalon airport, Geelong, Victoria
Tel: +61 3 5282 0500
airshow@amda.com.au
airshow.com.au

3-5 March
Network USA 2013
Hyatt Regency Hill Country, Texas
Tel: +44 20 8652 4610
anna.chamberlain-webber@rbi.co.uk
networkusaforum.com

4 March
SpeedNews 3rd Annual Aerospace Raw Materials & Manufacturers Supply Chain Conference
Beverly Wilshire, California
speednews.com/conferences

4-6 March
SpeedNews 27th Annual Commercial Aviation Industry Suppliers Conference
Beverly Wilshire, California

26-30 March
Langkawi International Maritime & Aerospace Exhibition
Langkawi, Malaysia
Tel: +603 4142 1699
hw5@hwlima.org
lima.com.my

9-10 April
SpeedNews Aerospace Manufacturing Conference
Charleston Place Hotel, South Carolina

9-12 April
LAAD Defence & Security 2013
Riocentro, Rio de Janeiro, Brazil
laadexpo.com

29 April to 1 May
African Aviation Training Conference & Exhibition
Cairo, Egypt
africanaviation.com

21-23 May
EBACE: European Business Aviation Convention & Exhibition
Palexpo, Geneva, Switzerland
Ana Baptista
abaptista@ebaa.org
ebace.aero

27-29 May
African Business Aviation Conference & Exhibition
Nairobi, Kenya
africanaviation.com

17-23 June
Paris Air Show
Le Bourget exhibition centre, France
visiteurs@salon-du-bourget.fr
paris-air-show.com

26-28 June
Air Finance for Africa Conference & Exhibition
Johannesburg, South Africa
africanaviation.com

For a full list of events see **flightglobal.com/events**

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Registered at the Post Office as a newspaper. Published by Reed Business Information Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS, UK. Tel: +44 20 8652 3500. Newstrade distributed by Marketforce (UK) Ltd, Blue Fin Building, 110 Southwark Street, London SE1 0SU, UK. Tel: +44 20 3148 3300.

Classified advertising prepress by CCM.
Printed in Great Britain by Polestar (Colchester) Ltd.

Flight International published weekly 49 issues per year. Periodicals postage paid at Rahway, NJ. Postmaster send changes to Reed Business Information, c/o Mercury International Ltd, 365 Blair Road, Avenel, NJ 07001

ISSN 0015-3710

Organised by: Flightglobal AVIATION CONNECTED | FLIGHT INTERNATIONAL

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7th and 8th May 2013
Singapore

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National Transportation Safety Committee – Indonesia

John McCormick
Director of Aviation Safety
CASA Australia

Mr Lei Do'd
SMS and Risk Management Officer
CASA Papua

Captain Rilo Nauli Raja
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- **Assess** what training options may be available as the solution to current pilot training challenges in the Asia Pacific Region

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General

Tenders

INVITATION TO TENDER

The Air Traffic & Navigation Services Company Limited of South Africa (ATNS) provides air traffic services throughout the country and is responsible for the provision of the system infrastructure necessary to ensure a safe and effective service.

(Reference No: **VDF113/2013**)

APPOINTMENT OF SERVICE PROVIDER TO RENDER AND SUPPLY VERY HIGH FREQUENCY DIRECTION FINDER

Details of the project and further requirements can be found in the RFT documents which may be collected (in CD format) from ATNS Head Office, Eastgate Office Park, Block C, South Boulevard Road, Bruma, and Johannesburg, South Africa daily between **09:00 and 16:00 (CAT)**. Electronic copies of RFT documents, in Adobe Reader format may also be obtained on request.

Interested parties must note that the RFT documents can only be obtained from **11 February 2013, at 09:00 (CAT)** until on **15th February 2013, 16:00 (CAT)**, both dates included. The closing date for registration of interest to tender is **22 February 2013 at 16:00 (CAT)** and regrettably no tenders will be accepted without record of such registration. To register interest to tender, tenderers must fill in the "Undertake to Tender" form attached to the tender document in volume 1A.

Sealed tenders are to be submitted at the tender box, Reception, Ground floor, ATNS, Eastgate Office Park, Block C, South Boulevard Road, Bruma, Johannesburg, South Africa.

Printed and bound documents for the tenders are required. No tenders forwarded by email will be considered. However, printed and bound tender documents must be coupled with a software copy of the tender documents in a form of CD, DVD, disk or similar medium. **Late tenders will regrettably, not be considered**.

To request tender documents and any other queries on the tender please contact:

Molatela Moloto Tel: +27 (0) 11 607 1187 or via e-mail: **molatelam@atns.co.za**

ATNS reserves the right not to award any tender.

CLOSING DATE FOR SUBMISSION OF TENDERS: 08 March 2013 at 12:00 (CAT)

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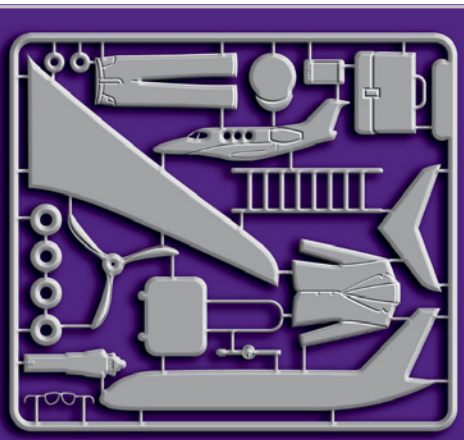

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Flightglobal Ascend is part of Reed Business Information (RBI), a division of Reed Business and a member of Reed Elsevier plc, the world's leading publisher and information provider.
We are looking for a Business Development Executive to join our team whose primary responsibility would be prospecting, leading and ultimately growing key strategic accounts in Japan. The successful candidates will be working on one of the most profitable brands within the RBI portfolio, currently able to boast double-digit growth.
You will need to be a motivated and energetic individual, with experience in business development. Working well in a team environment is essential and you should have ambitions to succeed in a multi-national company.
The role will be based from our Tokyo office and is an office based role with occasional travel required.

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- Effective presentation and communication in English and Japanese is essential
- Either information sales or software sales experience is required
- People orientated, excellent listening skills
- Proven success in developing new business and managing sales cycle, from generating leads to closing deals
- Proven track record of succeeding quotas and goals
- Experience selling business information to banks and financial institutions, and/or with aviation knowledge preferred
- Demonstrated record of building extremely strong client relationships
- Strong account management, written and presentation skills
- Enjoys working in a structured, targeted environment to challenging KPIs
- Great negotiation and communication skills
- Highly self-motivated, organised and be able to manage own time

The Company

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WORK EXPERIENCE DAN DOEPKER

Handling helicopters for Hillsboro

After finding inspiration watching firefighting Hueys in action, Dan Doepker is now assistant chief instructor at Troutdale for Hillsboro Aviation, running charter, sales and flight instruction out of airports in Portland, Oregon

Did you always want to work in aviation?
I had wanted a job in aviation since I was really small. In Montana, they have Huey firefighting helicopters doing initial air attacks on fires during the wildfire season. They used long-line water buckets at the local lakes and it was amazing to watch. I used to go down with my dad and we would buy all the pilots and crew soda and ask them to show us the helicopters.

What was your first job?
My dad owns a landscape business back in Montana, so I worked there during high school. And my first aviation job was at a company called Red Eagle Aviation back in Kalispell, Montana. I was basically doing line service during high school, fuelling aircraft and moving them around.

When did you learn to fly?
I started when I was 17. I traded my time for lessons. I got my private rating at Red Eagle right before I graduated from high school in 2004 and went to college.

What did you do next?
I earned my degree in aviation management. I went to the University of North Dakota, and that is where I did more fixed-wing training. I worked at the university for a year as a flight instructor. I really wanted to fly helicopters. My wife had gone to Portland to finish her graduate programme so I came out to Hillsboro and started working as a fixed-wing flight instructor. I started my helicopter training after working there for six months and did all my helicopter ratings within a year. After that, they were hiring instructors for helicopters so I jumped ship and worked for the helicopter school. I've worked at Hillsboro for four years.

Doepker: enjoys seeing students succeed under his tuition

How is Hillsboro handling the economic uncertainty?
It has been pretty good. Like everybody, enrolment is a little lower. We have been lucky enough to get a good veteran affairs programme so we are carrying out a lot of training on the helicopter side for students with veterans' assistance benefits. We also have pretty strong international programmes. We recently had seven ab initio students come over from a company in China and we are currently training them. We have several students from Brazil who have just started training with us. That is the key: marketing our international programmes and finding financing with those students. With helicopter students it is a lot harder to find that financing, but at the airplane school we have a lot more international contracts for training.

What is your favourite part of the job?
In general, Hillsboro is full of good people, which I think the industry is full of – for the most part. That is what's really cool about working here. My favourite part of the job by far is seeing students succeed and accomplish what they are trying to do. So, whether it is becoming a private pilot, getting their first solo, or finishing their training and becoming a certificated flight instructor and working with us, it is always really cool to see that happen and to know you helped them get there.

Least favourite?
I do a lot of paperwork now that I'm the assistant chief and I am not a big paperwork guy. I would much rather be flying the aircraft. I do the paperwork because it's necessary to let us all fly.

What are your ambitions?
I'm 26. I would really like to end up in the EMS field somewhere. My dream job is to be flying helicopters and airplanes – but helicopters are my main passion. ■

For more employee work experiences, pay a visit to **flightglobal.com/workingweek**

If you would like to feature in Working Week, or you know someone who does, email your pitch to **murdo.morrison@flightglobal.com**

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