

PEOPLE

Under Rob Gillette's leadership, Honeywell has slimmed down and restructured itself into three core business that are more customer facing – air transport and regional, business and general aviation, and defence and space. *Steve Nichols* enquired how the company copes with its diverse aerospace markets...

FACE THE FACTS WITH...

ROB GILLETTE

Q. How has the Honeywell restructure been received?

A. I think customers love the new organisation because the focus is on them, not on individual products. I have been pleased with the result. We are learning a lot about how we can improve by having the whole integrated supply chain in one organisation.

Q. How have you managed to cut out duplication?

A: By setting up engineering centres of excellence instead of having people spread across the business. That was an important move for us.

Q. Do you plan any further restructuring?

A. It really finished in 2005. There are no plans for any significant reorganisation going forward.

Q. How did Honeywell staff react to the changes?

A. Normally there is one-third who relish change, a third who adapt to it and the final third who don't want any change. It is the same all over the world.

Q. What are the main issues facing Honeywell at this time?

A. I think the biggest question facing Honeywell – and the rest of the market – right now is defence and space funding and what that will look like. There is also a move to a more network-centric basis for defence. There is a lot of work in the fields of communication and engineering, so for us we're pretty well positioned.

Q. What are you focused on?

A. The challenge is to focus on the contracts that we want to win and making sure that we do. We don't have to go after everything. We also have to look at opportunities by customer and by technology and focus on the ones that

are most important to us. That's part of the cultural change for us.

Q. How have supply chain changes affected you?

A. After the downturn in 2002 and 2003, a lot of the supply base cut back on its capabilities. A lot of people are now struck on how it has come back. There are long lead times both on materials and products and the challenge for the whole market now is getting the product out.

Q. What about space?

A. We earn about \$1 billion of our revenue in the space industry. What happens going forward on NASA's Crew Exploration Vehicle (CEV) programme should be known in Q3 this year and should be good for us.

Q. What about air transport?

A. This is doing well for us – 45% growth in terms of flight hours as far as we can perceive. In terms of Original Equipment Manufacturers (OEMs), everyone is making pretty much everything they can ship. The general aviation market is also looking good, despite the market swings.

Q. What's your view on the current problems facing Airbus?

A. One thing I have learned is that there will always be problems with any new product introduction in the aerospace industry. It isn't a simple thing. It will be interesting to see what happens in the whole aircraft-building business. Both Airbus and Boeing are fighting hard to show the efficiency gains for long-distance aircraft.

Q. In November you forecast a business jet delivery record of more than 800 aircraft in 2006. Six months down the line, do you still support that?

A. Absolutely. All the manufacturers are flat on the throttle and selling all they can make. The challenge to everyone is the supply chain and keeping up. This has had a knock-on effect on the used market as well. It is very buoyant.

Q. What do you think will happen at L-3 with founder Frank Lanza gone? Do you think his death could trigger a round of industry consolidations?

A. Frank was an incredible guy. He was the machine that drove that business, but it is anyone's call to guess what will happen.

Q. Last quarter, your aerospace division's revenues grew by 5%. What are your predictions for the remaining quarters?

A. I think the growth will remain similar, in the 5-6% range.

Q. Overall then, how is business?

A. We're very pleased. It is going well and I'm feeling upbeat about the market. I'm looking forward to being at Farnborough for the first time too. I've heard a lot about it and it will be a good chance to meet with our customers.

Doncasters casts net wide in global growth strategy

Chuck Grieve

It's business as usual at Doncasters, the Derbyshire-based specialist engineering group, in the wake of its much-publicised acquisition by Dubai International Capital (DIC). In fact, it's better than business as usual, says chief executive Eric Lewis.

DIC is a "very good owner" whose hands-off approach allows the company's management to focus on customers, says Lewis.

The names of those customers read like a Who's Who of global aerospace and are a measure of the success Doncasters has had in transforming itself in just five years from a traditional casting and forging business to a supplier of engine-ready components.

"We've been through the survival and consolidation modes," says Lewis. "Now we're very much in growth mode."

The £700 million DIC acquisition, agreed last December but only finalised on 4 May due to US security concerns, has given Doncasters freedom to pursue growth and innovation at a brisk



Eric Lewis: in a growth mode.

rate. Investment in the business has equalled or surpassed depreciation, says Lewis, something that would be impossible for a publicly listed enterprise.

Although the company has 25 manufacturing sites around the world, including the British Midlands, Wales and northern England, it is under-represented in

the Middle and Far East, and is looking to expand there and in the USA through acquisition. It employs around 4,700 staff worldwide.

Doncasters has not been immune to the problems that beset the global economy – fallout from the Enron fiasco cost Doncasters £150 million in less than nine months – but has succeeded by becoming closely focused.

Legacy

The company specializes in cost-effective technical solutions to highly complex and demanding applications in aerospace and defence. It excels in working with alloys and metals that are difficult to shape and form – a legacy from its automotive past – and in developing and exploiting new processes.

One such is 'centrispin' forging, a process using centrifugal force to shape molten metal. It reduces processing by as much as 80% and results in "near-machined shape", says Lewis. Despite the advantages, he says it is difficult to convince customers used to tradi-

tional methods.

Technology and business sense has helped Doncasters move up the value-added chain and brought it wins on most of the major global programmes. As well as manufacturing, the company has considerable design capacity and works alongside its clients. Six Doncasters engineers have been working in San Diego, California with their Hamilton Sundstrand counterparts for two years on the Boeing 787 APU. "We wouldn't have done that a couple of years ago," says Lewis.

The company is an innovator in its own right. As a supplier of air exhausts to both Boeing and Airbus, Doncasters has been looking at replacing metal with a honeycomb design which would result in significant reductions in noise, in anticipation of major programme changes by 2013.

Good corporate citizenship is also important to Doncasters. It has spent "huge amounts" on energy conservation and looks poised to meet its own 20% across-the-board energy reduction targets this year.

Lewis is first to admit it's not

rocket science. Nor is 'lean' manufacturing – a staple of automotive manufacturing since the 1980s – but by applying these principles in its aerospace business, Doncasters has increased its capacity at the same time as becoming more profitable.

Lewis is proud of having been able to increase profitability while helping clients reduce their costs by stripping redundant processes out of their operations.

"Many of our products are the result of technology and manufacturing skills that are genuinely unique to Doncasters. Together with our depth and breadth of processes, we are positioned to offer complete supply chain solutions," says Lewis.

"We work very closely with our 'blue chip' customer base at every stage of the manufacturing and product delivery process."

With a corporate philosophy that encourages finding the best engineering solution for the customer's particular requirements, Doncasters is creating the kind of long-standing commercial relationships others can only dream of.

IN BRIEF

Lion Air signs V2500 service deal

Indonesian low-cost carrier Lion Air has signed a long-term contract with International Aero Engines (IAE) for the engine maker to support the V2500-A5 version of the engine that powers its five Boeing MD-90s. The deal is worth \$35 million. IAE says more than 80% of its customers that have selected the V2500 in the past 18 months have signed up for IAE after-market agreements.

The integrated approach

Supply chain management and integrated logistics company DAHER believes companies adopting an integrated approach to their supply chain management processes stand to make considerable financial and efficiency gains. DAHER UK Director Chris Melrose says: "On our stand we are explaining how value added technologies and services can help companies in the aerospace and defence sectors." Among DAHER's customers are Airbus, Bombardier, Dassault, EADS, Eurocopter, Finmeccanica, General Electric, Rolls-Royce, SAFRAN and Thales.

JetBlue service by Honeywell

Honeywell has signed a 10-year component flight-hour service agreement with JetBlue Airways for its Airbus A320 aircraft. The contract, valued at \$38 million over the life of the agreement, covers the suite of Honeywell avionics and the mechanical components for JetBlue's entire fleet of Airbus A320 aircraft. "The flight-hour programme provides for controlled and predictable maintenance costs to JetBlue while minimising those costs over the term of the agreement," says Marc McGowan, vice president, airlines-Americas at Honeywell.

Space Shuttle spend

NASA could get an additional \$1 billion in funds to help cover the costs of keeping the Space Shuttle flying. A \$51.2 billion fiscal 2007 spending bill for space, science, law enforcement and other federal programmes will be debated by the US Senate sometime this summer.

OPINION

Amid the buzz of Farnborough, the aviation industry faces enormous social, economic and environmental issues. Ron Van Manen, Qinetiq's director, Civil Aeronautics, argues that these challenges can be adequately met and dealt with only by continued long-term investment in innovation, combined with sustained government support for aerospace.

INVESTING IN INNOVATION

To an outsider, aircraft of the early 21st Century look remarkably similar to those of 40 years ago. Yet the introduction of light-weight composite materials, advanced electronics and avionics, and the remarkable progress in engine development and refinement means the aircraft of today are marvels of technological achievement.

Innovation has clearly served the aviation community well to date. It has an even bigger role to play in the years ahead.

Today everyone, including the industry, accepts that aviation has an impact on the environment. The aerospace and the aviation communities are committed to further improving the environmental performance of aircraft.

Today, because of the imperatives of the environment and global warming, we find an industry working hard toward a sustainable future.

It is this word 'sustainable' which presents an important paradox for the industry – indeed for society – for it needs to be understood in its broadest sense. Do we mean environmentally sustainable aviation operations; or a sustainable industry which continues to offer high quality, high added value employment to hundreds of thousands of people and is also profitable?

Do we mean an industry which sustains innovation and technology leadership, with the long-term support and policy mechanisms of governments? Or do we mean the continued and sustainable development of the global economy, for which a viable air transportation system is vital?

We should of course mean all of these, but often the debate is one-sided and

focused myopically on the growth of aviation in the mature and wealthy 'first world' nations, and its often exaggerated impact on the environment.

This is the aviation industry's biggest challenge: to reconcile the different meanings and values of 'sustainable aviation'.

There is an entire industry to sustain – from the UK's perspective, the world's second largest; there is a global economy to protect, while at the same time there is a need to face up to the pressures from tough legislation and increasingly environmentally aware consumer and voting constituencies.

In the midst of these competing challenges and complex issues, we must avoid being blinkered by the Western perspective. We need to be more mindful of the global economic value of air travel.

Exports

As an underpinning infrastructure, air transport – including air freight – has been one of the largest contributors to economic development in the developed, 'second' and 'third' worlds. It will continue to do so. For instance, air cargo is estimated to be worth \$3.25 trillion and approximately 36% of total global exports travel by air.

Here is an industry, therefore, that cannot simply unplug itself from world demand.

From the aerospace manufacturers' perspective, delivering on the Advisory Council for Aerospace Research in Europe (ACARE) targets for environmental performance and fuel efficiency is the way ahead. They form a major challenge which European industry is committed to meeting.

At best though it is the tip of the iceberg in terms

of creating a long-term sustainable aviation future. For that, today's new generation of technologists, scientists and engineers need to provide the leadership for a technological revolution.

The reality for the aviation industry is that it will take decades and trillions of dollars of investment for 'game changing' innovation to take place.

Although fundamental advances in clean technologies such as alternative fuels and propulsion technologies will probably not be available until beyond 2050, the work needs to begin now on creating and, far more importantly, on maturing and delivering these innovations.

How will this work be funded? The civil industry cannot realistically access capital markets for high risk technology research which may not bear fruit within 30 years. This is market failure in its truest form.

It makes public financing and funding of civil aeronautics R&D acutely important, and the pull-through of disruptive, innovative technologies through collaborative demonstration programmes an absolute requirement.

At the European level, the proposed Clean Sky Joint Technology Initiative (JTI) is indicative of how a public-private partnership can help enable the innovation that society demands. But that too is only the first step toward a long-term sustainable future.

The aerospace industry has had little recognition for its achievements. It has reduced fuel burn and emissions by more than 60% and noise by 75% since the early 1970s. Compare this with the high-speed train systems in Europe where Stage 2 level noise is created along the



entire 500km journey – not just the first three and the last two kilometres.

Clearly we need to work harder on our image.

There is a tendency to accept the view that aviation is the devil incarnate, while the reality is far more balanced. Road-borne traffic, for example, accounts for some 13% of global emissions, a far larger contribution than the 2.5-3% generated by aviation, and road traffic emissions are currently still growing faster in absolute terms.

An A380 will consume fuel equal to, or less than, a Smart car, in terms of average fuel per Revenue Passenger Kilometre (RPK). Yet how many of our detractors are 'downshifting' to Smart cars in their personal lives?

Tests

Some of the communities in the greater London area with the most vociferous anti-aviation public opinions sport the highest percentages in Europe of 4WD 'Chelsea Tractors'. And extensive tests have shown that local air quality in the communities to the east of Heathrow deteriorates when an easterly wind blows: clearly the greater London air blowing in is of a poorer quality than that of the airport itself.

In the UK, the govern-

ment has made an important first step in energising aerospace innovation through the Aerospace Innovation and Growth Team (AeIGT), and by supporting the National Aerospace Technology Strategy. It has shown admirable foresight in putting climate change on the international agenda and in embracing a UK Sustainable Aviation strategy.

The critical next step would be to underpin the two with a well-funded, long-term aerospace technology programme.

We need to learn to think in decades, not annual budgets. Only then can the UK industry take the lead role in delivering the innovation required to benefit the environment, and allow the global air transport system to continue to expand through the middle of this century.

With the right policy and funding, the UK aerospace industry can make sustainable aviation a reality by leading from the front, not shouting from the back.

Unlike the marvels of modern technology that power our aircraft, we can and must learn how to make more noise about the remarkable levels of sustained value this industry can continue to bring.

FOCUS ON VLJs

Are we witnessing the next giant leap forward for aviation – or are we just hoping to?
Liz Moscrop reports

ALL HAIL THE AIR TAXI?

Silicon Valley chutzpah is flying into aviation as former IT entrepreneurs Vern Raburn (Eclipse) and Ed Iacobucci (DayJet) are on short finals to land new companies in an unproven market.

Several manufacturers are behind them on base leg, with Cessna, Embraer and Adam Aviation in advanced stages of developing their new machines.

Not everybody is as bullish about the prospects for a very light jet (VLJ) air-taxi market and the airframers and upstart start-ups are spawning acres of newsprint.

In May, Raburn fuelled further debate when he told EBACE attendees in Geneva that Eclipse is looking to develop very light jet self-recovery systems.

Two weeks later Diamond Aircraft's CEO Christian Dries said at Berlin's ILA airshow that he, too, is working on such a system using unmanned air vehicle technology and applying it to a Diamond light aircraft.

The headline-grabbing statements threw up even more possibilities and on 23 May, *Flight International* wrote that certification issues – not the ability to create a simple 'get-me-home' system – are going to be the major hurdles to overcome.

The technology exists, but the challenge lies in creating a system that would eliminate the need for a second pilot, while ensuring the safety of

everyone involved in getting a pilotless aircraft back on to the ground.

David Wu, flightdeck systems marketing manager for Rockwell Collins Business and Regional Systems, agrees: "The avionics system that underlies integrated flightdecks certainly has the capability to grow to 'get me home' capability. The challenge will be in the regulatory requirements."

There is strong business rationale behind the manufacturers' statements. In most of the world, jets used for air-taxi operations require two pilots. If regulatory agencies were to accept that fitting an aircraft auto recovery system would dispense with the need for a second pilot, operating costs would fall dramatically.

But the biggest obstacle will be passenger confidence. Aviation professionals might embrace new industrial concepts, but a typical passenger would be leery of an aircraft flown by one pilot, let alone none.

Says Rupert Dent, chief executive of UK air charter operator Air Med: "It's exceptionally difficult to convince the flying public that a self-landing system is safe. Today people still ask us to fly two crew even on aircraft where they can fly with one. We will likely only feel the benefit of self-landing technology when it has become ubiquitous."

The spark behind the VLJ



Top: Embraer has an order for 50 Phenom 100s for a European fleet. Above: Dayjet has 239 Eclipses on order.

concept was Raburn's notion of designing a jet that could compete directly with the car, therefore opening up a brave new world of business opportunities.

Thanks to his vision, air-taxi operators are springing up around the world and potentially creating a whole new market sector. The ability to travel to previously inaccessible areas is proving enticing.

Pricing is an attractive part of the proposition. An Eclipse 500 costs \$1.45 million. Cessna wants \$2.5 million for its Citation Mustang and Embraer and Adam are asking \$2.85 million and \$2.28 million respectively for the Phenom 100 and the Adam 700.

Analysts can't quite agree on the number of new machines set to shape the



"The biggest obstacle will be passenger confidence. Aviation professionals might embrace new industrial concepts, but a typical passenger would be leery of an aircraft flown by one pilot, let alone none."

European fleet launch order for 50 of its Phenom 100s from Swiss start-up JetBird, an on-demand charter operator scheduled to begin operations in April 2009. Founder Domhnal Slattery says: "We plan to start from our base in Zurich and within five years operate a fleet of 100 aircraft from up to five hubs."

Embraer is equally upbeat, predicting 24% of new business jet deliveries in Europe to be VLJs.

Eclipse says it will increase investment in Europe, with European certification and first deliveries set for mid-2007. Cessna has sold seven Mustangs to UK air-taxi operator London Executive Aviation and Adam Aircraft's A700 is scheduled for European certification and first deliveries in late 2007.

Spectrum Aviation Europe looks likely to announce its first European fleet

customers at NBAA this autumn, with chief executive Stefano Sturlese saying: "We anticipate around 70% of our customers will be classic charter companies, 20% per-seat-on-demand air-taxi/fleet operators and 10% owner pilots."

However, established air charter operators are cautious. Says Dent: "The Eclipse and Mustang were designed with the US market in mind and are very effective there. In Europe there are fewer owner pilots and the need for two crew to pilot complex aircraft means that they will be costly to operate."

"That means they are more likely to appeal to a target audience of first class users. The manufacturers are going to have to pre-educate brokers as well as end-users."

With so much at stake, that education process should be an interesting spectacle.



Attractive pricing options: Cessna wants \$2.85 million for its Mustang.

PEOPLE

As general director of Russia's Rosoboronexport State Corporation, Ivan Goncharenko is the head of Rosoboronexport's delegation at Farnborough '06. He talks to *Alan Peaford* about the sizeable presence – and aspirations – of Russian aerospace

FACE THE FACTS WITH...

IVAN GONCHARENKO



*Ivan Goncharenko,
general director of
Rosoboronexport
State Corporation.*

Q: Organisations often use the air show to talk about their performance since the last show and their plans for the future. How has it been for Rosoboronexport?

A: Since the last aerospace show in London, Russia has continued consolidating its position in the world defence market. In 2005, the volume of Russian defence exports reached a record level of \$6.1 billion with the Rosoboronexport exporting in excess of \$5.2 billion. Meanwhile, supply of aviation platforms, equipment and provision of space services still make up around half of its volume of exports.

We managed to exceed the Plan 2005 by almost \$1 billion by fulfilling the so-called 'short-term' contracts qualitatively and on time.

Rosoboronexport increased its contracts portfolio as a direct result of its task-oriented marketing. In 2005 alone the overall value of contracts signed amounted to more than \$9 billion. This success will provide Russian defence industries with enough work for the next five years.

Q: Why do you think you are seeing such success?

A: Russian aviation manufacturers participate in all major regional tenders for multirole fighters and combat helicopters. Our packages often turn out to be among the favourites, and not only on 'price:quality' ratio where Russia is traditionally strong. More and more, our offset proposals and programmes for transfer of technologies and licences are recognised to be highly competitive.

I think the Russian aerospace industry demonstrates its maturity and competence as a long-term and strategic partner within the framework of large-scale contracts which are already in the stage of implementation. The presence of Russian aviation equipment is expanding noticeably. India and China remain Russia's major strategic partners in military-technical cooperation.

At the same time, last year the corporation continued expanding the scope of its arms exports. It promotes cooperation with such promising partners in Southeast

Asia as Malaysia, Indonesia, and Vietnam. Rosoboronexport also continues to strengthen its position in Latin America and North Africa. The corporation has managed to conclude a contract on delivering defence products to Morocco, for the first time in Russia's history.

Q: The Russian aerospace industry is ranked among world leaders. What aviation platforms are in centre stage in the Russian presence here?

A: The composition of Russia's exposition is planned with regard to world trends in warfare and the major requirements of customers, including the countries of Eastern and Central Europe, in repair and updating of Soviet and Russian-made military equipment in service.

The full range of export versions of Su-27 family aircraft is widely exhibited here at Farnborough. Sukhoi Aviation Holding Company – the leader of the Russian aviation industry – is making a special focus on the modernisation programmes of Su-27, the most

advanced fighter of the Russian air force. Different modifications of Su-27/30 are now operational with different foreign countries.

At the heart of our display is the MiG-29M2, which is an updated version of the famous MiG-29 fighter. This aircraft participates regularly in demonstration flights and show visitors will get a chance to appreciate its outstanding flying characteristics.

The MiG-29M2, also known as MRCA Project (Multi-Role Combat Aircraft), is in fact a qualitatively new multirole aircraft developed on the open architecture concept with increased range as compared with the original version of MiG-29 fighter. Both Rosoboronexport and

RAC MiG promote the MiG-29M2 in the Indian air force's tender for a batch of multirole fighters.

Yakovlev Design Bureau is also here and showing the Yak-130 trainer. Yak-130 is actually a dual-use aircraft: it may be used either as trainer or as a light combat aircraft. As a trainer, it provides high-quality training for pilots of any fourth generation aircraft and even higher. In its second role, Yak-130 is capable of carrying any type of modern armament, making it efficient in combat.

Q: Different types of Russian-origin helicopters are operational with countries of Central and Eastern Europe. What models of the Russian helicopter industry are you demonstrating at Farnborough '06?

A: The current military conflicts in complicated mountain and desert conditions of the Middle East have clearly demonstrated a special role played by helicopters, both strike-combat and transport. That's why a considerable place in the Russian display is occupied by various versions of helicopters from Mil and Kamov.

These include the Ka-50 and Mi-28NE combat helicopters, Ka-31 early warning helicopter, Mi-17-1V assault transport helicopter, Mi-35, Mi-35P, Mi-35M transport combat helicopters, Ka-60 multimode rotorcraft, Ka-50-2 combat double-seater helicopter, Mi-26 heavy transport helicopter and Mi-171Sh military transport rotorcraft.

We are keen to draw attention to the Mi-35M combat transport helicopter, which incorporates a 'deep' upgrade of the famous Mi-35 combat transport helicopter. From being equipped with more powerful engines, modern avionics, arms systems, high precision navigation and night-vision systems, the combat power of the helicopter is substantially improved. It is now capable of performing landing operations and deploying ordnance around the clock and in all weather conditions.

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*ATI User Survey, 2006.

PEOPLE

ATR continues to be a great aerospace comeback story. Chief Executive Filippo Bagnato believes its rediscovered fortunes represent a paradigm shift in the turboprop industry, writes *Colin Baker*

FACE THE FACTS WITH...

FILIPPO BAGNATO

ATR comes to this year's Farnborough in high spirits, with what chief executive Filippo Bagnato describes as a "step change" in the turboprop manufacturer's fortunes over the last two years.

The Toulouse-based EADS/Alenia joint venture comes to Farnborough with 47 orders in the bag so far this year, a remarkable turnaround from 2003, when deliveries dropped to just nine aircraft.

As a result of this success, production is being ramped up to 26 units this year, 44 in 2007 and 55 in 2008.

Bagnato is predicting that revenues next year will top the \$1 billion mark, nearly double the \$540 million achieved in 2005. Revenues for this year are expected to reach \$720 million, itself a healthy increase. "This

increase in production is a challenge," admits Bagnato, although he adds that his main concern has been ensuring the supply chain is up to speed, rather than the production line. "I was helped by investments made in the past. Before this 'jet mania' we were already producing around 50 aircraft a year."

Production slots are rapidly filling up. "We have a reasonable part of 2008 already covered by orders," says Bagnato, adding that

part of the production schedule for 2009 is also already covered.

Bagnato is convinced that the sudden change in fortunes of the turboprop represents a paradigm shift in the aviation industry.

"Over the next 10 years, we see a need for 1,000 turboprops worldwide," he predicts. "That means 100 aircraft a year, which will be split between Bombardier and ourselves."

"Historically, we have done a little bit better than



Bombardier, but a 50/50 split would be a prudent assumption. That means 50 orders per year for ATR."

In contrast, Bagnato says the 50-seat regional jet "does not have a future – it is practically at the end of its life."

Transformation

Bagnato is careful to give the ATR team first mention when picking the reasons for this transformation. He acknowledges, however, that the relative fuel efficiency of turboprops has played to the company's favour during a period when kerosene prices have rocketed.

"There is massive competition between airlines, and this means costs are hugely important. Not just the acquisition cost, but also

direct operating costs. Clearly today, fuel is a big operating cost."

On top of this, Bagnato thinks that the lower maintenance costs for turboprops have also played a role.

Over a distance of 300-350nm (550-650km), Bagnato estimates that ATR turboprops now offer a 35% cost saving against their equivalent in the regional jet sector. "This is huge," he stresses.

Looking at an airline with 10 turboprop aircraft, he estimates a saving in fuel costs of \$38 million-\$39 million over a five-year period compared with a fleet of similar sized jets.

Bagnato is also feels that the environmental headwinds facing the airline industry are blowing in

ATR's favour. Again, comparing an equivalent 10 aircraft jet and turboprop fleet over five years, he estimates the latter will use 45,000t less fuel.

Over the next year or so, Bagnato says the emphasis will be on performance, comfort and technology.

"We are working extra hard on performance, particularly when it comes to take-off. We are working to reduce take-off weight," he says, and looking to increase the aircraft's operating ceiling by 1,000ft (300m).

He doesn't see increased speed as a priority given the emphasis on efficient fuel burn and the relatively short sectors involved. "I will not spend one single penny on increasing speed," he emphasises.

"There is massive competition between airlines, and this means costs are hugely important. Not just the acquisition cost, but also direct operating costs. Clearly today, fuel is a big operating cost."

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PEOPLE

Once one of the world's leading makers of car tyres, Goodrich is burning rubber to make an ever bigger mark in the aerospace systems business. Jerry Witowski, segment president for electronic systems, talks to *Brendan Gallagher*

FACE THE FACTS WITH...

JERRY WITOWSKI

Q: Goodrich reorganised itself several times in recent years before arriving at the present three-segment structure. What drove these changes?

A: In the past 20 years we have transformed ourselves from a rubber and plastics company with comparatively minor interests in aircraft systems into a specialised aerospace supplier with products on almost every commercial aircraft in the world. Today's three-segment structure – Airframe, Engine and Electronic Systems – reflects logical groupings of our products and the needs of our customers.

Q: How much does Electronic Systems contribute to the overall Goodrich business? How do you expect the segment to evolve?

A: Total net sales last year were \$5.3 billion, of which Electronic Systems contributed \$1.2 billion. I expect to see increased volumes in defence – through emerging technologies such as laser perimeter-awareness systems for homeland security – and space. And we will continue to contribute enabling technologies for major programmes in the other segments. They include temperature and tire-pressure sensors for the electric brakes on the Boeing 787 and Global Hawk, as well as more electric, more efficient ice detection and protection.

Q: You have a very significant presence on the 787. What are your prospects on the Airbus A350?

A: So far we have been selected to provide the nacelles and thrust-reversers. We note that Airbus is planning to clarify the A350 situation soon – we're fully prepared to participate in either the current aircraft configuration or any newly defined 'A370'.

Q: As supplier of the escape slide system, what did you learn from the recent A380 mass evacuation trial?

A: That the Goodrich technology on board was a complete success – our slides added to the speed with which the passengers were able to get out of the aircraft. On average, thanks to new inflation technologies developed specifically for the A380, our slides deploy around 40% faster than other equipment now in service.

Goodrich has other significant content on the A380, including the main body and wing landing gear; variable-frequency technology for the power generation system, primary and standby air data systems, and several structural components. We expect the cut in A380 production rate though to 2009 to have a slight impact on our sales in 2006-8 and a negligible effect on our income this year and next.

Q: Your recent agreement with Jeppesen provides you with world-leading content for your electronic flight bag (EFB) product. How long do you think it will take this market to get up to speed?

A: Until recently there were only a few early adopters of EFB retrofits, mainly to provide take-off performance calculations, charting and document viewing. That's because it's taken a while for operators to quantify the return on investment. Most of them have done it now and we think that, along with increasing availability of EFB applications, it will soon lead to

rapid adoption. In fact we're already seeing an upturn in airline requests for proposals.

Q: You are active in UAV payloads with your Snapshot miniature infra-red camera. Do you have other UAV interests?

A: UAV control systems require increasingly smart, precise sensors to form part of artificial intelligence-based flight control systems. Our contribution there includes the SmartPort air data system for the Northrop Grumman J-UCAS. We also provide laser altimeters and inertial sensors for UAV applications, and we are working with several customers on advanced sensors designed to support "sense and avoid" operations.

Q: Sum up the Goodrich involvement in the Joint Strike Fighter.

A: Overall, JSF is expected to contribute more than \$5 billion to Goodrich revenues over the life of the programme. The company's content includes landing systems for all three variants, fuel quantity gauging, the STOVL lift-fan drive-shaft, friction material and anti-icing, the weapon-bay door drive and electronic control unit, and the air data system.

Q: Your contribution to the Airbus A400M includes variable-frequency electrical power generators. What



The recent agreement with Jeppesen provides Goodrich with world-leading content for its electronic flight bag (EFB) product.

is the significance of that technology?

A: Variable-frequency (VF) generation is the key to increased electrical power without corresponding significant growth in generator weight. In a traditional constant-frequency generator, the speed variations of the engine are cancelled out by a complex integrated-drive generator subsystem typically producing a constant 400Hz AC supply. VF technology allows the generator output to vary with engine speed, eliminating the integrated-drive subsystem and its weight, and also yielding significant improvements in reliability and maintainability. We supply VF generators for the A380 and Bombardier Global Express as well as the A400M.

Q: What have you got to say about your helicopter health and usage monitoring systems (HUMS) work?

A: We think HUMS is now gaining critical mass with our customers, who are beginning to see the benefits. Early adopters include the US

Army's 101 Airborne Division in Iraq, who have our HUMS on some of their UH-60 Blackhawks. This allows them to compare the availability of equipped and non-equipped aircraft. They're finding that the HUMS aircraft are averaging significantly more missions than the rest. In other words, HUMS is a force multiplier.

Q: Name an emerging technology that could grow to contribute to your business.

A: I see the ability to do predictive diagnostics in anything – an actuator, an air data system, electric brakes, electronic or non-electronic, in military, commercial or unmanned vehicles – growing out of today's HUMS. Applications could include a structural health monitoring system for the composite aircraft of the future. Ultimately, making all of our products smarter will improve maintainability and increase availability. Last year we spent the equivalent of 7% of our sales on R&D, and I expect that number to keep on growing.

Q: Could nanotechnology have a place in improved diagnostics?

A: We've seen the benefits of going to sensors based on microelectro-mechanical systems (MEMS). Not so long ago sensors were basically mechanical in nature – moving diaphragms, vibrating cones, cylinders – and vulnerable to things like thermal stress, shock and accelerations. Now they're etched on a bit of silicon,

yielding big improvements in cost, size, weight and environmental performance. Just as MEMS is currently an enabling technology, we are beginning to see nanotechnology as another enabler. We're interested and getting educated, and before long we'll decide on how to apply it.

Q: Identify a production method that you see growing in significance.

A: The next big step forward lies in moving lean beyond production and putting it into product development and programme management. An example is our 'Voice of the customer' process, in which we involve him from the start in development of things like the Boeing 787 nacelle. Working this way means the design will be done at lower cost, in a shorter time, and more to the satisfaction of the customer.

Q: Are you contemplating any new business models for the way you supply your products?

A: We see a demand for this and we're responding with some innovative asset management programmes. Customers want a range of options – the traditional model is best for one, asset management is better for another, a blended programme suits a third. We can offer all those choices. What's more, activities like predictive maintenance and lean production feed into asset management, allowing us to guarantee that the right assets will be in the right place at the right time.



"The next big step forward lies in moving lean beyond production and putting it into product development and programme management. An example is our 'Voice of the customer' process, in which we involve him from the start in development of things."

Jerry Witowski

PEOPLE

In today's asymmetric wars, everybody's in danger, says ITT's Chris Carlson, who is here at the show with a high-level team from the New York-based electronic warfare specialist. "In the past the slow-movers tended to fly behind the lines and there was no need for protection. Now every airfield is a potential shooting gallery."

Carlson is responsible for identifying and marshalling the technologies that ITT puts into all its EW products – not just the high-end systems in which it continues to excel, but also a new generation of affordable systems for the transport aircraft and helicopters that are increasingly in the firing line.

"Cost is an unfortunate fact of life," Carlson stresses. "Expensive systems tend to be bought in limited quantities, and today's infra-red countermeasures (IRCM) are very expensive. Equipping all of the US Army's rotary-wing aircraft, for instance, would add up to a lot of dollars. So we need to work on pushing the cost down to give the operators what they need at an affordable price."

ITT is pinning its hopes for a low-cost counter to man-portable IR-homing anti-aircraft missiles such as the Russian SA-18 Iгла on its ability to integrate technologies from a variety of sources.

"Unless you're willing to settle for flares, you have to go to a very expensive system," says Carlson. "So we're looking outside our own four walls, finding partners with relevant technologies, and putting them together to form a better and cheaper solution."

"We do believe there's no reason for people to be paying today's prices for IRCM."

Affordability is not being pursued at the cost of capability, however. "The threat of today is fairly low-tech," says Carlson. "But we have to keep in mind the possible near-peer threats of the future."

"We're therefore also looking at solutions that cover the entire spectrum – radio-frequency as well as IR – while still being affordable. Our objective is all-purpose self-protection at as low a cost as we can possibly achieve."

Meantime, ITT's existing high-end business, centred on the ALQ-211 self-protection suite, has held up well despite the shift in emphasis towards the provision of higher quantities of lower-specification systems.

Share

"We're continuing to grow our share of the top-of-the-line market," says Carlson. "That's partly due to our success in providing systems for special forces, whose role in the battlefield looks likely to expand. They go in first, they go in alone, and they have a need for significant defensive systems."

One recent example of this relationship is a three-year contract from the US Army's Technology Applications Programme Office to supply ALQ-211 for special operations helicopters. The system has also been selected for the USAF's Special Operations Command CV-22 Osprey tiltrotors.



CARLSON: THE ITT MAN

Twenty years ago, ITT Industries was intent on helping fast jets survive in high-tech Cold War battles. Now, as technology planning director Chris Carlson tells *Brendan Gallagher*, the race is on to create affordable self-protection for thousands of helicopters and transports.

Special-forces installations of ITT systems vividly illustrate the practical payoffs from the company's continuing drive to miniaturise and integrate its products inside ever smaller physical packages. "We have self-protection systems on special forces MC-130s that yield an overall 1,000lb (450kg) weight saving compared with their equivalent of 10 years ago, as well as offering improved performance. That sort of thing really catches the eye of C-130 operators."

Conversely, it's proving possible to pack far more capability into a given weight and volume. "US

Army helicopters currently have a radar warning receiver that weighs around 15lb and, because it was designed a while ago, is severely limited in what it can do. Into that same envelope, and with the existing wiring, we can now put ALQ-211 levels of radar-warning performance, covering the entire threat spectrum."

Carlson believes it all adds up to both a deepening and a broadening of the capability available to aircraft operators. "In a particular airframe, what was a bare-minimum RWR 10 years ago can now be a very capable RWR," he says. "And instead of a standard

RWR we can give you something that is almost a full electronic support measures (ESM) set."

Deliberate performance compromises can be rectified, says Carlson. "Some of the older helicopter systems pre-ALQ-211 were knowingly limited because weight was such an overriding concern," he explains. "Now we can offer a system that gives operators the performance they need while fitting into their weight budgets – they don't have to sacrifice performance any more."

At the bottom end of the scale the savings in mass open up for the first time the possibility of

protecting smaller airframes that lacked the necessary space or weight-carrying margin.

Improvements in the weight and cost of self-protection are not the only stimuli for new technology at ITT. "The effort to replace the EA-6B Prowler electronic attack aircraft is really driving our work in solid-state RF transmit arrays," says Carlson. "Taking solid-state technology from narrow-band to broadband is a daunting task, and we're among the world leaders in that."

The company is running hard to absorb the benefits offered by advances in digital receivers. "A digital receiver weighs and costs less than its analogue equivalent, and once the data is digitised you can do more things with it," Carlson comments.

"The core component technology that goes into digital receivers keeps getting better, so we as system designers have to keep up and make sure we take advantage as these components come to market."

Wealth

Looking further out, Carlson sees the management and presentation of the wealth of data generated by modern electronic warfare systems as the next big challenge for companies like ITT. "While the hardware will continue to change dramatically, the really eye-opening things will come out of the software," he predicts.

One of those things will be a much more aircrew-friendly man-machine interface, Carlson believes.

"Aircrew already have a daunting task and you don't want them to have to do even more work," he says. "So instead of simple threat-reporting, our job is to create a total picture derived from multispectral sensors located both on the aircraft and elsewhere, and present it to them in a helpful way."

Carlson cites ITT's work on the CV-22 Osprey as an indicator of what lies in store. "We're very proud of our situational awareness provision on the CV-22," he says. "We take our EW data from various different sources and integrate it into the digital map. But even then there's a lot for the pilots to make sense of."

"In the future we'll serve up even more detailed and timely information but in a format that's much easier to understand. Like having your cake and eating it – more detail but also more understandable."



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"Our objective is all-purpose self-protection at as low a cost as we can possibly achieve."

Chris Carlson