The South will rise again

With a long history of aviation in the US state, Georgia is now repositioning to put itself higher on the global aerospace industry map. **TIM ROBINSON** reports from Georgia as the state prioritises aerospace as a key sector for jobs and growth.

Think Seattle and immediately Boeing comes to mind, Toulouse and the same for Airbus; Warton and BAE Systems. Even California will draw up associations of Burbank/Lockheed; Long Beach/McDonnell Douglas/Boeing and General Atomics, let alone the testing grounds of Edwards or the new frontiers of space tourism at Mojave. Yet the southern state of Georgia does not get instant recognition among these global aerospace clusters.

That may be about to change. The state has been hit hard by the economic downturn with above 10% unemployment yet its Governor, Sonny Perdue (a keen pilot himself) has identified aerospace as one of eight strategic industries for growth that will revitalise the state and create skilled, high paid jobs for the future.

So what has held it back before? It may be that, unlike Seattle or Toulouse which are clusters around a single OEM, Georgia boasts some four major aerospace centres — based on the Lockheed Martin plant at Marietta, Gulfstream in Savannah, the vast USAF Warner Robins support base and the Delta Air Lines hub at Atlanta-Hartsfield International Airport — one of the world's busiest terminals. These companies, along with smaller concerns (such as GA manufacturer Maule), mean the state boasts some 83,000 highly skilled aerospace workers. Another reason may be, says one insider, its previous 'hillbilly' image which has left some outsiders unaware of its aeronautical expertise. Its labour force, for example, thanks to a southern 'can-do' spirit and fierce pride, is the most productive per person ($135,000 in value added ouput) than anywhere in the entire US, despite ranking lower in the pay scales.

Similarly, the state boasts an academic powerhouse in the form of Georgia Tech University which ranks second in the US after MIT in aviation universities. Its world-class academics have been responsible for key aviation breakthroughs like CDA (continuous descent approaches) now saving airlines around the globe millions, and one of its academics, Prof Robert D. Braun was recently appointed NASA chief technologist in February and is now advising the space agency and President on key policy decisions. Its alumni also include NASA astronauts and brain behind the F-4 and F-16, David Sloan Lewis.

At a lower level, Middle Georgia College Aviation Campus teaches some 400 students per year in flight training, maintenance and boasts the latest in ATC simulation training facilities. The state then clearly has a rich history dating from WW2 and before and is thus keen to preserve its aerospace jobs and expand the sector further. It is reconciled to the fact that in the globalised industry its workers are its best asset and to support existing industry and attract new companies it must demonstrate a commitment to inspiring and retaining that pipeline of a highly skilled workforce. Let us take a look at some of Georgia's key capabilities.

Home of the 'Herc'

Based in Marietta, outside Atlanta, is Lockheed Martin, which runs the world's oldest continually operating military aircraft production line in the C-130. The factory originally was built in 1942 to produce B-29s for the war effort and today produces the C-130J, F-22 and is also involved in rewinging P-3 Orions for the US Navy and international

Lockheed Martin

Products of Lockheed Martin's Marretta, Georgia, facility. The P-3 Orion (now being rewinged), C-5M Super Galaxy, F-22 Raptor and C-130J.

customers. To meet rising demand for the C-130J (latest customers include India, Canada and in March, Tunisia, which will take two aircraft) Lockheed is having to ramp up production rates of the C-130J and, in 2011, will reach a rate of 25 a year. As a company spokesmen notes: "We're in a recession yet we are recruiting." The company sees extra possibilities caused by the slippage of the A400M and has a backlog of 97 aircraft.

LM has also taken on extra staff to cope with the P-3 Orion rewinging programme which will see it deliver refurbished P-3s to Taiwan, as well as rewinged examples to Norway, the US Navy, the US Customs Service and Canada. Brazil, too, is a new P-3 operator and its first examples will become operational in this quarter. With 400+ aircraft in service today, even by 2018, Lockheed estimates that there will still be some 250+ Orions in service around the world — not bad considering its civil originator, the L-188 Electra, first flew in 1957.

Marietta is also the home for the C-5M Super Galaxy upgrade programme — which will see these legacy airlifters in the USAF inventory given a new lease of life with GE CF6-80C2 powerplants and new avionics. The new engines, in particular, boost the airlifter's performance figures with 22% more thrust, and, in September last year, a C-5M test flight set 41 new records for various payload classes. The C-5M upgrade should be completed by 2016, effectively giving the aircraft a new lease of life beyond 2040. All told, Lockheed Martin's Marietta facility employs some 8,000 workers and supports some 331 companies in the supply chain.

Boeing in Macon

Another defence giant in Georgia is Boeing which has a facility in Macon producing C-17 parts, CH-47 components and is also responsible for producing the centre wing box for the USAF's A-10 Wing Replacement programme. The factory employs some 500 (non-unionised) workers on these structural assemblies and the plant has consistently given high marks for its 'Team Macon' work culture and employee engagement and, in 2004, it won an award for being one of the top ten manufacturing plants in the US from *Industry Week*. As well as rewinging work for the A-10, Boeing Macon is also looking to snare new work packages, such as any rewinging programme for the USAF's T-38 trainer should the Pentagon decide to extend its service life.

Boeing's Macon facility also benefits from Georgia's QuickStart programme — a state-level initiative which aims to help companies find suitable workers by providing pre-employment, screening and job-specific training free of charge to ensure a company has the right candidates, with the right skills, at the right time.

Boeing C-17 at Warner-Robins AFB. Note the sandblasted paint — a sign of some hard usage.

On the C-17 side, despite various efforts to halt production, the airlifter continues to win sales, both from the US and from foreign sales with India the next potential customer. Boeing, too, sees potential additional exports to NATO's pooled SAC (Strategic Aircraft Capability) of three C-17s, and has proposed a similar pooled force for Asia-Pacific nations, though it admits the alliance structures are less established there. The C-17, too, is still relatively young in its career and Boeing has proposals, such as the Advanced C-17, which would further enhance the capabilities of this airlifter. The Advanced C-17, for example, would feature higher thrust, double slotted flaps, an additional centre landing gear and, through a combination of a global terrain database and its infrared systems, be able to fly intercontinental missions to austere strips and even flat-enough ground anywhere in the world without any type of ground-based landing aids or surface preparation at all.

Warner Robins AFB

Georgia is also home to the vast Warner-Robins Air Force Base (AFB), the largest industrial complex in the state, which supports some 20,000 jobs and provides some $4bn of direct economic impact to the state. One of three giant logistics superbases in the US, it is responsible for maintenance, sustainment and support of all the USAF transport fleet (C-5As C-17s, C-130s), helicopters, plus ISR/Special mission (U-2/Rivet Joint) and UAVs (Reaper/Global Hawk). The base also supports one fighter type — the F-15 — a legacy of Georgia's legendary senator Sam Nunn's influence in Washington. Not only that, but the base is home to the US JSTARS fleet, has been selected as the training centre for the C-27J Joint Cargo Aircraft (JCA) and is also the HQ of the US Air Force Reserve.

Uniquely for Air Force Material Command (AFMC), its workforce is made up of some 76% civilians (as opposed to 31% in the entire USAF) who provide the deep-level support and maintenance. With the high operational tempo of US forces in the recent past, Warner-Robins has thus been critical in keeping some of these increasingly aged aircraft flying and for some of these it is a race against time before the flying hours are used up and more serious problems develop.

One example is the USAF's ongoing C-130 centre wing box replacement programme, which aims to give the E/H era-models a new lease of life. Even then, stripping down and preparing them for a new centre wing is not a straightforward job. Since many of the C-130s are unique and have had custom modifications over their careers, preparation of the aircraft is extremely critical to allow the new wing kits (supplied by Lockheed Martin) to fit. A laser alignment process is used to individually measure each airframe and ensure a correct fit. Due to operational demands, the first 'classic' Hercs through this process are the special operations AC-130/MC-130 variants. Interestingly, these examples, which one might think could cause problems to upgrade


Gulfstream

The G650 production line at Gulstream Savannah.

because of aggressive low-level flying and (in the gunship's case) vibration from 105/40mm cannon being fired sideways, have so far produced the least problems — whereas some more 'common' C-130s have thrown up surprises. The facility has six docks for airframes and is aiming to replace 24 wing-boxes per year with a 90-day turnaround.

As a support and logistics base for the USAF's ISR (intelligence, reconnaissance and surveillance) aircraft Warner-Robins has also picked up the sustainment task for the Air Force's rapidly growing UAV fleet of Global Hawks, Reapers and Predators. Its specialisation in avionics, software, communications and support equipment for manned ISR aircraft such as the U-2, or JSTARS, thus has a large read-across into UAV systems.

Currently these three UAV systems are managed by the 560th Aircraft Sustainment Group at the base but sources are hopeful that as experience of flying UAVs is built up, new technology arrives and regulations change, the UAVs, for example Global Hawk, could be flown in remotely to Warner-Robins for support. It is clear that Warner-Robins is well positioned to exploit any further expansion in the USAF's UAV fleet and, indeed, may even become, in time, the large UAV/UAS MRO centre. If, too, the commercial explosion in UAVs does take off in the near future (and a significant civil market in HALE/MALE –sized vehicles emerges), then Warner-Robins workers could find themselves in high demand by the civil sector too.

Gulfstream

On the civil side, Georgia is home to Gulfstream based in Savannah, the world's foremost manufacturer of ultra-luxury large business jets. Employing some 6,500 people in Georgia, the company is also expanding its Savannah facility with a new service centre and 1,100 jobs making it the largest bizjet MRO in the world.

The company is now at the beginning of a flight test campaign for both its flagship ultra-large cabin long-range G650 and medium size G250 aircraft which both flew in late 2009. In February 2010 it flew the second prototype T2 article G650 and the type is expected to gain FAA and EASA certification in 2011, with service entry in 2012.

The Savannah facility, as well as its company HQ, also includes the large cabin production line, the new G650 line and R&D and engineering facilities and flight test centre. The plant also includes Gulfstream's luxury interior design 'showroom' where customers can select matching crockery, trim and carpets — and even test them under different lighting conditions — such is the attention to detail.

At the top-end of the business jet market, one might think that Gulfstream would have been hit hard by the recession and indeed in 2009 it reduced production rates and furloughed staff for 4/5 weeks in the summer. However, these measures are now over and judging by the amount of activity on the large cabin production line, the company is now 'cautiously optimistic' about earnings saying 'market conditions have somewhat stabilised'. Indeed the large cabin aircraft 400/450/500/550 at the very top of the market have been less affected by the downturn than the middle size cabins — a function of the brand's high-end prestige factor as well as its usefulness as a business tool. The company expects to deliver some 77 large cabin and 14 mid-cabin aircraft in 2010.

Georgia Tech

One of the keys to Georgia's success in attracting and retaining such companies as Boeing, Gulftream and Lockheed Martin (and its influence beyond state borders), has been the Georgia Institute of Technology. Known simply as 'Georgia Tech', its Daniel Guggenheim School of Aerospace Engineering established in 1930 (though it dates back to 1917 as one of eight schools of military aeronautics) is ranked second only to MIT in aerospace. Indeed, in levels of R&D expenditure by Georgia Tech it dwarfs other US aerospace universities and is twice as big as MIT. The School also works with a number of sponsors, including NASA, the US Navy and major aerospace companies from not just the US, but elsewhere, including Airbus, Thales and Rolls-Royce. Its total research contracts were $41m as of June 2008, split three ways between NASA, DoD and industry.

It has some 800 undergraduates and 500 post graduate students on its books and its 38

academic and 70 research staff run some 55 engineering courses. With more than 65% of the US aerospace workforce aged 49 and above (and the average age of AIAA members 55) the School has, its current chair, Professor Vigor Yang, notes a "tremendous responsibility for the future of US aerospace" in maintaining a high-quality pipeline of graduates.

Its research programmes encompass aerodynamics (reducing tailfin size to cut weight), air transport management (optimising gate-to-gate operations with concepts such as 'virtual queues' and automated departure clearance), rotorcraft (Georgia Tech is the oldest and largest US helicopter academic research centre) and UAV autonomy and spacecraft manoeuvring. To support the latter, it has a five degree of freedom (5DoF) 'satellite simulator' in the basement, where a test rig can 'glide' across a hyper smooth surface, supported by air. This rig is being used to develop automated formation flying and satellite docking procedures, without the need to go into space.

Other research areas include load-bearing antennas, load bearing/structural solar panels, as well as work looking into turbulent flows and fluid dynamics at the nano level — using 0·5trillion grid points and 131,072CPUs.

Middle Georgia College Aviation Campus

It is not just at Georgia Tech where the state is producing high flyers. At Middle Georgia Aviation Campus in Eastman the students are producing composite components for NASA's future James Webb Space Telescope. The Aviation Campus itself is an extremely modern technical college that runs courses for pilots, maintenance and ATC students. The College boasts its own control tower at the airfield, as well as a 'virtual ATC' tower simulator with voice recognition to allow ATC students to control simulated traffic at busy airports. The facility also includes a terminal area ATC simulator, with screens and stations replicating an authentic ATC centre. In this sim, the part of the aircraft on screen is played by pilots or other students behind a screen. These students, role-playing airline captains and responding to instructions from the ATC students, have a God's eye view of the airspace and this can even be panned and rotated in 3D to see the airspace divisions more clearly. Taking turns at 'playing pilots' then is an invaluable experience in learning how airspace is managed. It is no wonder then, with these faculties and high calibre of teaching, that the ATC/M course has been rated No 1 in the entire country under the Collegiate Training Initiative. Other countries, too, are recognising the College's capability and send their ATC students there.

As well as new residential buildings and flight training, the campus also includes significant maintenance training facilities. These include workshops, a composite manufacturing facility (which as noted above has been approved by NASA for supplying a 'baffle' for the JWST to re-radiate heat) and a 'petting zoo' of non-flyable aircraft for use in maintenance instruction. These include a Rockwell Sabreliner, Cessna 310 and even, parked outside, a DC-9 — which is a star attraction for students. The college also maintains its own fleet for flight training.

This College then, despite being relatively unknown, is 'second only to Embry-Riddle' in technical training, according to one insider.

ATC tower simulator at Middle Georgia Aviation Campus. The voice recognition system is even able to interpret accented English first time and pass on instructions to AI traffic.

Co-located at Eastman with the Campus is Georgia's Center of Innovation for Aerospace. Founded in 2003, this is a one-stop shop to connect academia and industry and other partners such as Warner-Robins for aersopace companies looking to expand in the state.

Summary

Will Georgia succeed in putting itself on the global aerospace map? There are signs that it is already working. In February Bombardier announced it is to open a support and service centre for CRJ-series airliners at Macon airport. Also in February Canadian firm Star-Navigation (which specialises in innovative real-time flight recorder data downloads) selected Atlanta as its new US HQ.

Established firms, too, continue to generate revenue and jobs for the state. Boeing's C-17, for example, is still (compared to the C-130) at the start of its life, despite repeated attempts to cap production and is continuing to win foreign orders. Meanwhile Lockheed's C-130 line keeps on churning out the airlifter — and should Lockheed develop a new transport — (either a widened C-130XL or a clean sheet design, perhaps based on the Skunk Works' Advanced Composite Cargo Aircraft (ACCA) prototype), Marietta would be the obvious home.

If, too, Warner Robins succeeds in becoming the USAF's large UAV MRO centre (a natural fit given its current ISR support) then this is likely to generate a significant number of high-tech highly skilled jobs. Should the holy grail of civil UAV usage (for border patrol, search and rescue/pipeline patrol/law enforcement) break-out too, as many experts predict, this could also see Georgia becoming a civil UAV MRO centre hub.

Its educational establishments, too, in the form of Georgia Tech and Middle Georgia College Aviation Campus are key in preparing the next generation of US aerospace workers and the state, through other programmes like QuickStart and the Middle Georgia Work Ready Partnership (mgWRAP) is conscious of, and is already addressing, the demographic changes in the US workforce. Its workers are not only well trained but have a Southern outlook and work ethic that is attractive to employers.

Finally, it seems that Georgia has the kind of high-level political support for its aerospace industry that will produce results.