



# UK Aerospace International Strategy 2012



In association with



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## Executive Summary

1. This report identifies the major opportunities for UK Aerospace in international markets and provides recommendations on how these opportunities should be approached during the next 12-18 months.

Over the next 10 years, the large high growth markets such as China, India and Brazil will drive global civil aerospace growth, although existing/traditional aerospace markets will remain important for UK industry. As well as supplying to major OEMs, such as Airbus and Boeing, the emerging markets are also developing their own indigenous civil aerospace programmes, UK companies, particularly at OEM and Tier 1 level, with the assistance of UKTI and ADS, need to enter discussions on these programmes at the earliest possible stage to enable them to secure work. This will then facilitate opportunities for other UK companies lower down in the supply chain.

2. The principal opportunities in the next 10-year period are likely to be on new Boeing, Airbus, Bombardier, COMAC and Embraer programmes due to their sheer volume and the fact that there will be options for new supplier entries. There are also significant opportunities for UK suppliers to win international business on new rotorcraft and business aircraft.
3. The globalisation of the supply chain and current market conditions require that UK aerospace companies and UK Government co-operate even more closely than before to maintain and expand their share of this important part of the advanced engineering sector. ADS will continue to work collaboratively with UK Trade & Investment (UKTI) and the Department for Business, Innovation and Skills (BIS) Aerospace Marine & Defence Unit, which has lead responsibility to ensure that the UK has the right strategies and frameworks to increase the competitiveness of the UK civil aerospace sector and maintain its comparative advantage, and to promote and safeguard the UK's long-term growth in civil aerospace e.g. through promoting internationally competitive skills, supporting innovation & technological development, and supporting more effective supply chains.

4. Successive UK Governments have recognised the importance of aerospace as a strategic sector and have been supportive in helping it to develop and grow its international civil and defence aerospace business. Advanced manufacturing sectors such as aerospace and defence also continue to be seen as important to maintaining a balanced economy in the UK.
5. This document is a direct result of UKTI requiring a consolidated UK aerospace industry view of where it can best allocate its resources. ADS and the UK Aerospace Industry welcome the support that UKTI and BIS have given to producing this document and look forward to continued collaboration between all parties for the benefit of the UK Aerospace Industry.
6. The information contained in this report was compiled from data provided by major UK-based companies in the aerospace sector during late 2011. It provides a consolidated view of future international opportunities and was signed off as such by ADS Aerospace Export Focus Group in January 2012.
7. The 2012 report was formally launched at the UKTI International Aerospace Exchange event on 7 February 2012. At this event major civil aerospace OEMs, and their Tier 1 partners, gave presentations on their major civil aerospace programmes, including data generated for the current report, and how the UK supply chain can access these opportunities.

## Introduction

This report is an update of the strategy document that was produced in February 2011 by the ADS Aerospace Export Focus Group, which outlined the status of the worldwide marketplace, identified key export markets for the UK aerospace sector and recommended how opportunities in these markets should be approached. This document was submitted to UKTI in support of their annual business planning process.

As a result a targeted programme of activities focusing on key aerospace opportunities has been delivered for UK companies based around the recommendations. During the past 12 months, this has resulted in greater engagement from UK industry than previously seen, which has included inward and outward activity involving China, India, Russia and USA markets and a series of well supported market and programme briefings in the UK. All of these activities have received positive feedback and significantly increased UK companies' knowledge and interest in pursuing business in these markets.

The data gathering and consolidation exercise also resulted in a comprehensive set of worldwide programme forecast data that has been made available to the UK Aerospace Industry via the ADS website and through regional trade associations. This has been particularly valuable for SME companies that do not have their own in-house research teams to gather and produce this analysis. They have been able to use this data to identify which programmes offer greatest potential for their products/services and thus prioritise their marketing and business development activities. Larger companies have also been able to use this data to calibrate their own in-house market analysis and forecasts and to identify where there are differences, investigate these areas and refocus their strategy if required.

The consolidated data analysed to produce this report will be made widely available to UK industry on a request basis, along with a copy of this report summarising the key opportunities. ADS proposes to promote the availability of this report via its own website, its regional partners and the UKTI website. It is also proposed that a series of road shows will be organised in Regional locations to present both the consolidated data and the recommended activity to UK industry and to allow them to ask questions about the content.

It is also intended that the UKTI Advanced Engineering Team should circulate this report to their virtual network around the world to inform the aerospace leads in each market where UK industry believes the greatest opportunities are and how they can target their activity to assist UK Industry pursue these opportunities.

### Objectives

The primary objectives of this report are:

- To provide an evidence base to inform UKTI Advanced Engineering 2012/13 activity planning.
- To provide the UK Aerospace Industry in all areas of the supply chain and across all tiers a rich and validated evidence base on which to base future business capture activities and planning.

## Methodology

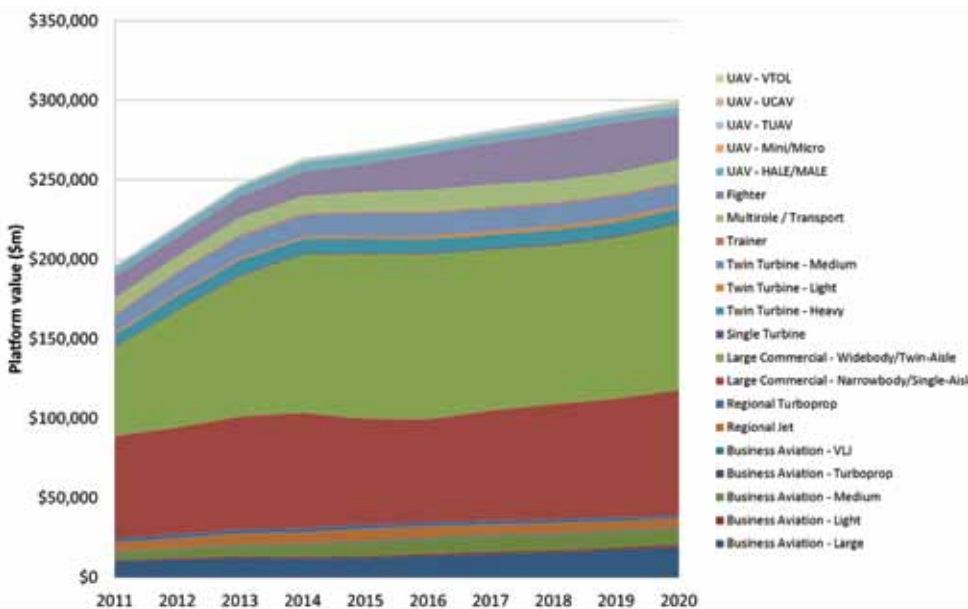
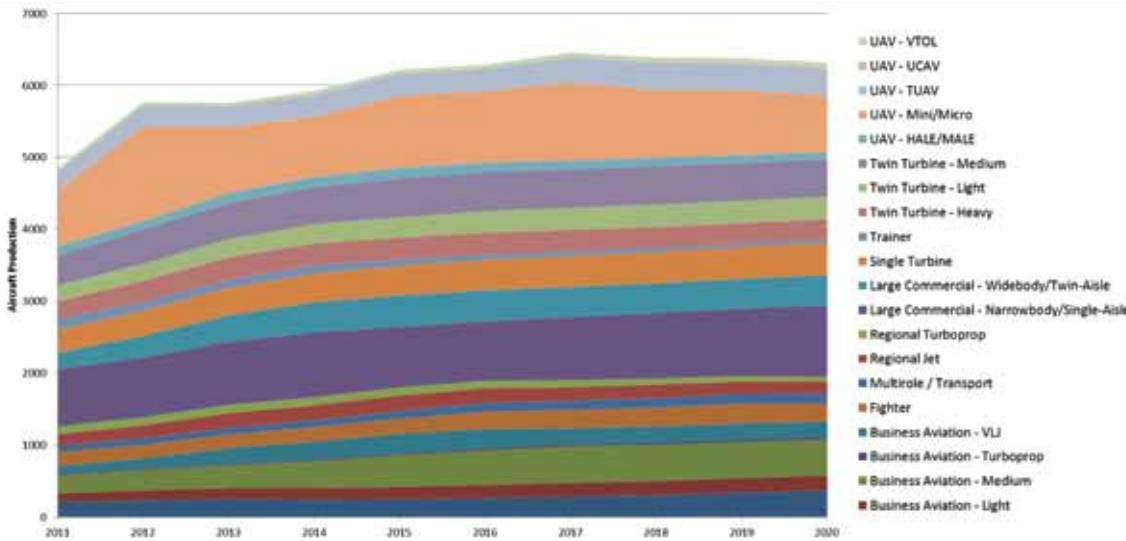
ADS contracted a consultant to gather market intelligence and forecast data for key aerospace programmes from ADS member companies and consolidate these data to produce an industry view on global opportunities. In a workshop facilitated by the consultant the members of the ADS Aerospace Export Focus Group analysed the summary data, generated a list of priority opportunities for the UK aerospace industry, and a list of recommended actions by ADS and UKTI in support of winning business in these areas.

The workshop covered the following issues and was broken down into 3 phases:

- Presentation and Evaluation of Consolidated data
- Identification of Priority Programmes, Stage of Development and level of opportunities that remain for the UK supply chain
- Identification of Priority Markets/Countries

The consolidated data was presented by sector and the total market volume by sector and market value by sector from the data that was submitted are summarised in the charts below:

### Market Volume



## Opportunities

The workshop identified a list of priority programmes that it is believed will present the greatest opportunities for UK industry during the period 2012-2020. Each of these programmes was evaluated by benefit to UK companies of securing work on these programmes versus ease of access. The criteria used for each of these categories were as follows:

<b>Ease of Access</b>	<b>Benefit</b>
Level of Investment required	Volume of Production
Cost to win	Continuity of Programme
Cultural skills	Scope (range of opps)
Openness of supply chain – lack of incumbents	Stability of programme
Export/import barriers/costs	New customer access
Offsets	Margins
Dual use	No IP transfer
Level of competition	Timescales
Win probability	
Product liability	
IP protection	
Access to finance	
Currency	
National support	

In addition, in order to identify the opportunities that remain for the UK aerospace supply chain, each programme was analysed by stage of development, which was classified into four categories identifying where opportunities exist in general:

**Concept (C)** - a programme that is still at concept stage and therefore presents opportunities for companies of all sizes and levels of the supply chain.

**Design and Development (D)** – a programme that is already in design and development and where the major systems and structures have already been selected and opportunities remain for sub-system, component and material suppliers.

**Manufacture (M)** – a programme that is already in production and limited opportunities are likely to remain for UK companies to re-compete for existing business e.g. dual sourcing.

**Operations and Maintenance (O)** – a programme that has already entered into service but may still present opportunities for UK companies providing logistics and operational support.

This resulted in a mapping of priority programmes as shown in the image below:

### Priority programmes

	Harder access	Easier access
Higher benefit	C919 (D) F-35 logistics chain (O) US AAS (C) MA700 (D) Avicopter (C,D) US T-X trainer (C) Embraer 190X (C) Russian helicopters (C,D) CVLSP (C) F-35 LRIP 8 (M) KC390 (D) S-97 (C) Bell Magellan (C) Korean KFX (C) PWC 800 (D)	Trent XWB engine (A350) (D) 787-9/10 (M/D) Gulfstream P-42 (D) Falcon SMS (D) C Series (M) LEAP-1B engine (D) LEAP-1A, PW1100G engines (D) Anglo/French MALE UAV (C) AW169 (D) F-35 OE/2 <sup>nd</sup> sourcing, Sovereign support (M) 777-X* (C) Eurocopter X4 (C) Global 7000/8000 (D) GE Passport 20 engine (D) A350-1000XWB (D) Snecma Silvercrest (D) GE NG34 (C)
Lower benefit	KC-46A (D) MS-21 (D) KAH (C) Indian 5 <sup>th</sup> Generation (C) MTA (C) CH-53K (D) Indian Regional Transport Aircraft (C) LOH (India) (D) RSH (India) (D) VXX (C) MH-60 recap (C) Military UAS (C)	AW149/189 (D) New ATR* (C) Gripen NG (D) AW609 (D) Eurocopter X3 (C) 737 MAX (D) A320neo (D)

\*not launched

It is important to note that during the workshop a number of programmes that were included in the previous year's strategy were taken out as they were considered to no longer present significant enough opportunities for the UK supply chain to remain a priority. The main reasons for this decision were that supply chains for these projects were already fully committed or that the programme was highly unlikely to proceed in the timescales that the report covers. The programmes that were removed from this year's priority programme list include:

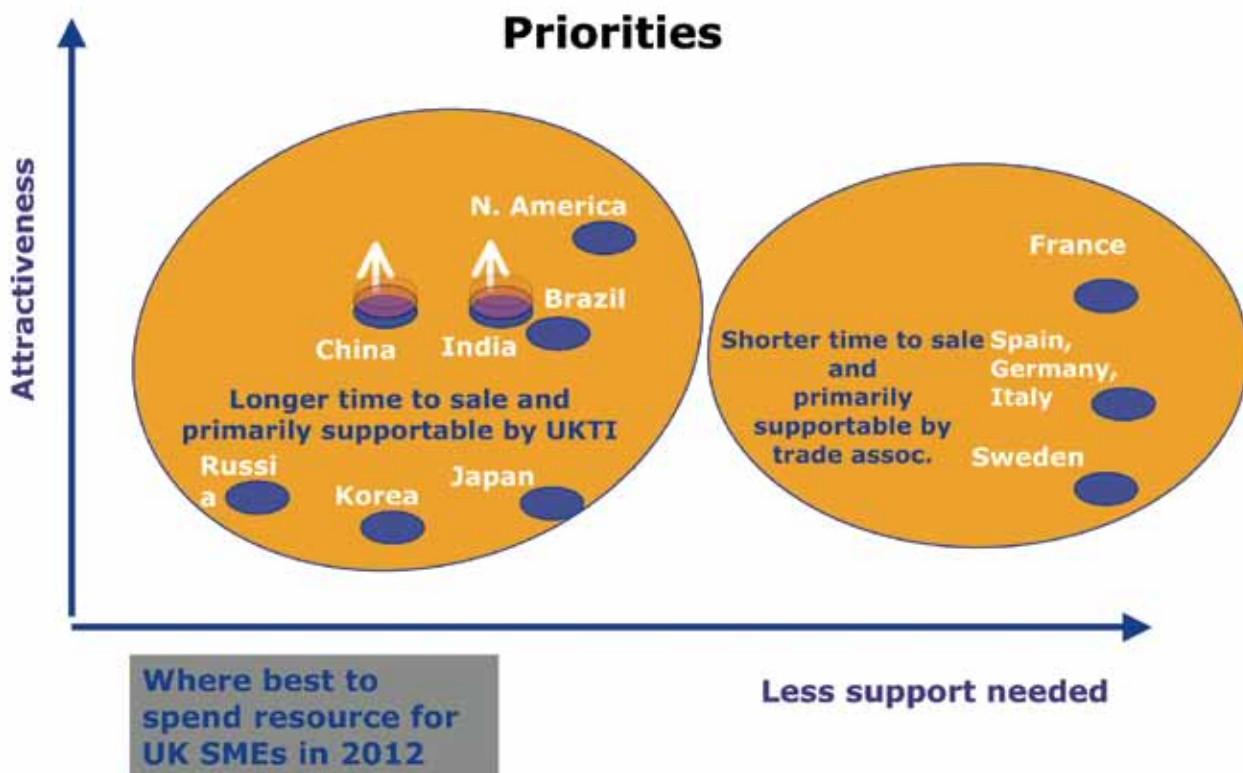
Mitsubishi Regional Jet (MRJ)  
 Civil UAS

A number of programmes that were not considered far enough advanced in 2011 to represent opportunities for UK industry when the 2011 report was prepared have also been added to the 2012 Report which include:

Sikorsky S-97  
 Bell Magellan  
 Korean KFX  
 Gulfstream P-42  
 Falcon SMS  
 GE Passport engine



A similar mapping was also produced by market which resulted in two sets of markets – those that have a shorter time to sale and are therefore primarily supportable by a trade association and those that have a longer time to sale and where UKTI support can add the most value to companies business development efforts as shown in the image below:



Although North America is a transparent market, it is a demanding one from UK SME's to address and this market has therefore been moved to the longer time scale set of priority markets, as it is felt that UKTI support is essential.

## Civil Programmes

### Fixed Wing Widebody/Twin Aisle

In all cases engines applicable to relevant airframes follow directly after the airframe summary:

#### Airbus A350 - 1000 XWB (D)

The Airbus A350-900XWB design is firmed up. Final assembly of the first aircraft has slipped from 2011 into 2012 with first flight now scheduled for mid-2013. The aircraft is proving to be an attractive commercial proposition with Airbus claiming 567 orders at time of writing. Entry into Service (EIS) of the A350-900XWB is scheduled for 2014 followed by the smaller A350-800XWB in 2015. Following a decision by Airbus to use a higher thrust Rolls-Royce Trent XWB engine for the A350-1000XWB and increase the variant's payload-range capability, its entry into service is now scheduled for 2017. It will compete for business with the larger variants of Boeing's 787 and the Boeing 777. The aircraft has so far only been offered with versions of the Rolls Royce Trent XWB engine.

Although Tier1 suppliers are now selected, some opportunities still exist in the near term at lower tiers on A350-1000XWB.

#### Rolls-Royce Trent XWB (D)

The Trent XWB has been developed and optimised exclusively for the Airbus A350 XWB family and will be the sixth member of the highly successful Trent family. The XWB Engine range consists of 3 engines with differing thrust ranges from 75klb to 93klb. The Trent XWB will use the successful three-shaft architecture of Rolls-Royce engines and the detailed design will reflect 70 million hours of Trent family service experience.

The A350 has currently attracted 567 firm aircraft orders from 36 customers, an order book that already exceeds 1,100 engines before it has entered into service, a record for any Rolls-Royce engine.

In June, at the Paris Air Show, Airbus announced that the revamped A350-1000 would feature a more powerful thrust range up to 97klb.

#### Boeing 787- 9/10 (M/C)

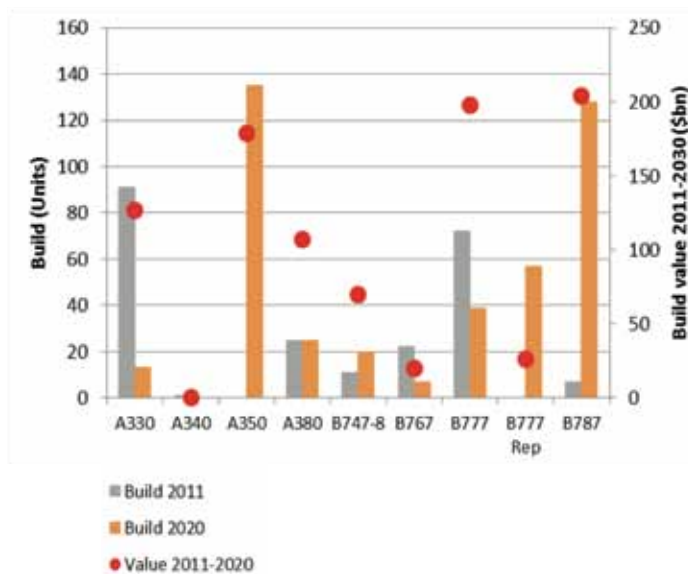
The Boeing 787 has had some well publicised schedule problems. The first flight took place on 15 December 2009 and the first 787-8 revenue flight was made by ANA in October 2011 after 40 months of delay. Net orders for the programme declined in 2010 and 2011 due to cancellations. Nevertheless, the programme looks set to be successful with a backlog in excess of 800. The aircraft is offered with both the Rolls Royce Trent 1000 and General Electric GENx 2B engines.

To recover as much programme slippage as possible Boeing has been pulling work back in-house. It is possible Boeing will look to replace underperforming contractors and re-outsource work. This may be an opportunity that established and trusted UK suppliers could exploit. Nonetheless it is obvious that Boeing will be risk averse with regards to its supply chain for many years to come.

The base model is 787-8 which is to be followed by the slightly larger 787-9. Suppliers are producing components for the first 787-9 now. A further stretch to 787-10 is planned but would not deliver the range/payload capability to make it a 777 replacement (see entry below).

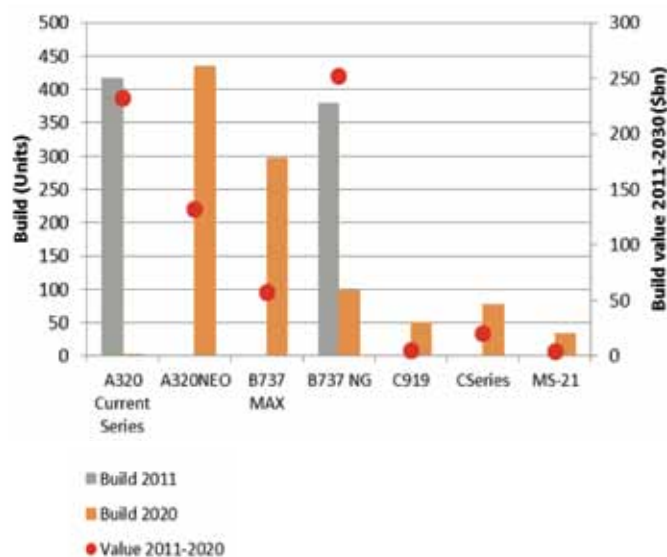
#### Boeing 777X (C)

To keep its offering attractive and to compete with the A350-1000XWB, Boeing seems set to upgrade the 777. Any new Boeing aircraft is likely to be comparatively accessible for UK industry. There is however no programme launch and no declared timescale. Boeing appears to be waiting for more clarity of the A350-1000XWB timeline before fixing that for the 777X.



## Fixed Wing Narrowbody/Single Aisle

After enjoying a duopoly position in single aisle narrowbody aircraft, Airbus and Boeing face competition from new entrants that promise fuel savings using new generation engines. Both have reacted with re-engined versions of their narrowbody offerings.



### Boeing 737 MAX (D)

Boeing has launched the 737 MAX re-engined aircraft with major orders from American Airlines and Southwest Airlines. First deliveries are scheduled to take place in 2017. Boeing claims more than 900 orders from 13 customers.

Boeing intends to minimise changes from the 737NG but will develop widespread structural strengthening and a longer nose gear to accommodate the larger diameter fan of the LEAP-1B engine. Opportunities at first tier exist now in the areas of airframe, nose gear and engine related equipment.

### CFM LEAP-1B (D)

Airlines have been pushing engine manufacturers for less fuel consumption and less noise/ Nox. In Nov 2010, GE and Snecma launched the LEAP-X (18-50K thrust), which represents a totally new turbofan engine that will be able to provide a longer life to the B737 and A320 family. It has no common parts with the current CFM56-5/7 engine.

In December 2009, CFM was selected as the sole engine (LEAP-1C) for the C919 programme by the Chinese company COMAC. Entry into service for the 919 is targeted for 2016. Following this, in Nov 2010, Airbus selected the LEAP-1A as one of two alternative engines that will power the new A320neo (New Engine Option). The third platform for the LEAP-1B is on the new 737 MAX.

The engine is a real “leap” in technology. The Leap-X will have a bypass ratio of around 10, compared with 5-6 for the CFM56 family, and a core pressure ratio double that of the current engine, at 22. The power plant will also feature a two-stage high-pressure turbine driving a 10-stage HP compressor, and the low-pressure turbine blades will be produced using ceramic matrix composite. GE is in charge of the HP core, combustion chamber and the HP turbine, whilst Snecma is responsible for the low pressure turbine and compressor. Nexceller will provide an integrated light weight nacelle system.

The total firm LEAP-X order book stands at over 1500 engines. This includes the latest order by Southwest Airlines for 150 737 MAX aircraft. The MAX order book stands at 948 aircraft from 13 customers, but the LEAP-1B engine is not yet reflected in the total MAX orders tally.

### A320neo

Airbus has reacted to new competition with the A320 New Engine Option (NEO). The ‘option’ includes the CFM International Leap-X or Pratt & Whitney PW1100G engine and improved aerodynamic performance. The aircraft is due to enter service in 2016 and has proven popular with operators. . In the first year after the programme launch in December 2010, Airbus claims to have received 1,420 orders and commitments. As a derivative of the existing A320, the A320neo is likely to offer less scope for new contracts, with exception of the engines and related equipment, than an all new-aircraft. Opportunities exist at Tier 1 and lower and new engines will present new opportunities in related systems and aero structures.

### PW1000 (Geared Turbofan) (D)

Launched in July 2008, Pratt & Whitney’s PW1000G family (formerly GTF) is the company’s solution for a next-generation turbofan. The engine has conventional turbofan architecture, but features an additional planetary gearbox between the fan and compressor sections.

Engine compressors and turbines run most efficiently at higher rpm, while fans are most efficient at lower speeds. The reduction gearbox allows both the fan and turbine sections to turn at their optimal speeds. This reduction results in less fan noise as the blade tips are moving at a slower speed, which produces around a 12-15% reduction in fuel consumption when installed on a current airframe, and a 20-25% reduction when installed on an optimized airframe.

To date, the GTF is being developed for the Bombardier CSeries (21K thrust), Mitsubishi Regional Jet (17K thrust) and the Irkut MS-21 (25K thrust). The engine is targeted to enter service on the CSeries in 2013.

The PW1100G for the A320neo has been very successful since launch and has achieved 744 orders resulting in a market share of 45%. On the Bombardier C Series, the PW1500G has added another 266 engines, and as sole engine is set to win further significant orders

#### Bombardier CSeries (M)

Bombardier launched this programme in July 2008, and holds firm orders, options, purchase rights and LOIs for up to 307 aircraft. Customers include Braathens Aviation (Malmo), Deutsche Lufthansa, Korean Air, Republic Airways and Lease Corporation International. Optimised for the lower end of the 100- to 149-seat commercial market, the CSeries family of aircraft is designed to offer airlines improved economics and performance, with a reduced environmental impact.

CSeries will include the latest technological advancements, such as increased use of composites and aluminium lithium in structures; a next-generation engine – the Pratt & Whitney PW1000G PurePower Engine; fly-by-wire, and advanced aerodynamics.

The advanced composite wings are being developed and manufactured at Bombardier's Belfast facility, which has almost 40 years' experience in composites technology. Producing the wings is further developing Belfast's capabilities, and ties in with the UK's wider strategic interests in aircraft wing technology. The CSeries programme is benefiting significantly the UK, wider European and US supply chains. Tier1 suppliers are now selected and signed up to the programme. Opportunities however still exist in the near term at lower tiers.

#### COMAC C919 (D)

The C919 is a Chinese indigenously developed 168-190 seat narrowbody airliner with a scheduled entry into service date of 2016. There are rumours that ARJ21 certification issues are causing resource to be taken off the C919 project, putting C919 timescales at risk. Contracts have been announced for the major aircraft systems.

China is growing an indigenous civil aero-engine capability but recognising that it is not able to do so in time to meet the Entry into Service date of this programme, COMAC has selected Nexcelle to provide an integrated propulsion system including nacelles and CFM LEAP-X engines.

While all the First Tier supplier positions are notionally allocated, significant gaps exist between allocated packages and capability, and opportunities therefore remain for Tier 2 companies to help fill these gaps, particularly where specialist capabilities are required and where experience of certification is needed. Opportunities also remain for Tiers 3 and Tier 4 suppliers. Some form of local content will be an important factor in supplier selection as China seeks to develop its aerospace industry.

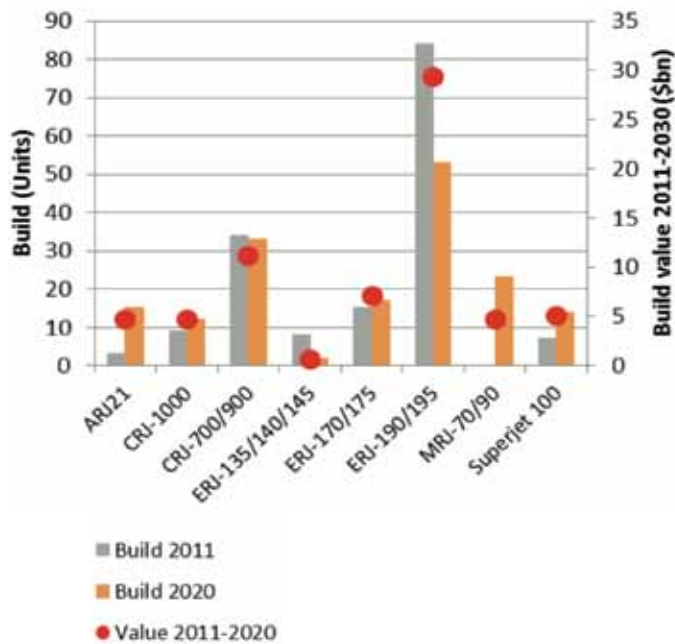
COMAC has expressed its intent to follow the C919 programme with an indigenously developed widebody aircraft.

#### Irkut MS21 (D)

System and sub-system suppliers have been selected for UAC's 150- to 212-seat next-generation replacement for the Tupolev Tu-204 from 2016. These include the PW 1400G PurePower engine, Russian landing gear provider Hydromash, Hamilton Sundstrand for the auxiliary power unit, Intertechnique for the fuel systems and Eaton for the hydraulics.

UK suppliers who can bring significant tier 3 and 4 products with significant intellectual property in technology or processing and for which there is no credible indigenous source have opportunities to gain a position on this programme. Local content will be an important factor in supplier selection as Russia seeks to develop its aerospace capability.

## Fixed Wing Regional Jets



### Embraer 190X (C)

Embraer has announced that it has decided not to follow Bombardier in going head-to-head with Boeing and Airbus in the narrowbody market. Instead it intends to re-engine the E-Jet series of regional jets with an entry into service target of 2017 or 2018. It aims to clarify its strategic direction in early 2012 and then define which systems will be upgraded in addition to the engine. Enhancements under consideration include a composite fuselage and a stretch to beyond the current 110-120 seat E-195.

Because of poor demand at the lower end of the regional jet market, it is thought likely that Embraer will launch the upgrade on its larger E-190/195 aircraft first.

### GE NG34 (C)

GE is working on a replacement for the venerable CF34 engine, of which there are over 4,000 in the fleet. The new generation regional jet engine (NG34) would feature an e-Core™ similar to that on the CFM LEAP-X, comprising a 10 stage high pressure compressor, composite fan case, wide chord fan technology based on the GENx engine, a TAPPS 11 combustor and next generation high pressure turbine blade material.

GE are seeking a first application for the engine and it is rumoured that the Embraer 190X would be the first major target platform.

### Indian RTA-70 (C)

India's sees this regional aircraft programme as a stepping stone to larger aircraft. Both turboprop and turbofan versions of the 70-90 seater are under consideration by the National Aerospace Laboratories (NAL). This programme is at a very early stage with no announced schedule and no suppliers selected yet. There is the possibility of partnership with existing producers of regional aircraft. NAL was hoping to have the go-ahead to create the aircraft by the end of 2011 but this did not happen. NAL is in talks with the major engine suppliers.

Involvement of local supply chain is likely to be an extremely important factor in selecting suppliers. Fixed Wing Regional Turboprops

### New ATR (C)

ATR is talking about a new or stretched derivative regional turbo-prop to meet expected demand in the 90 seat segment and may decide to proceed in 2012 without fully committing.

### MA 700 (D)

The CAAC & Chinese Government perceives the need for a medium size Turbo prop aircraft to transport people for short to medium distances in the middle and Eastern regions of China. The X'ian Aircraft Company (XAC) has been selected to develop the MA700 which has a 2 cabin configuration carrying 76 passengers in standard class or 64 standard with 4 Business class seats. XAC is an AVIC company that has already developed the MA60 & MA600 regional turbo prop aircraft for the Chinese market.

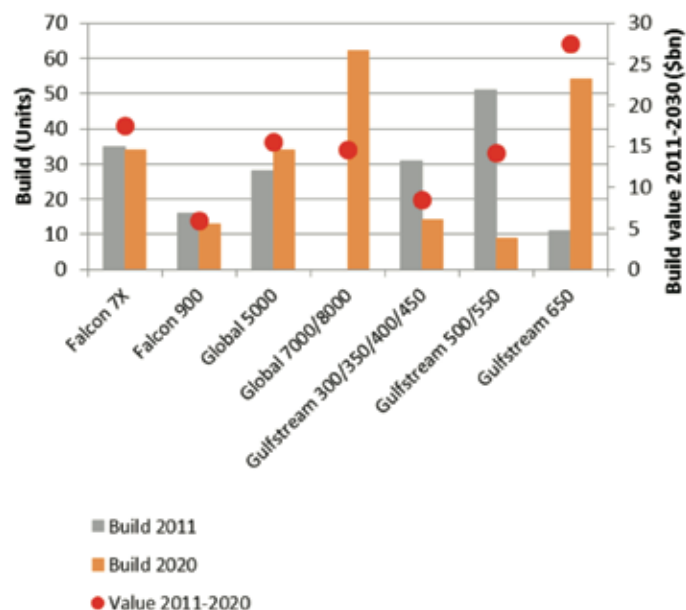
The aircraft structure will be 20% composite with fly by wire control and an integrated avionics & electrical power. It will have Electrical actuation drive flap & stabiliser, windscreen & propeller blades with electrical de-icing and Electrical-Hydraulic servo actuator drive, rudder & elevator. It will be powered by two Pratt & Whitney PW-127 engines.

XAC is in the process of selecting Tier 1 partners for the MA700. For the rest of the supply chain, XAC will prioritise those companies that are existing suppliers to the Tier 1s they select.



The programme is not launched and project timescales are likely to slip with entry into service expected to be at least 2016. The XAC MA700 platform will compete with Bombardier & ATR in the Chinese & export (Mainly African) markets.

### Business Jets



Business Jets represent a very diverse and highly segmented part of the overall market and UK industry plays a significant role. All segments were enjoying strong growth until the global financial crisis took hold. The airframers in this segment have been hit very hard and most were forced to make swingeing cuts in their workforce during 2009/10.

The mood at the annual National Business Aviation Association (NBAA) show in October was hopeful but almost all participants were reluctant to show too much enthusiasm given the seemingly endless wait for a recovery (total deliveries in 2011 were down 13% on 2010).

The large segment continues to remain strong whilst the small and mid-size segment continues to await traction. Manufacturers are hopeful for a modest order improvement in 2012, followed by a stronger delivery recovery in 2013. However, this segment still remains attractive to UK industry due to the high rate of new model introductions and the reduced barriers to change, allowing incumbent suppliers to be replaced.

There are some signs that the industry is recovering. Bizjets for sale, as a percentage of the total fleet, is regarded as a leading indicator, and in December the percentage of US bizjets for sale fell to 12.9%, considerably down from 16.3% in May 2009. Although the segment is only currently recovering, it looks likely to generate a number of new programme opportunities in the near future which will be accessible to UK suppliers. New opportunities for airframe and engine programmes are concentrated in the large segment and in the 10,000 lb. thrust super mid-size segment, as described below.

#### Bombardier Global 7000/8000 (D)

In October 2010, Bombardier launched two new additions to the Global family of business aircraft - the Global 7000 and 8000. With EIS dates of 2016 and 2017 respectively, these aircraft will be powered by the next generation GE engine, and will have a new high speed transonic wing.

Tier1 suppliers are currently being selected and signed up to the programme. Opportunities exist in the near term at lower tiers.

#### GE Passport 20 (D)

Passport 20 (formerly TechX) is the next-generation GE Aviation engine for the large business aviation market. Bombardier selected the Passport 20 engine exclusively to power its Global 7000 and 8000 long-range business aircraft.

Leveraging technology scaled-down from the GEnx-series, the 16,500lb-thrust Passport 20 engine promises an 8% reduction in specific fuel consumption compared with similarly sized turbofans.

Nexcell was selected for the supply of the integrated nacelle and thrust reverser, which comprises a joint venture company of GE's Middle River Aircraft Systems (MRAS) and the Safran Group's Aircelle. The Passport series becomes the key brand in GE Aviation's three-year-old business and general aviation business.

#### Gulfstream P-42 (D)

Gulfstream is developing a clean sheet successor to its G450 and G550 large-cabin business jets, incorporating concepts and systems designed for its flagship G650. It is rumoured that the company is currently holding a competition to select a next generation engine to power the new aircraft. The successor has been tagged the P-42 in the press.

**Falcon SMS (D)**

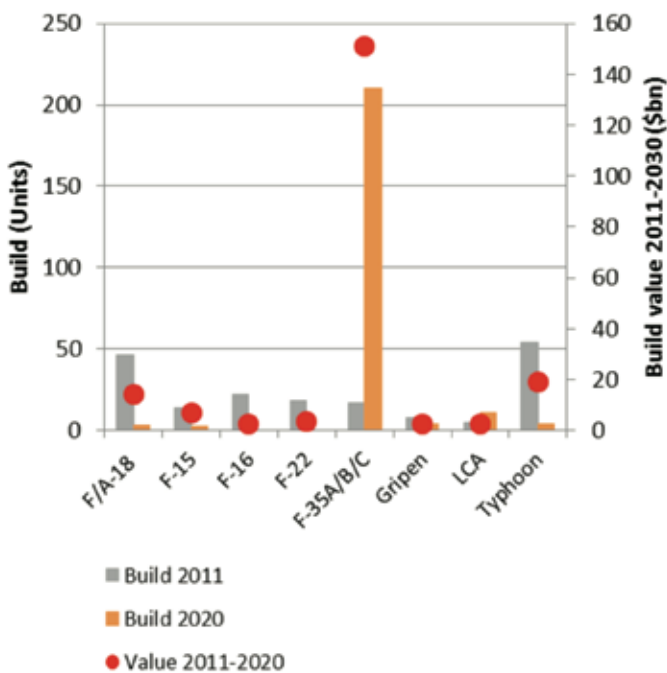
This is Dassault’s second attempt at the new model after the economic situation in 2007 delayed its plan to finish what was then a Rolls-Royce RB282-powered jet by 2014.

The new, still-under-wraps Falcon super-midsize (SMS), will be in a category above today’s Falcon 2000 series. The new aircraft, as a result, will be its biggest ever twin-engine Falcon jet. Its large cabin aircraft will be based on the Falcon 7X, sharing its wing contours, fuselage design and digital fly-by-wire system. To be competitive with G450 and Global 5000, it will need a range of at least 4,500-plus nm at 0.80 Mach.

The detail design phase for the new jet has begun and more than 1,500 engineers are working on the program. The program is on track for a 2016 entry into service and is a major new opportunity for UK Tier 1 suppliers, and below. Engine selection has not yet been announced.

**Defence Programmes**

**Fixed Wing Fighters**



**Lockheed Martin F-35 Lightning II (O, M)**

The Joint Strike Fighter (JSF), also known as the F-35 Lightning II, is the U.S. Department of Defense’s next generation strike aircraft weapon systems for the Navy, Air Force, Marines and Allied Nations. The program consists of three variants: F-35A Conventional Take Off & Landing (CTOL), F-35B Short Take Off/Vertical Landing (STOVL) and F-35C Carrier Variant (CV). Nine nations are partnering in the F-35’s System Development and Demonstration (SDD) phase of the program: the United States, United Kingdom, Italy, the Netherlands, Turkey, Canada, Denmark, Norway and Australia. Partnership in the SDD phase entitles those countries to bid for work on a best value basis, and participate in the aircraft’s development. Additionally, Israel and Singapore have agreed to join the program as Security Cooperation Participants.

Lockheed Martin is the F-35 prime contractor, while Northrop Grumman and BAE Systems are principal partners in the program. Manufacture of the F-35 forward fuselage, wings and aircraft final assembly takes place at Lockheed Martin Aeronautics Company in Fort Worth, Texas. Northrop Grumman Corporation in Palmdale and El Segundo, California manufacture the center-fuselage, and the aft fuselage and tails are manufactured by BAE Systems in Salmesbury, England. The F-35 is powered by the Pratt & Whitney F-135 afterburning turbofan engine manufactured in Middletown, Connecticut.

The program continues to progress through the SDD phase for all three variants of the aircraft in conjunction with supplier rate readiness. The US Department of Defense continues to pressurise the individual aircraft cost and ultimately the overall budget for the aircraft programme which in turn drives a number of key operational decisions such as second sourcing.

The procurement approach of second sourcing for extensive elements of the aircraft remains an ongoing exercise within the Joint Programme Office (JPO) and the primary partners and is likely to continue to present further opportunities for participation in airframe and engine component and subsystem supply as the program continues through low rate initial production (LRIP) and approaches full rate production volumes circa 200 aircraft per year.

It is anticipated that there will be a large number of opportunities in local logistics supply chain requirements. The global concept of the F-35 will dictate cohesive requirements to support aircraft operations, training and simulation facilities and maintenance and field support requirements. Decisions are yet to be made for local support facilities and equipment that are likely to present opportunity for a wide range of suppliers in support of the programme.

The UK MoD has sovereign requirements for the Joint Combat Aircraft (JCA) which includes the carriage of UK weapons such as Paveway 4 and ASRAAM. Design work is also underway to explore the carriage of Meteor. MoD has a requirement for in-flight refuelling of JCA and is considering options including utilising its FSTA (Future Strategic Tanker Aircraft) and a "Buddy" type arrangement where one F-35 would refuel another F-35 whilst on operation.

A Performance Based Logistics (PBL) support arrangement is preferred for F-35 in the UK but this can't be addressed until an operational base has been agreed for JCA. The JPO would like its F-35 operators to have a common Global Logistics Support (GLS) approach with the JSF aftermarket but the UK's sovereign approach will fall under a "pay to be different" scenario.

#### SAAB Gripen Next Generation (D)

The JAS 39 Gripen is a lightweight single engine multirole fighter aircraft in service with Sweden, Czech Republic, Hungary, South Africa, Thailand and the UK Empire Test Pilots School. The Gripen Next Generation (NG) version has a new engine (F414G), increased fuel capacity, higher payload, upgraded avionics and other improvements. SAAB is now promoting the aircraft in a number of current high-profile fighter competitions, including Brazil. It was announced in 2011 that Gripen NG entry into service with Sweden was dependent on a foreign order being finalised. In November 2011 the Swiss government announced its decision to buy 22 Gripen NG fighters. The Sea Gripen is a proposed carrier-based version based on the NG variant and is currently in development, originally for Indian opportunities, but now more probably for Brazilian ones. Following a meeting with UK MoD officials in May 2011, Saab agreed to establish a development centre in the UK to expand on the Sea Gripen concept. Saab chief executive Håkan Buskhe stated: "The MoD is looking for competition".

The decision to proceed to a flight demonstrator will be made in late 2012. Although SAAB has a well established supply chain for Gripen, it is possible that the location of the Sea Gripen development centre in the UK will provide new opportunities for UK industry, with which the Swedish company already has strong ties.

#### The Fifth Generation Fighter Aircraft (C)

The Sukhoi/HAL Fifth Generation Fighter Aircraft (FGFA) is a fifth-generation fighter being developed by Russia and India. It is a derivative project from the PAK FA (T-50 is the prototype) being developed for the Indian Air Force (FGFA is the official designation for the Indian version). Two separate prototypes will be developed, one by Russia and a separate one by India. The Russian version of the aircraft will be a single-seater, the Indian version will be a twin seater, analogous to the Su-30MKI which is a twin seat variant of the baseline Su-27.

A contract between Bangalore-based Hindustan Aeronautics Ltd (HAL) and Russia's United Aircraft Corporation (UAC), will commit to building 214 fighters for the IAF and 250 fighters for Russia. The option for further orders will be kept open. HAL and UAC will be equal partners in a joint venture company that will develop and manufacture the FGFA.

Further it was reported that the Bangalore-based HAL has negotiated firmly to get a 25 per cent share of design and development work in the FGFA programme. HAL's work share will include critical software, including the mission computer; navigation systems; most of the cockpit displays; the counter measure dispensing (CMD) systems; and modifying Sukhoi's single-seat prototype into the twin-seat fighter that the Indian Air Force (IAF) wants.

A total of 500 aircraft are planned with option for further aircraft. Russian Air Force will have 200 single seated and 50 twin-seated PAK FAs while Indian Air Force will get 166 single seated and 48 twin-seated FGFA's. Sukhoi has projected a market for 1000 aircraft over the next four decades, two hundred each for Russia and India and six hundred for other countries.



### Korean KFX (C)

DAPA has requirement for 120 new Korean next generation fighters to complement its FX1, 2 & 3 aircraft. This is a new development program and Agency for Defence Development (ADD) is currently conducting concept studies. The aircraft will be manufactured at the KAI Sachon plant in circa 2020. This is an opportunity to brief ADD on UK Industries systems capability. Korean IP will be needed and Korean partners should developed in 2012.

### Next Generation Fighters (C)

Other countries, including Japan, Turkey and Indonesia have announced plans to develop indigenous Next Generation Fighters. Some of these programmes are more advanced than others and it possible that some countries may work together and that some of the programmes may not go ahead. Due to the potential for sensitive technologies being exported, it is considered unlikely that any significant UK industry involvement in any of these programmes will be achieved without UK Government support. This has been the case for the Korean KFX programme, where some UK Tier 1/2 companies have already been involved in discussions with Korean industry through the support of the UK Government. It is suggested that SME's will find it much easier to engage with these programmes through UK Tier 1 and 2 companies, rather than have to engage with the overseas national industry directly.

### Long term strategic aircraft

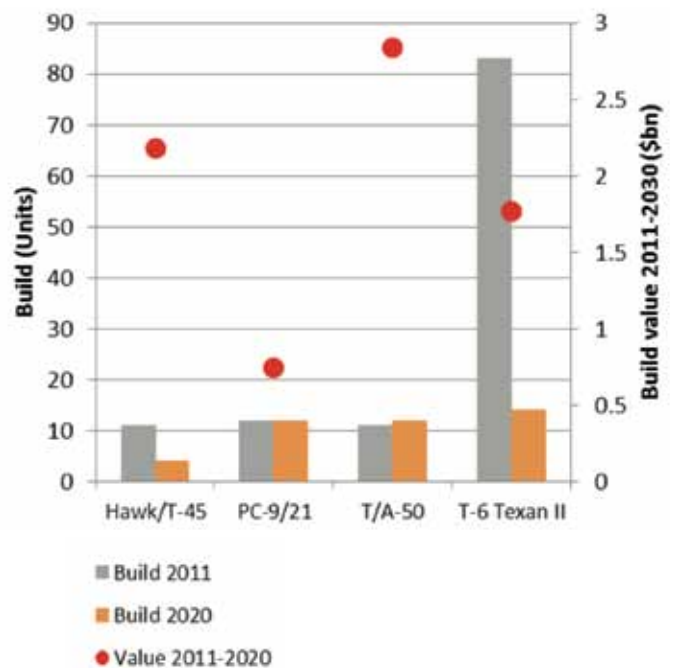
The USAF is interested in developing a Next Generation Bomber with Lockheed Martin, Northrop Grumman and Boeing being the obvious candidates for such a project. The long range Bomber will be a twin engine stealthy platform with a nuclear capability and could be with or without a pilot.

The USAF and US Navy are interested in a Next Generation Tactical Fighter with greater speed, stealth capability and utilising self- healing material. Lockheed Martin's Skunk Works division has revealed a conceptual next-generation fighter design that offers the first hints of an ambitious, long-term technology strategy for the new class of tactical aircraft that will emerge after 2030.

The concept - published in a 2012 calendar distributed to journalists - indicates the company will continue to seek new breakthroughs in performance despite the risk-averse culture of today's weapons buyers in the US military. Featuring an F-22-like nose, an unusually contoured wing and nearly flat canted tails, the concept suggests a new level of speed and agility.

## Trainers

### US T-X Trainer (C)

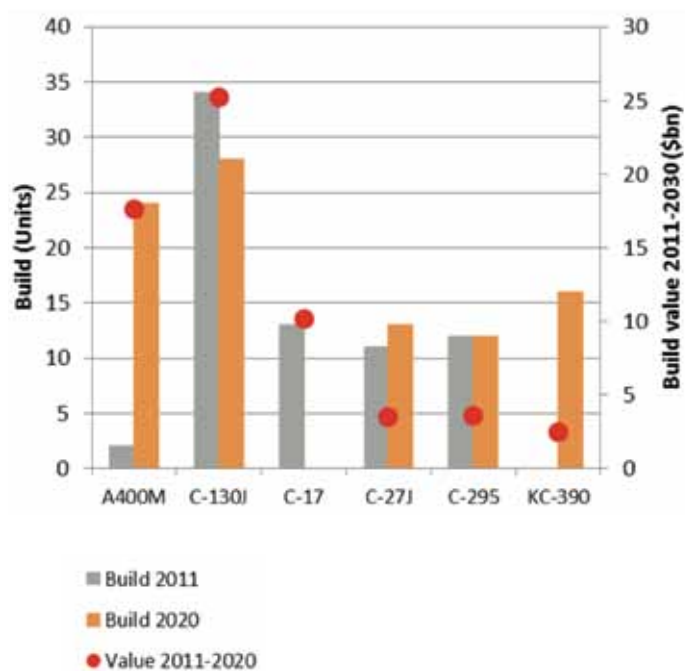


The T-X Program is being initiated to enable the U.S. Air Force (USAF) to procure a new two-seat jet trainer for advanced fighter/bomber specialized undergraduate pilot training (SUPT) to replace the aging inventory of Northrop Grumman T-38 Talons that first entered service in 1961. The T-X trainer program's primary objective is to provide a world-wide trainer for 5th generation fight aircraft such as the F-22 and F-35. Current planning is to purchase ~350 aircraft over a 10 year period with target initial fielding in the 2017-2018 time frame. The production goal is achieve a rate of 45 aircraft per year by 2020. The USAF has performed an Analysis of Alternatives (AoA) and assuming that sufficient funding is provided in the upcoming Presidents Budget submittal, will proceed with plans for a competitive source selection to begin in 2012.

Key competitors are expected to be:

- Lockheed Martin / Korea Aerospace Industries – T-50 Golden Eagle
- Alenia Aermacchi – M-346 Master (designated T-100 for the US competition)
- BAE Systems/Northrop Grumman – Hawk Mk 128 (RAF standard)
- Boeing – Likely a new aircraft design

### Fixed Wing Multirole/Transport



#### USAF KC-46A Tanker (D)

The KC-46 tanker is a military aerial refuelling and strategic transport aircraft currently being developed by Boeing as a derivative of its 767 commercial jet airliner. Boeing was selected in February 2011, after a long and controversial competition, to develop and build the new U.S. Air Force (USAF) Tanker to replace the older KC-135 Stratotankers. The contract is for production of 179 next-generation aerial refuelling tanker aircraft that will begin to replace the USAF fleet of 416 KC-135 tankers and calls for the design, development and production of 18 initial combat-ready tankers by 2017. The KC-46A will be able to refuel any fixed-wing receiver capable aircraft via a modernized KC-10 refuelling boom.

Boeing is progressing through the SDD program to support Preliminary Design Review in 1Q12, Critical Design Review in 3Q13 and First Flight in early 2015. The KC-46 will leverage a mature supply chain team utilizing many of the 767 production sources.

#### Embraer KC390 (D)

The KC-390 is a multi-national tactical air transport program whereby Embraer and the Brazilian Air Force will develop and manufacture a medium-sized, twin-engine jet-powered military transport aircraft. It will be able to transport up to 21 tonnes (23 tons) of cargo, including wheeled armoured vehicles and is expected to be capable of being refuelled in flight and also quickly configured as a tanker.

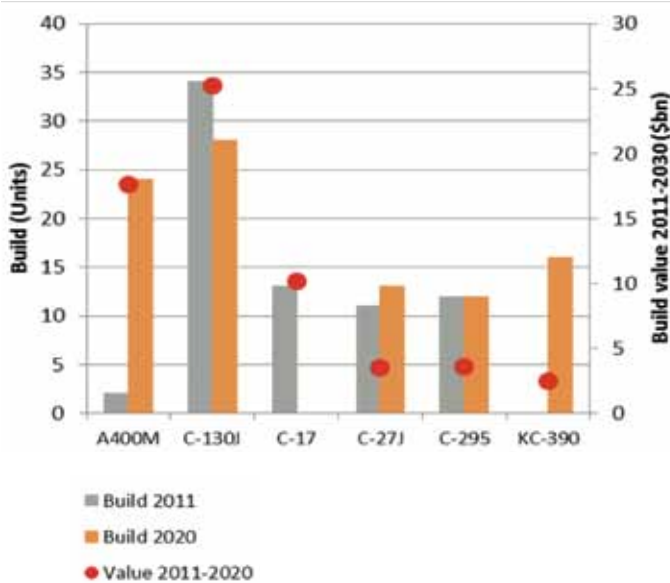
The KC-390 is expected to compete primarily with Lockheed Martin's C-130J as well as with larger and smaller air transport solutions such as the Airbus's A400M, Russia's AN-12, EADS-CASA C-295M and Alenia's C-27J. First prototype flights are expected to take place in 2014 with the first of an expected 28 aircraft being delivered to the Brazilian Air Force circa 2015. To date, possible orders remain at ~60, including Brazil (28), Argentina (6), Chile (6), Colombia (12), the Czech Republic (2), and Portugal (6). Brazil is funding the development program however no formal production contract commitments have been made by other countries at this time.

Joint Definition Phase partnerships & commitments to date include but are not limited to the following companies:

- Aero Vodochody (Czech Republic) – Rear fuselage II section, Crew and parachutist doors, Emergency door and hatches, Cargo ramp, Fixed leading edge.
- BAE Systems (UK/USA) – Flight control computers, Actuator control electronics.
- Cobham plc (UK) – Aerial refuelling pods.
- Denel Saab Aerostructures Ltd. (Sweden/ South Africa/ USA) – Composite components, in collaboration with HITCO.
- DRS Training & Control Systems – Cargo Handling and Aerial Delivery System.
- EEA (Portugal) – Engineering and testing work on 3 unspecified segments.
- Elbit Systems' AEL (Israel/Brazil) – Mission computer, HUD, DIRCM, Self-protection suite.
- ELEB Equipamentos Ltda. (Brazil) – Landing gear.
- Esterline Control Systems (USA) – Auto throttle.
- Fabrica Argentina de Aviones (Argentina) – Wing spoilers, Doors for the nose landing gear, Ramp door, Flap fairings, Tail cone, and Electronic cabinet.

- Goodrich Corp. (multi) – Electro-hydrostatic actuators, actuator electronics, and electrical controls.
- United Technologies’ Hamilton Sundstrand (USA) – Electric Power Generating System.
- International Aero Engines (multi) – V2500-5 engines (final assembly in Germany).
- Liebherr-Aerospace Toulouse SAS (France) – Cabin pressure and environmental controls.
- OGMA (Portugal) – Central fuselage section, 3 unspecified segments.
- Rockwell Collins (USA) – Cockpit avionics.
- Safran Group’s Hispano-Suiza (France) – Emergency Electric Power Generator System.
- SELEX Galileo (Italy) – T-20 Tactical Radar.

Multi-Role Transport Aircraft (MTA) (IL-214T)



The UAC/HAL IL-214 Multirole Transport Aircraft (MTA) is a medium-lift military transport aircraft which is being constructed as a joint venture of the United Aircraft Corporation (UAC) of Russia and Hindustan Aeronautics (HAL) of India.

The MTA will replace the Indian Air Force’s aging fleet of Antonov An-32 transport aircraft. The aircraft will be able to perform regular transport duties and will also be designed to deploy paratroopers. It is expected to fly by 2014 and to enter service by 2016.

Russia and India agreed to produce the aircraft for their respective armed forces and for friendly third-party countries, and to develop a civilian variant of the MTA in the form of a 100-seater passenger airplane, for which India’s Hindustan Aeronautics Ltd (HAL) will be the lead partner and principal integrator. The Indian portion of the MTA’s serial production will take place at HAL’s Transport Aircraft Division in Kanpur.

Russia’s United Aircraft Corporation (UAC) and India’s HAL will set up a subsidiary company to develop the aircraft. The new company have already begun initial development work on the MTA. India plan to acquire 45 aircraft and Russia 105. There would, however, be scope for exporting this aircraft, both for civil and military use, and more MTAs could be manufactured.

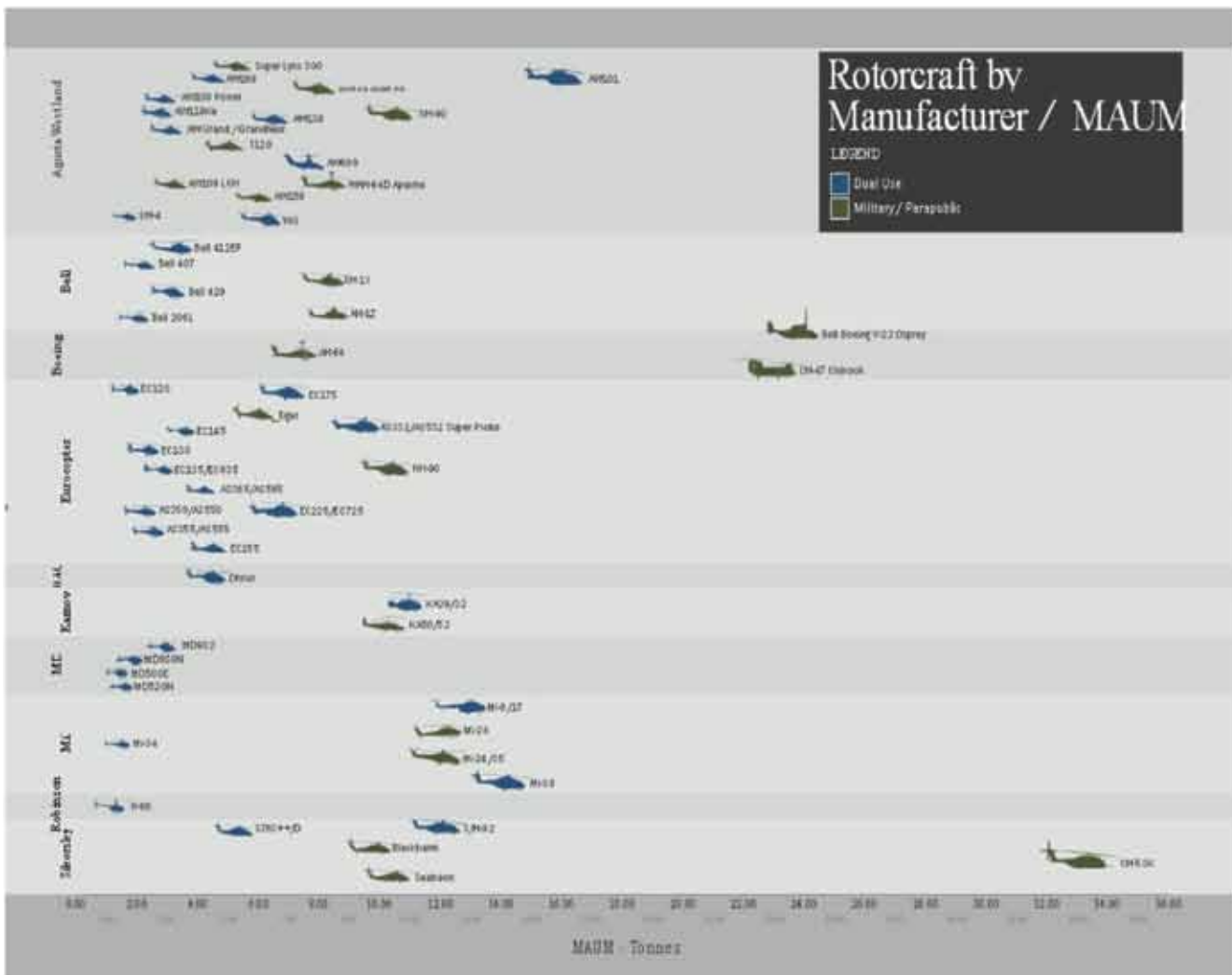
The aircraft is expected to be powered by Russian-made Aviadvigatel PD-14 turbofan engines attached to top-mounted wings and will have a T-shaped tail. The cabin size will be the same as the Ilyushin Il-76, but will be half the length, supporting a maximum payload of 20 tonnes (44,000 lb) of military or civilian cargo. The aircraft will have a range of 2,500 kilometres (1,600 mi) and a top speed of 870 kilometres per hour (540 mph).

### Rotary Wing Programmes

For the purpose of the platform forecasts we have defined rotary wing categories as follows:

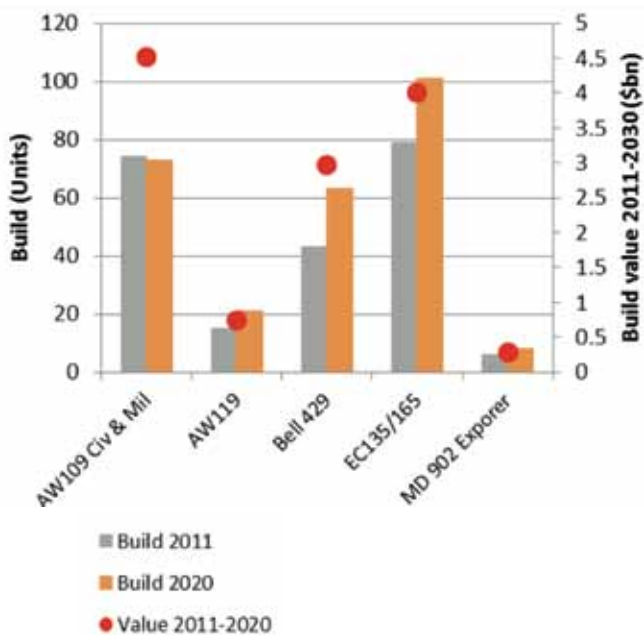
- Light – under 5 tonnes
- Medium – 5 tonnes to under 10 tonnes
- Heavy – 10 tonnes and above

The chart below supplied by AgustaWestland also categorises the major turbine rotary wing programmes by Maximum All Up Mass (MAUM):



## Civil

### Light



#### AgustaWestland AW169 (D)

The AW169 was unveiled at FIAS 2010, and is a new generation, multi-purpose, twin engine, light transport, utility helicopter, designed in response to the growing market demand for higher mission flexibility and multi-role capability in the 4.5 tonne class. The AW169 design makes extensive use of composites, advanced airframe aerodynamics, next generation navigation avionics and state-of-the-art systems. The programme is in the design phase with an entry into service date in 2015.

#### AgustaWestland AW189 (D)

The AW189 is the largest member of the family of helicopters that also includes AW139 and AW169. It was unveiled in June 2011 and is a new generation, multi-purpose, twin engine, 8-tonne helicopter designed in response to the growing market demand for higher payload, longer range and higher productivity. It was designed in parallel with AW169 and shares similar features such as extensive use of composites, advanced airframe aerodynamics, next generation navigation avionics and state-of-the-art systems. The programme is in the design phase with service entry is expected in 2014.

#### Eurocopter EC X3 (C)

The X3, designed around the EC155, has two tractor propellers that are shaft driven from the main gearbox. X3 is a compound helicopter technology demonstrator used to test the high-speed concept and related technologies.

#### Eurocopter EC X4 (C)

Eurocopter's X4, will replace its 12-seat Dauphin platform. The company has stated that it is planning two versions, one for 2016, with a more advanced one to follow in 2020.

#### AgustaWestland AW609 (D)

AgustaWestland has recently acquired the full control over the BA609 project from Bell Helicopters. AW609 is designed around the tilt-rotor concept and will aim to respond to the market demand for higher speed, all-weather operation and passenger comfort. There are requirements for such capabilities in practically all market segments but particularly in Oil & Gas, Search & Rescue, Corporate/VIP and Border & Maritime Patrol roles. Certification of the AW609 is expected in 2015/2016.

#### Sikorsky S-97 (C)

Sikorsky S-97 is based on the technology from the Sikorsky X2 demonstrator. It is designed around a compound helicopter concept with coaxial main rotors and a pusher propeller. This will allow it to fly at higher speeds than conventional helicopters while keeping important features such as vertical take-off and hovering. Although the current version of the S-97 is designed around military requirements, if successful the civilian version will follow.

#### Bell Helicopters Magellan (C)

In early 2011 Bell Helicopters released information about a project for a new helicopter named Magellan. It is a redevelopment of Bell 412 with improved performance and new cockpit aimed at the intermediate civil helicopter segment.

## Military

### Light

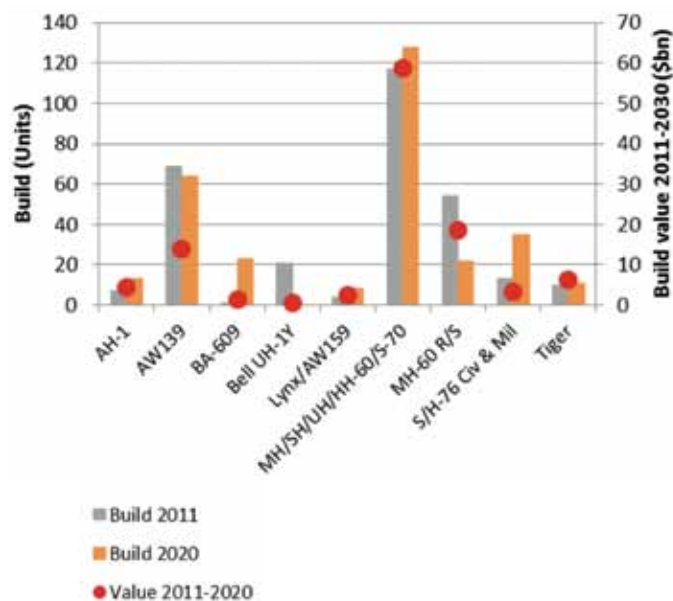
#### US Armed Aerial Scout Helicopter – AAS (C)

The U.S. Army is planning for a replacement for the Bell Textron OH-58 Kiowa single-engine; single-rotor military helicopters used for observation, utility, and direct fire support. The AAS program emerged from the now cancelled Armed Reconnaissance Helicopter (ARH). An analysis of alternatives is currently underway with a planned request for proposals targeted in 2014, assuming that sufficient funding is provided in the upcoming Presidents Budget submittal. The U.S. Army has stated that it will be unlikely to afford a new-build program and is strongly interested in commercial off-the-shelf (COTS) solutions to sustain and modernize its currently fleet to bridge the gap until the proposed joint multirole (JMR) helicopter is available in the 2030 time frame. The JMR is envisioned as a combined utility-attack platform.

Most likely key competitors are expected to be:

- Boeing – AH-6 based solution
- EADS North America – AAS-72X
- Bell Helicopter – OH-58 Block II based solution
- Agusta Westland – A119 based solution

### Medium



#### AgustaWestland AW149 (D)

The AW149 is an 8-tonne maximum gross weight twin engine helicopter that is designed to meet the most demanding requirements for military and governmental markets. The primary market is for government agencies and the aircraft will be designed to meet military qualification standards. The aircraft has a large cabin and will be capable of transporting 15 passengers within a standard layout with a large sliding door on each side of the cabin.

The AW149 is designed from the outset to cope with the latest operational requirements, including an ability to operate easily in hot and high, harsh conditions and day and night, all-weather, operations.

The aircraft is part way through its development and suppliers for many of the major components, including engines, have been selected. The maiden flight of the AW149 took place on November 13th 2009. The project office is based in Yeovil, UK.

#### CVLSP (C)

The Common Vertical Lift Support Program (CVLSP) seeks to replace UH-1N ‘Huey’ helicopters used for missile defence and VIP transport, (in the Washington DC area). The USAF is considering merging this program with the MH-60G Recap program. Elements of US industry are supporting the case for USAF to buy modified COTS aircraft for the VIP element of CVLSP.

#### KAH (C)

DAPA has let a contract on ADD and KAI to commence a concept study to consider modifying the Surion Light Utility Helicopter (LUH) into a Light Attack Helicopter (LAH) variant.

200 platforms are envisaged for the production phase and equipment already selected for LUH will form the baseline fit. HUMS is specified and it is likely GE Aviation’s Light Utility Helicopter kit will be selected.

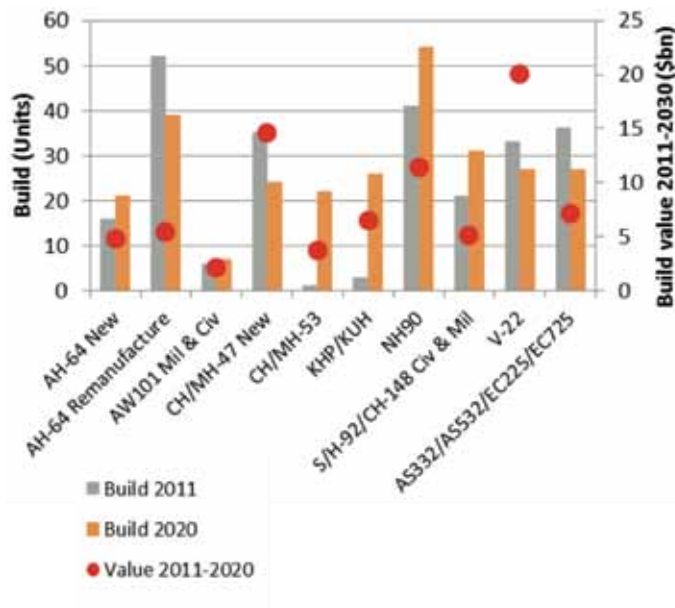
DAPA is planning on purchasing 36 attack helicopters and localisation of key equipment is required. A delay in the purchase was initiated to appease the North Korean military.



**MH-60G Recap (C)**

Following the intervention of the US Secretary for Defense, the CSAR-X programme was terminated in 2009 and a full 'root and branch' review of CSAR provision has been commissioned. The outcome of which is the MH-60G Personnel Recovery Recapitalisation Programme (MH-60G Recap). This seeks to replace 112 MH-60Gs. USAF preference is MH-60M airframes with upgraded avionics, although a competitive procurement is still a possibility.

**Heavy**



**VXX (C)**

The VXX program is intended to provide 23 new presidential helicopters to replace the current fleet of 19 aging presidential helicopters. As a successor to the VH-71 program, the Administration proposed beginning a new presidential helicopter program in FY2010 called the VXX Presidential Helicopter Program.

**CH-53K (D)**

The CH-53K Super Stallion is a large, heavy-lift cargo helicopter currently being developed by Sikorsky Aircraft for the U.S. Marine Corps as an upgrade to the current CH-53E Heavy Lift Helicopter fleet that began operations in the 1980's. The new design features higher performing engines, new composite rotor blades, an all-digital cockpit consistent with other modern aircraft and a wider cabin. When fielded, it will be the largest and heaviest helicopter in the U.S. Military able to operate from both land and navy ships. The CH-53K is expected to double the payload capacity over the CH-53E and increase the maximum gross weight. This will provide significantly improved performance in mountainous areas under difficult hot/day conditions.

The program is currently well along in its' System Development and Demonstration (SDD) phase with an objective initial operating capability (IOC) in 2016 provided that sufficient funding is provided in the upcoming Presidents Budget submittal.

The US Marine service plans to procure 156 aircraft with first deliveries starting late this decade. Export markets for this programme are small at best. Japan and Taiwan have announced a potential interest in this programme. France, Germany and Israel have a notional requirement for a helicopter in this class.

**Avicopter (C, D)**

The Chinese helicopter industry has also been consolidated in recent years within the group company China Aviation Industry Corporation (AVIC). Under this, a new company, Avicopter, has been created with joint ownership of 69% by AVIC and 31% by the Tianjin municipal government. Avicopter has assumed overall responsibility for all existing programmes and control of all existing plants. A new civil production plant was completed at Tianjin in 2009.

Avicopter have also assumed control of the Chinese half of the development programme for the EC175/Z-15, in collaboration with Eurocopter. The first, French-built aircraft, performed its maiden flight in December 2009, but the Chinese Z-15 first flight is still awaited.

Avicopter is also pursuing indigenous helicopter programmes. The first, the 13-tonne AC313, flew in March 2010. The aircraft is a development of the Harbin Z-8, which was itself a derivative of the Aerospatiale SA321 Super Frelon. Chinese certification was gained in January 2012, with certification in Europe and the US to follow

In November 2010, the company flew its second indigenous programme, the AC311. This is a 2-tonne, single-engine aircraft, which again borrows heavily from the styling of Eurocopter, this time the EC120, but using a conventional tail rotor. Chinese civil certification is expected in 2012. Avicopter has predicted it can sell up to 500 in the next 10 years.

#### Indian Helicopter Programmes (D)

India has a dynamic defence modernisation programme and the Indian Government intends to purchase or manufacture some 600 700+ helicopters over the next 10 years. As a result a contract for 12 VVIP AW101s was signed in 2010. The focus now is on 22 attack & 15 heavy lift helicopters for the Air Force, 16 ASW helicopters for the Navy, 30 SAR & maritime surveillance helicopters for the Coast Guard and a programme for 384 light helicopters, made up of 197 new light reconnaissance and surveillance helicopters (RSH), and a development programme for 187 light observation helicopters (LOH).

Hindustan Aeronautics Limited (HAL) are proposing to develop a helicopter in the 10 to 12 tonne class, the IMRH (Indian Multi Role Helicopter) for the Air Force and Army. The aircraft will be manufactured locally with the assistance of a Western partner.

In-country manufacture is important, a factor demonstrated by AgustaWestland's joint venture with TATA Sons for the manufacture of one of its products.

#### Russian Helicopter Programmes (C, D)

Russian Helicopters, a wholly owned subsidiary of UIC Oboronprom, is the managing body of the consolidated Russian helicopter industry, bringing together organisations such as Mil, Kamov, Rostvertol and Kazan for the purpose of revamping and modernising the Russian rotorcraft product line.

It is focusing on a number of development programmes across its range of helicopters, including a turbine-engine version of the Mi-34 and a deep modernisation of the Mi-8/17 (the Mi-8M), and a number of new designs, including the 15-tonne Mi-38, 6-tonne Ka-60/62 and 4.5 tonne Mi-54. There are also several designs for high-speed, compound rotorcraft competing for development funding from the Russian Government.

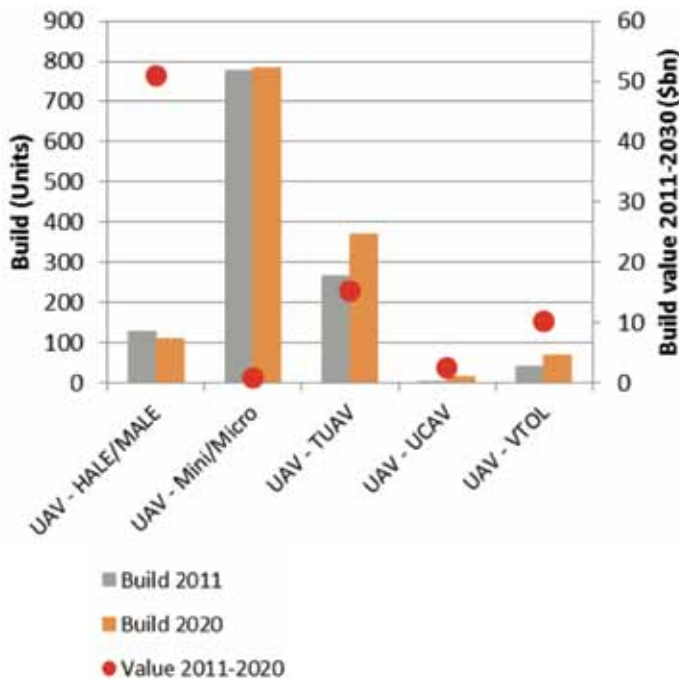
### Unmanned Aircraft Systems (UAS)

Unlike the civil and military aircraft and rotary wing markets the unmanned systems market is still immature and rapidly evolving and there are fewer open government-funded programmes than in the manned sector, with many fielded systems originating from privately-funded R&D or through classified programmes. For this reason, it is difficult to list programmes for which there may be opportunities for SMEs, although most value is likely to be generated from command and control, payload and sensors rather than airframes and propulsion. Therefore, supply chain opportunities are likely to differ than those for the manned sectors. That said there is evidence and argument that the market could evolve into one that is substantial, as technological, regulatory and customer utilisation develops over time with some of the greatest opportunities arising from the need to overcome technological, regulatory and cost-effectiveness challenges.

The market is currently divided into military applications, commercial applications and civil/national authority applications; and systems have so far been segmented by altitude, range and physical size. This segmentation is becoming less useful over time, and so it is likely that a new segmentation will evolve over the next few years.

Where it has been possible to segregate the airspace, there have been a small number of examples of UAS used by civil/national authority programmes, for example in border surveillance, however, wider civil use of UAS's will require airspace integration issues to be resolved. In the UK the Autonomous Systems Technology Related Airborne Evaluation & Assessment (ASTRAEA) programme is a UK industry-led consortium focusing on the technologies, systems, facilities, procedures and regulations that will allow autonomous vehicles to operate safely and routinely in civil airspace over the United Kingdom.





### Military market (C)

The unmanned air systems market is the fastest growing segment of the military aerospace market and is the largest segment of the unmanned systems market. At present the United States is responsible for the majority of the spending on the acquisition of military unmanned systems and is the largest investor in the development of new systems by a wide margin.

The export of larger UAS's are covered by the Missile Technology Control Regime (MTCR). The MTCR is an informal and voluntary association of countries which share the goals of non-proliferation of unmanned delivery systems capable of delivering weapons of mass destruction, and which seek to coordinate national export licensing efforts aimed at preventing their proliferation. The MTCR was originally established in 1987 by Canada, France, Germany, Italy, Japan, the United Kingdom and the United States. Since that

time, the number of MTCR partners has increased to a total of thirty four countries, all of which have equal standing within the Regime. The MTCR rests on adherence to common export policy guidelines (the MTCR Guidelines) applied to an integral common list of controlled items (the MTCR Equipment, Software and Technology Annex). All MTCR decisions are taken by consensus, and MTCR partners regularly exchange information about relevant national export licensing issues. National export licensing measures on these technologies make the task of countries seeking to achieve capability to acquire and produce unmanned means of WMD delivery much more difficult. As a result, many countries, including all MTCR partners, have chosen voluntarily to introduce export licensing measures on rocket and other unmanned air vehicle delivery systems or related equipment, material and technology.

Within the market, expenditure on strategic ISTAR (Intelligence, Surveillance, Target Acquisition and Reconnaissance) systems is likely to dominate. This segment is currently seen to offer the highest operational pay-off, and the experience gained by the US in deploying Global Hawk and the MQ-9 Predator B in Iraq and Afghanistan has demonstrated the operational effectiveness of this class of system.

The Unmanned Combat Air Systems (UCAS) market could offer opportunity for new programmes over the next decade. The US has already weaponised ISTAR platforms (e.g. General Atomics Predator) and has made significant investments in highly specialised Unmanned Combat Air Systems (UCAS), covering both technology demonstrators and systems that have been fielded operationally. The Northrop Grumman X-47B for the US Navy, the Boeing X-45 Phantom Ray, General Atomics Avenger and Lockheed Martin RQ-170 Sentinel being examples. Europe has also invested in UCAS technology demonstrators, the UK Taranis programme led by BAE Systems, the Neuron programme led by Dassault and the EADS Barracuda, being the major examples. However, although the UK and France have expressed longer term interest in fielding UCAS systems, currently there are no funded programmes for their development and production.

The UK and France have expressed longer term interest in UCAVs with an EIS of circa in 2030. This could be in the form of a modified existing UAS or an off the shelf US solution. The Northrop Grumman US Navy X-47B UAV and Boeing X-45A Phantom Ray J-UCAS are currently undergoing flight trials at Edwards AFB and Boeing Phantom work respectively. Positive results have been show in both platforms.

The Northrop Grumman Global Hawk UAV gave an impressive demonstration at the Farnborough Air Show in 2011 showing its advanced sensor capability.

#### New Anglo-French MALE UAV (C)

The UK & French Governments are to fund a collaborative programme to develop a Medium Altitude Long Endurance (MALE) Unmanned Air System (UAS) for its armed forces. The French Minister, General Longuet, said a French version of the IAI Heron TP will serve as the MALE Surveillance UAV from 2014 until 2010, when it will be replaced by the Anglo French Telemos system. The long deferred decision seems to end any prospect of a quick start for Telemos, which partner companies BAE Systems and Dassault have said could be delivered within five years of a go ahead. The MoD has already decided to invest more than \$200 million to buy five more Reaper UAVs from the US to meet short term requirements, and move their mission control from Nevada to the UK.

Dassault will be prime contractor for the "F-Heron-TP" with 10 other French companies involved. Thales is keen to play a major role in the programme.

#### Military Rotary Wing UAS

The development of rotary wing UAS has in the main been driven by maritime and expeditionary warfare requirements. In the USA, the requirement for an autonomous maritime ISTAR platform to complement manned H-60 helicopters has resulted in the development of the light single engine Fire Scout while the US Marine Corps have championed the need for unmanned cargo resupply using rotary wing assets. In contrast, the US Army is pursuing optionally manned platforms based on the currently existing legacy systems such as Black Hawk.

Europe lags the US in terms of the use of military rotary wing UAS by a number of years. The same can be said about development and production of larger military rotary wing UAS, although European manufacturers are doing well in terms of development of smaller and micro rotary wing UAS. In the short- to medium-term the European MoDs are most likely to procure tactical rotary wing UAS for naval operations. Physical demonstrations of ship-based operations using available off-the-shelf platforms were already made in France, Germany and Spain. German trials have led to a procurement of Schiebel S-100 rotary wing UAS to equip the K130 corvettes. The UK has also launched the two-year Tactical Maritime Unmanned Air System (TMUAS) Capability Concept Demonstrator (CCD) programme in late 2010 that will include a demonstration. TMUAS CCD is likely to lead to a follow-on acquisition programme following a Decision Conference in 2012. There is a strong likelihood that the final TMUAS platforms will be procured off-the-shelf, but the program is certain to bring opportunities for the development of lightweight UAS sensor payloads data-links and communication systems.

Military Rotary Wing UAS seem to be an even newer market and shows some signs of being able to be platform agnostic, e.g. the Northrop Grumman/QinetiQ proposal at the DSEi trade exhibition to use the NG Firescout control systems in old Aerospatiale Gazelles to give the UK an initial capability. A demonstration should ensue in the near future.

It is not clear if Europe will follow the US Marine Corps or US Army with the development of UAS platforms for cargo re-supply or optionally manned rotary wing assets for the battlefield.

## General Recommendations During the Period January 2012 – March 2013

- 1) ADS to continue to work with UKTI and BIS to update this document with the latest available information from industry experts on aircraft programme business opportunities across the world.
- 2) ADS to continue to work with UKTI and the regional aerospace alliances to disseminate the contents of this document to the UK Aerospace Industry as widely as possible.
- 3) UKTI to organise the “International Aerospace Exchange” event on 7 February 2012 focused on global civil aerospace programme opportunities, to include presentations from key OEMs including Airbus, Boeing, Bombardier, AgustaWestland and Rolls-Royce and workshops with their key Tier 1 suppliers.
- 4) UKTI to work closely with ADS, the regional aerospace alliances and UKTI commercial officers overseas, during the course of the year, to develop the contents of this strategy towards markets other than the key BRIC markets. In particular, from an industry perspective, for many aerospace SMEs a focus on European markets is known to be more aligned to the structure of the industry and company capabilities, and these are markets where the application of UKTI resources can prove invaluable. The recommendation is to “re-balance” this strategy over the coming year more towards Europe than heretofore.
- 5) AEEG to look at upgrade market and how it could be incorporated into future reports.

### Recommended UKTI/ADS Action by Country During the Period January 2012 – March 2013

#### Asia Pacific

- 1) ADS to organise a TAP supported UK Pavilion incorporating regional aerospace alliances and government departments at the Singapore Airshow in February 2012 to target opportunities across the Asia Pacific region.
- 2) ADS to organise a TAP supported UK Pavilion incorporating regional aerospace alliances and government departments at the Australian Airshow in March 2013 to target opportunities across the Asia Pacific region.

#### Brazil

- 1) UKTI Aerospace Sector/UKTI DSO teams in Brazil to maintain regular contact with Embraer and gather intelligence on new programmes, specifically the KC-390 and the E190X, and supply opportunities and feed this back to ADS for dissemination to UK Industry.
- 2) UKTI Ministers, Business Ambassadors and senior officials to present the UK’s advanced capabilities in primary structures, engines, avionics, systems and interiors to appropriate aerospace primes when on official visits (ADS to provide background briefing when required).
- 3) UKTI to continue to organise a programme of inward and outward missions focused on Embraer to support UK companies to engage with Embraer and win work on new aircraft programmes, working with ADS and the regional aerospace alliances to set up inward mission roadshows.

#### Canada

- 1) UKTI Aerospace Sector Team in Canada to maintain regular contact with Bombardier to gather intelligence on C Series and business jet programme progress, confirmed tier 1 suppliers and opportunities and feed this back to ADS for dissemination to UK Industry.
- 2) UKTI Ministers, Business Ambassadors and senior officials to present the UK’s advanced capabilities in primary structures, engines, avionics and systems to Bombardier when on official visits (ADS to provide background briefing when required).
- 3) ADS to maintain links with Bombardier in Belfast with regard to supply chain opportunities on C Series and other programmes.

#### China

- 1) UKTI to continue to facilitate the Government to Government UK-China Aviation Working Group (AWG) with representation from ADS and UK aerospace industry. The next meeting of the AWG is scheduled to take place in Xi’an in September 2012.
- 2) UKTI Aerospace Sector Team in China to maintain regular contact with COMAC, XAC, Avicopter and AVIC to keep up to date with progress with the C919, MA700 and new helicopter programmes and partnering opportunities for UK companies and feed this back to ADS for dissemination to UK Industry.

- 3) UKTI Ministers, Business Ambassadors and senior officials to present the UK's advanced capabilities in primary structures, engines, avionics and systems to appropriate aerospace primes when on official visits (ADS to provide background briefing when required).
- 4) UKTI to continue to organise a programme of inward and outward missions focused on COMAC, XAC, Avicopter and key AVIC Tier 1 companies to support UK companies to engage with Chinese aerospace companies and form new partnerships, working with ADS and regional aerospace alliances to set up inward mission roadshows. UKTI to organise a trade mission to China in September 2012, which will include a visit to X'ian and other centres in China.
- 5) ADS to continue to develop proposals to set up a representative office for the UK Aerospace Industry in China in partnership with the regional aerospace alliances.

#### Europe

- 1) UKTI Aerospace Sector Teams in France, Germany, Italy and Spain to build links with Original Equipment Manufacturers (OEMs) in the commercial aircraft and business jet sector in order to gather intelligence on new programme development timescales and potential opportunities for UK aerospace industry and feed this back to ADS for dissemination to UK industry.
- 2) UKTI Ministers, Business Ambassadors and senior officials to present the UK's advanced capabilities in primary structures, engines, avionics and systems to appropriate aerospace primes when on official visits (ADS to provide background briefing when required).
- 3) ADS to co-ordinate UK Village at the Farnborough International Airshow in July 2012.
- 4) ADS and UKTI to work jointly to co-ordinate a programme of networking opportunities for UK Aerospace Industry at the Farnborough International Airshow 2012 with visiting delegations from Japan, China, Russia, India, Brazil, South Korea, Canada and USA.
- 5) ADS to work with UKTI and regional aerospace alliances to maximise opportunities for UK companies to benefit from the civil delegation programme and Meet the Buyer Event at Farnborough Airshow 2012.

- 6) ADS to organise a TAP supported UK Pavilion at Aeromart in Toulouse in December 2012.
- 7) ADS to organise a UK Pavilion at Airtec in Frankfurt in November 2012.
- 8) ADS to organise a UK Pavilion at Aerospace and Defence Meetings in Seville in May 2012.

#### India

- 1) UKTI Aerospace Sector/UKTI DSO and Advanced Engineering Representative Office teams in India to maintain regular contact with HAL and NAL and gather intelligence on supply chain opportunities, developments in the proposed 5th Generation Fighter, MTA, RTA-70 and new helicopter programmes and feed this back to ADS for dissemination to UK Industry.
- 2) UKTI Ministers, Business Ambassadors and senior officials to present the UK's advanced capabilities in primary structures, engines, avionics and systems to appropriate aerospace primes when on official visits (ADS to provide background briefing when required).
- 3) ADS to organise a TAP supported UK Pavilion incorporating regional aerospace alliances and government departments at India Aviation in Hyderabad in March 2012.
- 4) ADS to organise a TAP supported UK Pavilion incorporating regional aerospace alliances and government departments at Aero India in February 2013.
- 5) UKTI to continue to organise a programme of inward and outward missions focused on HAL, NAL and key Indian private sector aerospace companies such as Mahindra Aerospace to support UK companies to engage with these organisations and form new partnerships, working with regional aerospace alliances to set up inward mission roadshows.

#### Japan

- 1) UKTI Ministers, Business Ambassadors and senior officials to present the UK's advanced capabilities in primary structures, engines, avionics and systems to appropriate aerospace primes when on official visits (ADS to provide background briefing when required).

- 2) ADS to maintain strong relationships with SJAC and organise joint activities to encourage networking and partnerships between UK and Japanese companies.
- 3) A|D|S to organise a TAP supported UK Pavilion incorporating regional aerospace alliances and government departments at the Japan International Aerospace Exhibition in October 2012.

#### South Korea

- 1) UKTI Aerospace Sector Team in South Korea to maintain regular contact with KAI and key private sector aerospace companies and gather intelligence on opportunities for UK companies to supply product or form new partnerships and feed this back to ADS for dissemination to UK Industry.
- 2) UKTI Ministers, Business Ambassadors and senior officials to present the UK's advanced capabilities in primary structures, engines, avionics and systems to appropriate aerospace primes when on official visits (ADS to provide background briefing when required).
- 3) UKTI DSO to keep a watching brief on the Korean Fighter Experimental (KF-X) programme and provide intelligence to ADS for dissemination to UK Industry.

#### Middle East

- 1) ADS and FIL to provide chalet facilities for members to organise a joint chalet at the Bahrain Airshow in January 2012 to promote UK Aerospace Industry and provide hospitality facilities for UK companies that are unable to take their own chalet presence.
- 2) UKTI, working with ADS, organise a UK group to attend the Global Aerospace Summit in Abu Dhabi in April 2012.
- 3) ADS to consider best model for representation of UK Industry in Middle East to help companies develop new business in the market in association with regional aerospace alliances.
- 4) A|D|S, working with UKTI in Abu Dhabi, to explore potential MRO and composites manufacturing opportunities.

#### Russia

- 1) UKTI Aerospace Sector Team in Russia to maintain regular contact with United Aircraft Corporation and Russian helicopter companies and gather

intelligence on new programmes such as the MS21 and supply opportunities and feed this back to ADS for dissemination to UK Industry.

- 2) UKTI Ministers, Business Ambassadors and senior officials to present the UK's advanced capabilities in primary structures, engines, avionics and systems to appropriate aerospace primes when on official visits (ADS to provide background briefing when required).
- 3) UKTI to continue to organise a programme of inward and outward missions focused on UAC and Russian helicopter companies to support UK companies to engage with these organisations and form new partnerships, working with regional aerospace alliances to set up inward mission roadshows.
- 4) ADS to consider how it can use its MOUs with UAC and Russian Engines Association to further develop collaboration and business between UK and Russian aerospace companies.
- 5) ADS/UKTI to consider how UK Industry should be represented at the MAKS Airshow in August 2013.

#### USA

- 1) UKTI Aerospace Sector Team in USA to build links with OEMs in the commercial aircraft and business jet sector, working closely with UKTI and BIS where companies are relationship-managed, in order to gather intelligence on new programme development timescales and potential opportunities for UK aerospace industry and feed this back to ADS for dissemination to UK Industry.
- 2) UKTI Ministers, Business Ambassadors and senior officials to present the UK's advanced capabilities in primary structures, engines, avionics and systems to appropriate aerospace primes when on official visits (ADS to provided background briefing when required).
- 3) UKTI to continue to organise a programme of outward missions focused on key US OEMs and Tier 1 suppliers to support UK companies to engage with these organisations and form new partnerships.
- 4) ADS to maintain strong relationships with AIA and organise joint activities to encourage networking and partnerships between UK and US companies.

## Conclusions

The commercial fixed-wing aircraft market is booming with record output and high order intake. Both Airbus and Boeing are planning further increases in output for 2012 and 2013. This bodes well for existing suppliers and a number of new models present new opportunities. The commercial market is historically cyclical and some are warning of problems ahead. Airline performance bounced back in 2010 with record profits. After falling in 2011, the International Air Transport Association (IATA) is predicting collective profits to half in 2012. It also predicts softening traffic growth from 6.1% in 2011 to 4% in 2012. Fuel prices are expected to remain high and the impact of this on airline performance could be exacerbated by the ability to hedge against high prices declines.

The business jet segment is set for recovery and there are a number of both airframe and engine programmes for the UK supply chain to target. There is less competition in this segment as the Airbus and Boeing market dominates supplier strategy, and margins can be higher. However, route to market can be more difficult and UKTI/ADS can provide valuable assistance to an SME aspiring to break into this market.

In sharp contrast to the civil market there are few new military aircraft fixed wing programmes where the supply chain is not already significantly mature. With the establishment of a UK HQ, the one that potentially offers SME's the easiest direct access is the SAAB Sea Gripen. SME access to the potential New Generation Fighter Aircraft programmes is considered to be most readily achieved by working through other UK Tier 1/2 companies. With so few new military aircraft fixed wing programmes, it is considered that aircraft from existing programmes will be expected to remain in service for many years to come, which opens up the opportunity for significant through-life upgrades.

As with military fixed wing programmes, there are few customer funded UAS programmes outside of the US. Several European countries have made investment in technology demonstrators for both ISTAR and UCAS missions either on their own, or as collaborative efforts with other countries. However, production programmes have yet to emerge, although the Anglo/French Telemos programme has the potential to be the first such programme to progress.

The helicopter market, both civil and military, continues to exhibit resilience to the world-wide economic downturn. The helicopter remains central to military operations and homeland security; it continues to be the only effective way to provide force mobility for a broad range of missions in both land and sea, conventional and non-conventional, warfare.

However, with the big traditional spenders such as the NATO countries reducing defence expenditure, investments are focused on those programmes that carry contractual obligations or are deemed vital for national security. The trend for Western countries to reduce defence expenditure while maintaining capability has increased government interest in commercial solutions and a tendency for customers to look at upgrading and/or extending the life of existing fleets. Meanwhile, military rotary wing procurement in high growth economies has increased during 2011, with multiple tenders being issued.

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