CHRIS WILSON
MESSIER-BUGATTI-DOWTY
SAFRAN GROUP

A GROWTH BUSINESS
FACING A LARGE VOLUME RAMPUP
THROUGH AN EXTENDED SUPPLY CHAIN

SAFRAN and MESSIER-BUGATTI names are marks owned respectively by SAFRAN and Messier-Bugatti-Dowty companies. The mark DOWTY is used under license.
George Messier
1896-1933

Messier Oleo Pneumatic Landing Gear

Farman 190
1927
History - THE INTERNALLY SPRUNG WHEEL

George Dowty 1901-1975

Gloster Gladiator
1934
A Family Aerospace History my Great Great Uncle Robbie!

1908 Robert Black and his flying machine
Parent Company – SAFRAN Group

- An international high technology group
- Revenue in 2013 of 14.7 billion euros
- 66,200 employees in 57 countries
- R&D investment 1.6 billion euros
- 3 core businesses:
World Leader in Landing Gear Systems & Integration

- 24,000 aircraft equipped
- 30 airframer customers
- More than 800 Airlines
- Over 42,000 landings per day
- One landing every 2.2 seconds
- 7000 people
- 13% of Safran group revenues
Over 42,000 takeoffs…

…and landings per day
KEY DEVELOPMENTS
ACCOMPLISHED

A320 NEO FIRST FLIGHT

MESSIER-BUGATTI-DOWTY ROADSHOW 2015
KEY DEVELOPMENTS
ACCOMPLISHED

BOEING 787-9 AND A350XWB, CERTIFICATION & EIS

MESSIER-BUGATTI-DOWTY ROADSHOW 2015
ON-GOING MAJOR INVESTMENTS
~100M€/YEAR

1. Bidos titanium building
2. Walton capacity expansion
3. Singapore VSM project
4. Mirabel capacity expansion
5. Suzhou assembly expansion
6. MBD Malaysia
7. Molsheim WB expansion
8. Gloucester assembly flow line
9. Molsheim SE expansion
10. Queretaro surface treatment unit
11. Hydrep
12. Villeurbanne carbon bench test
ON-GOING MAJOR INVESTMENTS

GLOUCESTER ASSEMBLY FLOW LINE

MESSIER-BUGATTI-DOWTY ROADSHOW 2015
2015 MARKET TRENDS & CHALLENGES
AND THE WORLD MARKET IS MOVING AND EXPANDING

- Population 7.1 Billion (and rising)
- Only 1 Billion with access to air travel, so far!

Current civil fleet ~ 19k a/c
Forecast to double in next 20 yrs
MARKET TRENDS: "MORE FOR LESS"

• **Trend**: continuous product improvement (better fuel burn) and downward evolution of price per seat

• **Our customers need more competitive and better performance from their partners**

• **Over the next 3 years we will see a 20% increase in volume.**

Source: Boeing - Nov 2014
HOW TO TACKLE THE CHALLENGE

• EU and UK governments have described clear strategies for aerospace in recent key documents
  – EU Flightpath 2050
  – UK Lifting Off

• Key aspects for the growth of the sector in the UK include:
  – Technology
  – Skills and Engagement
    – Manufacturing
    – Supply Chain competitiveness

• Aerospace Growth Partnership is working to enable UK industry to tackle these challenges
UK GOVERNMENT SUPPORT FOR THE CHALLENGE

Invest **£2bn** in an **Aerospace Technology Institute**

- **Certainty** of investment allows industry to plan

To create and safeguard jobs...
- **115,000 jobs** created in the sector from investment in the ATI

At all levels in the supply chain
- AGP will support **businesses of all sizes**, including SMEs
SAFRAN UK R&D PROJECTS THROUGH AGP

Subject of this presentation:

- Composite technologies to support more efficient assemblies and lighter structures
- Machining of high strength metals
- Quieter landing gear
- Engine / nacelle integration of lighter structures

Advanced Systems
Aerodynamics
Aerostructures
Propulsion
MARKET & CUSTOMER EXPECTATIONS

• Landing Gear design requirements are continually evolving to meet demanding operational and customer requirements.
  – Reduced complexity.
  – Full reliability
  – Low weight.
  – Reduced maintenance.
  – Reduced aero-dynamic noise
  – Extended time between restoration.
    • No surprises
  – Corrosion resistant materials.
  – Corrosion protection with environmentally friendly materials.
• Specific techniques have been developed to accommodate high strength titanium and steel alloys
• Machining performance objectives have been exceeded through these techniques
• Developed “as-machined finish” techniques for final surfaces
• Vibratory finishing
  • Avoids hand polishing to achieve required surface finish for fatigue strength.
  • Very significant reduction in manufacturing time related to surface finishing
GREEN MATERIALS AND COATINGS

• Extensive research to develop environmentally friendly coatings;
  • Preparation for future REACh legislation.
  • Maturity to withstand hostile LG environment for typically 12 years between overhaul

→ Working with research centres to develop optimised HVOF processes
  ▪ Avoids electroplating with chrome VI in the manufacturing process.

→ Cadmium replacement coatings
COMPOSITE STRUCTURES

• Messier-Bugatti-Dowty achieved an industry first
  • Introduction of composite braces for the B787 Main Landing Gear
  • Made possible through SAFRAN’s experience in woven composite technologies and resin transfer moulding

• Research continues within MBD and the SAFRAN Group
  • Weight reduction
  • Fatigue life enhancements
  • Shorter manufacturing lead time
  • Reduced cost

• Looking at simplification and optimisation of manufacturing processes
NOISE REDUCTION

- Active participation in industry aero-acoustic projects to reduce the amount of noise generated by landing gear upon approach
- Advanced methods to show how design choices influence the noise spectra.
  - 3D Computational Fluid Dynamics (CFD) analysis / Computation Aero-Acoustic (CAA) analysis

**Steady state analysis to visualise flow Velocity**

**Unsteady state analysis to visualise flow Vorticity**
• On-wing shock absorber monitoring.
  • Airlines can schedule maintenance when required.
  • Reduces risk of mal-servicing.
  • Highlights any deviation from design configuration.
    Target is to provide an electronic signal to monitor oil and gas levels.

• Develop Landing Gear Health & Usage Monitoring (HUMs)
  • Improve incident analysis on current products
  • Reduced operational interrupt performance
  • Reduction/elimination of no-value-added maintenance activities in favour of on-condition maintenance

• Health monitoring is a major research program within
MORE ELECTRIC LANDING GEAR

- Electric systems offer capability to improve ATA-32 systems performance through:
  - Suppression of operational interrupts,
  - New additional functions (e.g., HUMS, Green Taxiing),
  - Ownership costs reduction
- MBD innovations lead to the B787 adopting electric brakes
  - The world’s first electrically actuated brakes on a commercial airplane
- MBD is actively engaged on European research projects focused on EHA and EMA
  - Extension / Retraction
  - Steering
SAFRAN/Honeywell joint venture demonstrated eGTS capability at the 2013 Paris Air Show

- **Major gains:**
  - Fuel burn savings could be of a few % for short range flights
  - Brake wear reduction during cold temperature taxiing
  - Very significant taxiing noise reduction

- **Various technical solutions**
  - On-board: electrical motors incorporated in A/C wheels or on LG structure
  - Off-board: automated airport electrical tractors

- **Options**
  - Retrofit / upgrade solutions (off-board, powered NLG)
  - New programmes (off-board, powered MLG)
EXTENDED SUPPLY CHAIN - Expectations

- But the challenge is not just in our factories it extends to our whole supply chain.
- The existing supply chain is not big enough to absorb all the volume increase or technology development
  - This is an opportunity to gain an entry if you are willing to compete
  - SME’s find it difficult to get in the door of larger companies to get a piece of the pie.
  - It’s time to be creative and look to partnering or clustering of work to present a larger face to customers.
- The risk to put all work to low cost is very high so second or third sourcing is needed to help manage these risks.
  - There is no reason why that cannot be to competitive western sources like the UK
- There is ATI funding available for all levels not just the primes.
- NATEP is a vehicle for SME’s to gain funding to support their business growth.
  - The next call is in May this year. (ask Simon for more details)
  - This is a great way to develop a partnering approach and put in a combined bid.
  - If you have good ideas but cannot afford to bring them to market then consider this approach.
CONCLUSION

• We are part of a fantastic industry that is set to grow for the next twenty years.
• We have to work hard together to gain a large percentage of that work for the UK.
• We have a strong platform to build upon.
• There is government support & funding for Aerospace we must use it wisely.
• But remember the competition want our dinner.

Growing Market Place
Creating Great Opportunities
With Tough Challenges
And Great Rewards
WE ARE LEADING...

IT’S TIME TO ACCELERATE!
QUESTIONS

THANK YOU!