

Manitoba Aerospace Workshop

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Panel 1: Technology Priorities

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Magellan Sites



Headquarters: Mississauga (Toronto), Canada

TSX: MAL

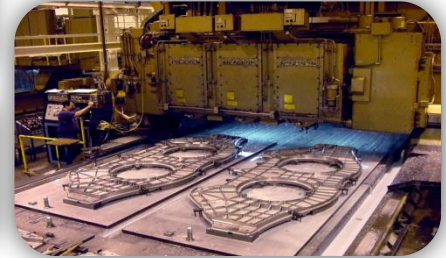
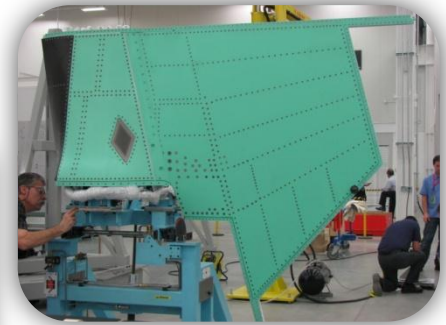


Market Segments

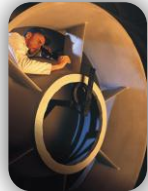
Aeroengines



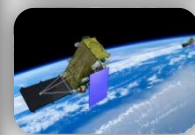
Aerostructures



Sand Castings



Propulsion & Space



Proprietary Products



Technology Challenges in Canada

• Market

- Volumes of new aircraft peaking at highest rates ever
- Airline needs:
 - Carbon and Sound emission reductions
 - More cost effective operation
- OEM Needs
 - Capacity and Capability
 - Affordability

• Geo-political

- Major shift in customer base to Asia Pacific region and India
- Offset requirements moving more work offshore from North America
- EAR/ITAR requirements making it more difficult to bid and contract work
- Competition with offshore countries difficult due to their domestic funding of technology with non-repayable grants

• Technology Needs

- Manufacturing processes and equipment to support rate increases and cost reductions
- Advanced materials for Environmental Designs

• Resources

- Aging workforce on Canada
- Shortage of availability for skilled trades
- Shortage of availability for professional trades



Challenges in the Industry Today

CIVIL

- Production levels at an all time high and climbing
- Strong 20 yr CMO's from Boeing/Airbus indicate > 30,000 aircraft to be built through 2031
- Customer base changing – strong Asian presence
- Offsetting requirements have either:
 - moved work to Asian region or
 - companies have established presence in country
- Very large focus on:
 - Fuel Prices
 - Environmental concerns
 - Operating costs

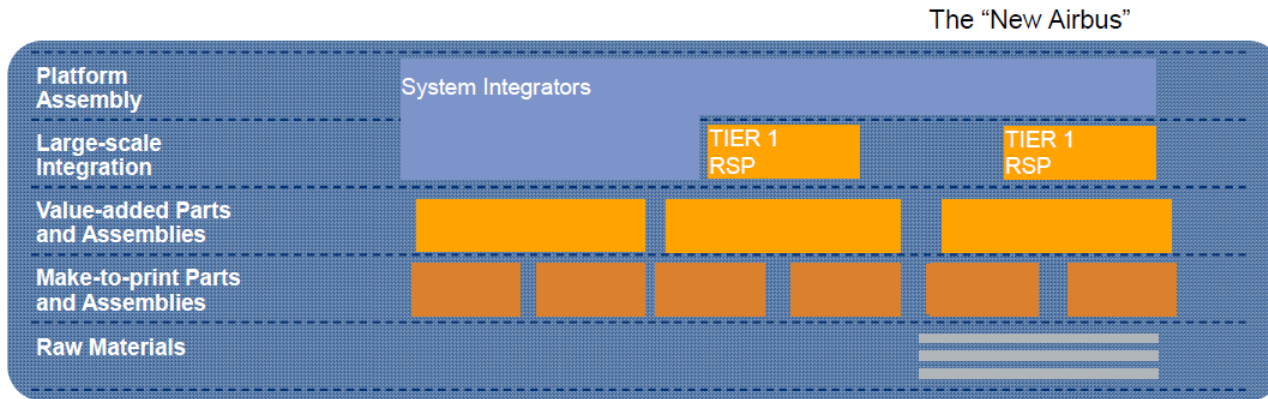
MILITARY

- Volume slowing due to financial crisis in the US
- Majority of platforms are mature and nearing end of production runs
- ITAR/EAR security issues applicable to both new and legacy platforms
- Security issues limit entry to market
- Focus is shifting towards UAV's



Voice of the Customer

Challenge for Canadian aerospace industry



Scenarios

- Develop a few large direct risk sharing partners with whom to build strong ties and who can share capital expenditure, development cost and risk, and who can build a real global extended enterprise and a local supply chain as necessary.
- Develop significant and "best in class" players at the value added parts and assemblies and make to print tiers.
- Become a technology leader.

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EADS



Emerson Report Recommendation

Recommendation 2:

“The government establish a list of priority technologies to guide aerospace-related policies and programs”

- General Feedback
 - Positives
 - Report explains the need to focus our efforts on technologies without limiting access to new technologies
 - Negatives
 - Recommendation does not suggest any technologies nor does it recommend who will lead/participate in formulating the top 10
 - A quick response to creation of the list needs to occur
 - Report does not discuss or recommend the need for a National Aerospace Vision
 - Agree with Tech WG recommendation on the Canadian Aerospace Environment Technology Roadmap being used as the starting point with Future Major Platforms adding input as well



Emerson Report Recommendation

- Opportunities
 - Need to gain input from Boeing/Airbus/GE/Rolls Royce on their technology needs and possible input to the list
- Challenges
 - Regional views of the priority list will be different depending the customer base and their requirements
 - In order for the list to be effective, it needs to not only maintain importance for the Canadian OEM's but also for the other major customers that the Supply Base are involved with



Technology Priorities for Magellan: Engines & Structures

- **Fabrications**

- Industrial Automation for joining
- Automated Inspection Technologies



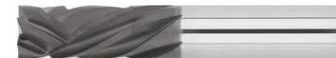
- **Assembly**

- Semi Automated Assy
- Robotic Fastening



- **Composites**

- Advanced Materials
- Automated Lay Down
- Ceramic Matrix Composites (CMC)
- Machining & Cutter Technology
- Acoustic Treatments



- **Robotic Finishing**

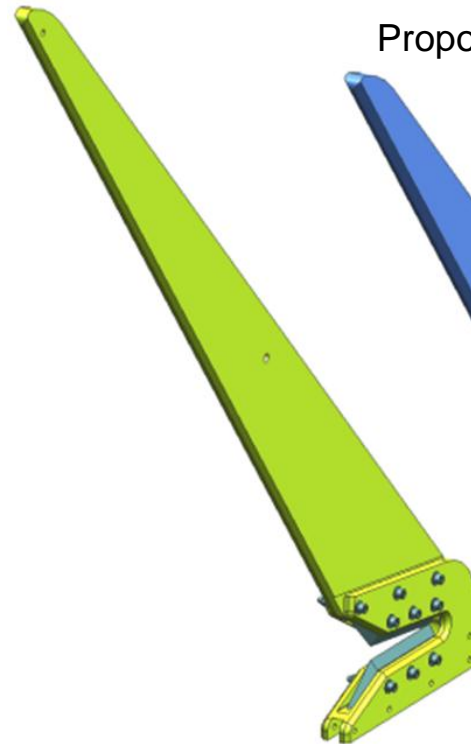
- Robotic Painting
- **Industrial Automation for treatments**



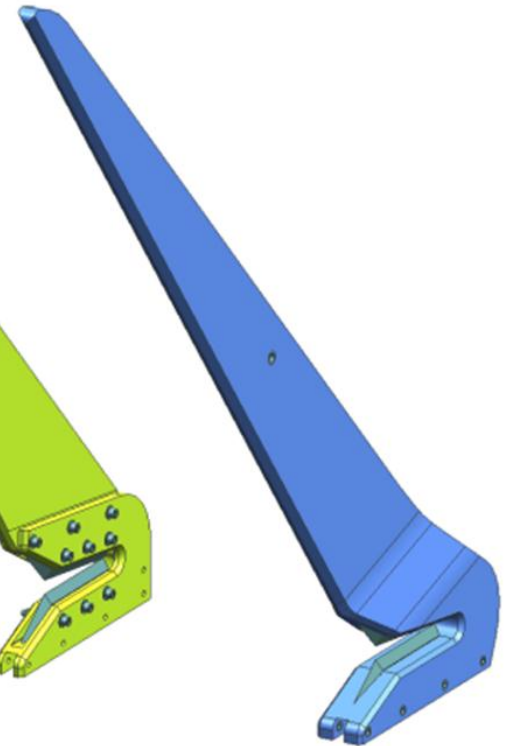
Technology Priorities for Magellan: Proprietary Products

- Program to design and transition metallic cutter body/blade designs to utilize composite structure
- Carbon Fibre Reinforced Plastics (CFRP) materials expected to realize up to 50% weight reduction without compromising strength and integrity of the system
- Collaboration project with Composites Innovation Center (CIC)
- Patent pending

Current Aluminum Design

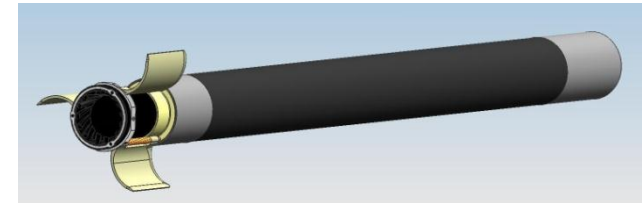


Proposed Composite Design



Technology Priorities for Magellan: Propulsion Products

- Guidance and Control (CRV7)
 - Implementation and testing of guidance systems on 70mm rocket motors
- Insensitive Munitions (IM)
 - Rocket motors
 - Composite Motor Case Development
 - Energetics
 - Propellant formulation
 - Packaging
- Ammunition Demilitarization
 - Facility Development
- New Rocket Motor Development



Technology Priorities for Magellan: Space Systems

- **Satellite Attitude & Orbit Determination**

- **Orbit determination**
 - Beyond GPS constellation
 - Combine with attitude estimator
- **Attitude reference generation**
- **Autonomous safing**
- **Thermal control**

- **Space Electronics – Radiation Hardening**

- **FPGA - Reconfigurable Processing Platform**
 - Multi-core processing
 - Extremely high computational throughput

- **Space Composites**

- **Structural Spacecraft Composites**
 - Launch vibration survivability
 - Out-of-autoclave technology
- **Composite Radiation Shielding Panels**
 - Alternative to Aluminum spacecraft shielding
 - “Multi-Functional” panels providing Structural integrity, Radiation shielding, Thermal control

