FICCI Indian Navy Seminar 2016

Emerging Aero Engine Technologies

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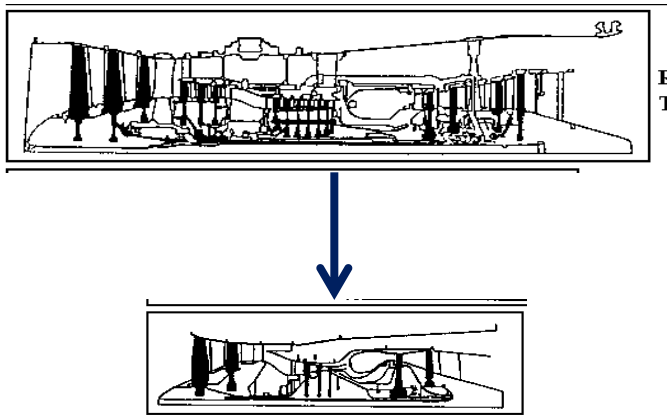
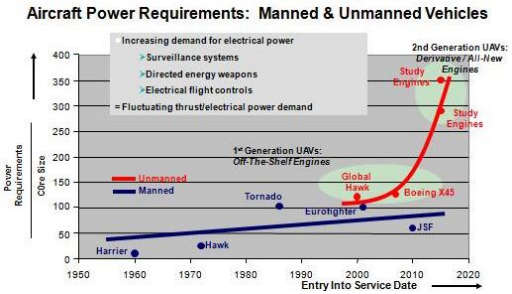
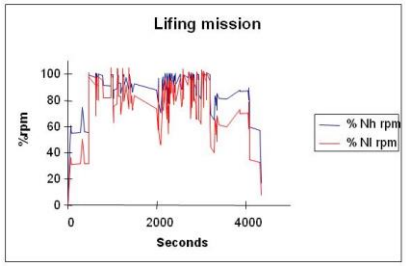
Power System Requirements



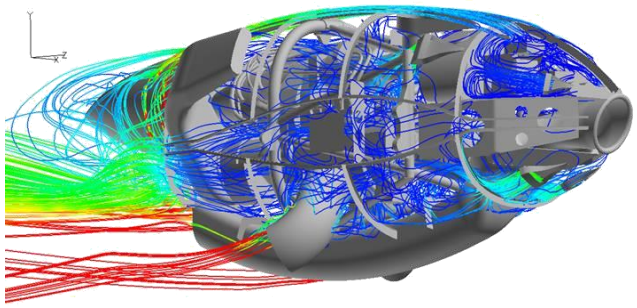
Smaller, Lighter and more Efficient Gas Turbines



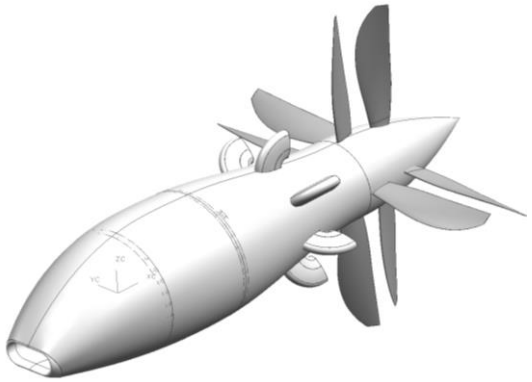
Increasing Electrical Power Demands



Advanced Health Monitoring, Lifing and Repair Techniques



Thermal Management



Advanced Propulsion

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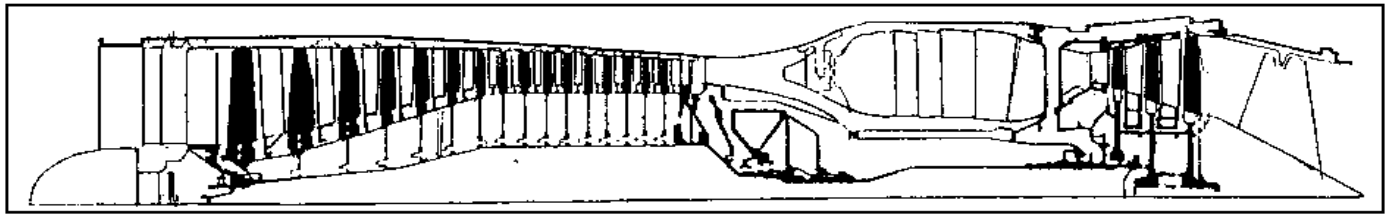
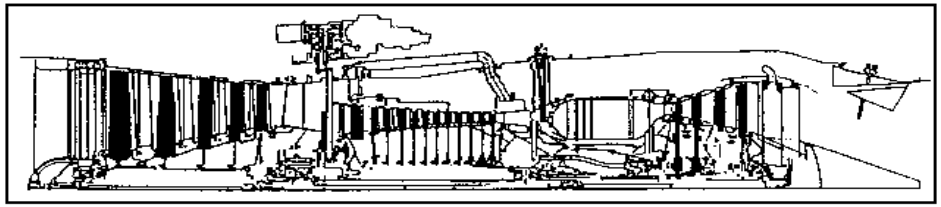
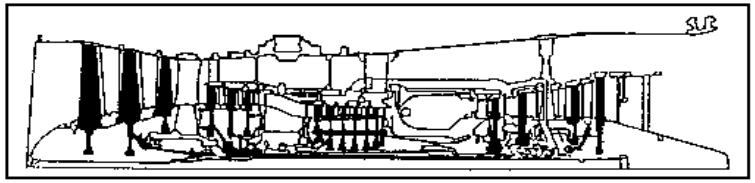
The Future Gas Turbine – Smaller, Lighter and More Efficient



Avon 20
T/W (Thrust to Weight) = 4:1

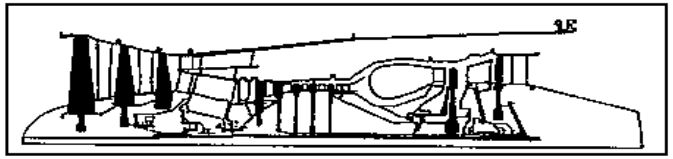


Spey 202
T/W = 5:1

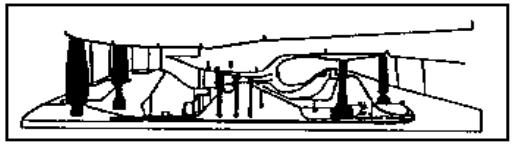


RB199
T/W = 7:1

Engines scaled to the same dry thrust



'Current Technology'
EJ200
T/W = 9:1



'Next Generation'
T/W = 15:1

Key Technology Differentiators

- High stage loadings (advanced 3D aerodynamics, aspirated aerofoils)
- Compact, high pressure ratio cores
- Advanced materials such as Composites (high temp, lightweight)
- Blisk/Bling Technology, Vaneless Turbines, Variable Cycles

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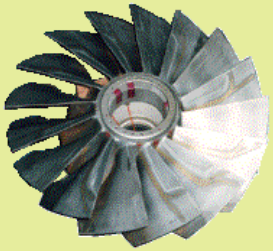
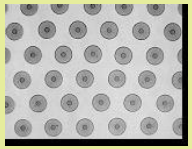
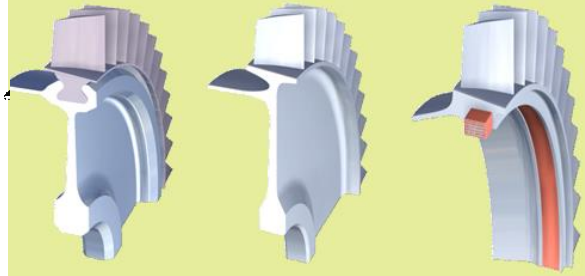
Advanced Gas-Turbine Technology



Advanced Hollow Blisks



Metal Matrix
Composite Blisks



Compressor Weight Reduction
Blisk – up to 30% weight saving
Bling – Ti MMC, up to 70% weight saving

Advanced 3D Aerodynamics

Aspirated aerofoils

Vaneless Counter-Rotating Turbines

Variable Cycles

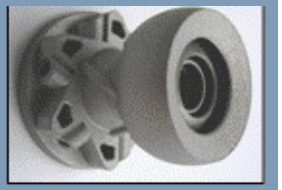
Innovative Low Cost
Manufacturing Processes

Precision
Sand Cast

Laser Drilled
Components

5-axi CNC
Machining

Laser
Deposition



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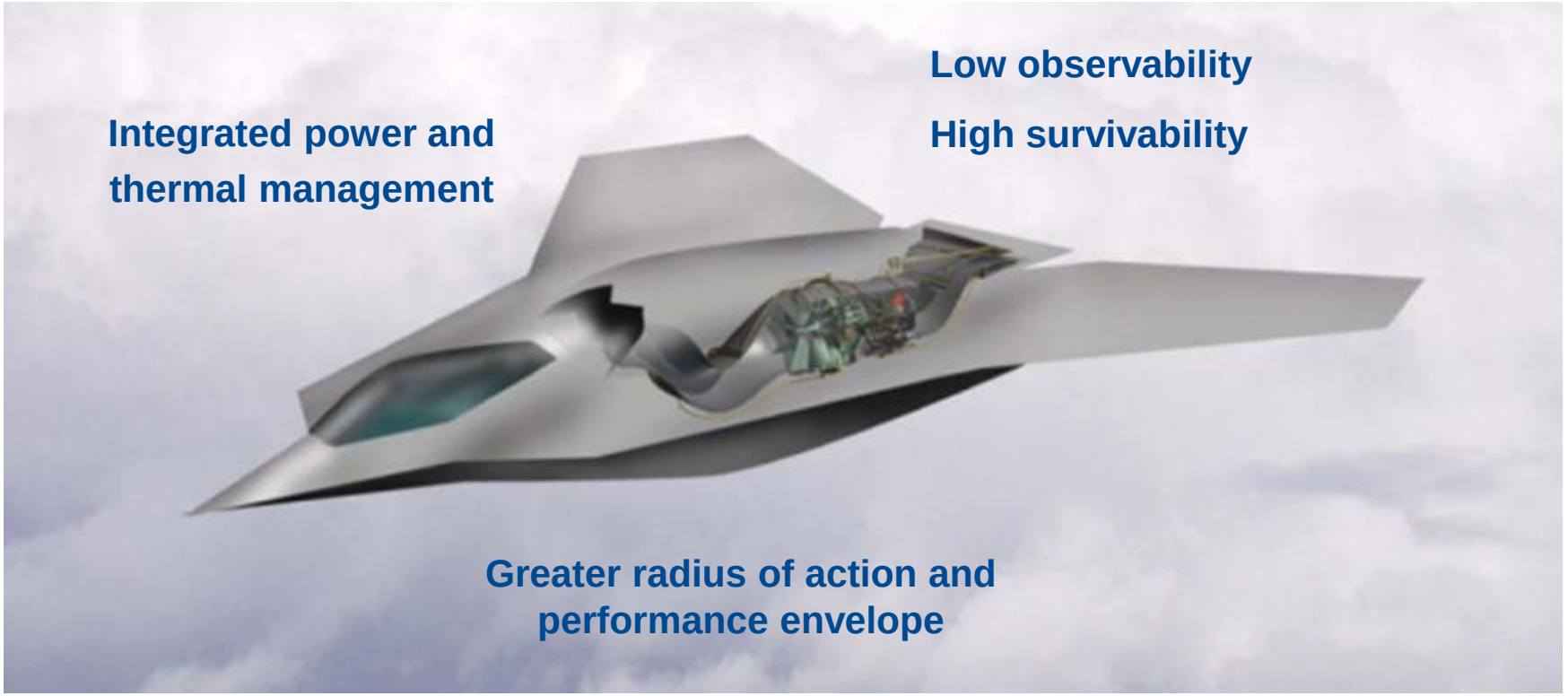
Advanced Combat Aircraft

Future Combat demands…

- Survivability, lethality, situational awareness and persistence

Future Battle-space demands greater levels of integrated design for next generation aircraft and aero-engines



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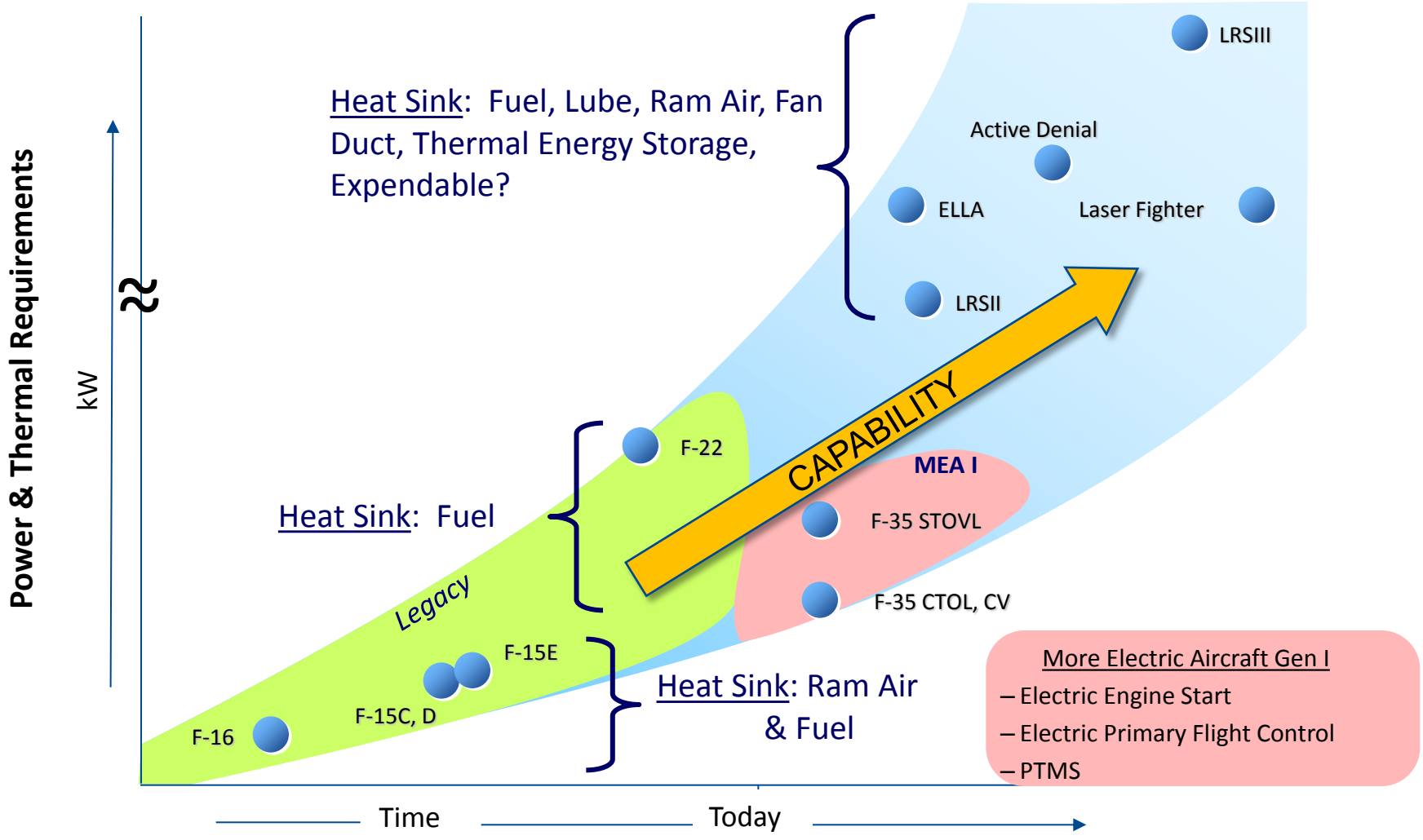
Power and Thermal Requirements - Trends



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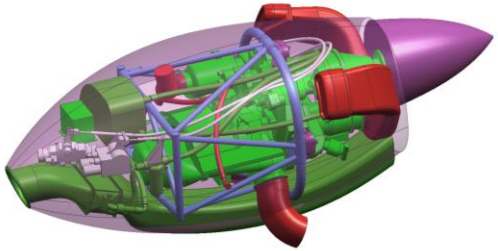
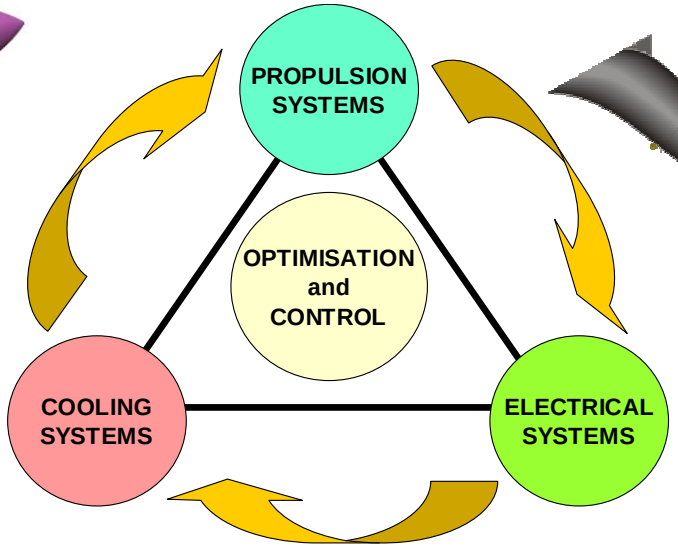
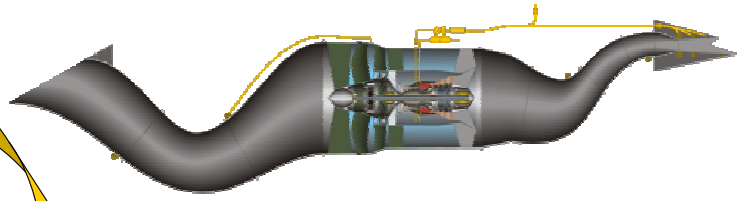
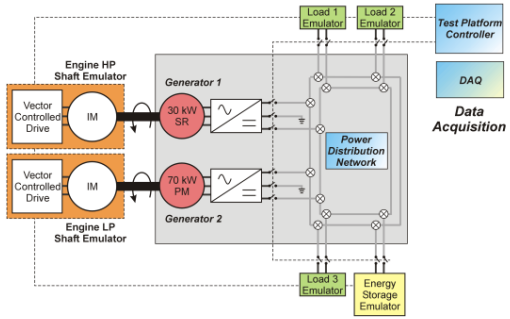
Integrated Power and Thermal Systems

Intelligent propulsion, thermal management and electrical power provision









Mantis UAV Demonstrator

Powering the Latest Unmanned Demonstrator Aircraft

Taranis UCAV Demonstrator

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Integration – ‘System of Systems’ Thinking

IAC2 Aircraft Carrier, potentially operating AMCA naval variant

- *Formidable projection of military power - an ultimate ‘system of systems’*
- *Integration of requirements critical to optimised operational effectiveness*

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Futuristic Aircraft for India

Operational Effectiveness

- Optimised in-flight performance and enhanced power offtake
- Stealth via integrated aircraft-engine design
- Future aircraft growth potential

Risk Management & Affordability

- State-of-the-art, proven technologies
- Benefit from existing industrial experience in partnership to minimise programme risk
- Lower unit and through life support costs

‘Make in India’

- Self-reliance for India - transfer of design, development and production capability
- Increased Indian aerospace capability and export potential

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Better Power for a Changing World