



The Pratt & Whitney PW1000G engine family

Past, present and future for GKN Aerospace

Marcus Borg | October 2016

Introduction

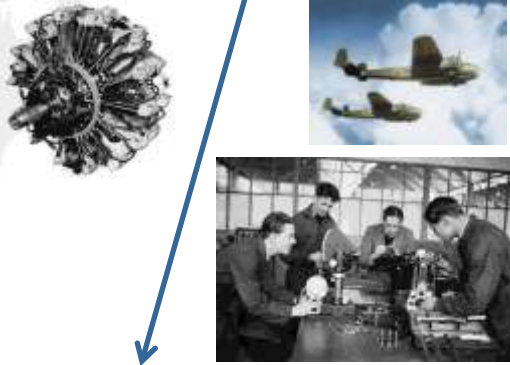
Content

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Partnership with Pratt & Whitney

From copy to co-operation

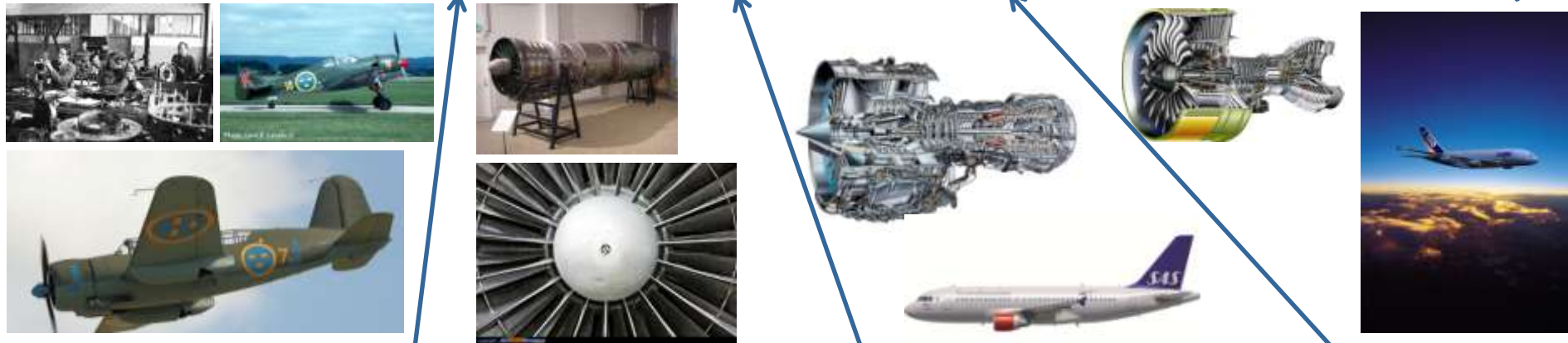
40's: Re-engineering of Twin Wasp. Became STW C3 powering J22, B17A & B18A



00's: Technology demonstrators ANTLE and CLEAN leads to the GTF-demo



2008-: RRSP contract for the design and manufacturing of IMC & TEC for PW1000G



60's: Development of P&W JT8D into RM8 powering "Viggen"

90's: Redesign of V2500 TEC. V2500 powers A319, A320, A321, MD90 & KC-390

00's: Redesign of GP7000 TEC reducing weight 23kg GP7000 powers A380

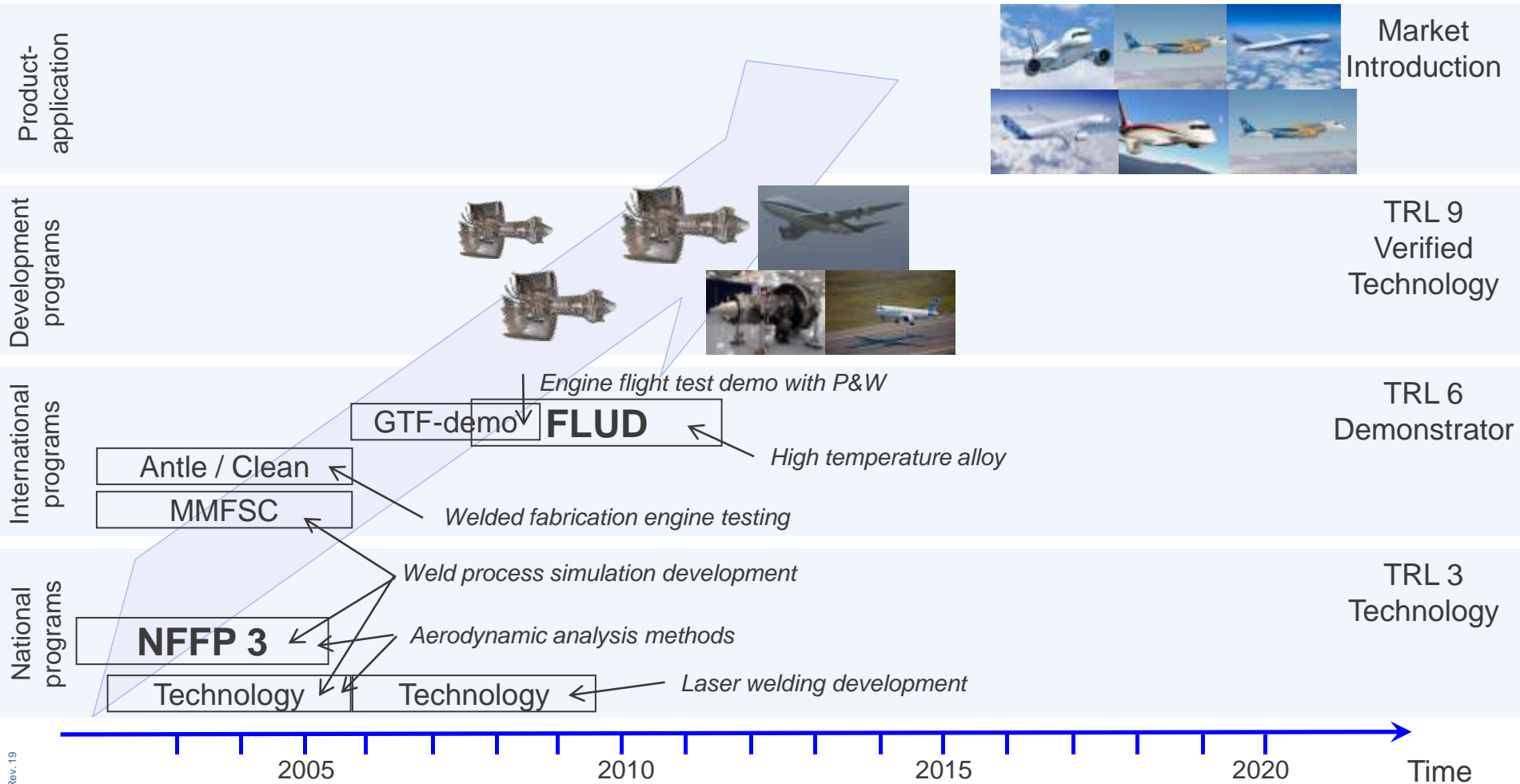
Photo & Computer renderings: GKN Aerospace, Swedish Airforce, Pratt & Whitney, SAS, Mitsubishi, Airbus, Lars E. Lundin, Dave Key,

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Technology maturation & validation

Successful technology insertion



Photos: Pratt & Whitney, Airbus, Mitsubishi, Irkut, Bombardier and Embraer

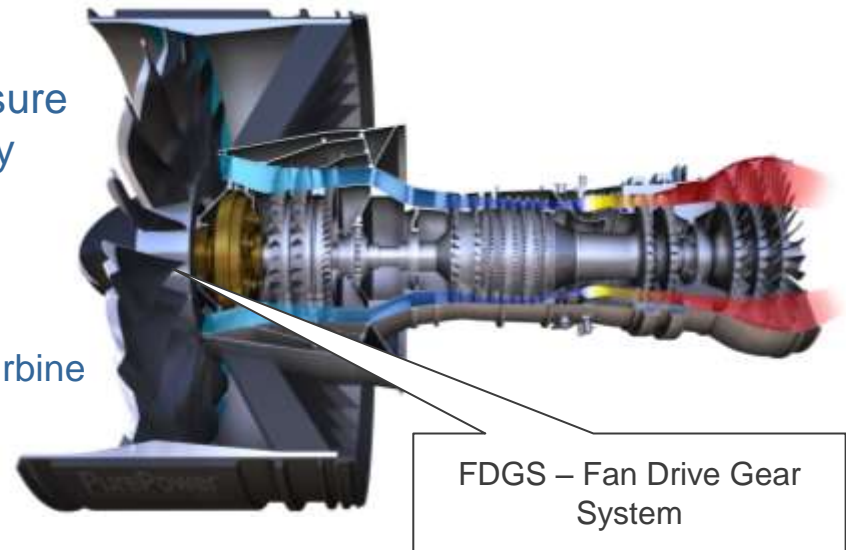
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Geared Turbo Fan™

Award winning technology

Key features and benefits

- > The fan is separated from the low pressure compressor and turbine with a planetary gear system , allowing each module to operate at its optimum speed
- Increased fan diameter
- High speed low pressure compressor and turbine
- Fewer stages → fewer airfoils → less maintenance
- Fuel burn improvement greater than 12%
- CO₂ emissions reduced by 3,600 metric ton per aircraft per year
- NO_x emissions reduced by 30 - 50%
- Reduces aircraft noise footprints by 50 - 75% operating 15 - 20dB below ICAO CAEP Chapter 4 standard



FDGS – Fan Drive Gear System



Photo & Computer rendering: Pratt & Whitney

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Engine program and GKN design solution

Scalable design enabling multiple aircraft integration



Airbus A320neo
PW1100G-JM

2016 EIS



MRJ
PW1200G

2018 EIS



Irkut MC-21
PW1400G-JM

2018 EIS



Bombardier CSeries™
PW1500G

2016 EIS



Embraer E2
PW1900G / PW1700G

2017 EIS / 2019 EIS



Compressor Intermediate Case

Diameter: 800-1100mm
Weight: 30-70kg

Design challenges

- High temperature
- Engine mounts
- Aerodynamic performance
- Interface complexity
- Light weight
- Low cost



Turbine Exhaust Case

Diameter: 800-1000mm
Weight: 45-75kg

Photos: Airbus, Mitsubishi, Irkut, Bombardier and Embraer
Computer renderings: GKN Aerospace

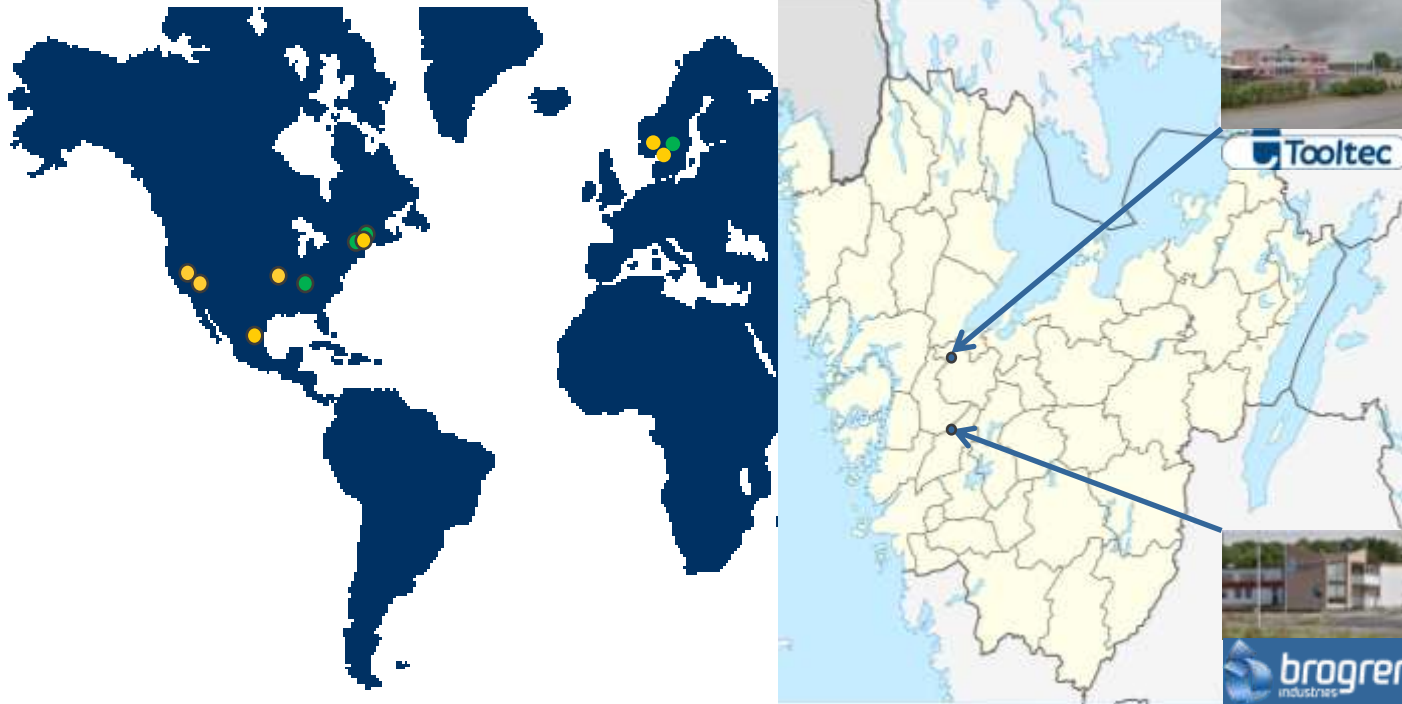
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"Glocal" foot-print

Near and far; Working together

Global & Local – Complex & Diverse

- > Complex supply chain with multiple sources
- > Leverage global footprint using competence and capacity within the GKN Group
- > Develop the region by developing local know-how into the aerospace business



Pictures: GKN Aerospace, Wikimedia Commons, Tooltec, Brogren, Google

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Conclusion

My take-away...

- 'Technology Business' and 'Peoples Business'
 - Commitment and cooperation pays dividend
- Pan-European technology development
 - Required to ensure future engine programs
 - Technology demonstrators – vital validation vehicles
- Environmental friendly technology
 - Geared Turbo Fan™ is here to stay
- PW1000G a rewarding challenge

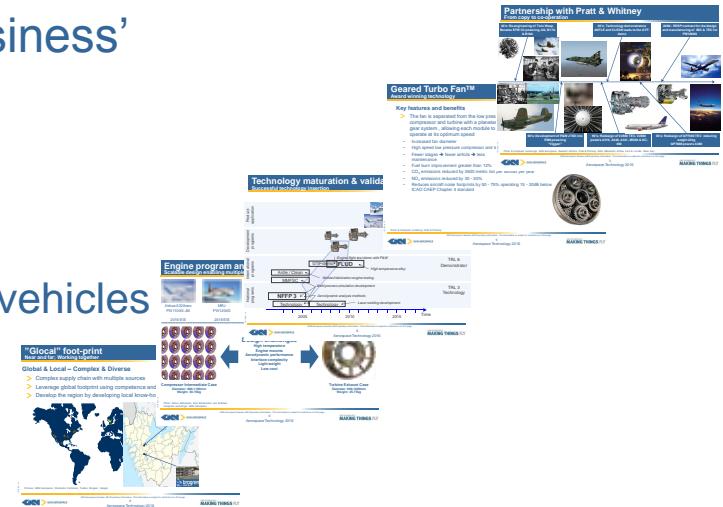


Photo: Aviafilms.com

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The End?

No! The beginning...

Thanks for your attention!



Questions?

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