ASX RELEASE

For Immediate Release: 25 May 2017

Orbital UAVE presents at AUVSI Xponential conference

Orbital Corporation Limited (ASX: OEC) ("Orbital") CEO Terry Stinson presented to the world's largest unmanned vehicle systems conference AUVSI held in Dallas Texas 8-11 May. Over 7000 industry leaders from 50 countries attended with more than 600 cutting edge exhibitors, giving Orbital enormous positive exposure.

A copy of the presentation materials can be found below.

Industry-leading provider of information for superior decision making, Insitu Inc. (a key customer of Orbital) who design, develop and manufacture customised unmanned aerial systems, was a conference sponsor and also a major exhibitor.

Orbital was pleased to participate and celebrate its continued collaboration with Insitu and reinforce its market leading position in the manufacture of tactical unmanned aerial vehicle engines.

Image: Orbital's CEO Terry Stinson with Jon Damush, VP, Insitu Commercial at the AUVSI Xponential Conference 2017

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CONTACTS

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About Orbital

ORBITAL is an innovative industrial technology company.

ORBITAL invents and builds smart technology that delivers improved performance outcomes for our clients in the aerospace, mining & industrial and consumer sectors.

ORBITAL operates on a global scale and is headquartered in Perth, Western Australia. From a world class facility, ORBITAL's innovation magic takes shape – from research and design to development, manufacturing and implementation.

Delivering state-of-the-art products and services within the industrial technology sector is what we do.

ORBITAL's technology leadership is exemplified by the patented REMSAFE remote isolation system for global mining and industrial applications and Orbital's® UAVE business that produces and supplies engine and propulsion systems for unmanned aerial vehicles.

Forward Looking Statements

This release includes forward-looking statements that involve risks and uncertainties. These forward-looking statements are based upon management's expectations and beliefs concerning future events. Forward-looking statements are necessarily subject to risks, uncertainties and other factors, many of which are outside the control of the Company that could cause actual results to differ materially from such statements. Actual results and events may differ significantly from those projected in the forward-looking statements as a result of a number of factors including, but not limited to, those detailed from time to time in the Company's Annual Reports. Orbital makes no undertaking to subsequently update or revise the forward-looking statements made in this release to reflect events or circumstances after the date of this release.


ORBITAL
ORBITAL
UAV
World Leaders in UAV
Engines and Systems

COMPANY OVERVIEW

- ORBITAL CORPORATION is an industrial technology company with 35 years of experience developing innovative engine solutions for a wide range of applications.
- **ORBITAL UAVE** is the global leader in heavy fuel Small UAV propulsion systems that deliver class leading endurance, reliability and power-to-weight advantages.
- **ORBITAL UAVE** operates the world's best Small UAV engine development, testing and manufacturing centre.

THE PRODUCT

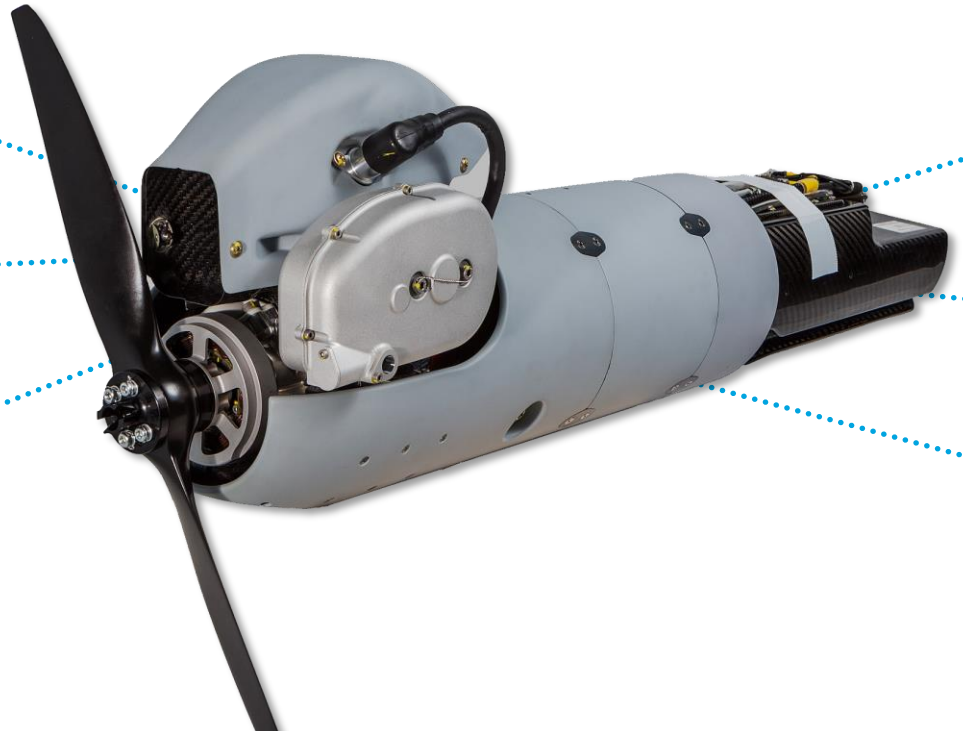
- **ORBITAL UAVE** is the global leader in spark ignited, heavy fuel propulsion systems for Small UAVs.

ORBITAL UAVE Propulsion System Features

FlexDI™
Revolutionary fuel & combustion system

Proprietary Combustion Systems

Small Package Size Engine
High power-to-weight ratio



Electronic Control Unit
Light weight military specification

Fuel & Oil Tank System
Light weight

Specialised Muffler
Minimizes noise and temperature profile

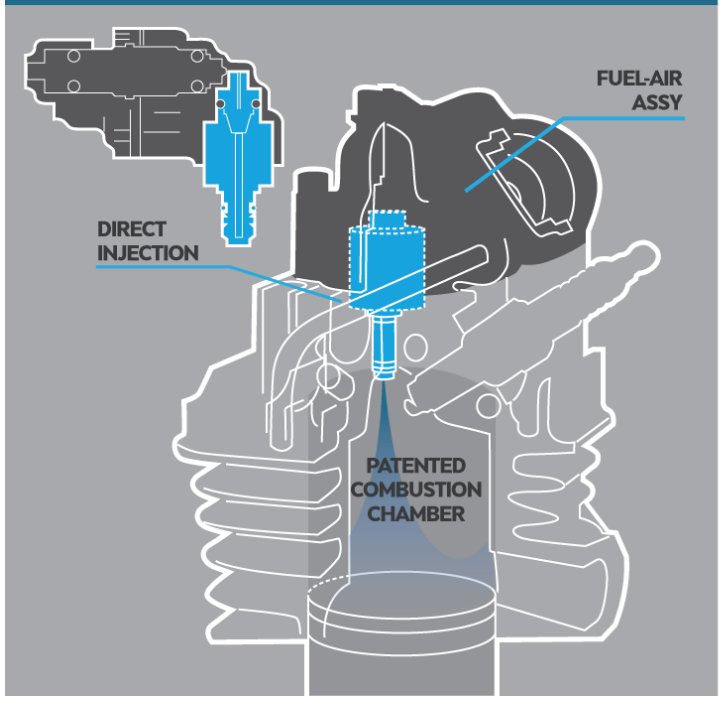
ADVANTAGES

- **Best power-to-weight** for heavy fuel application
- **Proven cold start and cold operation** capability to -30°C
- **High reliability and durability** – demonstrated FAR33.49 endurance test
- **The first fully self-contained UAV propulsion system**
- **Fuel efficient** – up to 40% more fuel efficient than today's conventional engine
- **Proprietary engine** designed for smooth, low vibration operation
- **Lowest cost flight time** – dollars per hour in the air (high TBO & low maintenance)

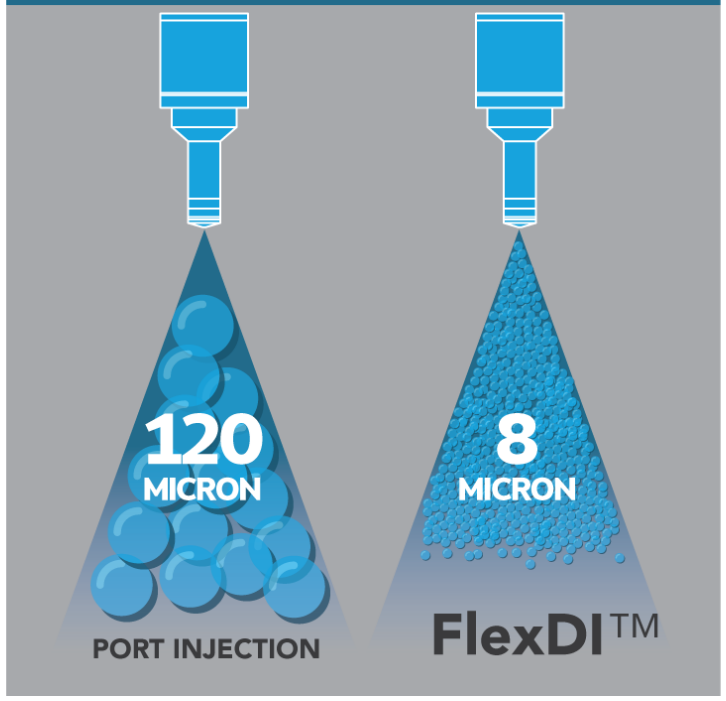
KEY TECHNOLOGY - **FLEXDI™**

- Orbital's patented proprietary **FlexDI™** technology is the difference that delivers the world class heavy fuel performance.

THE TECHNOLOGY



THE DIFFERENCE



THE BENEFITS

- Very fine atomisation of fuel droplets produce increased surface area and better vaporization
- Spray guided, stratified charge combustion system produces much more efficient process
- Orbital's in house electronic control engine management system optimises the combustion process and fuel efficiency
- Multi-fuel: Gasoline, JP5, JP8, Jet A

Up to 40% more fuel efficient

COMPETITIVE ADVANTAGE

	Turbine	Diesel Compression Ignition	External Heaters etc.	High Pressure Direct Injection	Others/ Experimental	**ORBITAL UAVE** Propulsion System
Low Cost	✗	✗	✓	✗	?	✓
High Power/Weight	✓	✗	✓	✓	?	✓
Cold Start & Operation	✓	✗	✗	?	?	✓
Fuel Economy	✗	✓	✗	✓	✗	✓
Scalable to TUAS and MALE	✓	✓	✓	✗	✗	✓
Reliability	✓	✓	✗	?	?	✓
Ease of Logistics & Field Deployment	✓	✓	✗	✓	?	✓

KEROSENE AS AN IC ENGINE FUEL

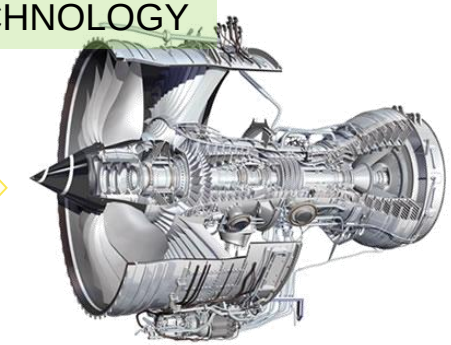
Gasoline

Developed for SI
- Increased Octane
- Detergent packages

RECIPROCATING IC ENGINES REQUIRE CUSTOMISED TECHNOLOGY

Kerosene

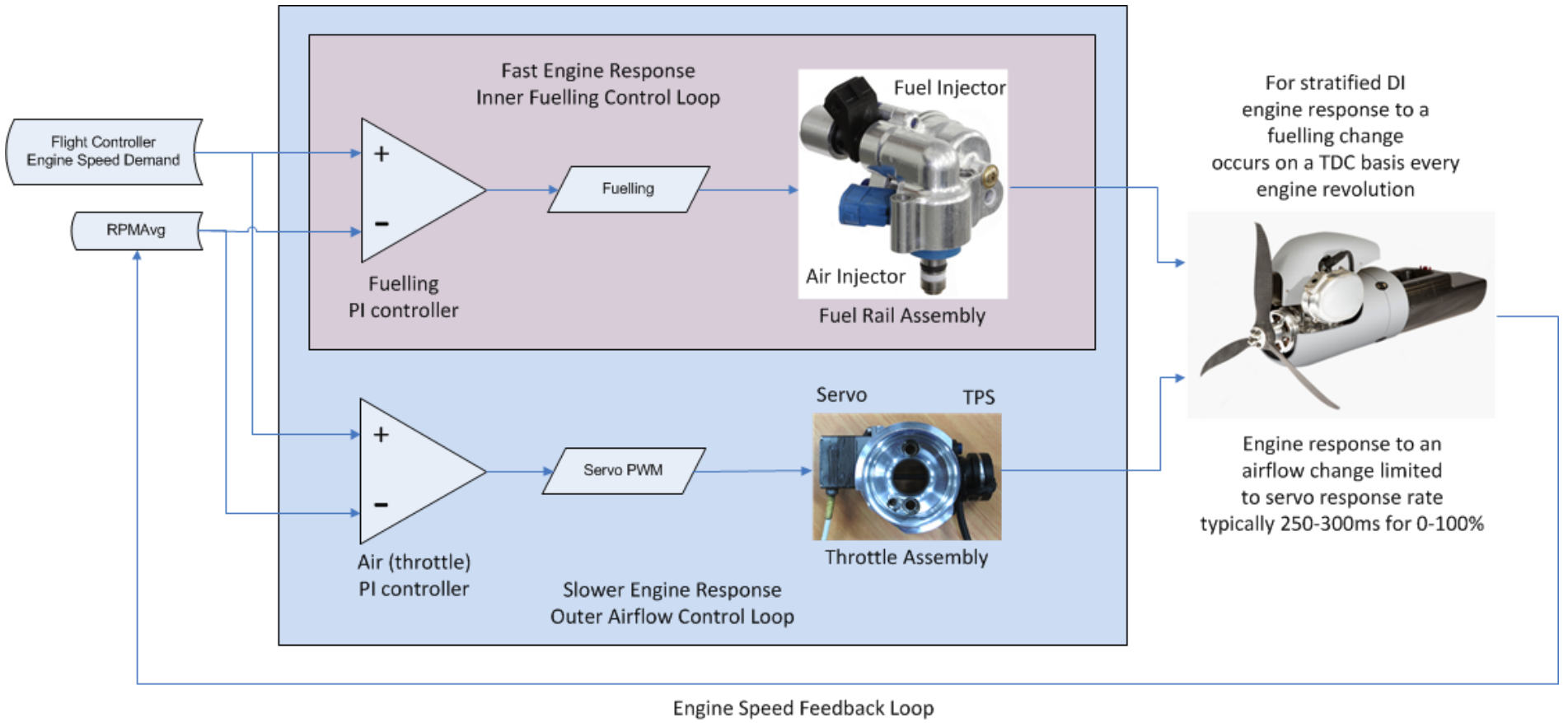
Developed for Jet Turbine
- Anti-corrosion
- Static dissipation etc.



Diesel

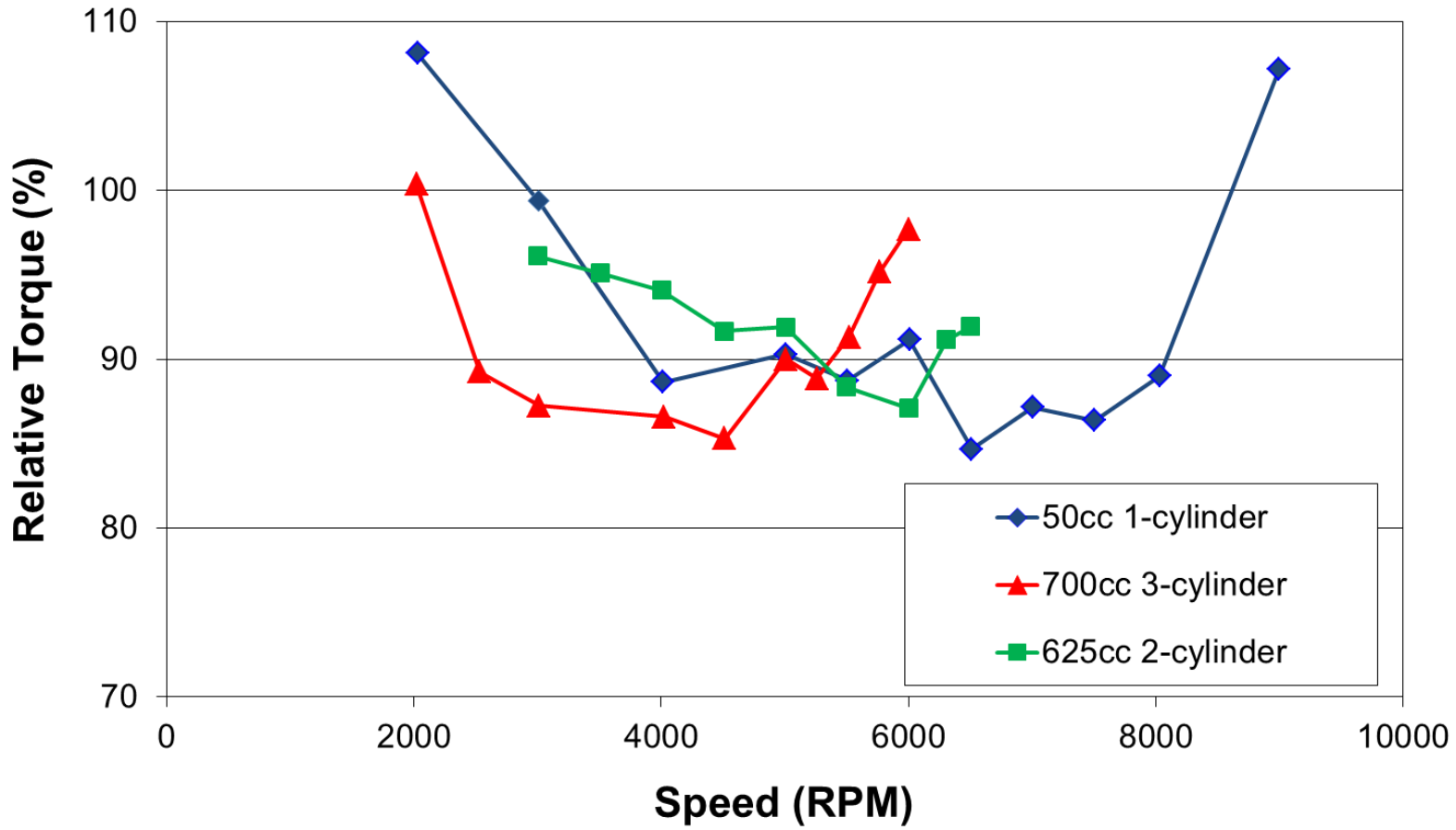
Developed for CI
- Increased Cetane
- Lubricity etc.

ADVANCED CONTROL STRATEGY EXAMPLE
ENGINE SPEED CONTROL



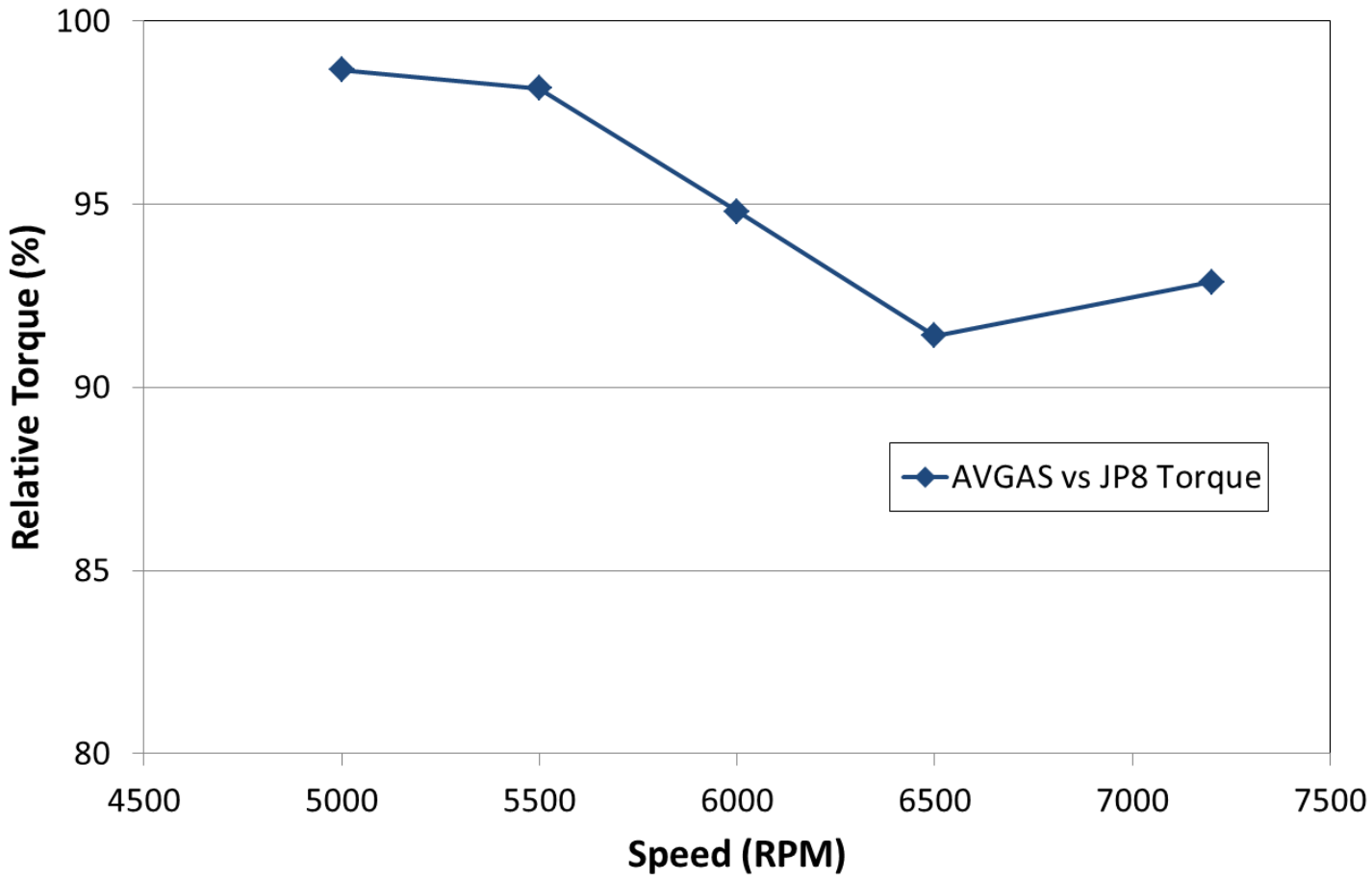
ENGINE FULL LOAD RESULTS

Full Load Relative Torque for FlexDI 2-stroke Engine: Gasoline to JP5



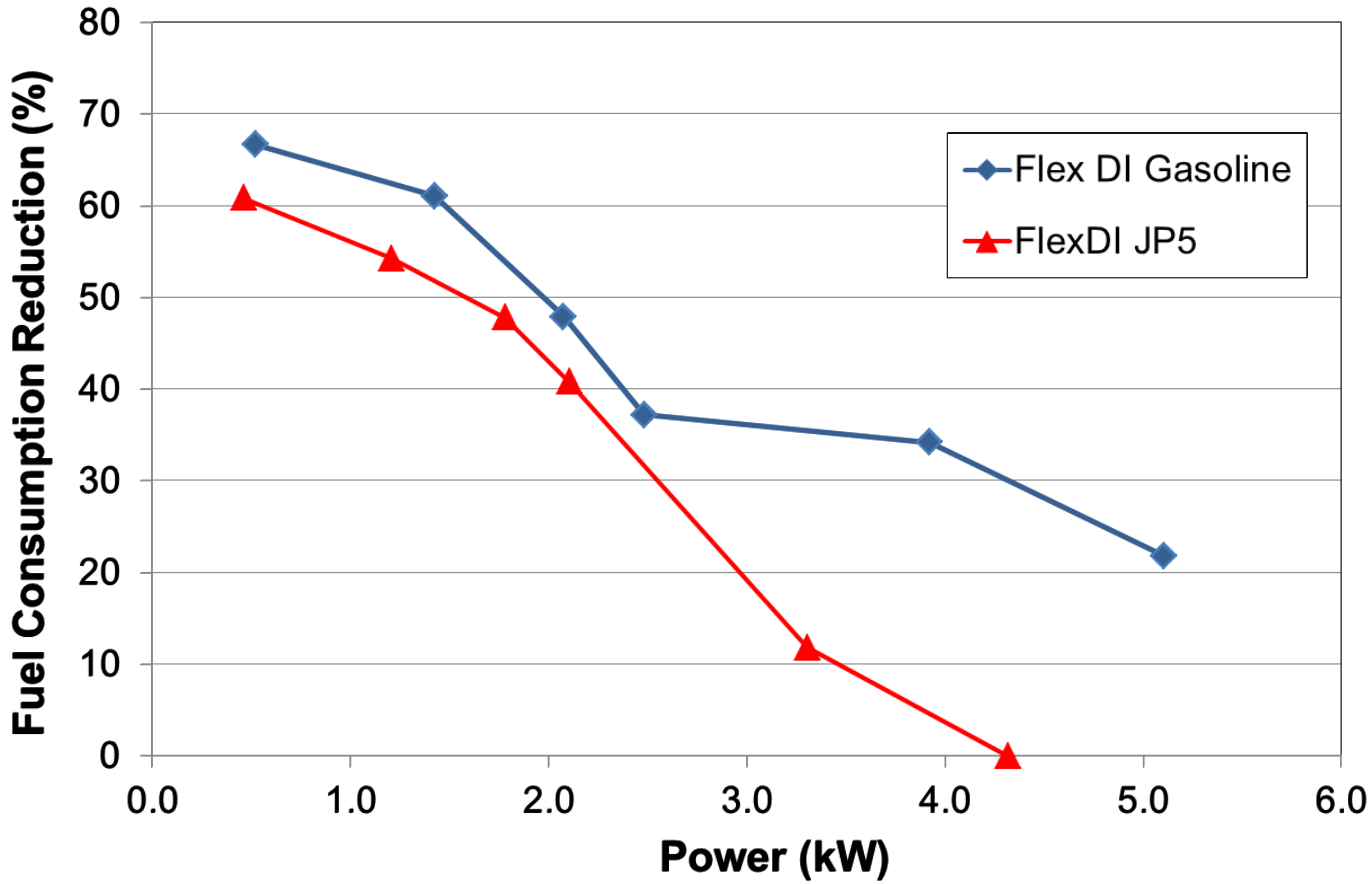
ENGINE FULL LOAD RESULTS

Full Load Relative Torque for FlexSDI Rotary Engine: AVGAS100LL to JP8

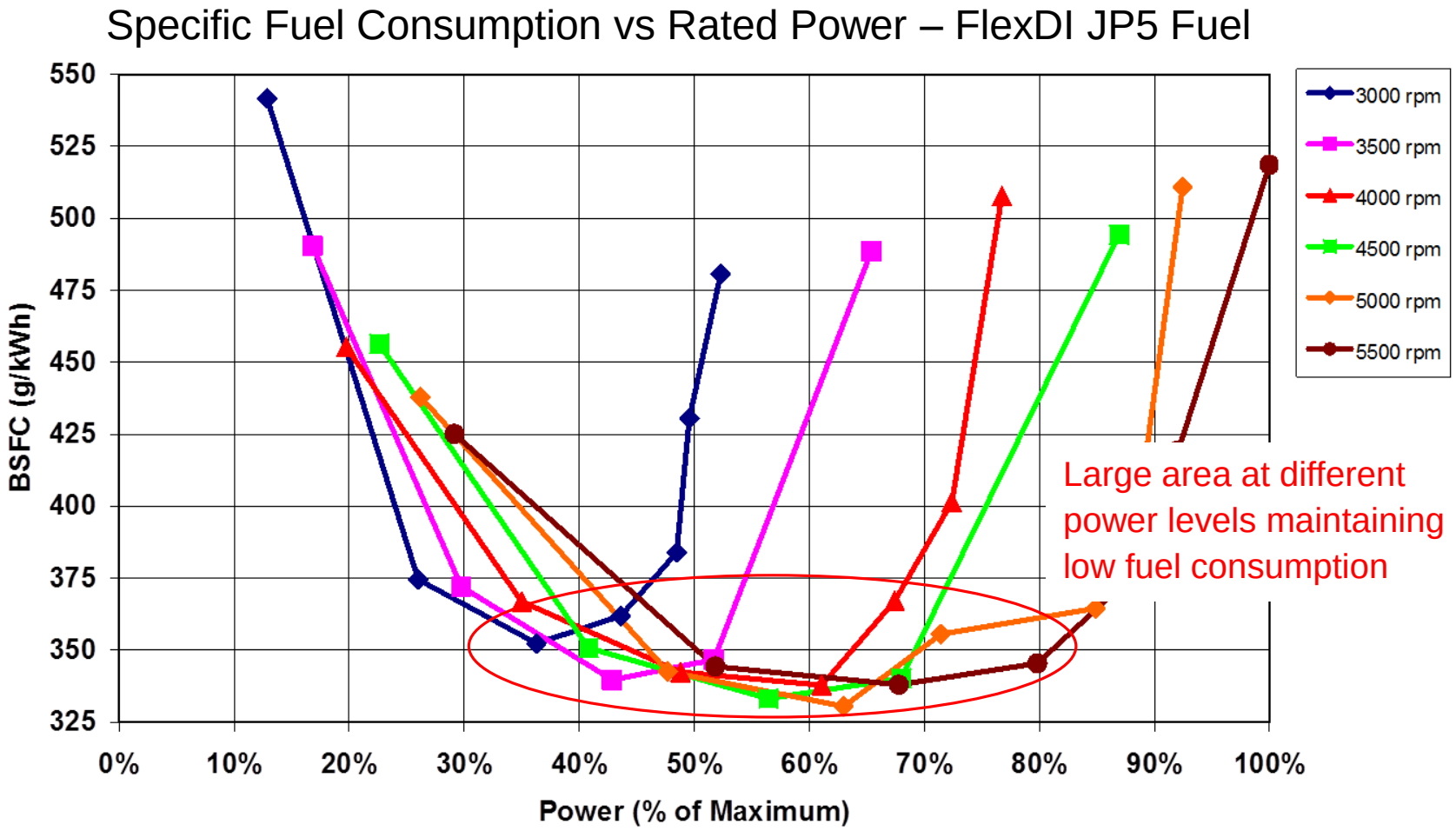


ENGINE PART LOAD FUEL CONSUMPTION
SINGLE CYLINDER 2-STROKE

FC Reduction for typical prop curve vs Gasoline carburettor baseline

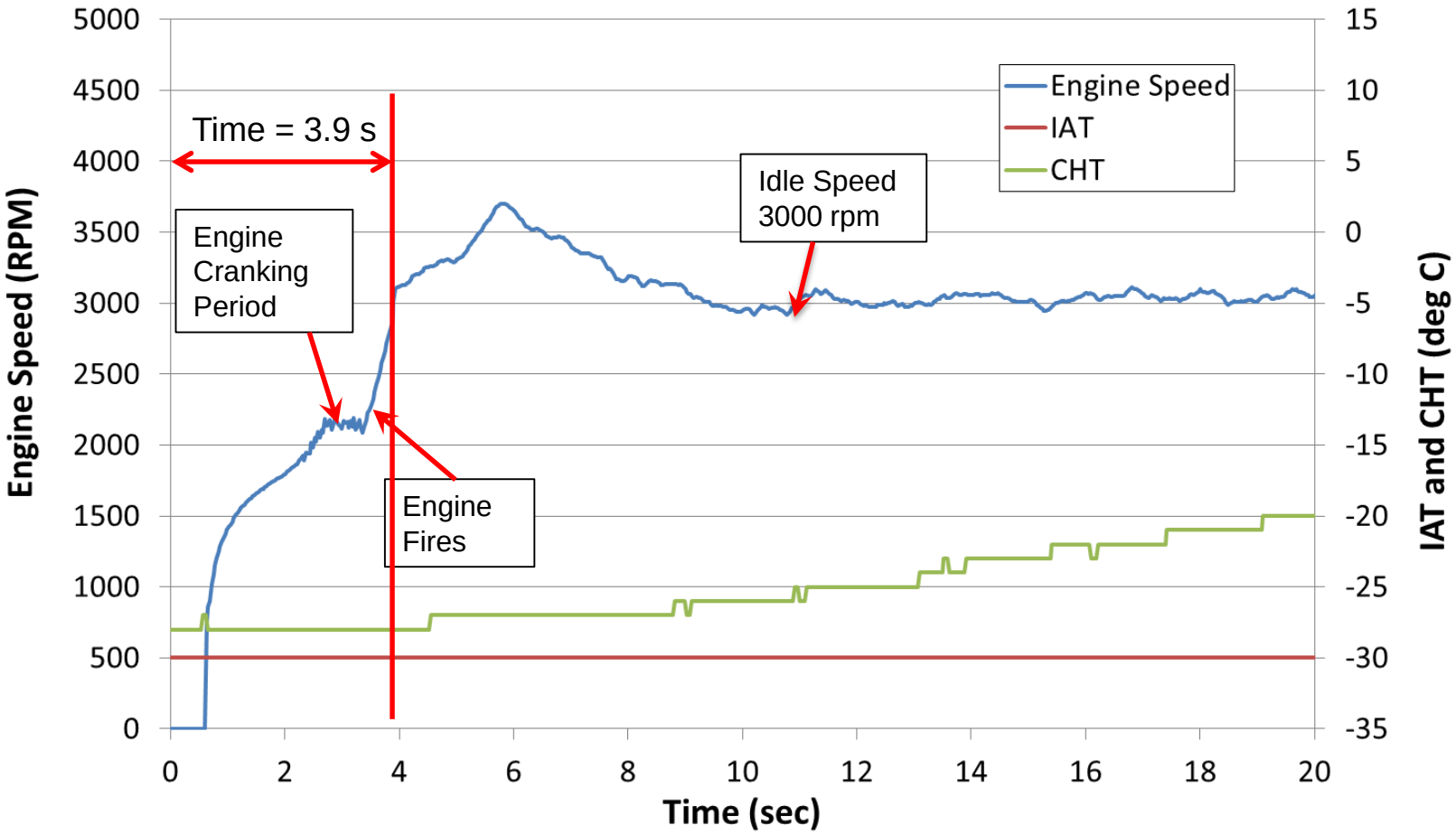


ENGINE PART LOAD FUEL CONSUMPTION
SINGLE CYLINDER AIR-COOLED 2-STROKE



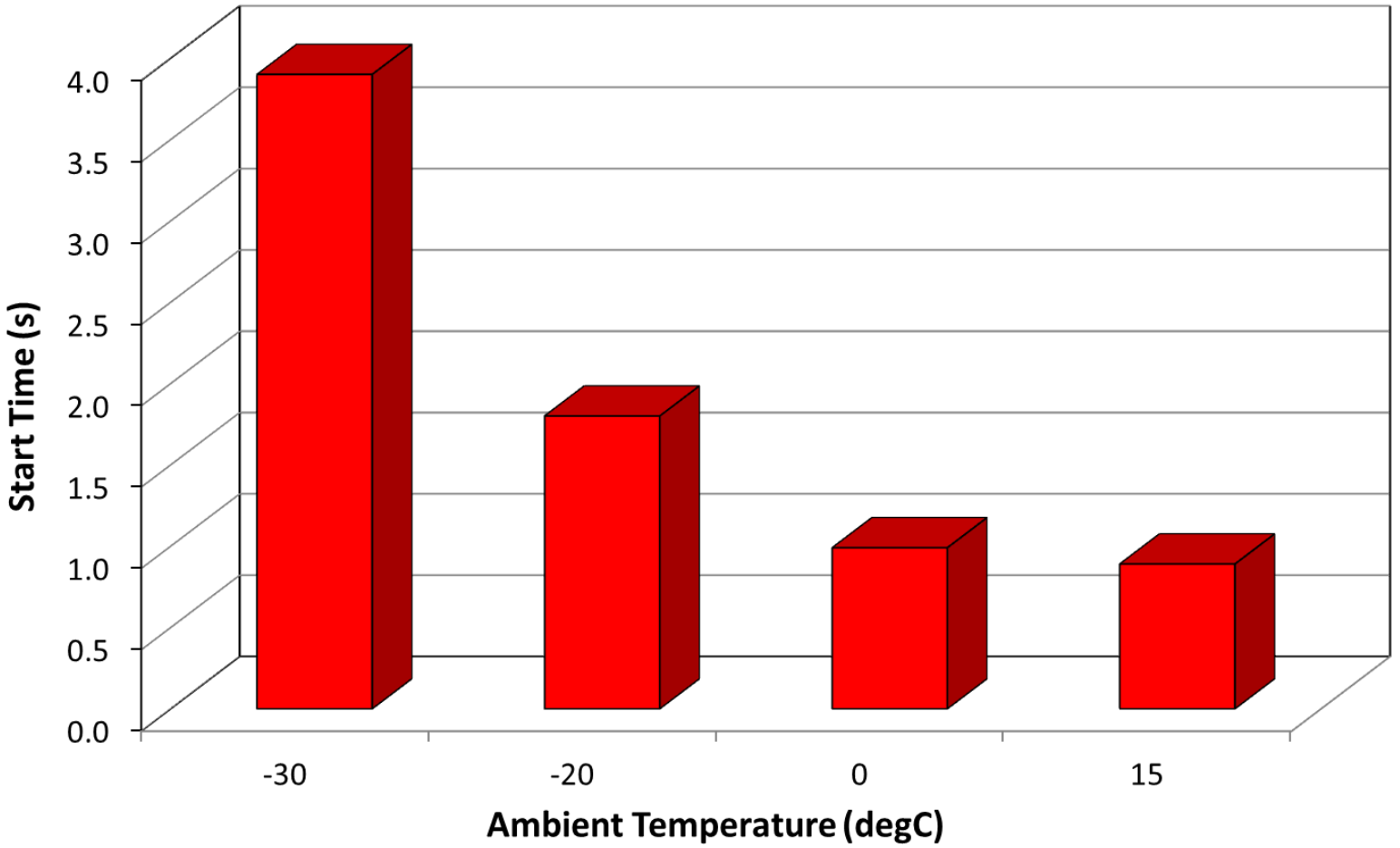
BATTERYLESS COLD START AT -30°C
SINGLE-CYLINDER AIR COOLED 2-STROKE

-30°C Cold Start – no internal / external heating, FlexDI JP5 Fuel



AMBIENT START SUMMARY
SINGLE-CYLINDER AIR COOLED 2-STROKE

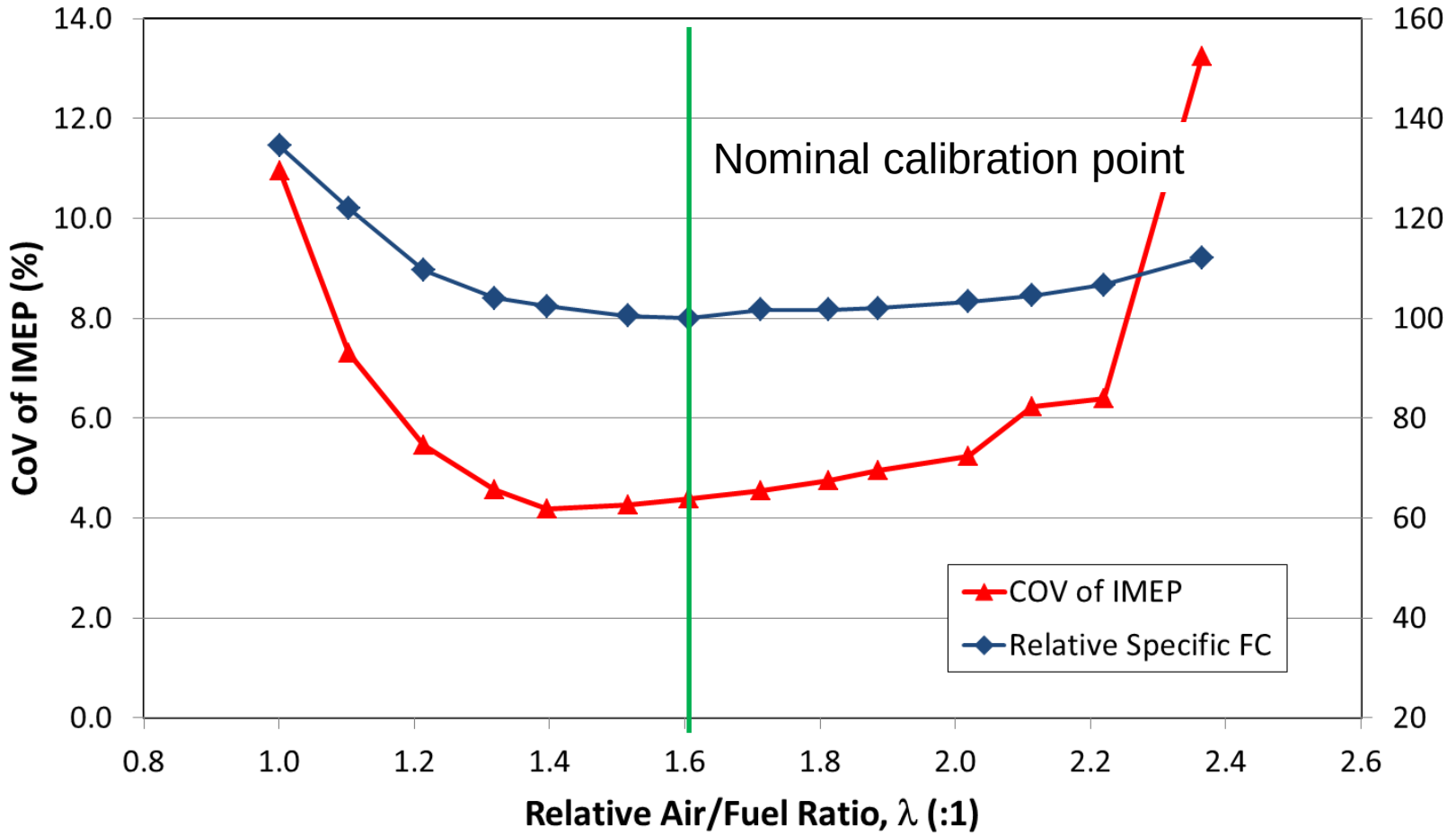
Ambient Cold Start – no internal / external heating, FlexDI JP5 Fuel



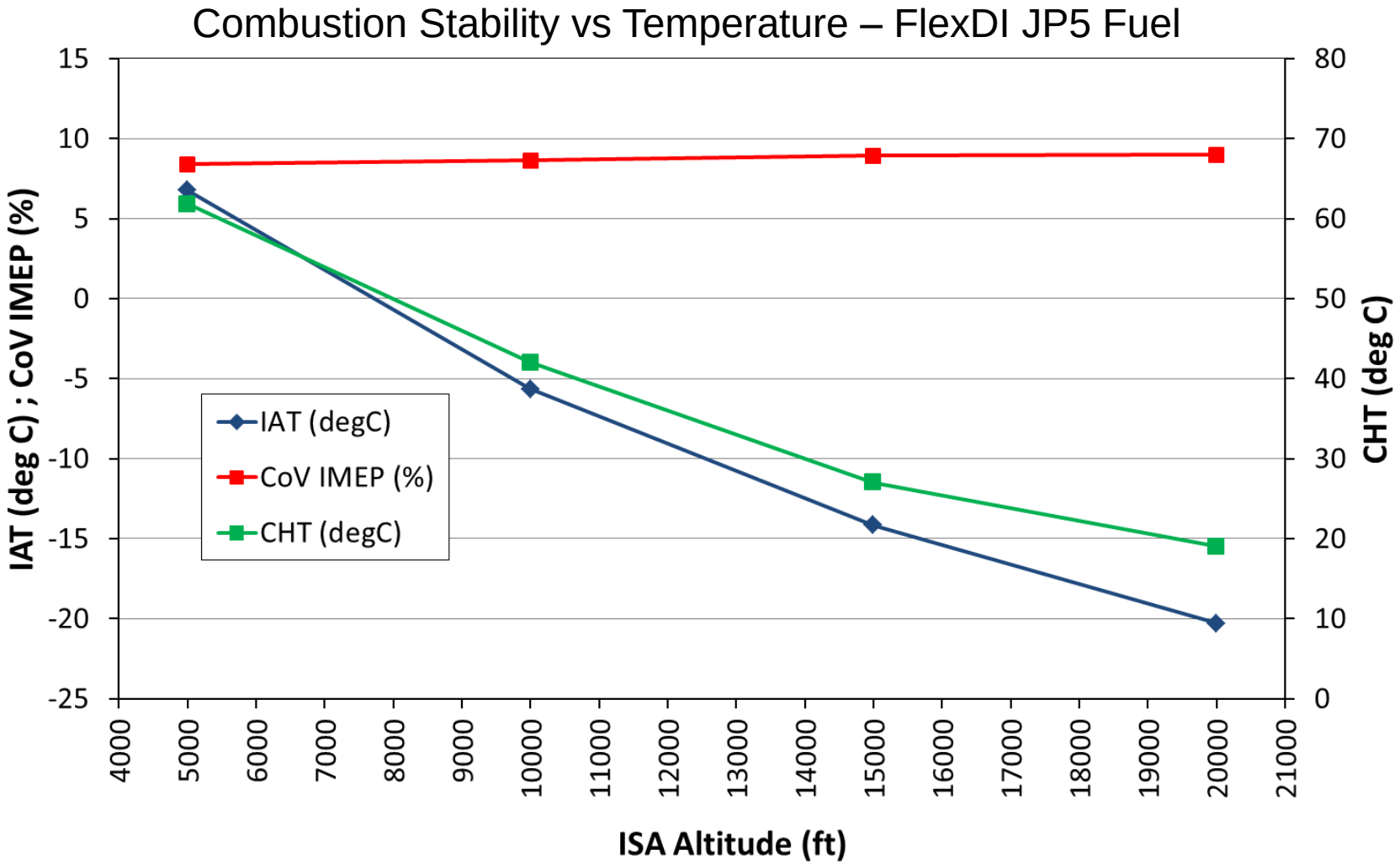
ENGINE ROBUSTNESS

TYPICAL LOITER POWER

Combustion Stability & Specific Fuel Consumption vs AFR – FlexDI JP5 Fuel



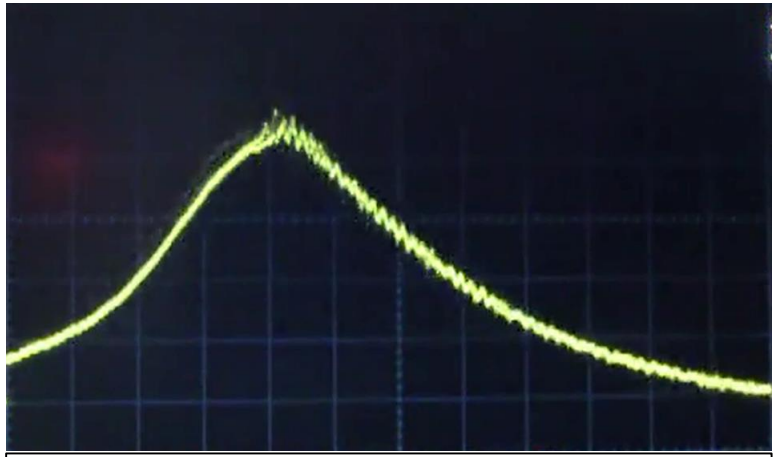
ENGINE ROBUSTNESS
IDLE (3000RPM)



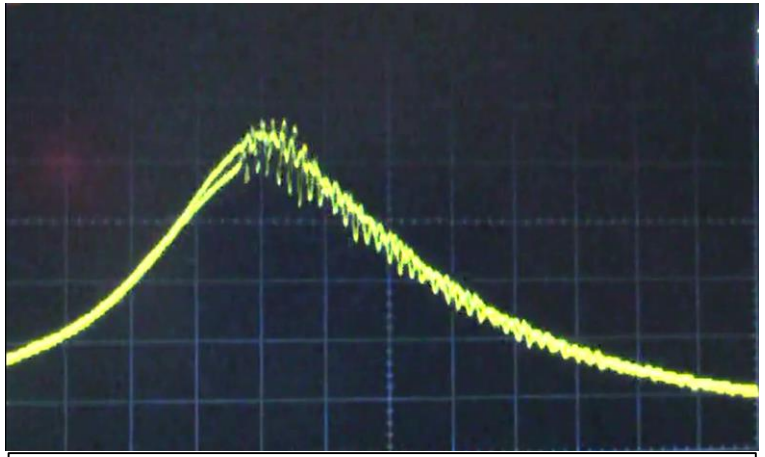
COMBUSTION KNOCK ROBUSTNESS
HIGH AMBIENT TEMPERATURE CONDITIONS

- Knock effectively controlled with direct injection via:
  - ☑ Charge cooling (fuel vaporization in-cylinder cools charge)
  - ☑ Reduced residence time (delayed injection timing)

In-cylinder pressure measurement, air cooled 2-stroke: FlexDI JP5 Fuel



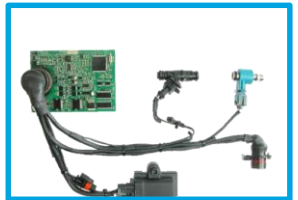
Maximum power (6500rpm/WOT)
Intake and cooling air temperature: 19ºC
Cylinder Head Temperature: 150ºC



Maximum power (6500rpm/WOT)
Intake and cooling air temperature: 56°C
Cylinder Head Temperature: 180°C

ENGINE MANAGEMENT SYSTEMS & COMPONENTS

- **ORBITAL UAVE** develops and supplies components and engine management systems specific to UAV requirements:
  - Complete Engine Management Systems
  - Ignition Coils
  - Wiring Harnesses
  - Electronic Control Units
  - Diagnostic Units
  - Temperature Sensors
  - Fuel Pumps
  - Servo Motors

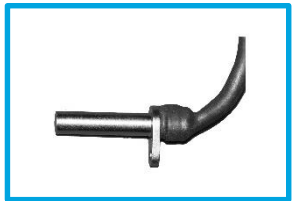

Complete Engine Management Systems

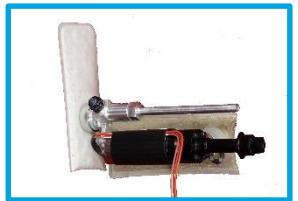

Ignition Coils

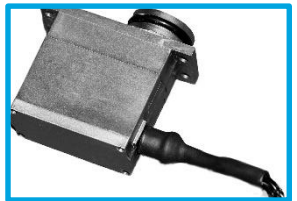

Wiring Harnesses


Electronic Control Units


Diagnostic Units


Temperature Sensors

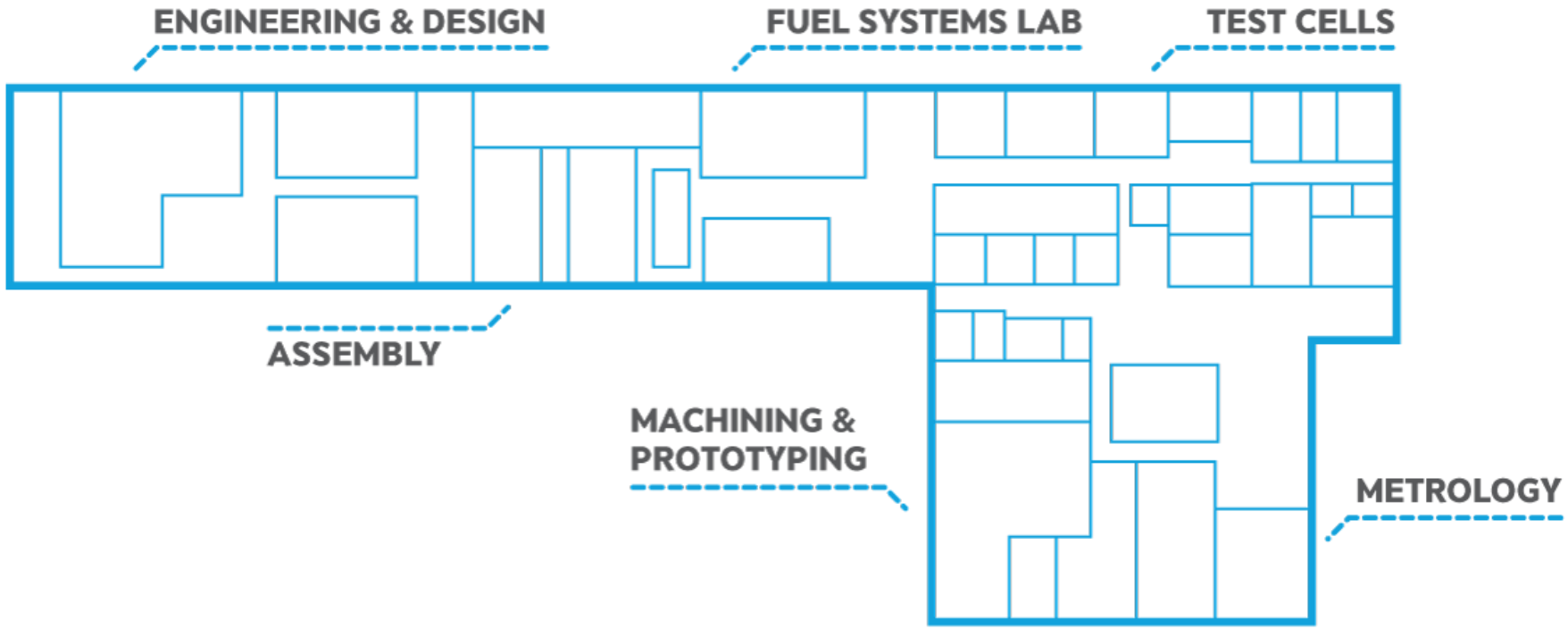

Fuel Pumps


Servo Motors


Power System Units

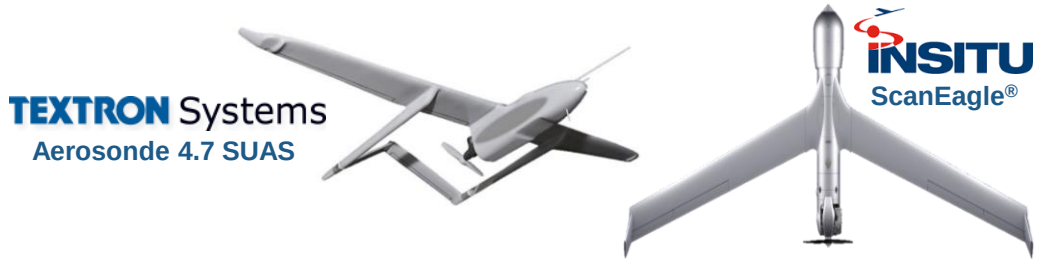
SERVICING AND REFURBISHMENT

- **ORBITAL UAVE** operates the world's best Small UAV engine development and testing centre in Perth, Western Australia, enabling it to offer leading manufacturing, after sales service, repairs and refurbishments to maximise the long-term performance of **ORBITAL UAVE** propulsion systems.



EXPERIENCE

- **ORBITAL UAVE** has over 11 years of experience as the global leader in spark ignited heavy fuel propulsion systems



2002	2004	2006	2008	2010	2012	2014	2016
• Initial R&D development	• Barrus (50Hp diesel-kero-gasoline) • Publication of technical capability papers	• Mercury JP Optimax Released	• Polaris 4S MV800 (JP8/Gasoline)	• Various UAV customers	• Internal R&D funded engine design	• **Gen 1** SUAS Engine Production begins	• **Gen 2** SUAS Engine Production development and Supply underway

CUSTOMER REQUIREMENTS

1 Customer Requirements

2 Concept Design

3 Detailed Design

4 Proto-typing & Sourcing

5 Testing & Validation

6 Manufacturing

7 After Sales Service & Support

- **ORBITAL UAVE** works with customers to ensure that projects stay on time, on budget and exceed client expectations
- **ORBITAL UAVE**'s 28 qualified engineers and 18 technicians average over 20 years of experience in engine design and development
- **ORBITAL UAVE** can support our customers globally, working across multiple time zones with state of the art communications and data transfer
- **ORBITAL UAVE**'s embedded quality management systems provide assurance that our products meet our customers' expectations

CONCEPT DESIGN

1 Customer Requirements

2 Concept Design

3 Detailed Design

4 Proto-typing & Sourcing

5 Testing & Validation

6 Manufacturing

7 After Sales Service & Support

ORBITAL UAVE Concept Design

- Determine best engine geometry
- 3D design concepts
- Computational analysis of critical engine performance characteristics
- Performance analysis – System application
- Concept Bill of Materials

Concept Design Criteria:

Maximum Torque/Speed	*Temperature & Altitude*	*Exhaust Temperature*	*Extreme Environmental*	*Mass*	*Displacement*	*Maximum Speed/Power*
Package Restrictions	*Maximum Speed*	*Idle Speed*	*Fuel Type*	*Number of Cylinders*	*Compression Ratio*	*Exhaust Noise*
		Bore & Stroke	*Durability, TBO Requirements*	*Electrical Power Requirements*		

DETAILED DESIGN

1 Customer Requirements

2 Concept Design

3 Detailed Design

4 Proto-typing & Sourcing

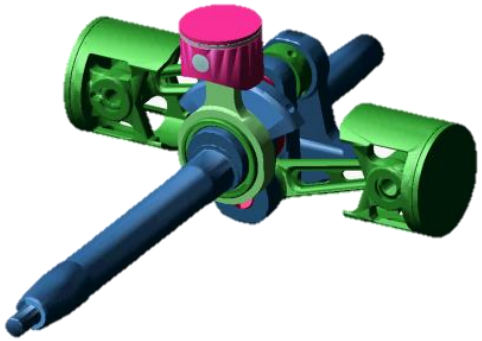
5 Testing & Validation

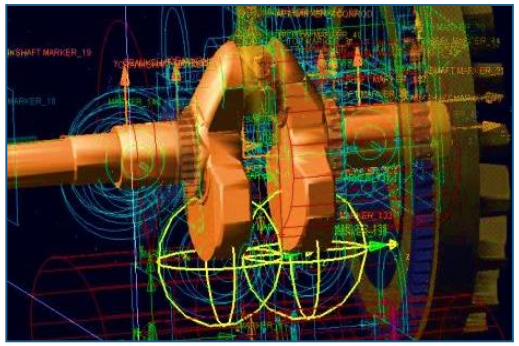
6 Manufacturing

7 After Sales Service & Support

ORBITAL UAVE Detailed Design Capabilities

- Detailed 3D CAD Modelling
- System Analysis/Design
- Performance analysis
- FEA (Finite Elements)
- MBD (Multi Body Dynamics)
- FMEA (Failure Mode Effects Analysis)
- DFMA (Design for Manufacture and Assembly)
- Production intent Bill of Materials
- Software Capabilities include:
- CAD: NX, CREO (Formally Pro-Eng), Solidworks
- Computational Fluid Dynamics: STAR CCMT
- Gas Dynamics & Valve Train Analysis: GT-POWER
- Explicit Dynamics (LS-DYNA)
- FEA: ANSYS
- MBD: ADAMS





PROTO-TYPING

1 Customer Requirements

2 Concept Design

3 Detailed Design

4 Proto-typing

5 Testing & Validation

6 Manufacturing

7 After Sales Service & Support

ORBITAL UAVE Proto-typing & Sourcing

- Component and Systems documentation and specifications
- Prototype drawings
- Prototype Manufacture
- In-house
- Rapid prototype
- World-wide mature component supply base

TESTING & VALIDATION FACILITIES

1 Customer Requirements

2 Concept Design

3 Detailed Design

4 Proto-typing & Sourcing

5 Testing & Validation

6 Manufacturing

7 After Sales Service & Support

ORBITAL UAVE Testing & Validation

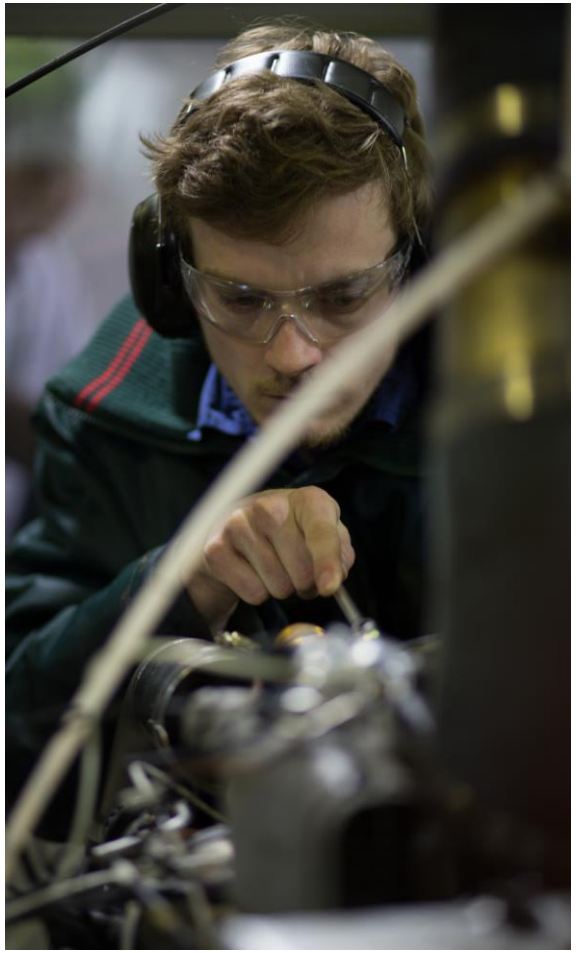
Orbital operate leading UAV engine testing, development and validation facilities, including:

Development test facilities

- Propeller test stands
- Dynamometer test cells
- Extreme Environmental test cells
- Semi-Anechoic test cell for noise optimisation

Validation Facilities

- Dyno and propeller test stands
- Automated end of line run in propeller test & inspection stands
- Automated power assessment sign off propeller test stands
- Automated validation testing (FAR 33.49 and others)
- Cold start/operation facilities
- Sub-assembly test stands



MANUFACTURING

1 Customer Requirements

2 Concept Design

3 Detailed Design

4 Proto-typing & Sourcing

5 Testing & Validation

6 Manufacturing

7 After Sales Service & Support

ORBITAL UAVE In-House Manufacturing:

- Metrology lab for quality control covering all incoming and machined parts
- Automotive and Aircraft level quality systems
- In-house computer controlled machining capability
- End of line engine run-in and performance qualification
- Extensive traceability, recording and reporting capabilities
- Qualified component supplier network in place

ORBITAL UAVE Dedicated Assembly Lines

- **ORBITAL UAVE** operates high quality, low volume, dedicated UAV engine assembly and qualification test lines
  - ISO 9001 quality accreditation for engine manufacture
  - Employing lean manufacturing
  - Extensive sub-assembly and final assembly EOL qualification testing
  - Complete propulsion system acceptance testing for delivering a validated product to our customers

AFTER SALES SERVICE & SUPPORT

1 Customer Requirements

2 Concept Design

3 Detailed Design

4 Proto-typing & Sourcing

5 Testing & Validation

6 Manufacturing

7 After Sales Service & Support

ORBITAL UAVE After Sales Service & Support

- Ensuring our customers get the most from **ORBITAL UAVE** products
- Ongoing technical support
- Global communication
- Engine refurbishment, repairs and rebuilds

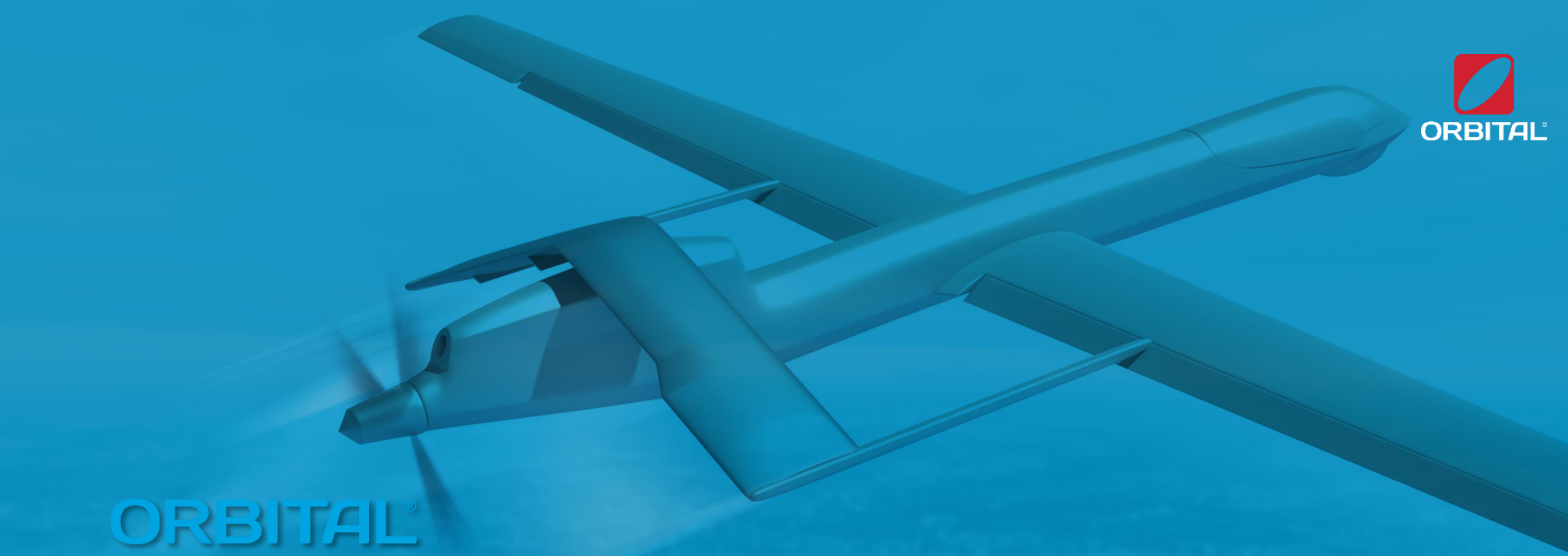
SUMMARY

- **ORBITAL UAVE** has over 11 years' experience as the global leader in spark ignited heavy fuel propulsion systems for Small UAVs.
- **ORBITAL UAVE's** expertise and success in the Small UAV class can be leveraged to seamlessly and rapidly deliver propulsion systems for other UAV classes.
- **ORBITAL UAVE's** propulsion systems, associated proprietary componentry and patented technology are applicable across all rotary, piston and size classes.
- **ORBITAL UAVE** operates the world's best Small UAV engine development and testing centre, enabling it to offer leading manufacturing, after sales service, repairs and refurbishments to maximise the long-term performance of **ORBITAL UAVE** propulsion systems.

CLIENT ENDORSEMENT

"Insitu is proud to partner with **ORBITAL UAVE** to bring our customers increased mission reliability and capability with more affordable life cycle costs. **ORBITAL UAVE** is the leading small unmanned aircraft vehicle reciprocating internal combustion engine supplier in the industry, and the ORBITAL designed engine sets a new standard for unmanned aircraft propulsion".

Ryan M. Hartman, President and CEO, Insitu Inc., a subsidiary of The Boeing Company



ORBITAL

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UAV

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