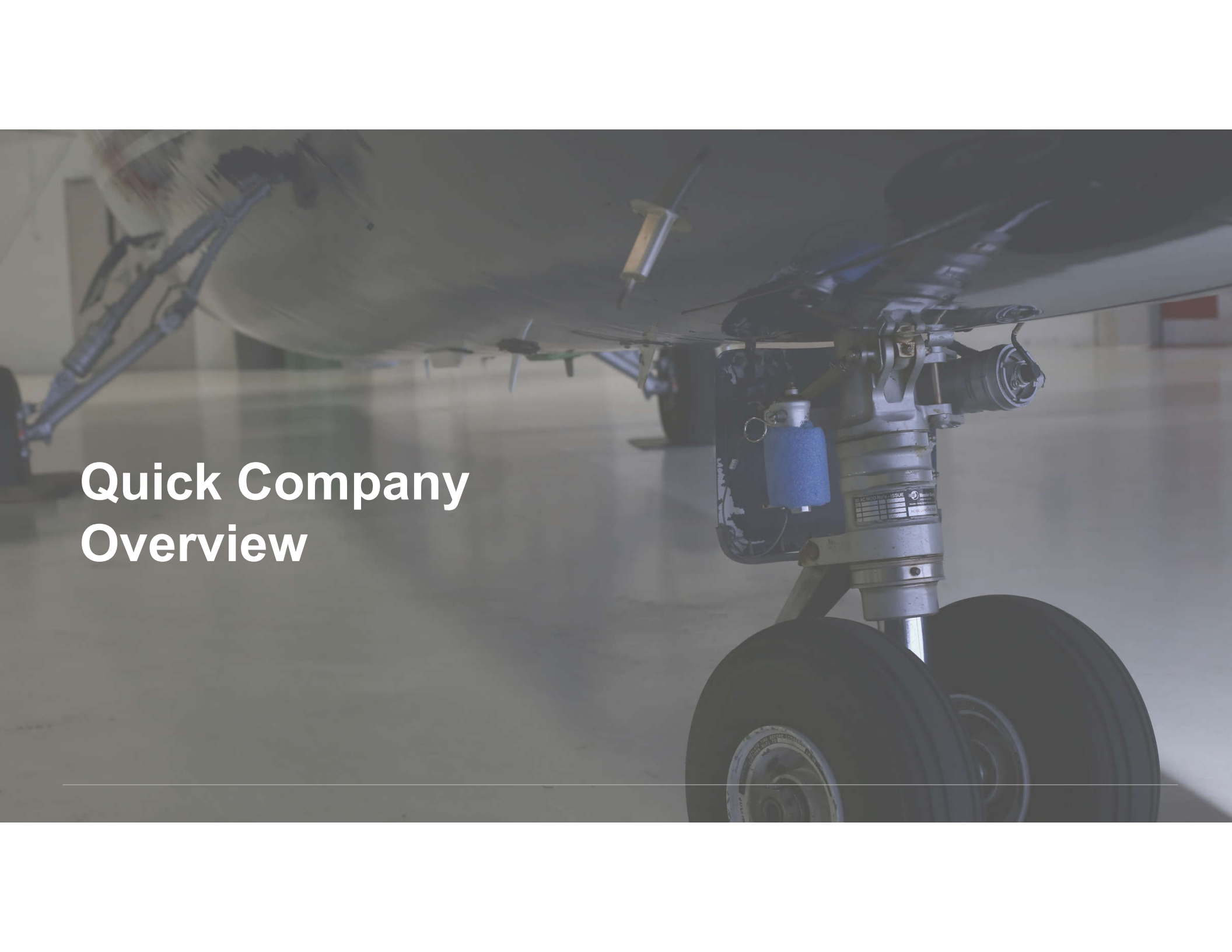


# Airfoil Performance Monitor (APM) Brief

- IASS 2020



The material contained in this document is provided in confidence, for the sole purpose of the evaluation of an investment in Certification Centre Canada through the Flight Test Centre of Excellence or part thereof by recipient. Distribution is restricted to individuals performing such an evaluation, and distribution to other personnel requires the express written consent from Certification Centre Canada.



# Quick Company Overview

---

# Marinvent Background



Privately-held Canadian Corp.

Organically funded business since 1983



Two distinct revenue streams serving two different sets of customers

Research and Development, IP generation and IP exploitation

Certification-related services of all kinds.



Stellar track record of success (Many awards)

+50 successful certification programs with TCCA and FAA

CGP and AS9100



# Management Team



**DR. JOHN MARIS**

President & Owner



**MR. PHIL COLE**

Vice President Business  
Development



**MR. SAM GRAINGER**

Vice President Operations

# Awards

## **Canadian American Business Achievement Award**

Awarded for leading a joint enterprise demonstrating strong business growth, remarkable innovation, noteworthy contributions to local communities and the capacity to provide their partners with a global advantage

## **Canadian Aeronautics & Space Institute: Trans Canada (McKee) Trophy**

Canada's oldest and most prestigious aeronautical trophy awarded to Marinvent for the Canadian whose achievements were most outstanding in promoting aviation in Canada

## **Aviation Week & Space Technology Laureate**

Awarded for "...helping to transition from paper in the cockpit to a digital flight deck."

## **Canadian Business Aviation Association Industry Award**

Outstanding contribution to aviation

## **Aerospace Association of Quebec (AQA) Prix de l'Entreprise**

Aerospace company of the year

## **Canadian Business Aviation Association Industry Award**

Awarded for the safety gains achieved through human factors enhancements, systems engineering and flight test services.

## **Create the Future Award**

APM product winner

## **New Zealand Ministry of Defense Award of Excellence to Industry**

Marinvent singled out as one of the two most valuable contractors from a pool of more than 800 contractors for contributions to C-130 LEP and P-3K capital programs

## **AIAC James C Floyd Award**

Aerospace company of the year

## **C2-MTL Annual Aerospace Award**

Marinvent's work on unmanned aerial systems flight test and evaluation with its Piaggio Avanti project singled out as aerospace innovation of the year

## **NASA**

Small Business Subcontractor of the Year (TASAR)

## **NASA**

LaRC 2014 Group Achievement Award

## **Canadian Defense Executive of the Year**

Dr. John Maris

## **Canadian Aviation Hall of Fame**

Dr. Maris Inducted

## **Canadian Defense Review**

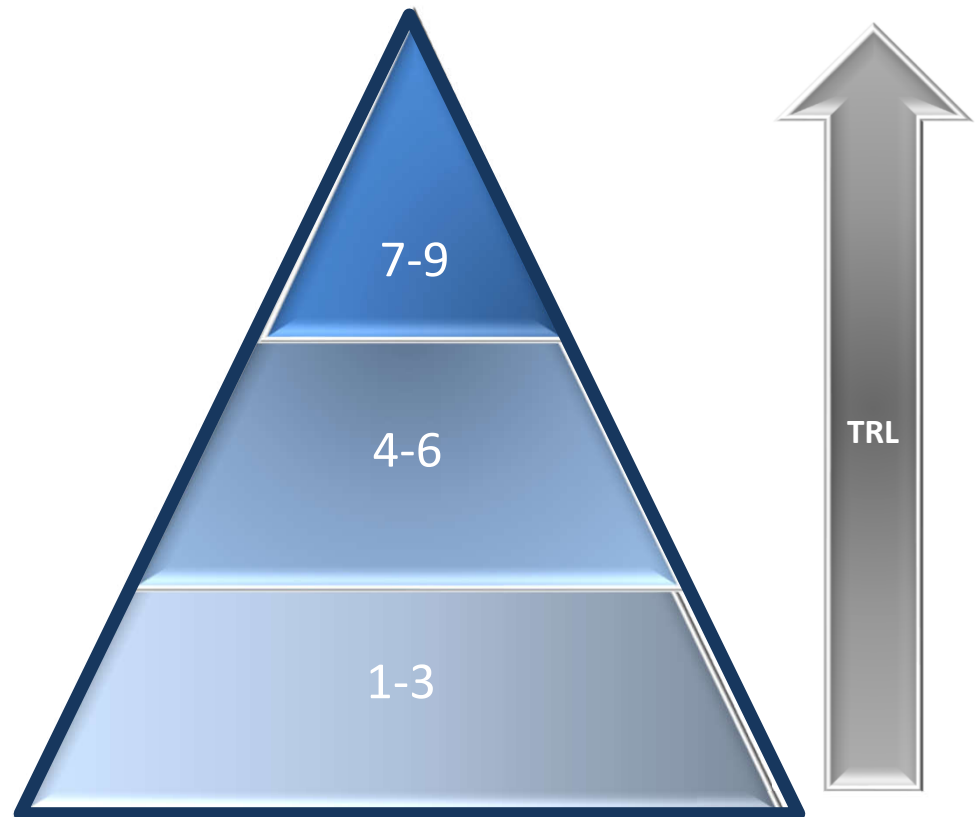
Canadian Top 50 Defense Companies 2015 - 2020

# Marinvent IP R&D Strategy

Market Pull Investment

Marinvent Investment

Collaborative Investment



# Marinvent Existing IP – Bell Relevance

Existing IP	Applicability	
Synthesis™ - tools for planning, optimization and management of certification and compliance programs	All programs	
APM – Airfoil Performance Monitor	Fixed wing, rotary wing and UAS programs	Focus for Today
DNLD – Dynamic Non-Linear Display	Display products	
Reticle – Tactical Displays	ISR products	
Sensor Fusion – Sensor Arrays	Target detection and tracking products	
Early stage R&D	Applicability	
Distributed Simulation Network	HLA-Based integration of simulated and real vehicles remotely	
Low cost software FMS	Primarily for UAS applications	
Prototype sense and avoid algorithms	UAS and AAM Applications	Focus for UAS/AAM
Route Optimization and Planning Algorithms	AAM Applications	

A detailed photograph of an aircraft's landing gear assembly, specifically the main gear. The image shows the complex mechanical structure of the gear, including the shock absorber, struts, and the dual-wheel configuration. The aircraft's fuselage and wing are visible in the background, providing context for the landing gear's location. The text "APM Overview" is overlaid on the left side of the image.

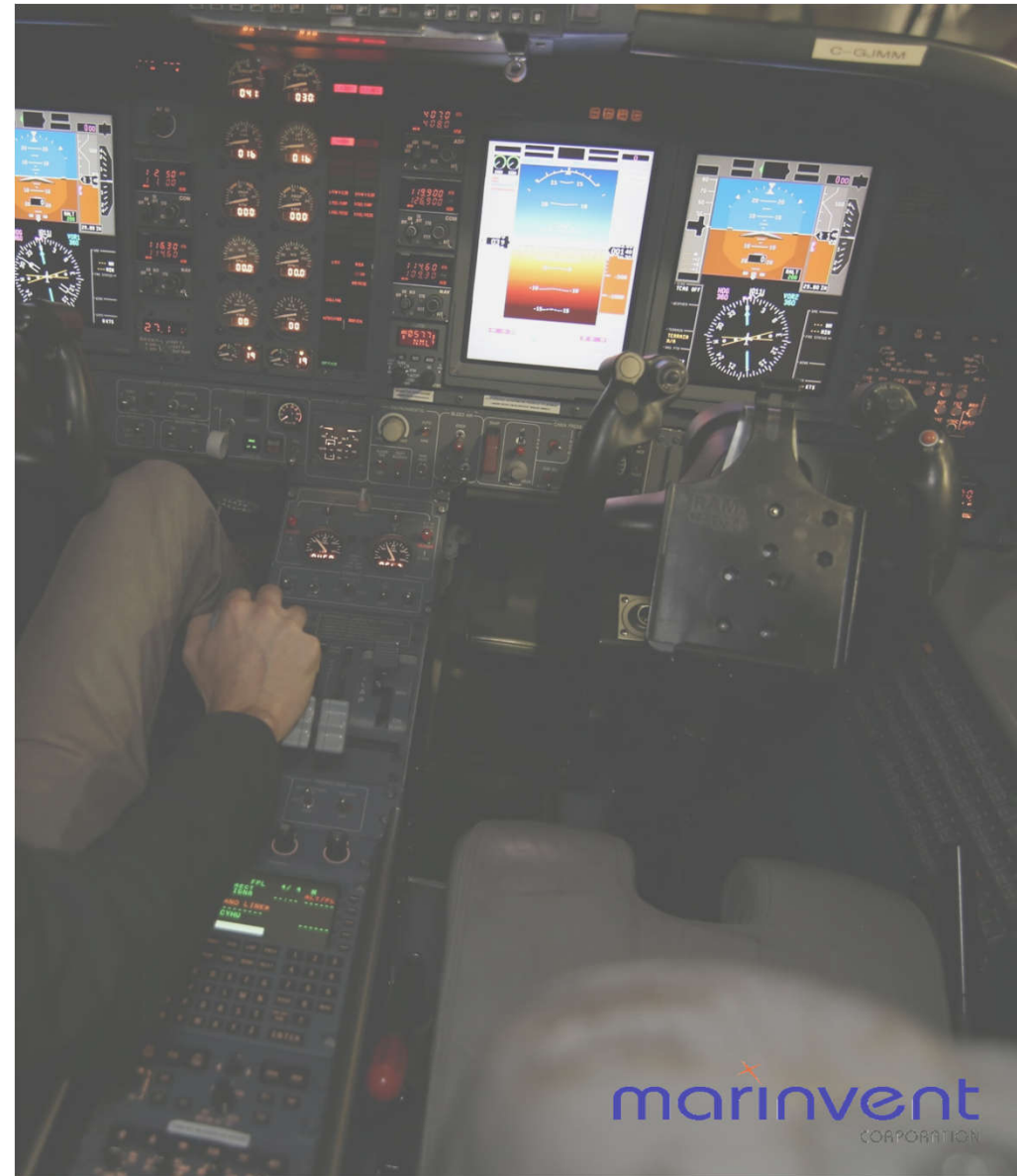
# APM Overview

---



# Airfoil Performance Monitor (APM)

- Worldwide Patented Technology, wholly Canadian
- Provides realtime margin to stall for any airfoil under any conditions and throughout the flight envelope
- Eliminates UAS loss as a result of icing or other airfoil contamination
- Works for wings and tails (including v-tails)
- Works with existing de-icing systems to reduce power consumption and use (extends range and payload)
- Already being tested on UAS from major vendor
- Potential to significantly improve mission survivability in all climates
- Already delivered in both manned and unmaned projects
- Particularly pertinent to Canadian DND (RPAS, RCN-ISTAR, AAM & complex aerodynamics applications)
- Very high CCV



marinvent  
CORPORATION



## What is APM

- Existing Angle-Of-Attack (AOA) and ice detector technologies allow numerous aircraft accidents due to iced or contaminated airfoils
  - Marinvent's Patented APM is an airflow monitoring technology that accurately assesses the “stress” on an airfoil at the airfoil surface itself by measuring the airflow turbulence intensity, which directly correlates to the airfoil's proximity to stall.
- 
- The APM system is the only system that measures the state of the airflow over any airfoil surface in all phases of flight and in all weather conditions.
  - APM tells the pilot or avionics systems the margin remaining to the stall for that airfoil even when it is iced, contaminated or degraded.





## APM Features

- APM directly measures aerodynamic performance at the source
  - The lifting surface of the airfoil (wing, tail, etc.)
- Measures airflow turbulence intensity (“R”) resulting from boundary layer tripping / separation
- Provides aircrew, UAS operators, de-icing systems and avionics systems with vital information that is currently not available to them
- Provides margin to stalls that occur for any reason
  - Exceeding stall angle of attack
  - Contamination at leading edge or lifting surface
  - Mach buffet

Contaminated wing stalls at lower AoA than a clean wing



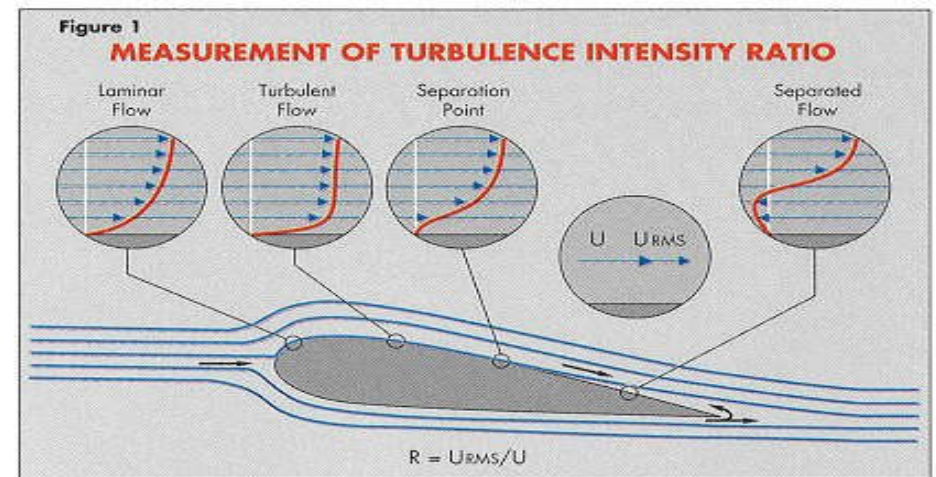
APM allows pilot to see impending stall and effect recovery





## APM Features

- Shows location of stall so pilot can take the appropriate action to recover
  - Allows critical decisions to be made fast that can significantly improve safety & survivability
- Allows the vehicle to be flown in most efficient manner at all times and under all contamination / weather conditions
  - By “flying close to R”
- Allows for optimization of use of anti-ice and de-icing systems
  - Use only when actually necessary
  - Clear indication of when ice has been removed

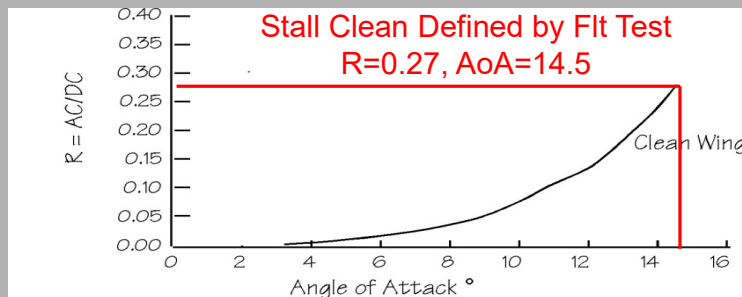




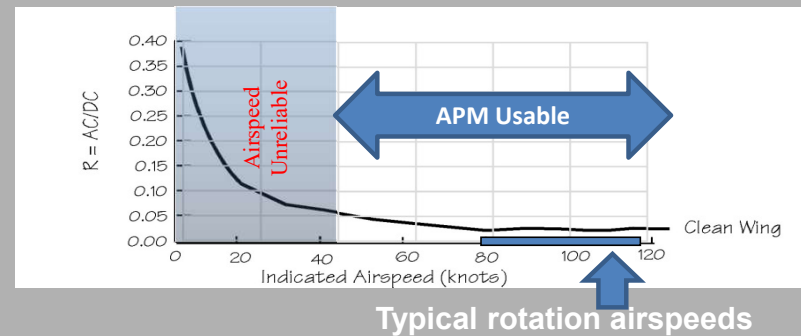
# APM Benefits

- APM provides critical, real time, information to allow aircrew and UAS operators to make the best stall recovery decisions and to avoid accidents:
  - Advanced warning of impending stall conditions
  - Useful information about the actual contamination conditions at the airfoil surfaces
- Leads directly to increased safety & survivability in all weather conditions and throughout the flight envelope
  - Has the potential to almost eliminate these types of accidents/losses by providing significantly earlier warning

## In Flight



## On Ground

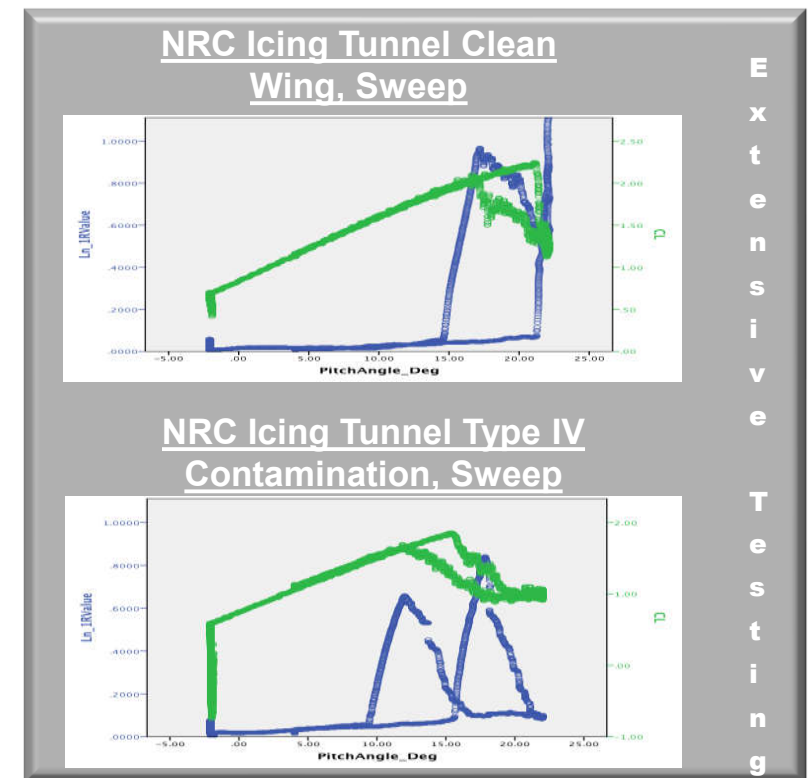


**Works throughout the flight envelope**



# APM Recent Results & Applicability

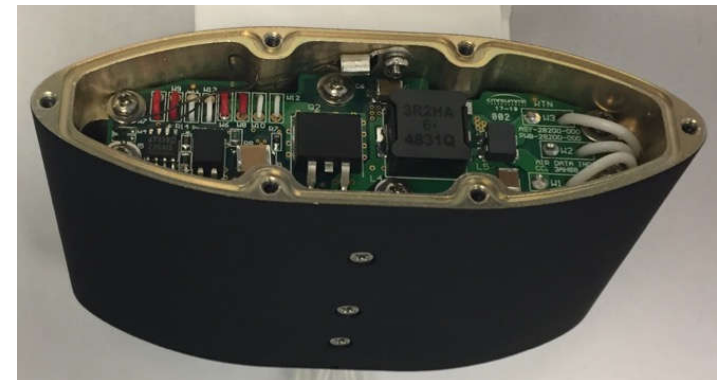
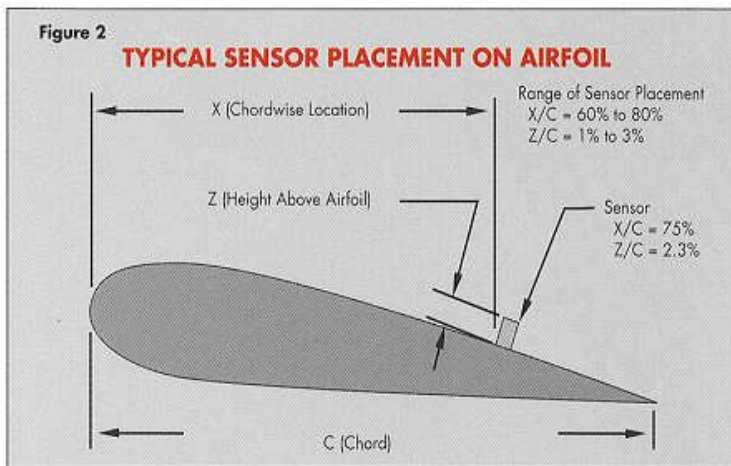
- NRC-BCIP Program (Now Completed)
  - Wind Tunnel and Flight Tests
- Most Recent Icing Wind Tunnel Tests on MALE UAS
- Flight Tests on that UAS due imminently
- What have we discovered so far re: use with de-icing system
- Applicability to:
  - RPAS
  - RCN ISTAR and any other CAF UAS platform
  - All RCAF platforms
  - All unmanned platforms
- Uses:
  - Extended safe use in adverse weather
  - Extended range and payload
  - Maintenance and fuel use optimization
  - Realtime R measurement for complex aerodynamic shapes on all air vehicles





# APM Availability

- Several different versions available, depending on use case
  - Wired/Wireless
  - Heated/Unheated
  - Including Accelerometer/No Accelerometer
  - Certified/Testing only
  - Range of sizes (depends on airfoil type)
  - Integrates with avionics/Own display



Video





50 Rabastalière est, suite 23, Saint-Bruno QC  
J3V 2A5, CANADA,  
Tel: (1) 450-441-6464, Fax: (1) 450-441-2411



## MR. ALISTAIR CHAPMAN

Marketing Director  
Alistair.chapman@marinvent.com



Commercial in confidence. Copyright Marinvent Corporation 2019