



MOIRA INDUSTRIAL MEETING 19-20TH JUNE 2023 | WROCLAW, POLAND

WP3 : Multi-Sensor Diagnostics & Prognostics

QMC VIBRO

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WP3 : Multi-Sensor Diagnostics & Prognostics

WP3 Agenda

13:30-17:00 **INDUSTRIAL SESSION (WP3, SAFRAN)**

13:30-13:45 [prof. Mohamad El Badaui | Safran] **Company presentation Safran company**

13:45-14:30 [Dr. Yosra Marnissi | Safran] **Health monitoring of aeronautical equipment (bearings, gears)**

14:30-14:45 *coffee break + networking*

14:45-15:30 [Fadi Karkafi | Safran] **Behaviour and Diagnostics Analysis for Aircraft Engines**

15:30-16:15 [Felix Fu | Cranfield University] **Hybrid Prognostic Methodology for Aircraft Systems**



Outlines

1. **Safran Corporate**
2. **Our core business**
3. **Safran Tech**
4. **Strategic activities**
5. **SPHM team activities**



1

SAFRAN CORPORATE



AN
INTERNATIONAL
HIGH-
TECHNOLOGY
GROUP

**3 CORE
BUSINESSES:**

Aviation
Space
Defense

**WORLD'S No.3
AEROSPACE
COMPANY**

(excluding aircraft
manufacturers)

More than **91,000**
EMPLOYEES in
30 COUNTRIES

€ 20 BILLION in
revenue 2022

€2.5 BILLION
in adjusted recurring
operating income*

€1.4 BILLION
in R&D expenditures,
equal to 8% of revenue*

**850 INITIAL
PATENTS**
filed in 2017

*as of December 31, 2017

SAFRAN: TECHNOLOGY THAT BENEFITS OUR DAILY LIVES



**1 SINGLE-AISLE
COMMERCIAL
JET TAKES OFF**
every **2 SECONDS**,
powered by our
engines**

**MORE THAN
54,000 LANDINGS**
a day using our
equipment



**80+
SUCCESSFUL
ARIANE 5
LAUNCHES**
in a row***



**3,000 MILITARY
AIRCRAFT** fitted
with our inertial
navigation systems



**1 OUT OF EVERY
3 HELICOPTER
TURBINE
ENGINES**
sold worldwide



**OVER 40,000
POWER
TRANSMISSIONS**
totalling over 1 billion
flight-hours



**20,800 NACELLE
COMPONENTS**
in service

**500 KM OF
ELECTRICAL
WIRING**
on an Airbus A380



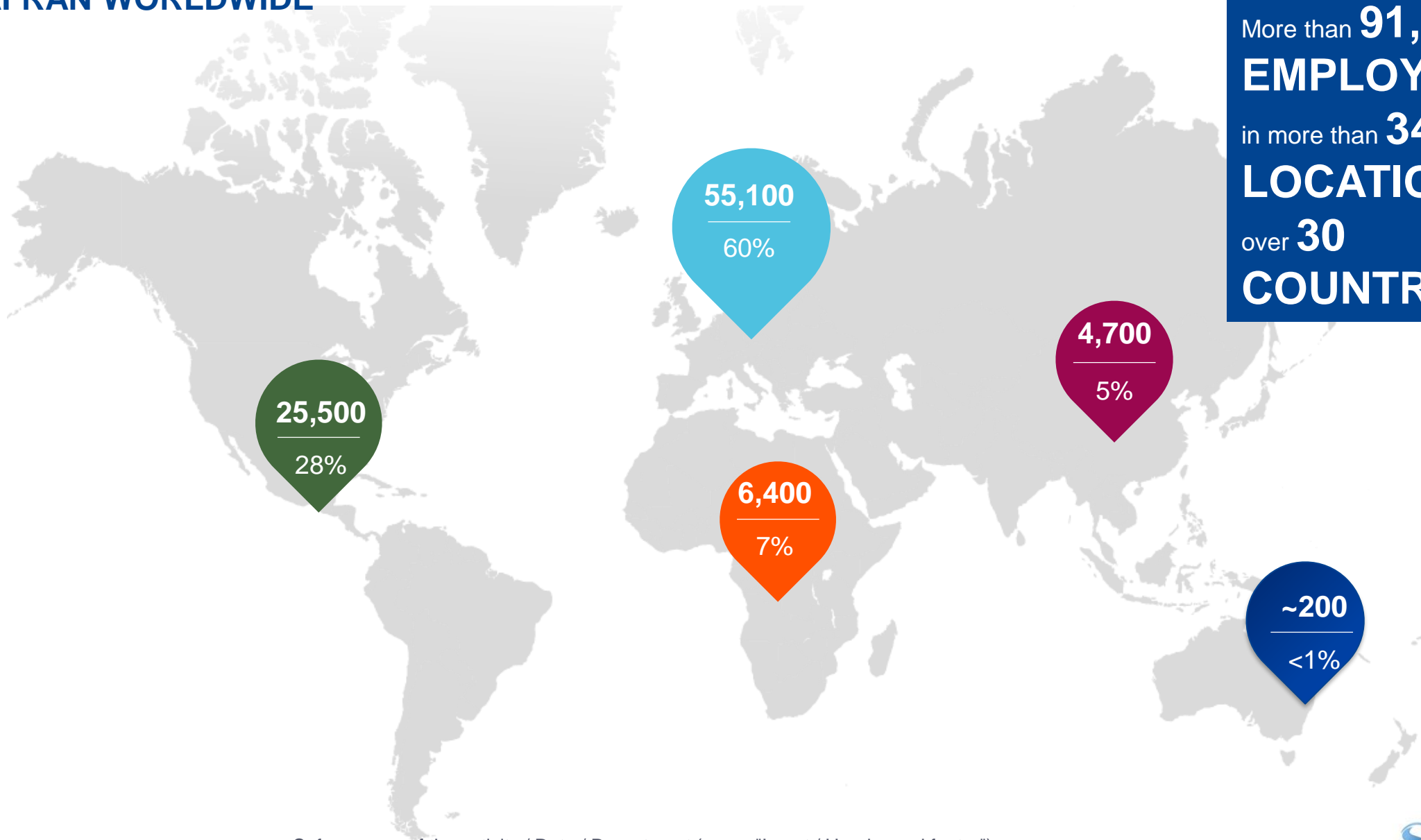
1 MILLION SEATS
in service in airline
fleets worldwide



**in partnership with GE, through CFM International
***in partnership with Airbus, through ArianeGroup

SAFRAN WORLDWIDE

More than **91,000**
EMPLOYEES
in more than **340**
LOCATIONS
over **30**
COUNTRIES



A COMPREHENSIVE RANGE OF AIRCRAFT PROPULSION SYSTEMS AND EQUIPMENT

Cockpit

Control systems
Panel & displays
Seats

Avionics sensors
Aircraft condition monitoring systems

Galleys & equipment

Landing gears
Braking & landing control systems
Wheels and carbon brakes

Lavatories, water & waste

Exterior lighting

Nacelles & components
Power transmission systems

Cabin interiors

Seats
IFEC – In-flight entertainment & connectivity

Flight actuators

Power & data wiring

Oxygen systems

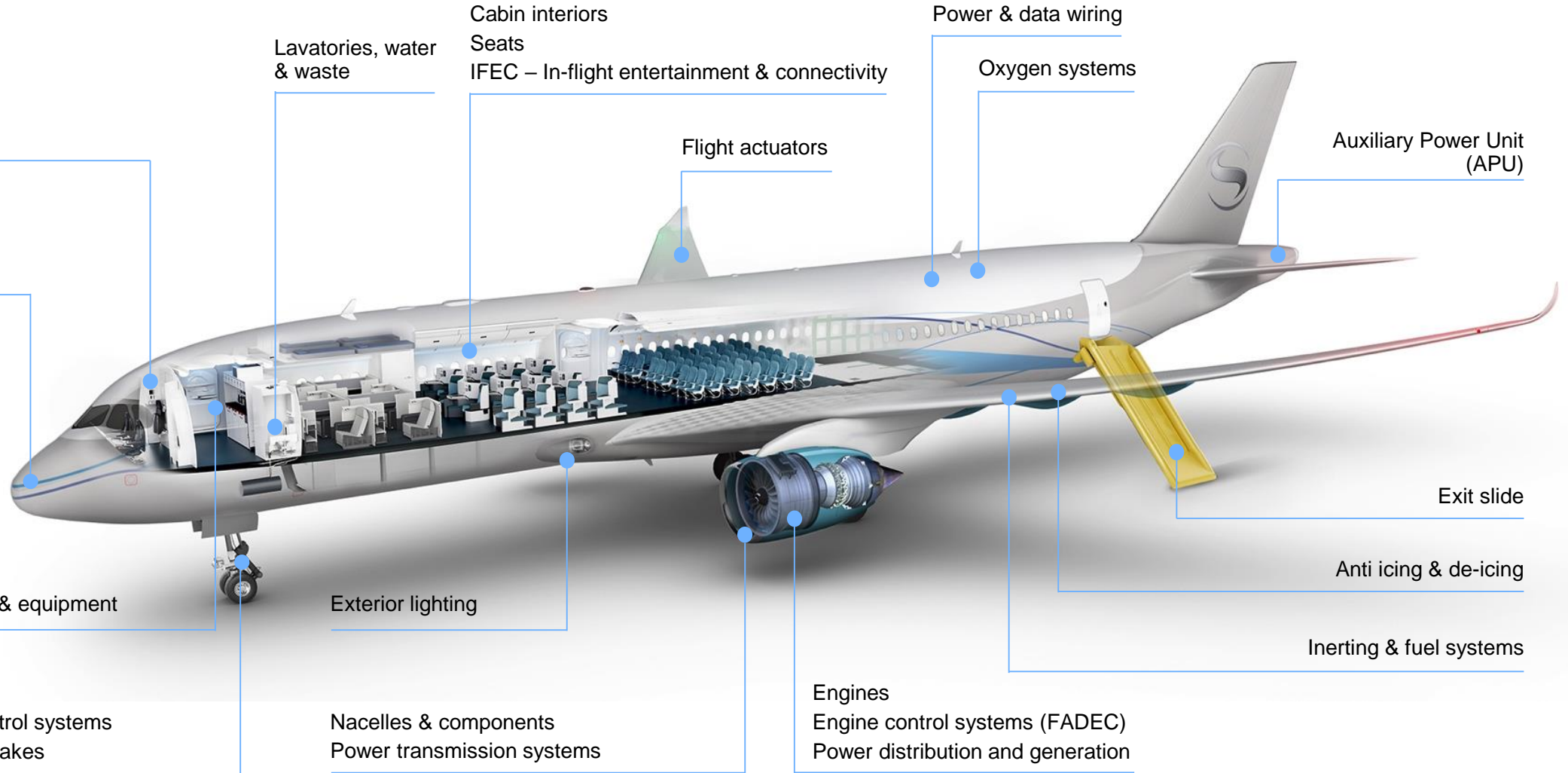
Engines
Engine control systems (FADEC)
Power distribution and generation

Auxiliary Power Unit (APU)

Exit slide

Anti icing & de-icing

Inerting & fuel systems



2

OUR CORE BUSINESS



BOOSTING AIR TRANSPORT PERFORMANCE

ENGINES

Innovative and reliable propulsion solutions for business and commercial airplanes and for helicopters



NACELLES

A complete range of lightweight, aerodynamic nacelles for all types of aircraft



ENGINE EQUIPMENT

- Mechanical power transmissions,
- Engine control units,
- Cooling, lubrication and filtration components and more



LANDING AND BRAKING SYSTEMS

- Design, production and support of landing gear, wheels and carbon brakes
- Complete landing systems for civil and military fixed and rotary-wing aircraft



ENHANCING PROTECTION FOR CITIZENS

MILITARY AIRCRAFT ENGINES

Innovative and reliable propulsion solutions for military aircraft



DRONES

Design and production of tactical drone systems for a wide range of missions: surveillance, intelligence, armed forces protection, threat detection, etc.



AVIONICS

Guidance and positioning solutions for air forces, navies and armies



OPTRONICS

Optronic (electro-optical) systems and equipment for military applications: submarines and surface vessels, combat vehicles, aircraft, etc.



3

SAFRAN TECH



SAFRAN TECH IN FIGURES*

1/4

Of Safran's R&T activities



> 20

nationalities



> 80

Experts, including
12 Distinguished Experts



> 450
employees



150
Invention
Disclosures

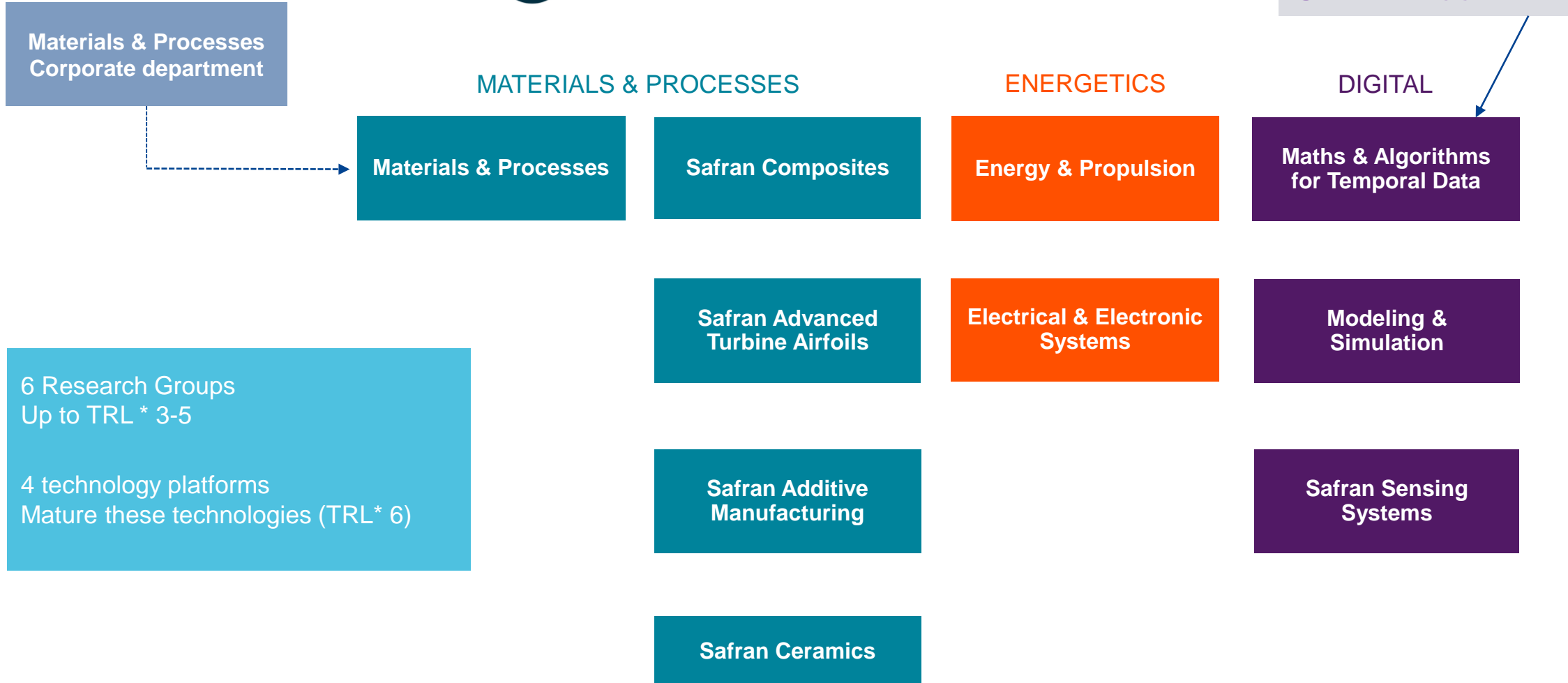
5 Facilities

Saclay, Itteville,
Gennevilliers, Le
Haillan,
Toulouse



65
Doctoral
Theses

SAFRAN TECH, OUR ORGANISATION



5

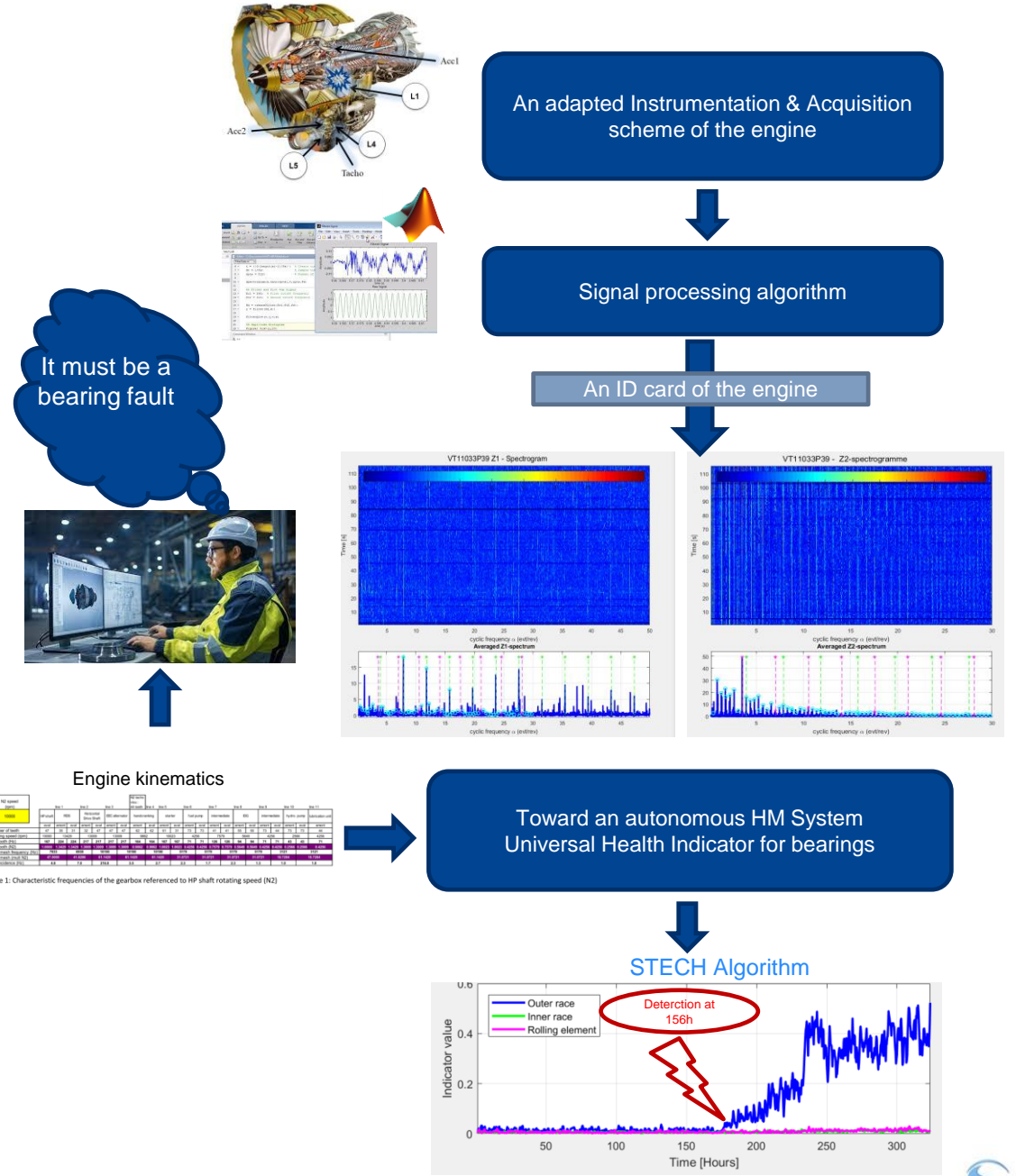
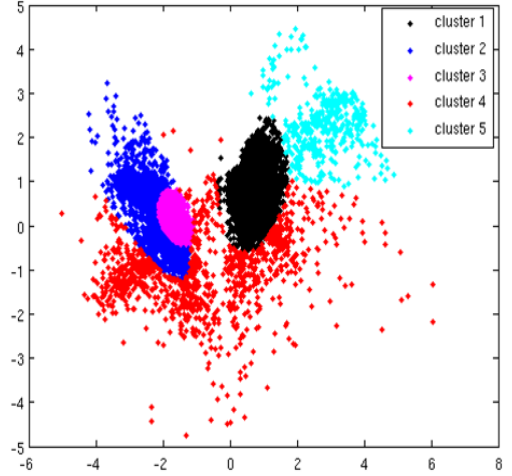
SIGNAL&DATA ANALYSIS TEAM



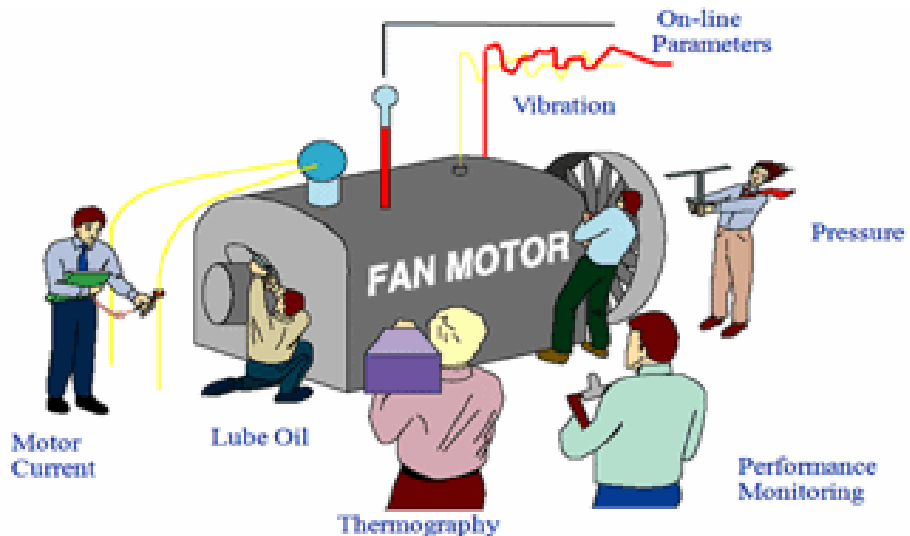
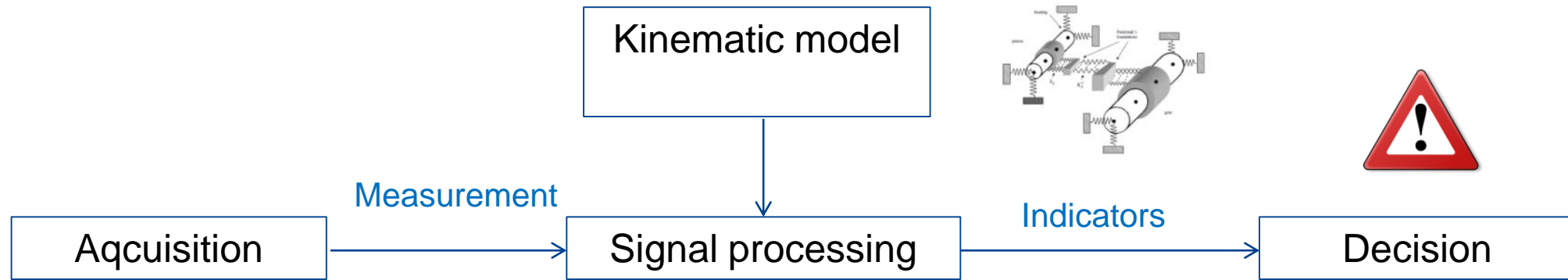
MATD TEAM ACTIVITIES

Signal&Data Analysis

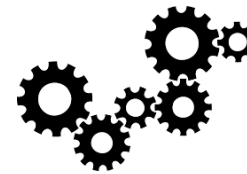
- ◆ Health Monitoring of mechanical equipments
- ◆ Advanced Industry & Operation Data Analysis
- ◆ Digital twin



Signal processing for health monitoring



Bearings



Gearbox



Turbofan



Compressors



**POWERED
BY TRUST**