

Optronics integration and sensor cooling

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www.thalesgroup.com



Thales Group 2025 key figures



85,000
employees



65 countries
A global footprint



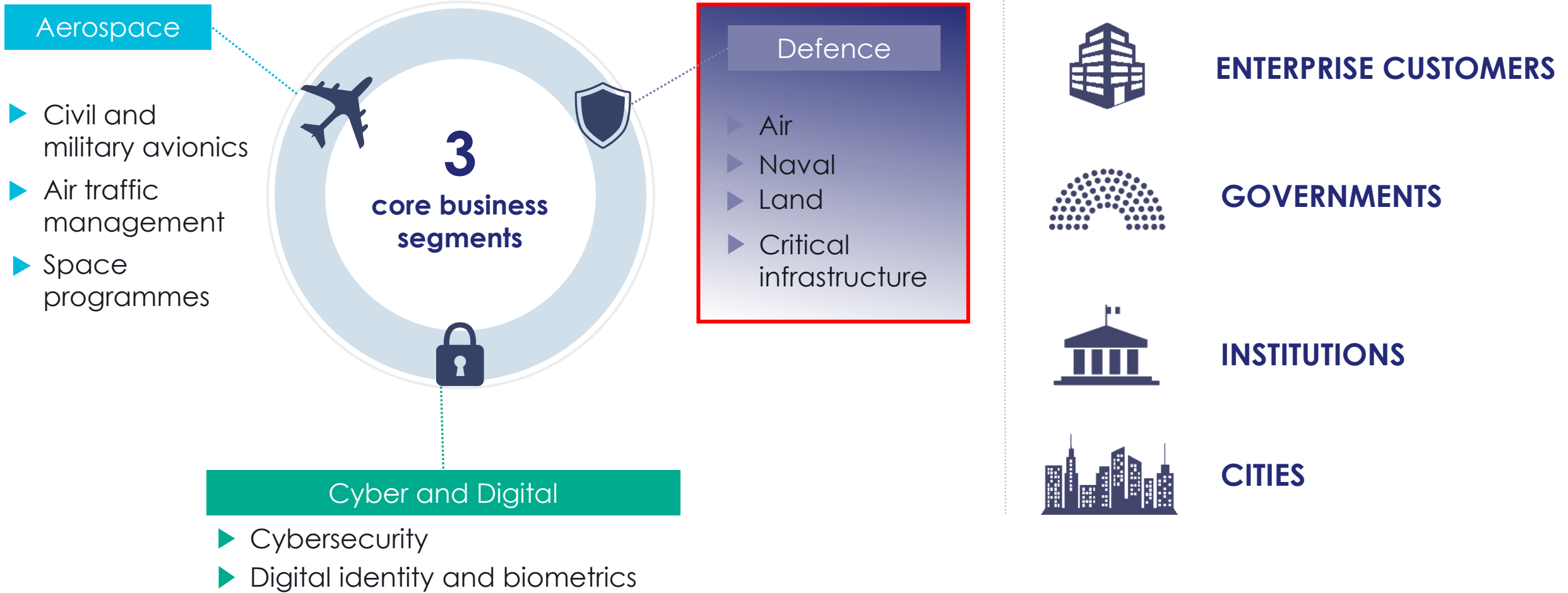
€4.5 bn*
dedicated to R&D
* + €1 bn self-financed



€22.1 bn
revenues



Three core business segments



Defence



50+ countries
rely on Thales
equipment to
protect their
populations and
territorial integrity.

800,000+
Thales tactical radios
in service in **more
than 50 countries**.



Thales systems and
equipment account for
close to **25%** of
the total value of the
Rafale combat aircraft.

Thales is deploying **collaborative combat solutions** to
augment the capabilities of soldiers, vehicles and
sensors in real time.





6 Global Business Units (GBU)

GBUs correspond to the Thales Group's six major strategic areas of business. The GBUs are one of the two major strategic axes in the matrix organization of the Thales Group. The other axis is the Countries.

27 Business Lines (BL)

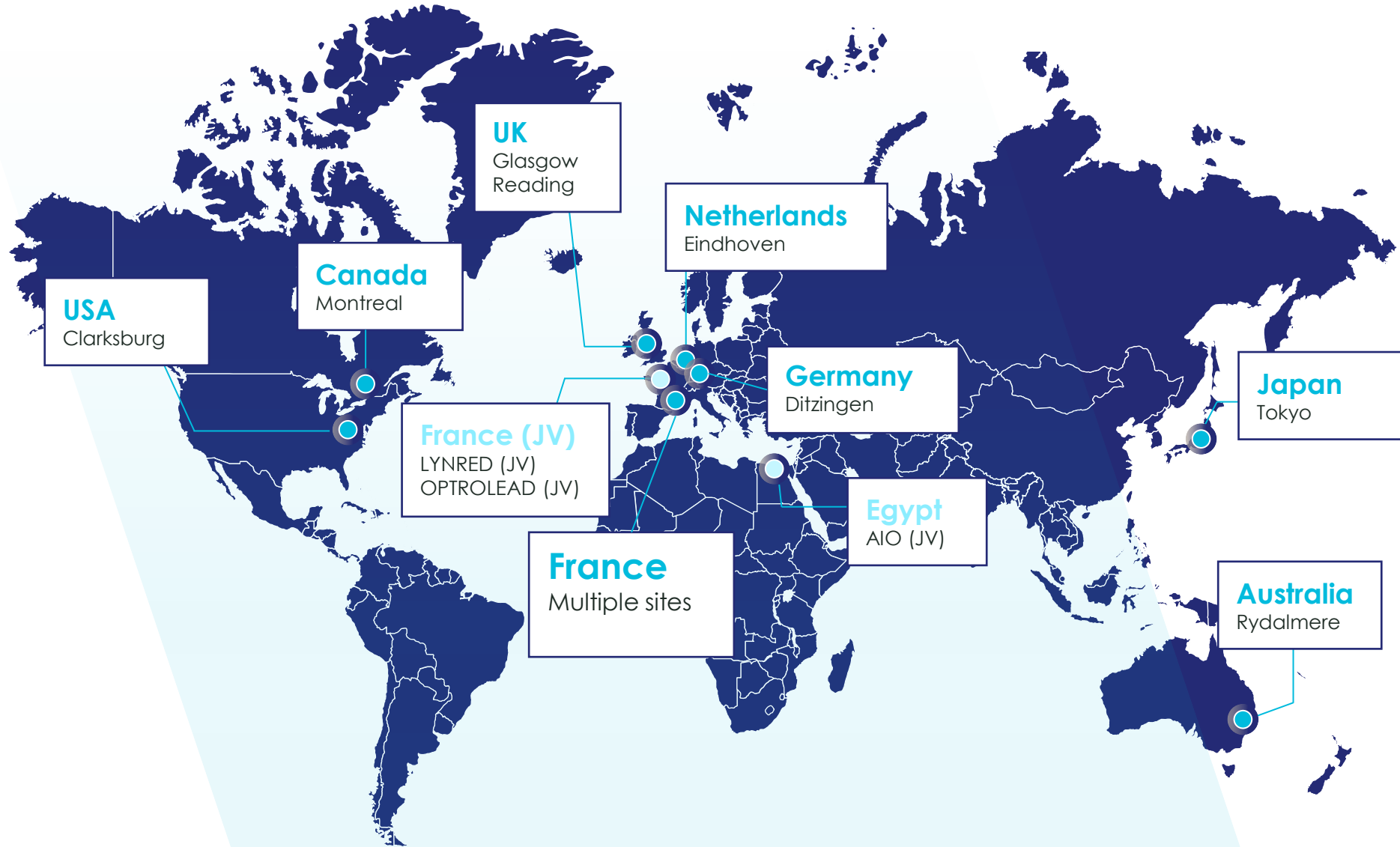
The BL is the basic strategic and operational unit of the Group. Each GBU is organized into BLs, which are managed as profit centers and cover a coherent range of products, solutions and services.

OME INTERNATIONAL FOOTPRINT


12 Thales sites
and **3** joint ventures


9
countries


~ 4,500
employees

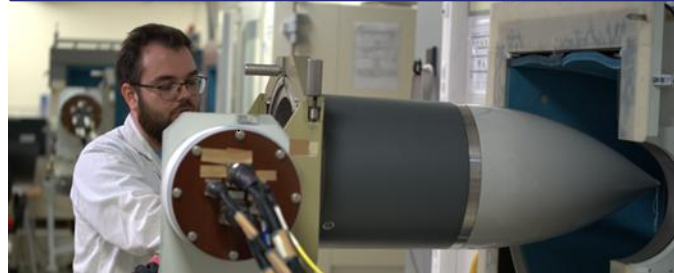


OUR **PRODUCT LINE** PORTFOLIO

AIRBORNE OPTRONICS



SEEKERS & FUZES



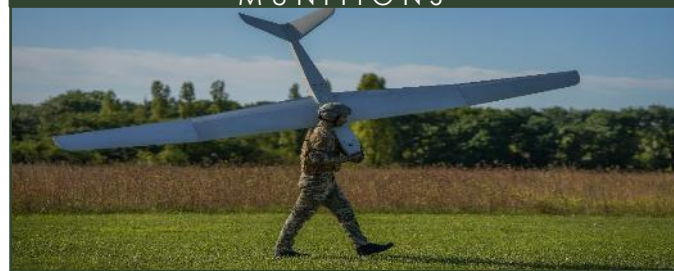
VEHICLE OPTRONICS



SOLDIER OPTRONICS



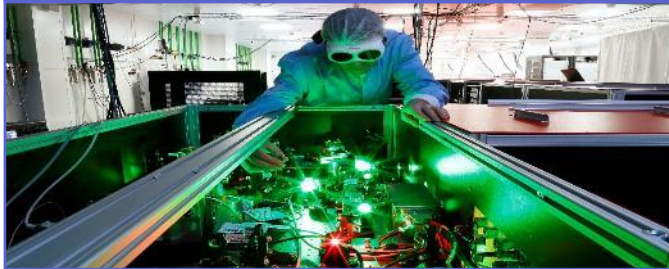
DRONE SYSTEMS & LOITERING MUNITIONS



NAVAL OPTRONICS



LASERS



CINEMA OPTICS



CRYOGENICS



CUSTOMER SUPPORT



AIRBORNE OPTRONICS



AIRBORNE OPTRONICS

- how we bring operational superiority

Targeting Precision

precision air-to-air and air-to-ground targeting:
target designation, missile guidance, and protection against emerging threats, including stealth aircraft and high-power jammers in high-intensity combat zones.

Enhanced Threat Detection & Protection

Missile Approach Warning (MAW) and Hostile Fire Indication (HFI), enhancing survivability for rotary and fixed-wing platforms.

Real-Time onboard AI

embedded real time AI, that allows target detection 100x faster and reduces the crew's cognitive load.

TALIOS



FSO/IRST



Elix-IR



Vicon-XF



cortAIx

Artificial Intelligence by THALES

Cooling of optronics in equipments

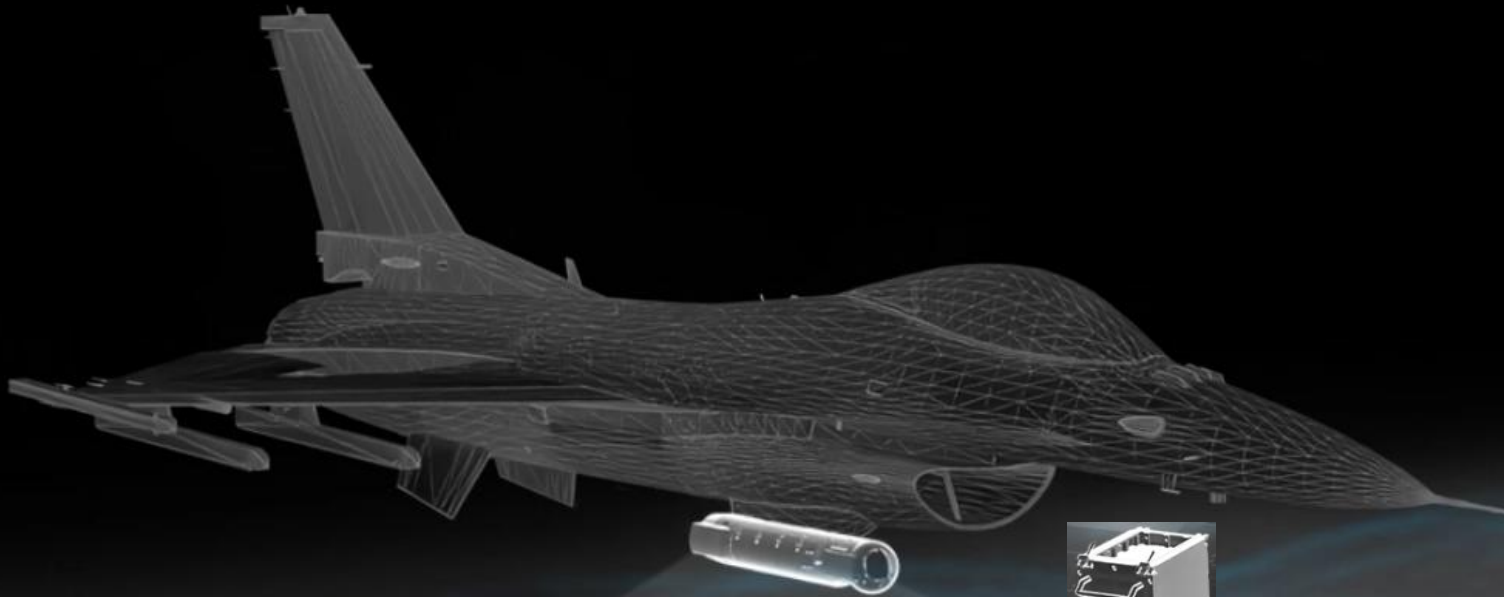
> The temperature constraints in our equipment is challenging, specially in airborne (fighters)

- During take-off, the environment temperature can go from 70°C to -50°C in minutes

> The infrared detectors are cooled down between -200°C and -150°C (~70K to 130K)

> The equipment must operate in real-time

1. Image processing for automatic target recognition (ATR) and tracking
2. The optical head must be able to point in any direction to compensate the fighter displacement and the mobile target
 - Difficult to implement a liquid cooling in all the product
3. The optical head includes more and more sensors (visible, infrared), lasers (designator, range finder, pointer)
 - Very dense integration



Multi-Spectral Imaging ✕

Larger color daylight, mid-wave IR, short-wave IR and long-wave IR sensors provide superior imaging for multiple missions

Environmental Control Unit ✕

Integrated environmental control keeps things cool throughout the mission

High Availability ✕

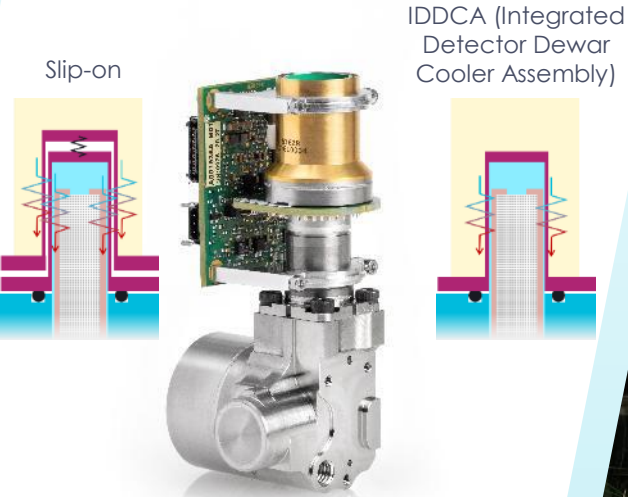
Advanced image processor and secure, two-way data links are housed in line replaceable units for high mission availability

IR detector integration with cooler

COOLER



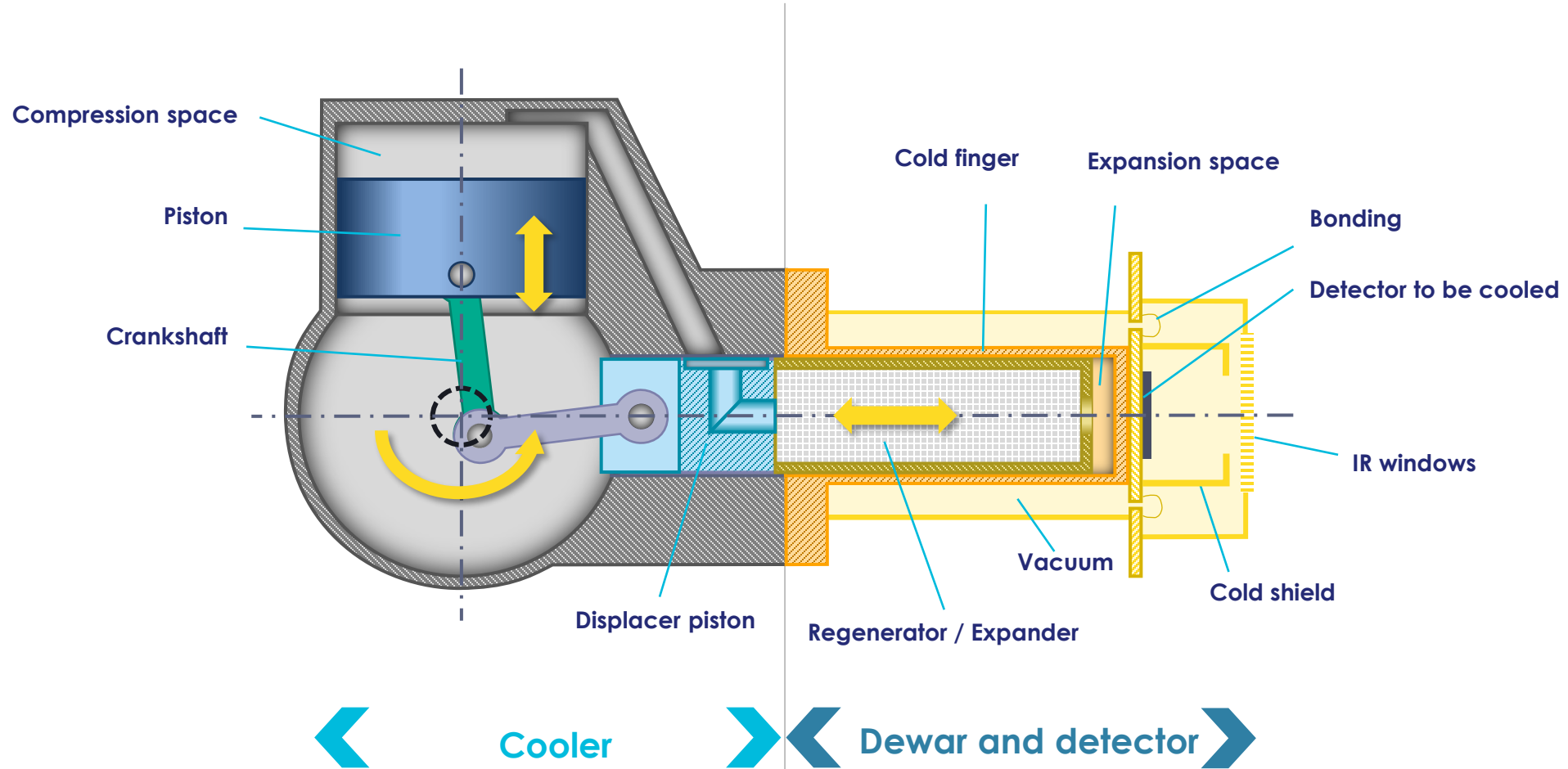
COOLER & DETECTOR



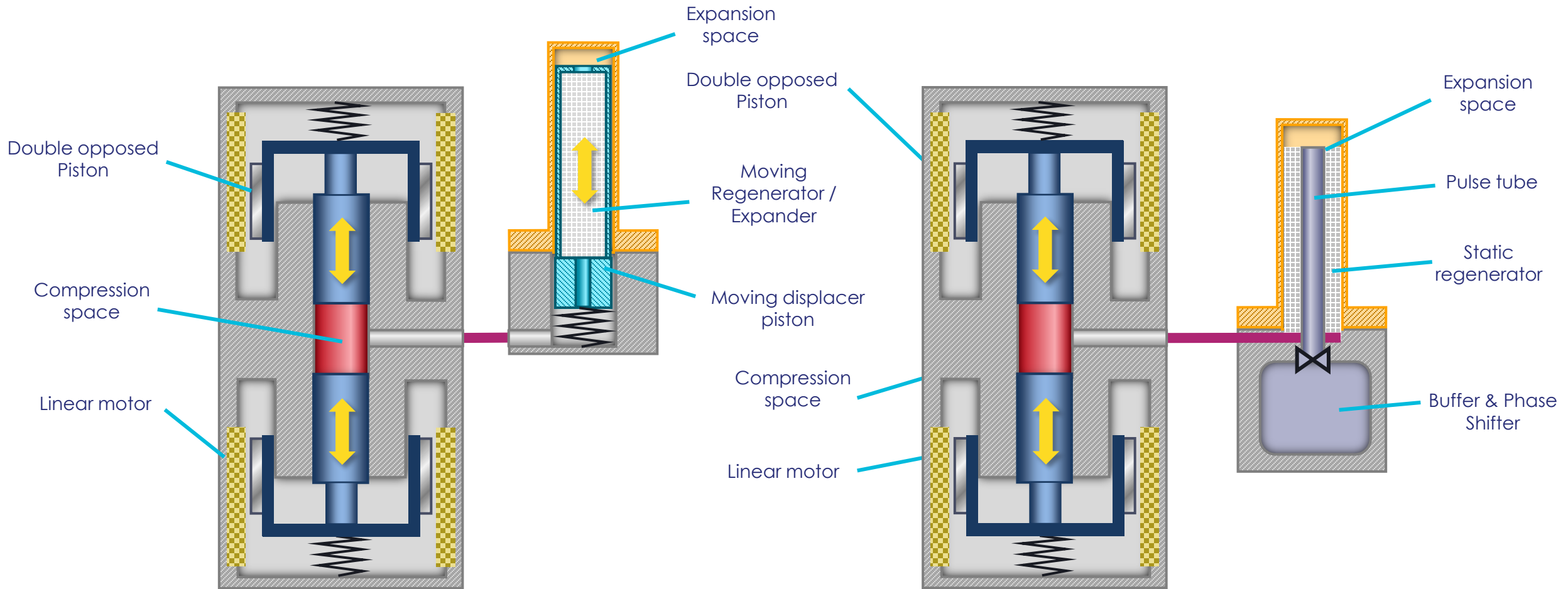
SYSTEM



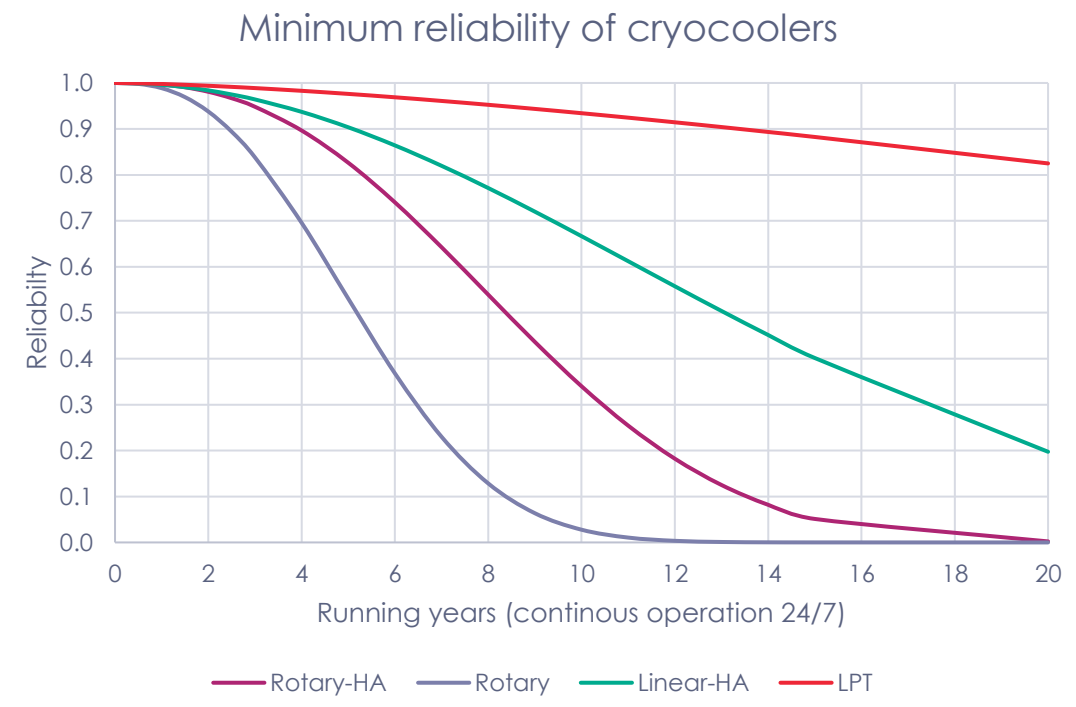
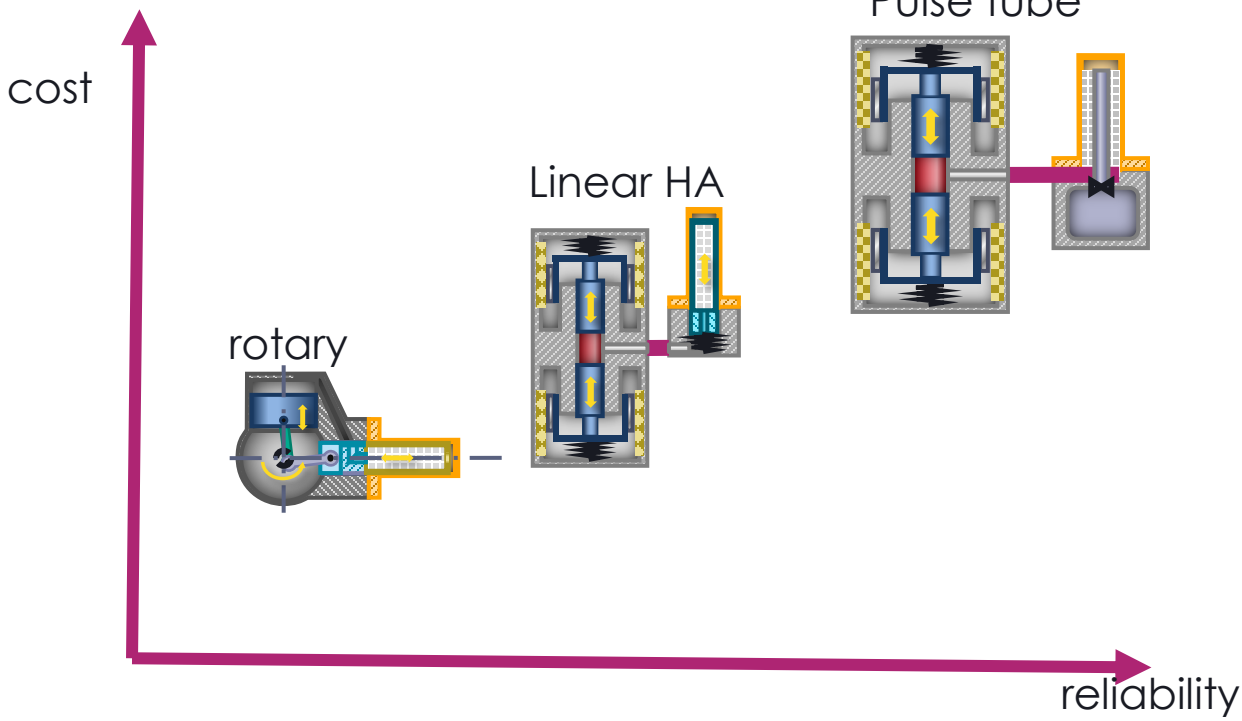
Rotary Stirling cooler



Linear Stirling cooler & Linear Pulse Tube cooler



Reliability : MTTF, lifetime, cost of the 3 technologies



Thales cryocoolers in space



> 130
flight models
already
delivered

> 80
flight models
in space

> 2.5M
Flight hours

