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Settore Aerospace

Politecnico di Torino

La QUALITÀ nell'AEROSPACE

Le sfide e i risultati

4–5 MAGGIO 2023
Politecnico di Torino

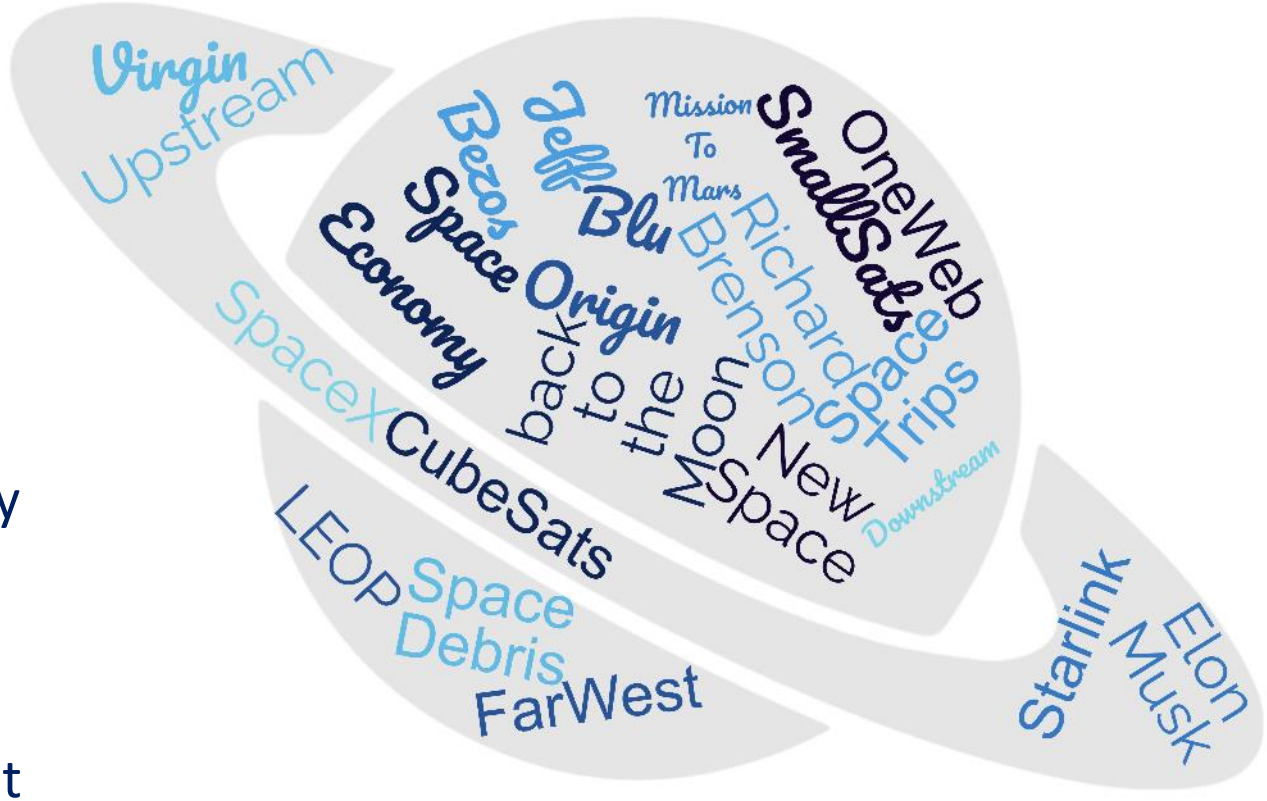
Thales Alenia Space Quality approach for New Space SmallSats
The NIMBUS Platform case

Federigo MICHELI

New Space in a Nutshell

From Wikipedia:

- "NewSpace, alt. space, and entrepreneurial space are umbrella terms for a movement and philosophy often affiliated with, but not synonymous with, an emergent private spaceflight industry. Specifically, the terms are used to refer to a community of relatively new aerospace companies working to develop low-cost access to space or spaceflight technologies and advocates of low-cost spaceflight technology and policy."



In this evolving market also the non "private spaceflight industries" have to survive. Thales Alenia Space is part of this evolution.

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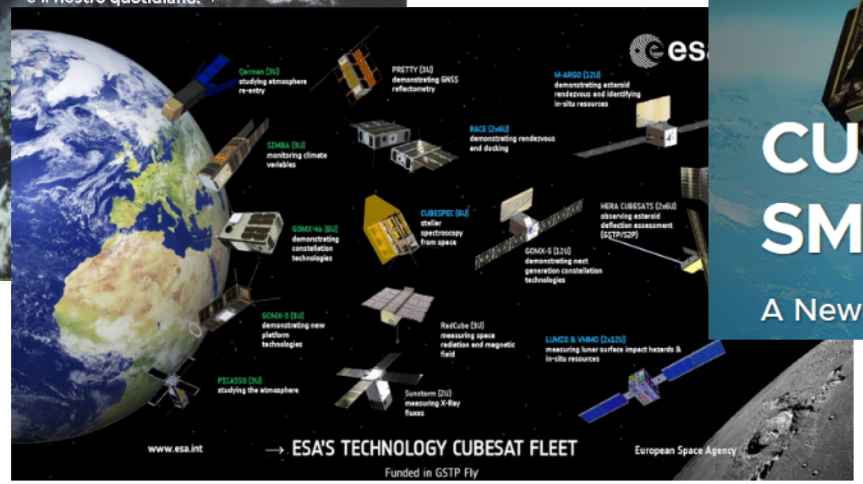
SPACECONOMY 360

Nel decennio 2012-2021 l'82% dei satelliti è smallsat

Secondo un'analisi di Bryce Tech sul decennio compreso fra il 2012 e il 2021, **dei 5.681 satelliti lanciati nello spazio, oltre 4.600, cioè l'82%, sono smallsat.** Nel 2021 i satelliti di dimensioni ridotte sono stati il 94%, vale a dire il 43% della massa complessivamente spedita oltre il cielo. **Il boom, negli ultimi due anni, si deve alle mega costellazioni per internet a banda larga Starlink e OneWeb,** che insieme hanno visto partire più di 2mila unità. Più piccole, più economiche e più numerose, come gli smartphone.



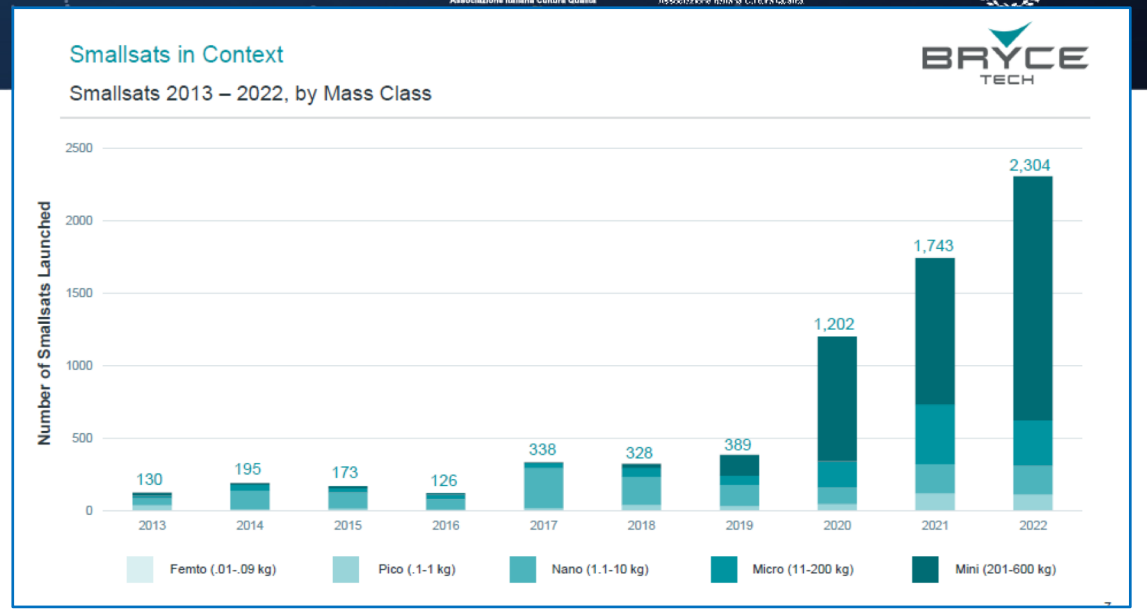
Smallsat in Space Economy

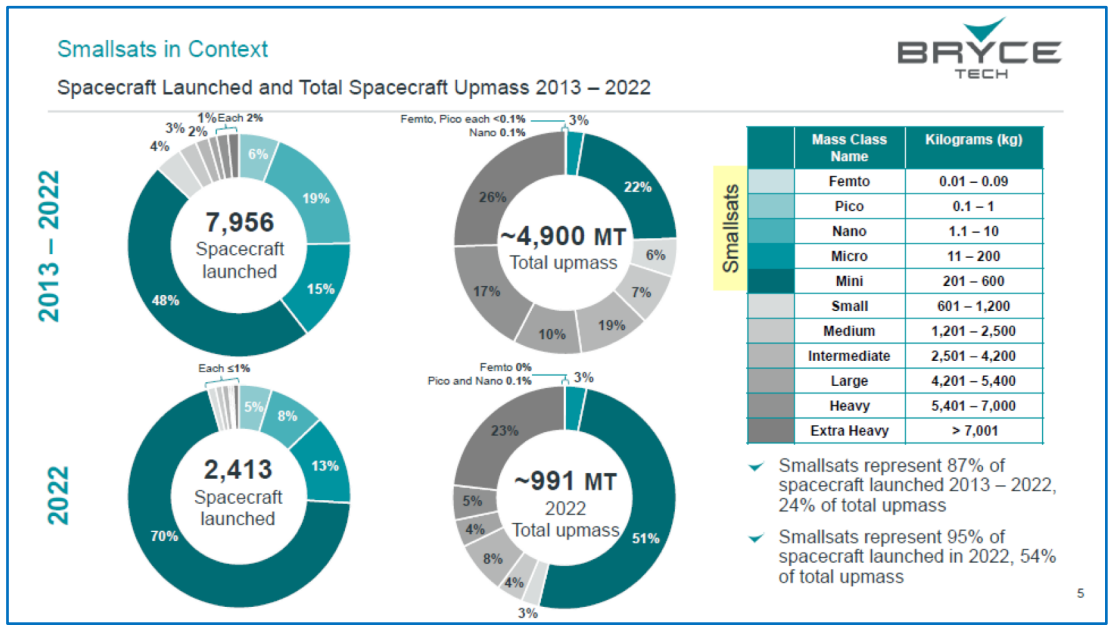
- **Why develop smallsats?**

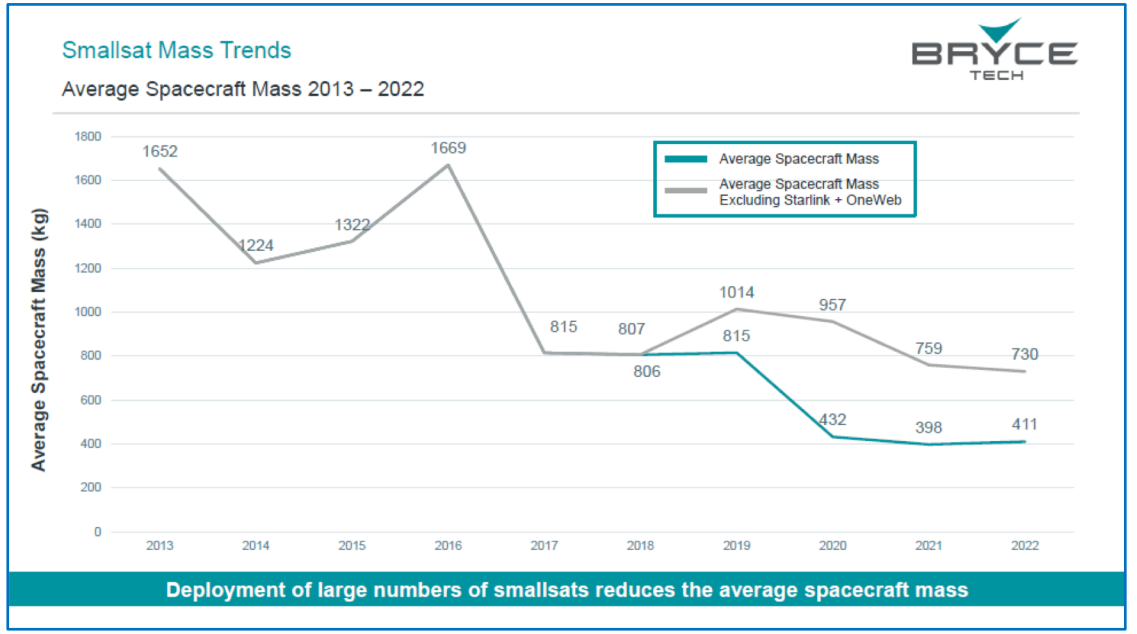
Smallsats are significantly more cost effective than larger spacecraft and easier to produce, making them better suited for constellations. Constellations, groups of satellites working together as a system, are enabling new technologies and applications.

- **What orbits are used?**

The orbit on which a satellite is placed is dependent on the satellite's mission, but the most common orbit for smallsats is Low Earth Orbit (LEO).

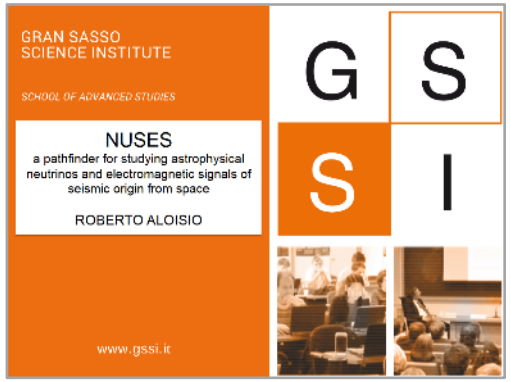






- Platino is **today** more than an idea, SAR P/L for the earth observation
- We're designing the **future** to **IRIDE constellation**

Ideas Land in Thales Alenia Space Italy



OASIS-NUSES

- Mission objective is to develop two scientific payload pathfinders (Terzina and Zirè) for studying astrophysical neutrinos and electromagnetic signals of seismic origin.
- **TERZINA**, a new optical telescope concept for astrophysical neutrinos, combines atmospheric Cherenkov light observation and the use of Silicon Photomultipliers (SiPMs), for the detection of high energy neutrinos and cosmic rays.
- **ZIRÉ**, also using SiPM technology, is devoted to flux measurements of cosmic electrons, protons and light nuclei with energies spanning from few to hundreds of MeVs, but also operating as X and gamma ray telescope in the MeV energy range. A Low Energy Module (LEM) is specifically designed to lower the detection threshold for electrons down to hundreds of keV. It will also include the study of space weather phenomena and the hunting for possible correlations of the electron and proton fluxes with seismic activities through magnetosphere-ionosphere-lithosphere coupling (MILC) phenomena.

IRIDE Nimbus

/// IRIDE is an end-to-end system made up of a set of sub-constellations of LEO satellites (Upstream Segment), the operational infrastructure on the ground (Downstream Segment) and services intended for the Italian Public Administration (Service Segment). Based on a number of different sensing instruments and technologies, the IRIS constellation will be one of a kind; ranges from microwave imaging (using Synthetic Aperture Radar, SAR), to optical imaging at various spatial resolutions (from high to medium resolution) and in different frequency ranges, from panchromatic, to multispectral, to hyperspectral, to infrared bands.

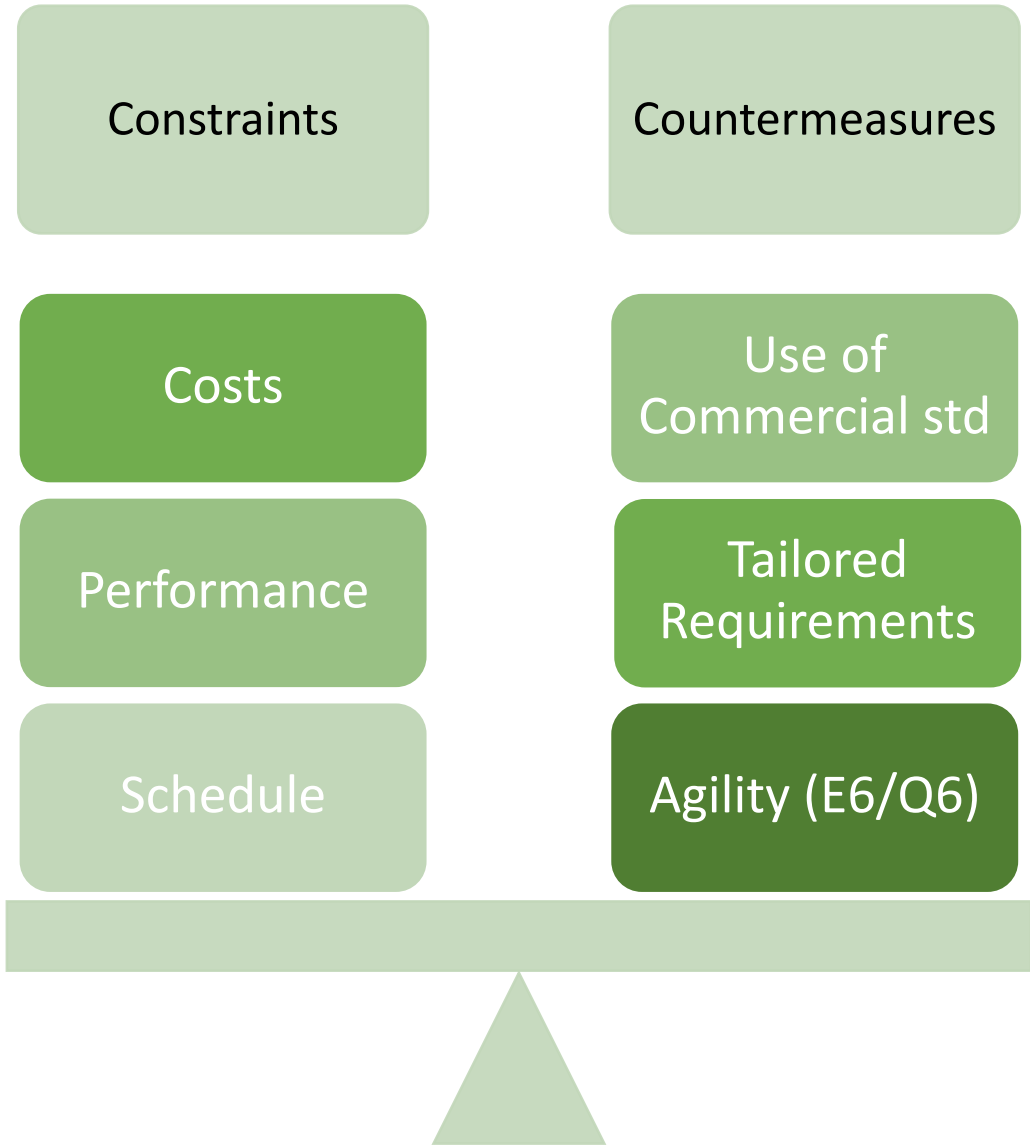
TAS are participating in IRIDE Projects providing SAR and Optical Satellites in the Upstream Segment

NIMBUS P/F Based Satellites

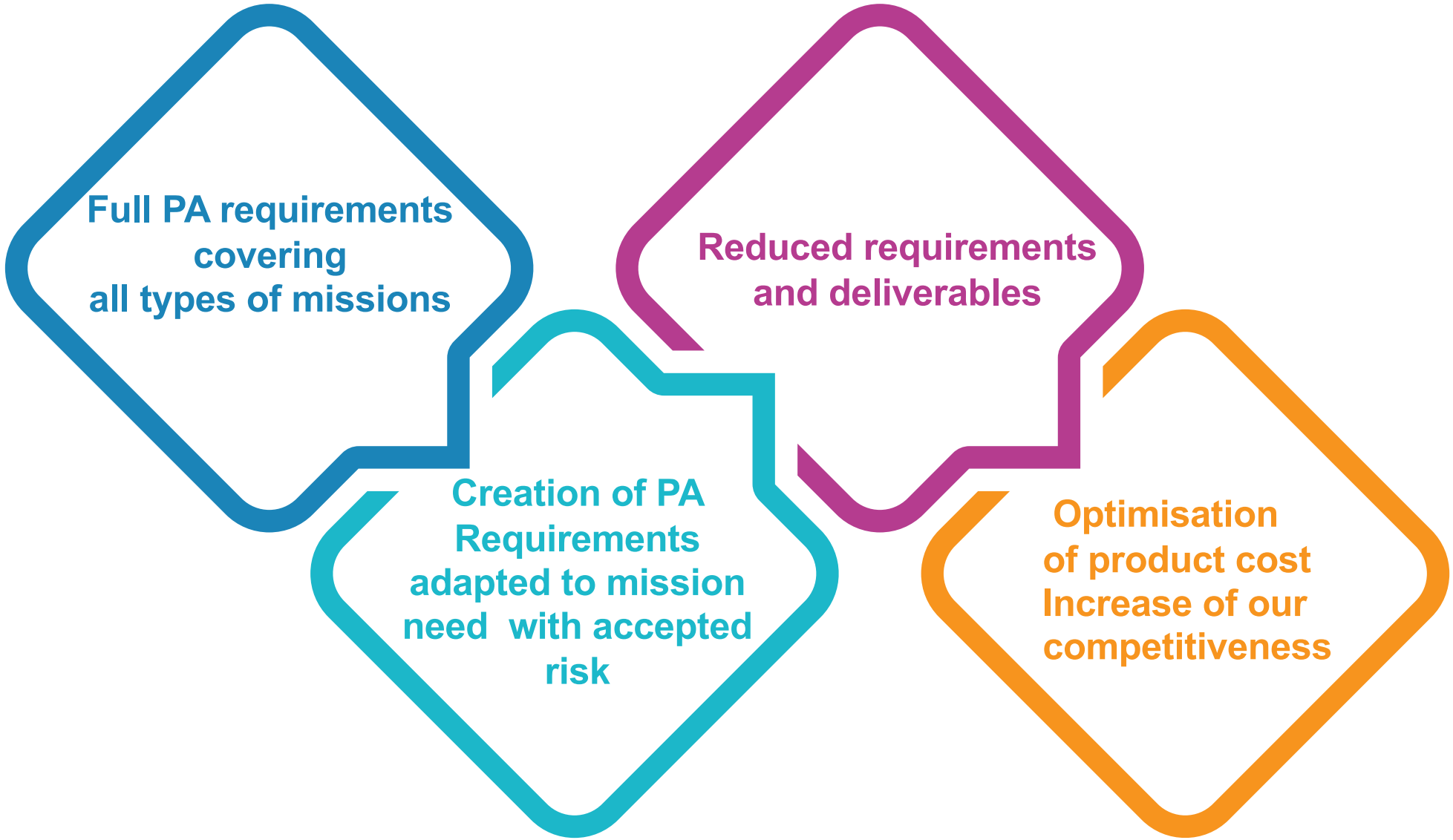
New SmallSats in TAS
OASIS/NUSES & IRIDE

Nimbus – the new Platform

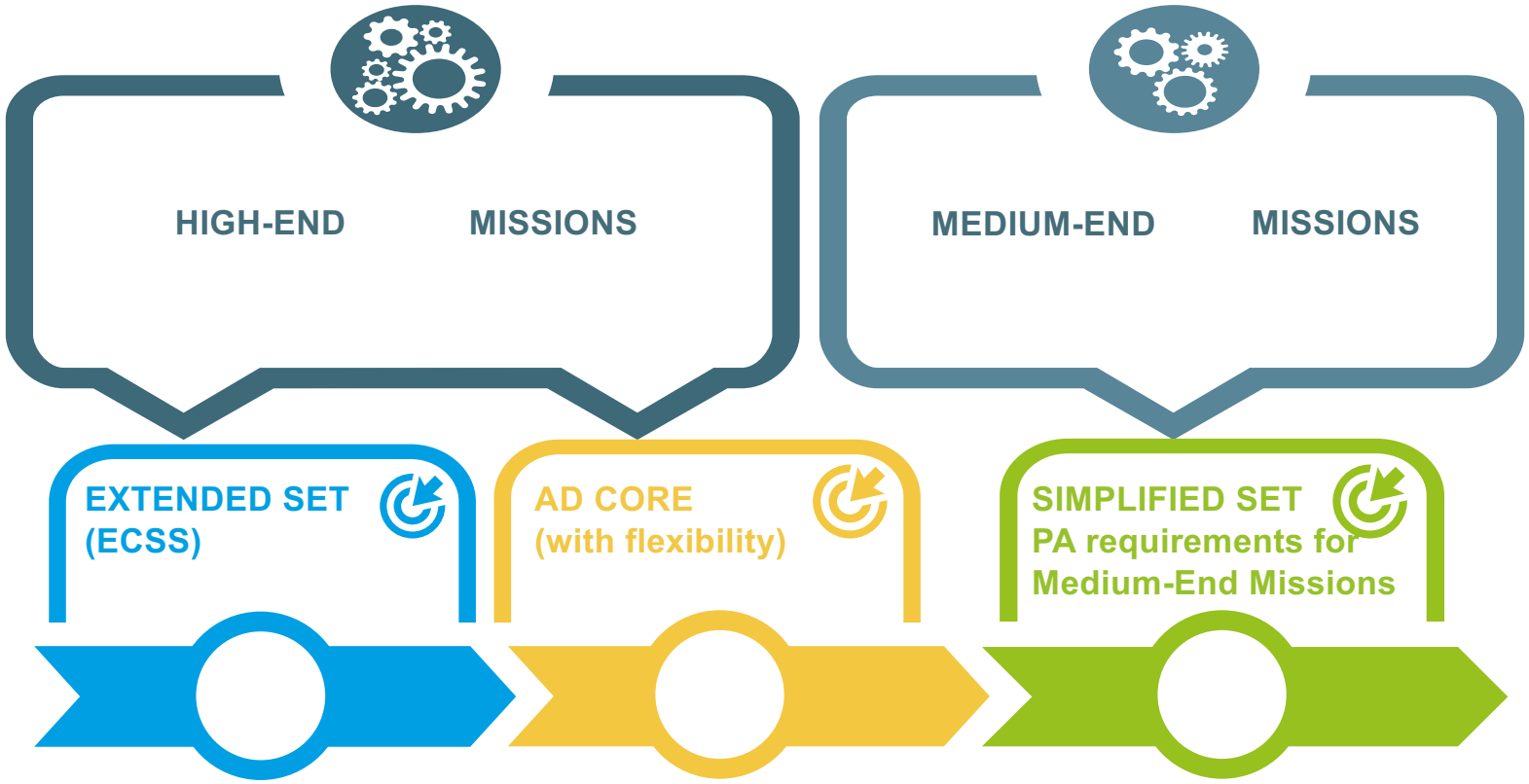
- Thales Alenia Space proposes an innovative New Space solution, based on the modular **NIMBUS** (New Italian Micro BUS) platform architecture, built by standard trays, all having the same base-shape and customized depending on their functions
- NIMBUS is a mini ***multi-application platform*** developed by TAS in Italy to respond to the international market opportunities as well as to the Institutional initiatives;
- The standard platform accommodates the avionic, communication, power, propulsion, thermal control subsystems, and it is compatible with different payload instrument , ready to satisfy the various mission needs

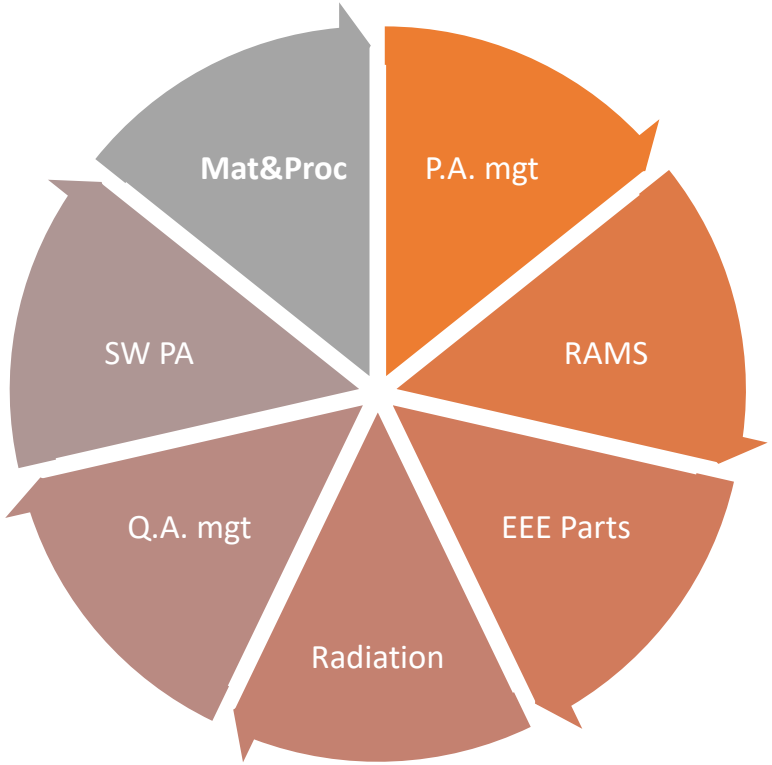

Constraints
Countermeasures
Costs
Use of Commercial std
Performance
Tailored Requirements
Schedule
Agility (E6/Q6)

Trade-off



PA Requirements adjusted to mission need



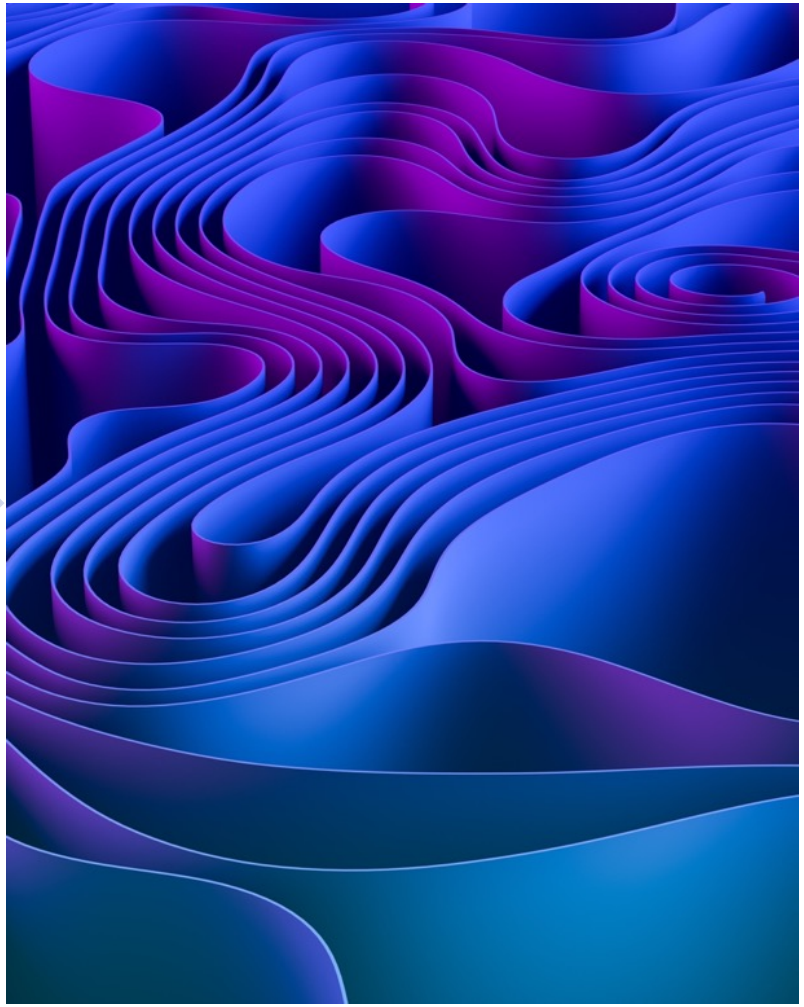


Simplification of PA Req.

Simplification of PA Requirements drivers

Medium End Missions

- Less formalism : priority is given to WHAT
- Less intrusive in organisation of Quality activities and supplier follow up
- Qualification test performed at unit or higher level
- Use of commercial standards (M&P & COTS) with lighter justification



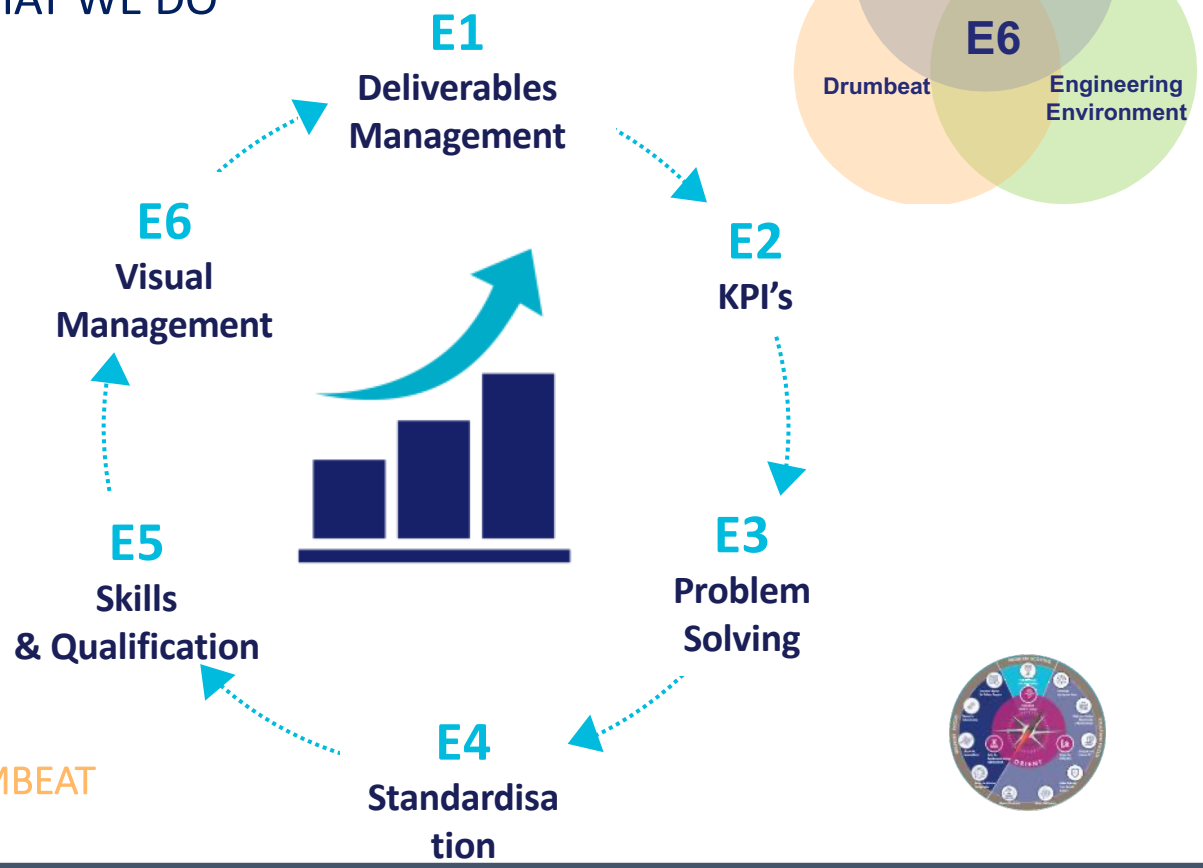
E6 approach

Drumbeat engineering activities, take decisions at the right level, at the right time

/// **#LEAN ENGINEERING** IS WHAT WE DO

VIA THE SIX PILLARS (E6)

- E1. Deliverables Management
- E2. Performance KPIs
- E3. Problem Solving
- E4. Standardisation
- E5. Skills & Qualification
- E6. Visual Management



DISCIPLINE, RIGOR, RHYTHM, DRUMBEAT

Targets

- Team work: **One Team Spirit** created with mindset focused on **Performance improvements**
- **Design-to-Cost** and **Design-to-Manufacturing** management oriented
- Implement robust **Daily Performance** rituals

Based on our THALES basics

- Lean Engineering
- 11 THALES design principles
- The 14 Engineering Fundamentals
- **Drumbeating** activities

Structured methodology, implemented on the shopfloor <u>with</u> the team, and <u>by</u> the team

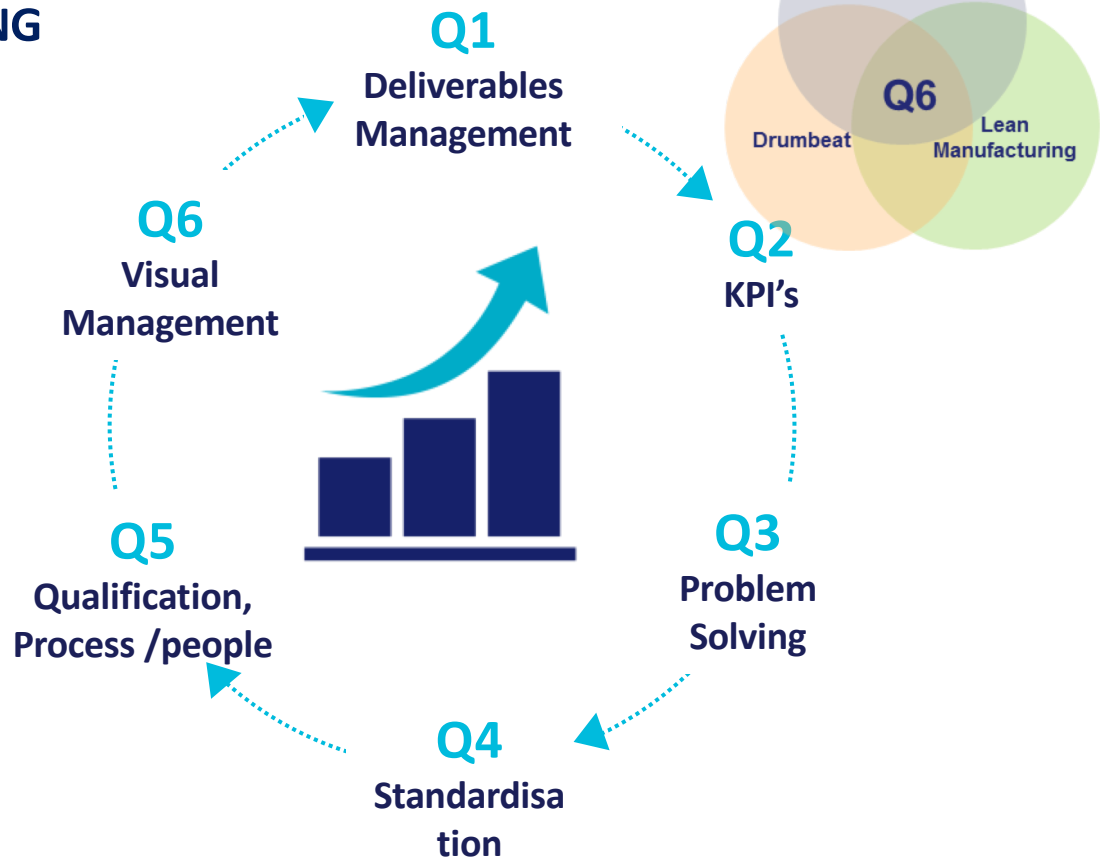
Q6 approach

Drumbeat activities around the production, take decisions at the right level, at the right time, by the right person

/// EXCELLENCE IN MANUFACTURING

VIA THE SIX FUNDAMENTALS (**Q6**)

- Q1. Quality Gates and Feedback-Loops
- Q2. Performance KPIs
- Q3. Problem Solving
- Q4. Standardisation
- Q5. Qualification, Process /people
- Q6. Visual Management



DISCIPLINE, RIGOR, RHYTHM, DRUMBEAT

Targets

- Team work: **One Team Spirit** created with mindset focused on **Performance improvements**
- **Drumbeat** activities around the production (manufacturing, AIT, …)
- Implement robust **Daily Performance** rituals

Based on our basics

- Lean Manufacturing
- **Drumbeating** activities

Structured methodology, implemented on the shopfloor with the team, and by the team

GRAZIE MILLE PER LA VOSTRA ATTENZIONE

ON BOARD FOR THE NEW SPACE