

Changing markets for Small Satellites: From Academia to Commerce:

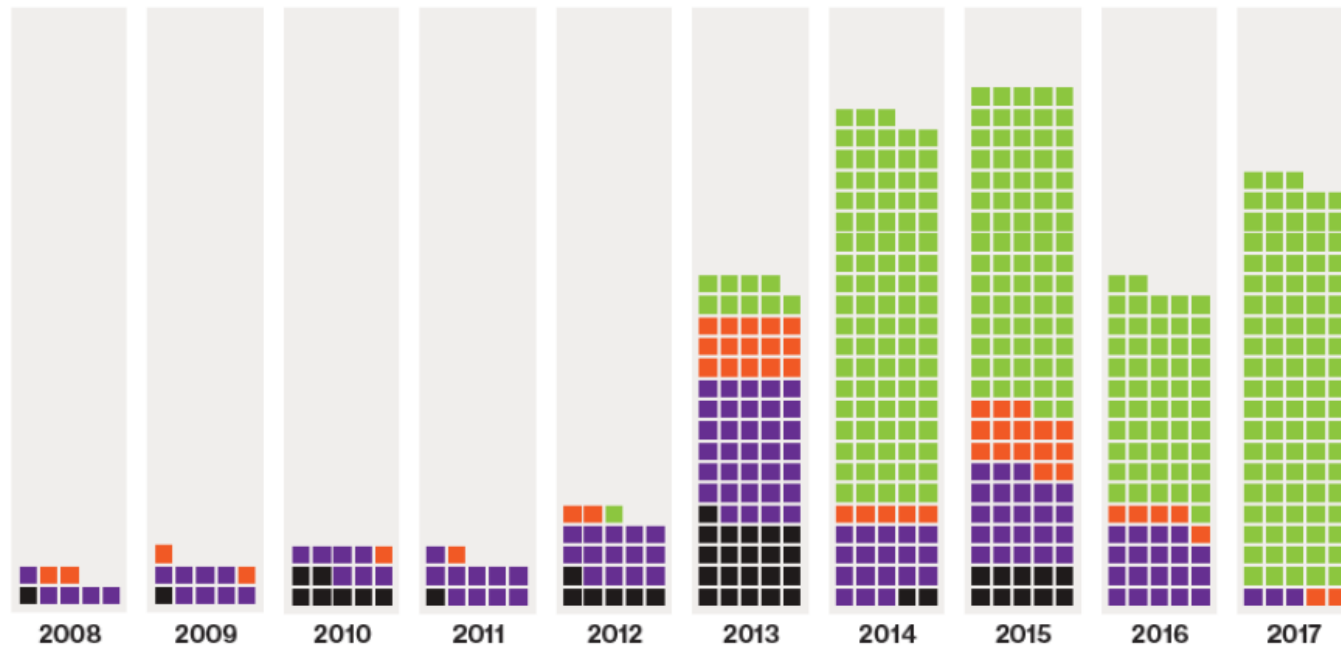


since 2014 the majority of small satellites is commercial

A Big Bet on Small Satellites

If all goes as planned, 2017 will set a new record for commercial launches of tiny spacecraft called CubeSats, each only a liter in volume and weighing less than two kilograms. The diminutive satellites have been used for over a decade in academic and government missions, but now investors and entrepreneurs are betting on new markets in imaging and telecommunications.

■ Military ■ University ■ Government ■ Commercial



Next technology driver :

Internet of Things (IoT) with expected 25 billion nodes by 2020 includes fraction not covered by fiber glas

→ Internet of Space (IoS) promoted by IEEE

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Nanosatellites

Nanosats are go!

Small satellites: Taking advantage of smartphones and other consumer technologies, tiny satellites are changing the space business

Huge Perspectives for Small Satellites

With progressing miniturisation software plays an increasing role to compensate related deficits, with effects on

- lifetime
- pointing accuracy



Small satellites offer

- faster innovation cycles due to shorter satellite realization period
- at the cost of one traditional satellite many small satellites can be provided
- use of high performance commercial components

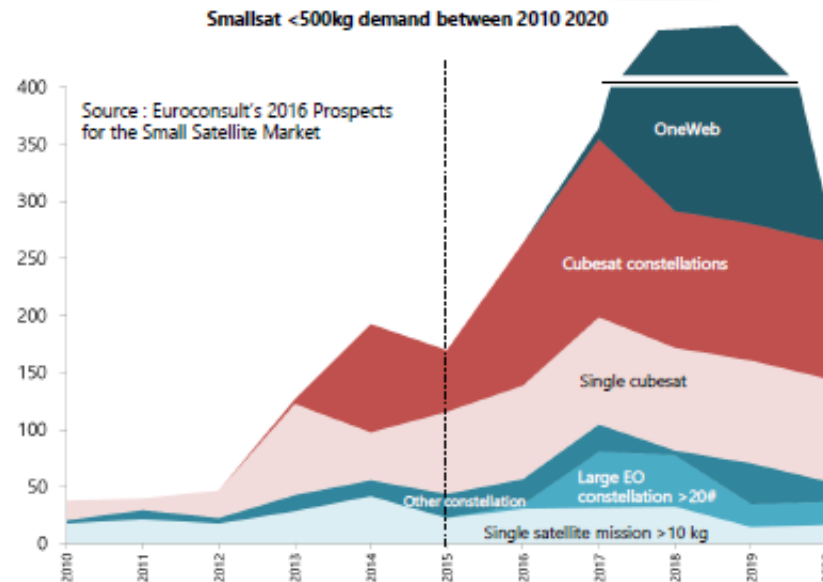
Constellation driving the smallsats' demand

BY AVERAGE +16% GROWTH EACH YEAR IN THE PAST DECADE

- > A total of 577 satellites (<500kg) have been launched over the past 5 years, 2200 are expected to be launched by 2020
- > In the past three constellations for satcom and earth observation accounted for 35% of the total and should growth up to 67% in the next 5 years driven by several large projects

A TURNING POINT OF THE DEMAND

- > Commercial operators will account for 86% of the future demand (40% in the past)



Expected perspectives

- towards decentralized distributed spacecraft systems
- from constellations (individually controlled from ground) to self-organizing formations in orbit

Huge Perspectives for Small Satellites

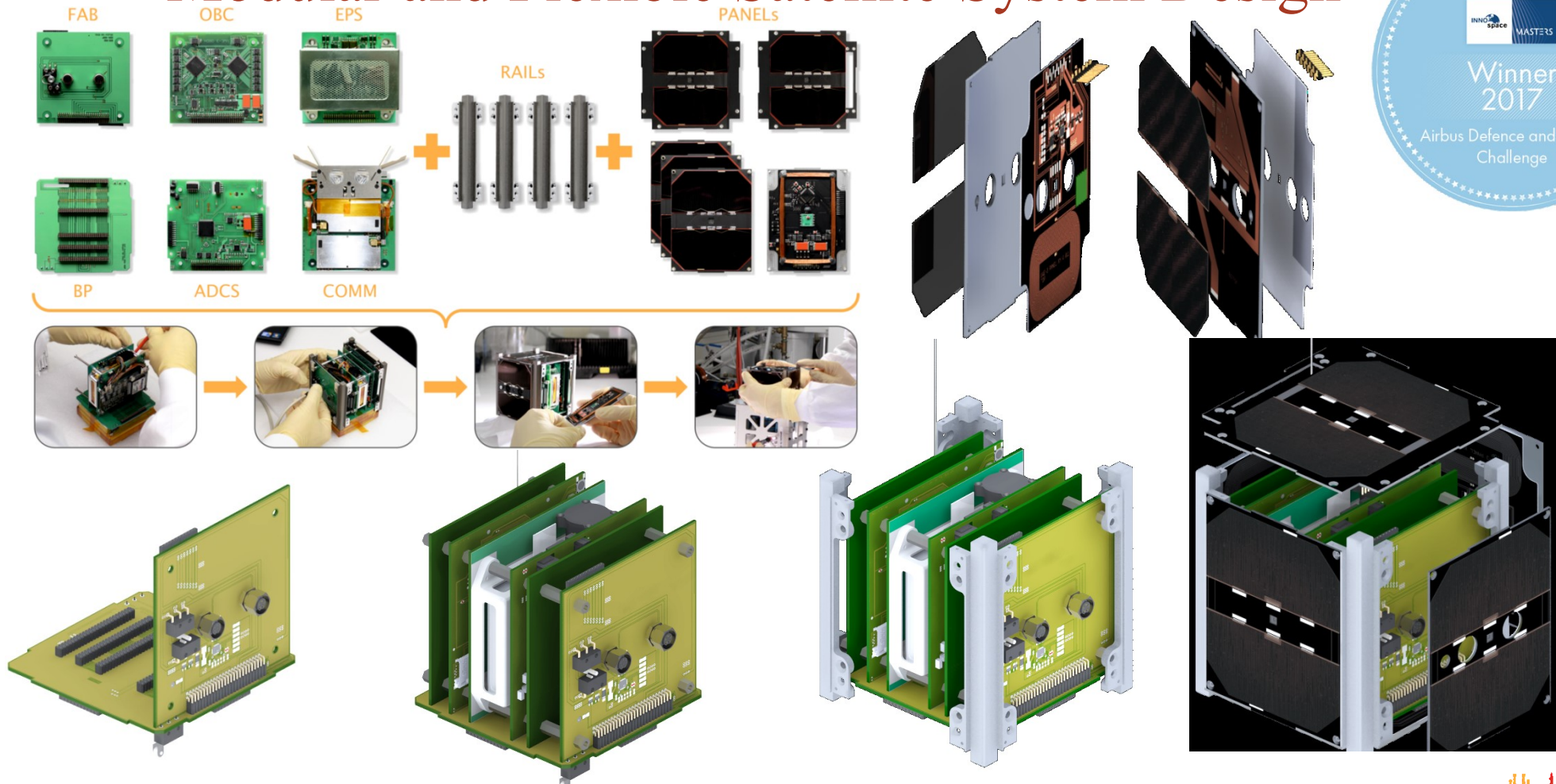


Technology Innovations: Standards



ZENTRUM FÜR TELEMATIK

Standardization of electrical IF: no Harness, Modular and Flexible Satellite System Design



Electrical IF Standards supported by UNISEC Europe

<http://unisec-europe.eu/standards/bus/>



Current Technology Achievements for Pico-Satellites