ThalesAlenia Space
A Thales / Finmeccanica Company

ASTRIUM
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AGENDA

08:30-09:30 Welcome coffee

09:30-09:45	1 - Introduction of NEOSAT context (ESA)
09:45-11:00	2 - NEOSAT Progress Status

11:00-11:20 Coffee break

11:20-12:00	3 - NEOSAT Challenges
12:00-13:00	4 - NEOSAT Way Forward

13:00-14:30 Break for lunch

14:30-15:30	5 - Applicable documents
15:30-16:00	6 - Supplier's survey feedback
16:00-17:00	7 - Questions & Answers,
17:00	8 - Conclusion

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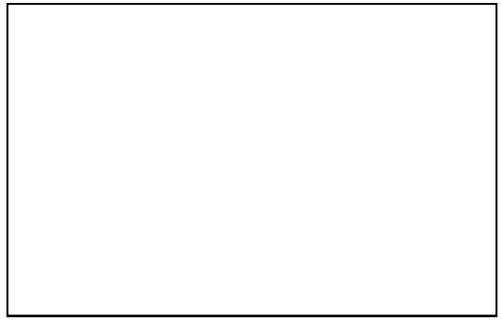
Neosat: The Next Generation Platform

A. Mauroschat, P. Roy

08/11/2013



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Objective

- The Neosat programme is to develop and qualify Next Generation Platform (NGP) product lines allowing the two European satellite prime integrators, Astrium (F) and Thales Alenia Space (F) to deliver competitive satellites on the 3 to 6 tons launch mass commercial satellite market by means of development, qualification and in-orbit validation, with protoflight models (PFMs) delivery in orbit by 2018/2019.
- Innovation is expected to be promoted at equipment, building blocks and platform levels under the satellite primes leadership to develop the most competitive Neosat product lines for the market.
- Industry at all levels, from satellite integrators down to building block and equipment suppliers will participate in the Neosat development of the future satellite platform product lines, ready for the subsequent commercial exploitation phase.
- Platform PFMs procurement will be initiated upon identification of candidate mission(s) and flight opportunity(ies) proposed by Industry with the goal of validating and demonstrating the Neosat product lines.

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Programme set up and achievements so far

- Neosat is an industry initiative developed through the French National PIA / “Satellite du Futur” programme and the ESA ARTES 14 Programme.
- The programme is managed jointly by ESA and CNES .
- CNES PIA programme has started end 2011 covering definition and design activities.
- ARTES 14 will cover the development and in-orbit validation of the new platform at system, building block and equipment level.
- Main achievements:
  - Ø System Requirement Review held in 2012
  - Ø Key Technology Review held in 2012 and 2013, based on wordwide call for idea, bottom-up approach
  - Ø Architecture Definition under consolidation

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ARTES 14 Programme Implementation Status

- Approval of Declaration of ARTES 14 CMIN-12 and subscription at a significant level (259 M€, over 300 M€ requested), as well as specific implementing rules.
- Participating States are:

  AT, BE, CZ, FI, FR, IE, LU, NL, NO, PO, PT, RO, SE, CH, UK
- Approval of Procurement Proposal by ESA Industrial Policy Commitee (IPC) in January 2013.
- Bi-Lateral Agreement between ESA and CNES signed in February 2013.
- RFQ for Phase B/C/D issued in July 2013.
- Proposal received and under evaluation.
- Contract start planned in Q1 2014.

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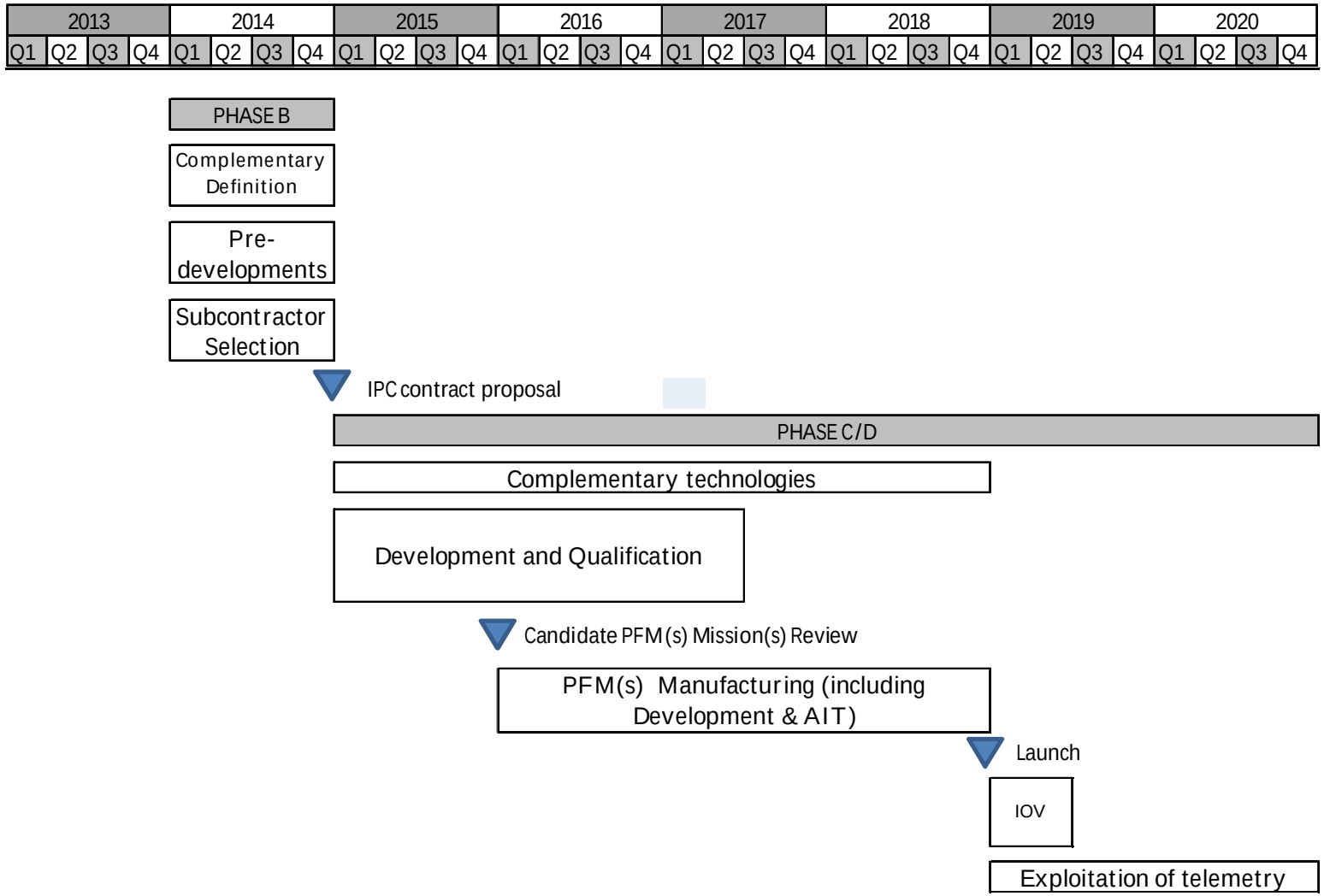
Overall NEOSAT / ARTES 14 implementation schedule



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Supplier Selection for Neosat (1)

- The Neosat equipment supplier selection will be based on open worldwide competitions. ESA Code of Best Practice will be applied with a strong focus on cost competitiveness and emphasis to achieve the stable industrial arrangements for the subsequent recurring production.
- During Phase B, and once building block and equipment specification have been defined and agreed with the ESA/CNES integrated project team, the Prime contractors will be organising the equipment supplier competitions.
- ARTES 14 is based on a fair contribution mechanism so that contributions of ESA Member States will be adapted, a posteriori, to the outcome of the supplier selection, ensuring selection of the best industrial set-up for Neosat.

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Supplier Selection for Neosat (2)

- ITT requirements will address the importance of competitiveness of the products including long term production capabilities and competitive recurring prices.
- The ITTs will request three elements:
    1. The development of the product line
    2. The manufacturing of protoflight equipment
    3. The terms and conditions for subsequent recurring sales
- The selected suppliers will be included in the Neosat Preferred Supplier List, from which the Prime contractors will procure the equipments and building blocks for subsequent recurring satellite sales.

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Preparing for Neosat equipment competitions

- Technology predevelopments have been initiated under the leadership of Astrium and TAS:
    - 1.within the General Studies Programme with European suppliers
    - 2. within the PIA programme with French suppliers
- In addition UK have launched predevelopments under the NSTP programme.
- The Phase B contract with Prime Contractors will include a series of additional predevelopments with European suppliers to consolidate key technologies for Neosat and prepare European suppliers for the upcoming equipment competitions.
- Predevelopments will be selected by the Prime Contractors in coordination with ESA/CNES.

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NEOSAT Progress Status

Project Managers
Michel Roussy (TAS), Jean-Marc Stephan (ASL)

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2 - NEOSAT Progress Status

Neosat Main Objectives

- **Develop a new generation of Telecommunications platform for a first launch in 2018 with first qualification models in 2015.**
  - In the core 3 to 6 tonnes (launch mass) segment where more of 80% of the accessible market lies
    - • 20 satellites /year
    - The target is to capture 50% of the market for TAS/Astrium
  - Common approach of TAS and Astrium with the following objectives:
    - Beyond 30% of competitiveness improvement vs. current satellite generation
  - Means:
    - Define best product architecture vs. market & launcher landscape evolution
    - Consider also “next generation payload and antennae” aspects
    - Identification and development of common platform building blocks procured with a single set of requirements.
    - Use of innovative technologies allowing breakthrough
    - Wider access to technology and products thanks to the joint TAS/Astrium cooperation
    - Increase of production volumes at supplier level
    - Reduction of Assembly, Integration and Test cycles from building blocks to satellite
- **One PFM satellite will be built for each TAS and Astrium Neosat product line**
  - Thanks to an operator mission selected at Candidate Mission Review
- **After the development phase, Astrium & TAS will keep the lead of their platform manufacturing and access to the market**

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NEOSAT Challenges - Competitiveness

Competitiveness improvement: background

- **The objective is to make a step on competitiveness which has the best "value for money" at customer level, vs offers from US and emerging players**
  - Ø Hence challenged at the level of total in-orbit acquisition cost
  - Ø The corresponding performance indicator is 36MHz Transponder Equivalent for broadcast / FSS, in Gbps for broadband missions
- **Rationale**
  - Ø Operators optimise their investment taking into account the launcher environment
    - n Both for medium (e.g. Falcon 9, Land Launch…) and heavy lift capabilities (e.g. Ariane 6, Angara, etc)
    - n Launch strategies other than GTO will enable to achieve more cost-efficient offers for the operators
  - Ø Step in innovative solutions performed on NEOSAT will enable to significantly improve the payload mass / launch mass ratio over the full 3-6 tons range, and to accommodate more payload capacity for a given launch mass.

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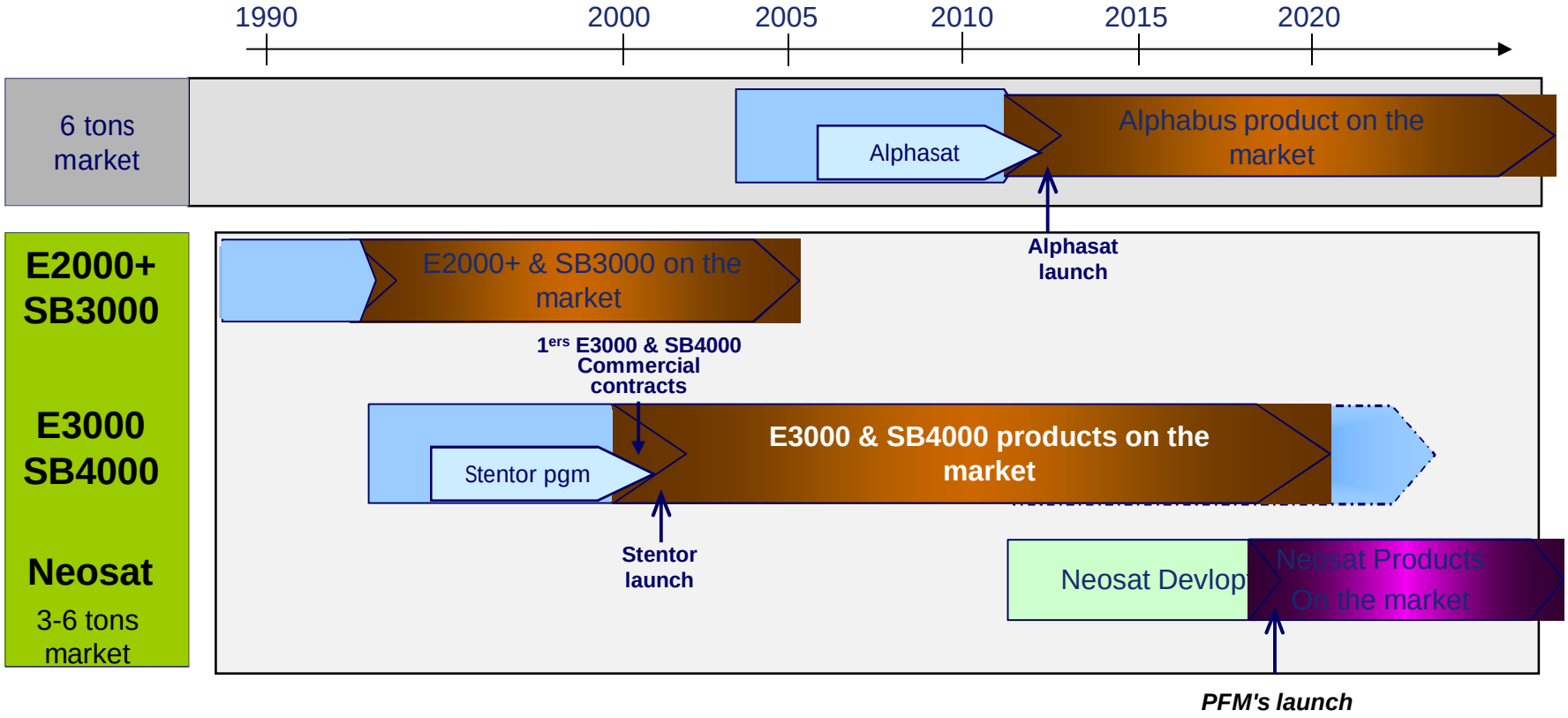
Neosat satellites positioning vs. current product lines



The Eurostar E3000 and Spacebus SB4000 product lines will remain the Astrium and TAS work-horses until Neosat products are commercially available and flight proven.

Eurostar E3000 and Spacebus SB4000 lines will be maintained at least until end 2020.

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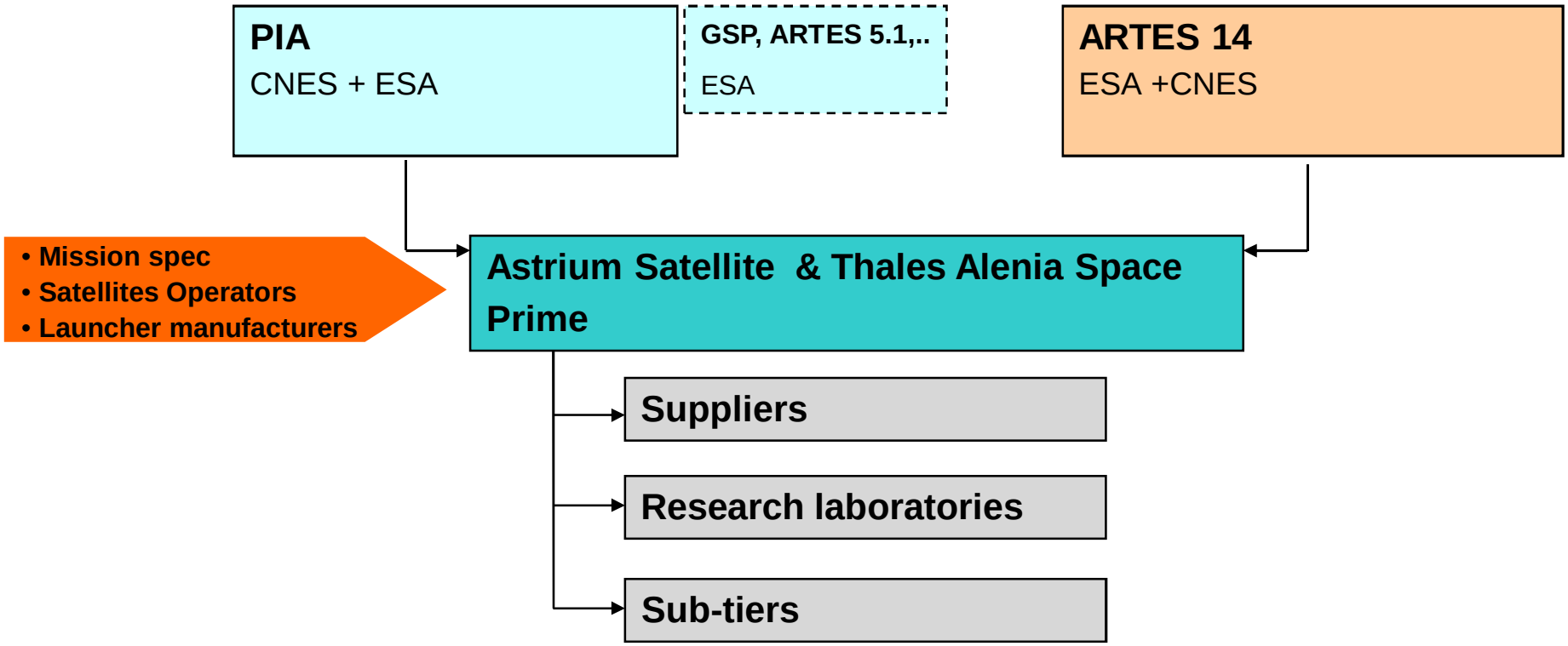
NEOSAT Organisation



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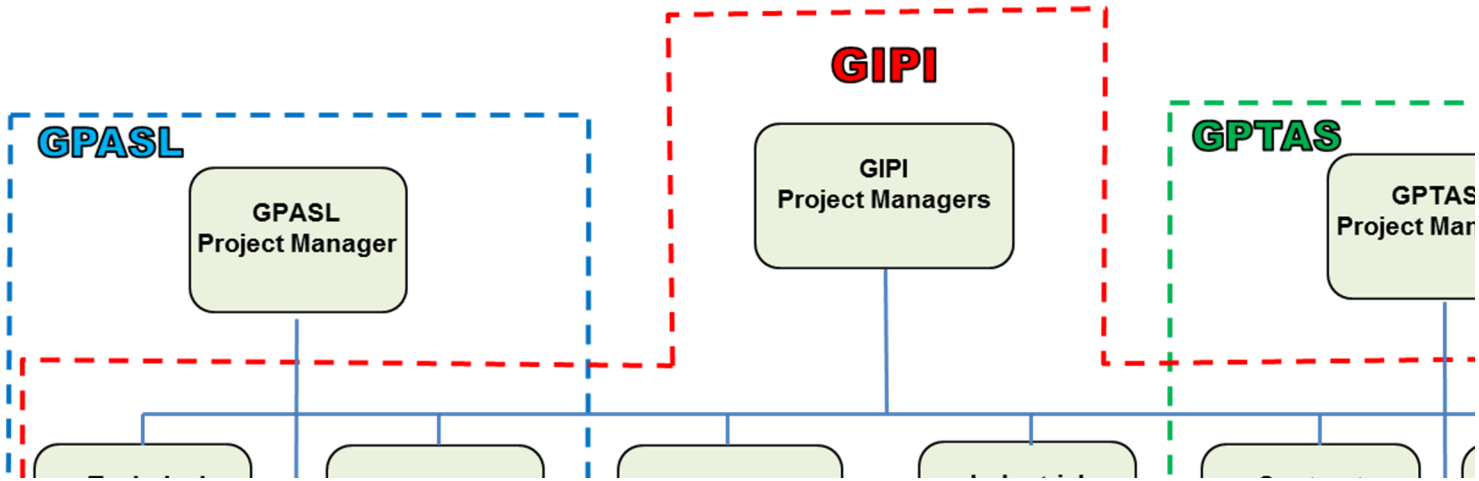
Neosat Project Team Organization

- The organisation put in place to conduct the Neosat program is shown below. It is based on 3 entities (GIPI, GPASL and GPTAS)



Ø The Neosat program is now based on three development streams, one common to both primes and lead by the GIPI and one specific for each Prime and lead by the GPXXX.

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Development and Schedule - Perimeter

Phase 1 (over 2011-2014) dedicated to:

- System & Platform definition
- Assessment & Pre-developments of critical technologies with early contribution from equipment & technologies suppliers
- Architecture & Preliminary Design of Sub-systems

ESA program ARTES 14 to be implemented & dedicated to:

Ø 2014-2016

- Completion of technological developments
- Development & qualification of new/modified equipments
- Development & qualification of sub-systems

Ø 2016-2020

- System validation & qualification
- Manufacturing of the satellite bus PFMs & flight equipments
- Satellites PFMs manufacturing and AIT
- Satellites PFMs validation in orbit

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2 - NEOSAT Progress Status

- Cmin 12 preparation and presentation to delegation/suppliers on track with full support from ESA :
  - ESA Workshop (Oct 11th)
  - Suppliers day (Toulouse - Oct 25th)
  - National days:
    - UK (Nov 9th)
    - Spain (Dec 1st)
    - Belgium (Dec12th)
    - Austria (Jan10th)
    - Sweden (Jan 12th)
    - Netherland (Feb 24th)
    - Czech (May 3rd)
    - Switzerland (May 23rd)
    - Luxemburg (October 2nd)
    - UK- Harwell (September, 26th)
    - Poland (November, 13th)
    - Norway (December, 5th)
    - Romania (April 24th)

- ARTES1 ITT 6861 : Disruptive technologies:
  - TAS/Astrium proposal selected and work under completion
- ARTES 5.1 :
  - 4 ARTES 5.1 studies proposed by NGP and selected by ESA
- GSP (gap filler funding tool until ARTES 14):
  - TAS/Astrium contract embedding CCN's from Suppliers

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2 - NEOSAT Progress Status

259M€ granted!

French contribution as anticipated

Very good news from UK

- Ø 2nd contributor just behind France

Strong contribution from numerous country

- Ø Sweden, Belgium, switzerland, Luxemburg
- Ø Romania 9M€
  - n Opportunity for new partnership to be developed in the frame of Neosat

Dedicated plan to involve some countries at next CMIN 14

- Ø Germany
- Ø Italy
- Ø Spain

NEOSAT: 2012 Cmin outcome

Country	Contribution (M€)
France	128,0
UK	72,0
Sweden	13,0
Belgium	12,0
Romania	9,0
Swiss	6,0
Luxembourg	6,0
Norway	4,0
Austria	2,0
NL	2,0
Rep Tcheque	2,0
Finlande	1,5
Irlande	1,0
Portugal	0,5
Germany	0,0
Italy	0,0
Spain	0,0
Poland	0,0
Total	**259,0**

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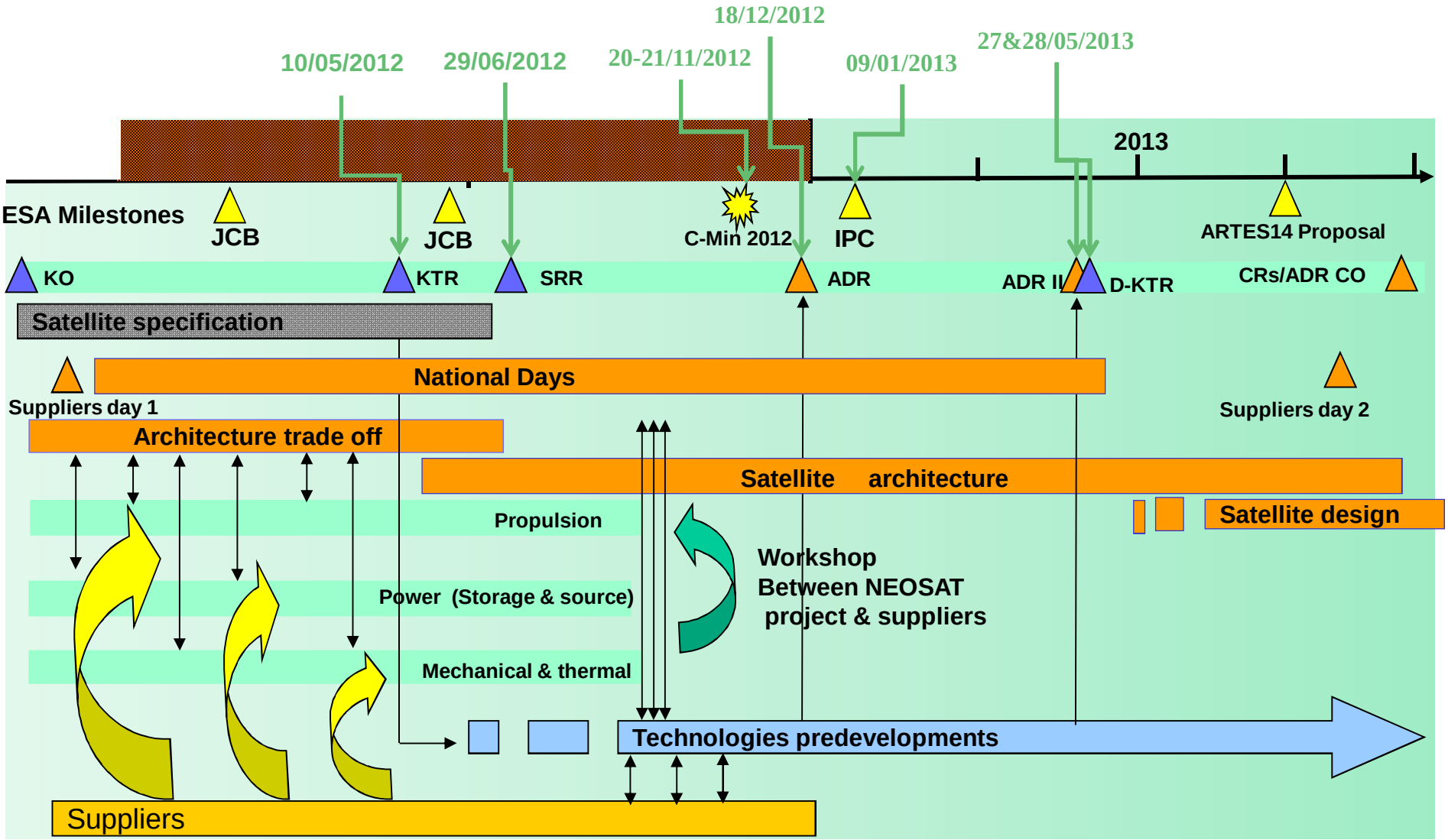
2 - NEOSAT Progress Status

Neosat schedule 2012-2013 Overview



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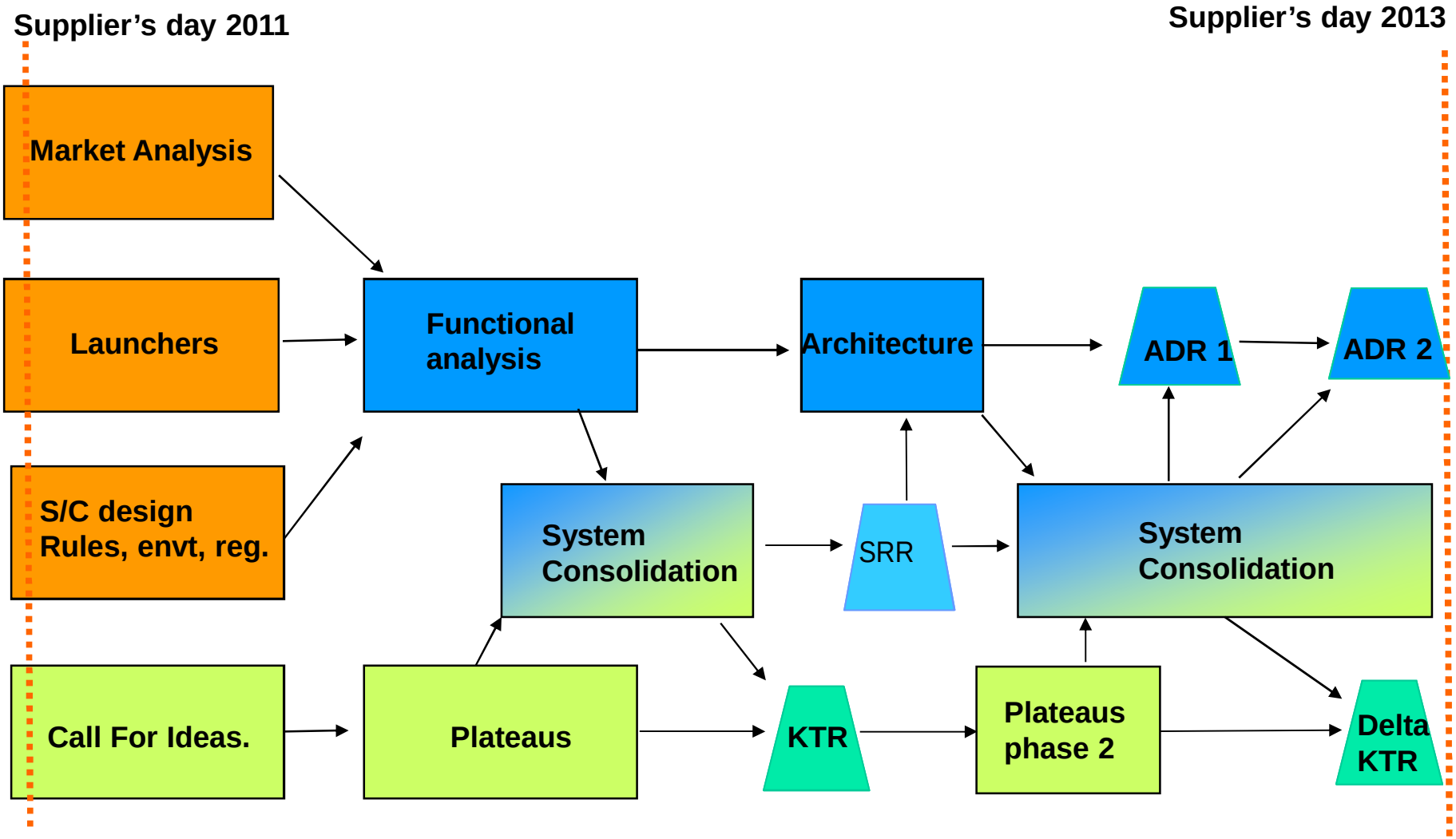
2 - NEOSAT Progress Status

Neosat development logic



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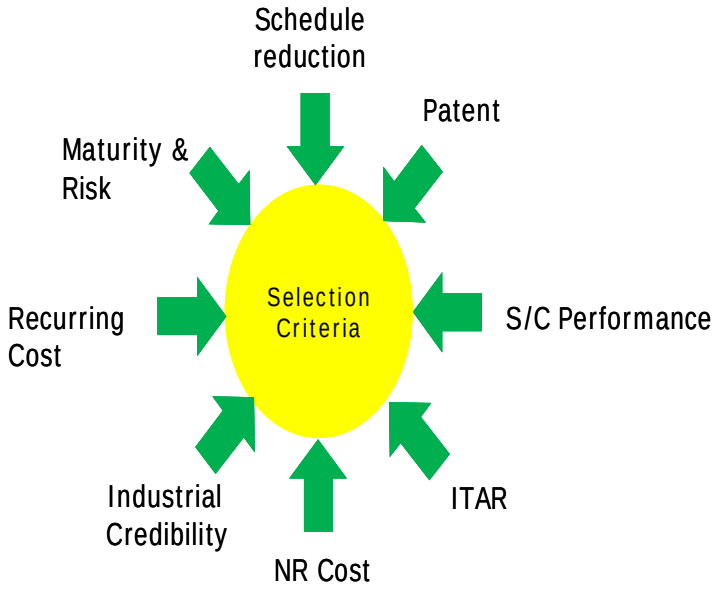
2 - NEOSAT Progress Status

"Call for Ideas" Initiative

- ITT initiated by the Neosat project
  - Ø Started in July 2011
  - Ø This call for idea is an on-going, continuous process (open ITT)
- This ITT was aiming at a bottom-up approach to assess what are the promising/disruptive technologies that are currently under development at supplier level.
- It was a powerful way to assess the most promising technologies that will be used to drive the system & architecture trade off's during the early architecture phases of the Neosat programme.
- One of its goal was also an opportunity for Neosat to discover new potential industrial partners



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2 - NEOSAT Progress Status

Suppliers day 1 (October 2011)

§ Following the Call For Ideas initiative, **ASTRIUM and THALES ALENIA SPACE** have organized a technology providers and suppliers day on October 25th,2011 in Toulouse.

§ Key figures & major outcomes

- **170 attendees among which 110 representing 76 companies / laboratories from 18 countries in the world (15 in Europe)**

- **Extensive session of questions & answers with clarification of the NGP context (a European program), and description of activities from T0 to Key Technology Review (KTR)**

§ **Following ARTES 14 RFQ and proposal submittal on October 4th, 2013 a new Neosat Suppliers Day is organized on November 8th,2013 in Cannes**

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2 - NEOSAT Progress Status

NEOSAT KTR / Delta KTR

On 10 May 2012, the Key Technology Review (KTR) for the NEOSAT programme was held in Toulouse with representatives from CNES and ESA.

Over 100 participants gathered on Astrium's site to attend this review.

- **The KTR was organised to present up-and-coming technologies that could be used for the programme preparing the next generation of platforms for communications satellites called NEOSAT.**

- **These base technologies were pre-selected following consultation with equipment manufacturers, research centres and laboratories worldwide.**

- **A Delta-KTR was held on May 28th, 2013 in TAS Cannes premises :**

  - to review new technology identified

  - to review list of potential predevelopments for European industry

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2 - NEOSAT Progress Status

Delta KTR – Call for ideas Reminder

- **From July 2011 to KTR review (May 2012) more than 230 potential technology innovating sources consulted (suppliers, R&D labs, Universities)**

§ **From KTR review to ARTES1 Final review (November 2012)**

Ø additional proposals received and evaluated

Ø Concurrent engineering plateaus held on mechanisms, avionics, PPU, PPS thrusters,…

§ **From KTR review (May 2012) to Delta KTR Review (May 2013) 210 more proposals have been received**.

Ø 180 were considered having consistent level to be evaluated

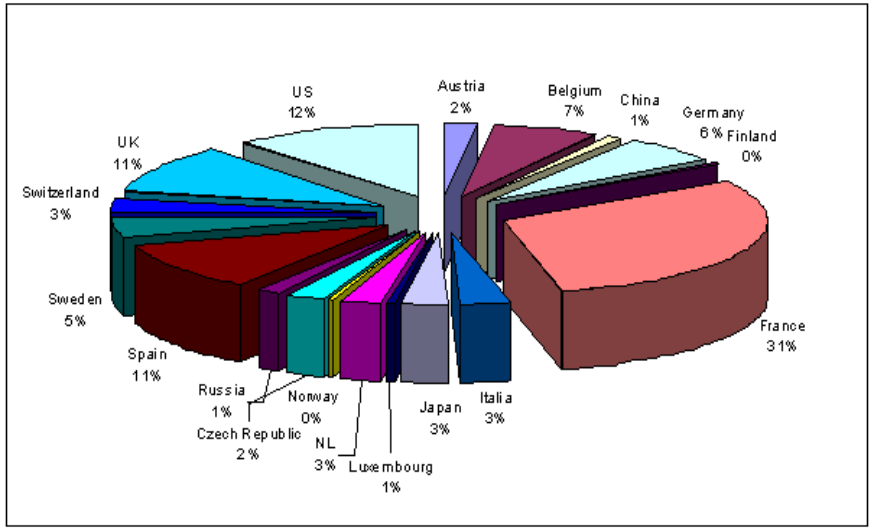
Ø 4 European days have been conducted (Norway, Poland, Romania, Uk days)

Ø 3 new technos have been received from Romania Day

§ More than 70% of responders from Europe

§ More than 150 meetings/teleconferences held with more than 130 organizations from November 2011 to May 2013

Ø Distribution of responders



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Concurrent Engineering

- **Concurrent Engineering with Equipment & Technology providers has been conducted :**
  - To allow a significant suppliers contribution to the Neosat programme from start through a bottom-up approach & contribution to the building blocks definition
    - Identification of cost drivers
    - Identification of optimal “perimeter” of building blocks/equipments
      - vs. functional share
      - vs. validation & programmatic aspects
    - Contribution to building block/equipment specification
  - To identify the key technologies that will be used on the NGP satellites
  - To prepare the next phase (ARTES 14)

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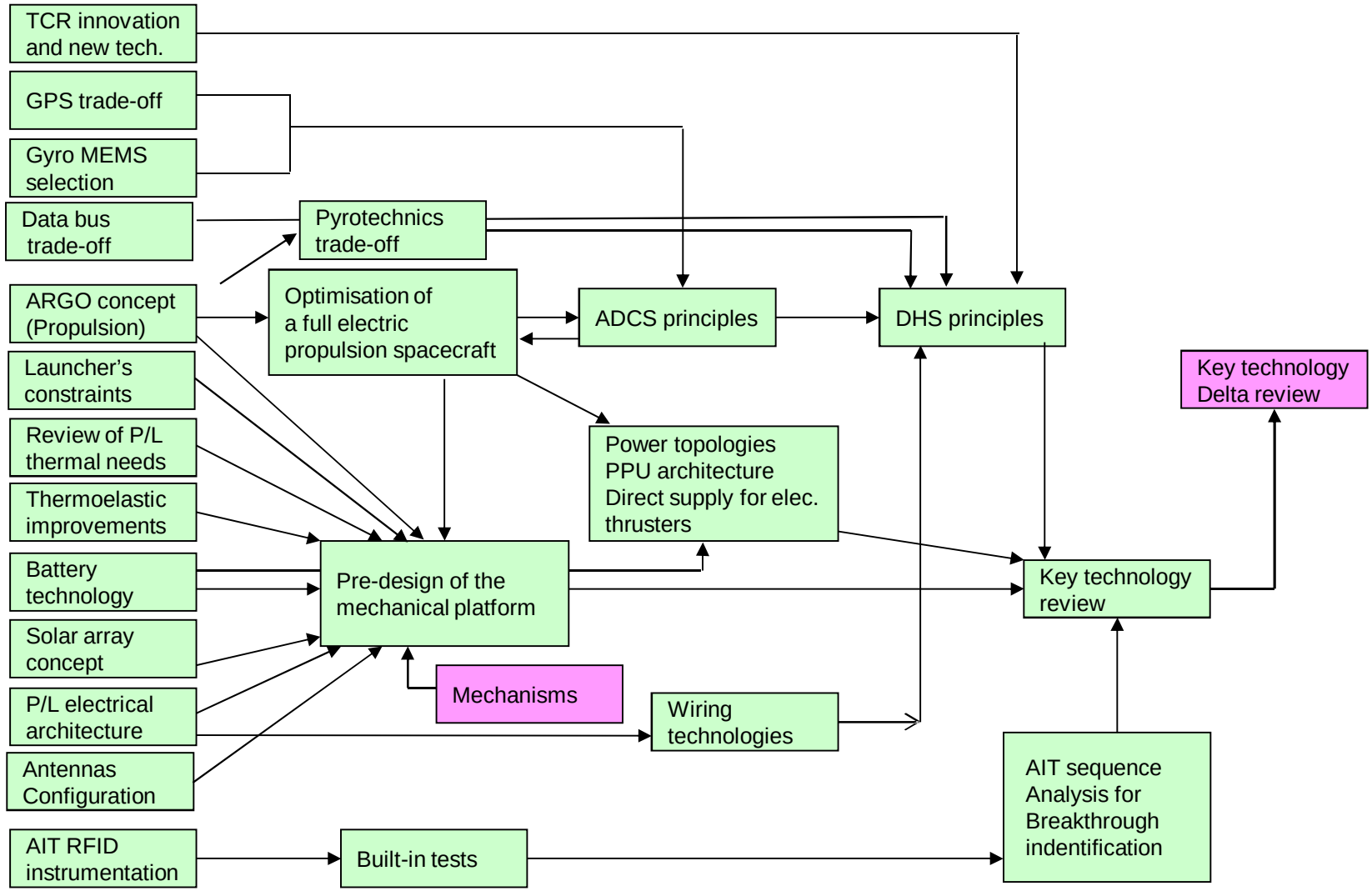
Delta KTR – Call for ideas
Engineering workflow (Plateaus)



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2 - NEOSAT Progress Status

KTR outcome: Pre-developments

- **The purpose of these proposed predevelopments is either**
  - To mitigate some risks as the proposed technology is perceived as promising but not mature enough (Too low TRL)
  - To improve the TRL level to allow the selection of the proposed development onto the NEOSAT satellite architecture/pre-design (Insufficient TRL level to baseline the proposed technology)
  - To further explore and consolidate the interest of the proposed development / technology wrt the NEOSAT key objectives (competitiveness)
  - To allow (consolidate) a schedule compatibility with the NEOSAT PFM schedule

- **Approach based on:**
  - Co engineering between technology suppliers and NEOSAT team
  - Limited breadboarding when needed
- **Predevelopments list :**
  - 37 predevelopments already engaged
  - 31 predevelopments proposed in ARTES 14 Phase B proposal out of a list of more than 100 presented at delta KTR

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Neosat overview

- **System specifications**
- **Market Analysis**
  - **Common Astrium-TAS marketing work to assess the global demand with internal & external databases complemented by interview of operators.**
  - **Recall of Main messages for the next decade:**
    - The existing L, C, Ku Telecom market will remain and the upper bands will be explored
    - There will be a market for small (3t) satellites (new market, schedule, CAPEX) and large (6t) satellites (replacement fleet, reduced cost per transponder)
    - Full electric propulsion is welcome as well as transfer duration of up to few months
    - Operators are looking for secured schedule and cost optimized solutions
    - Operations and FDIR should be revisited to be simpler
    - Do not propose complex solutions with longer schedule
    - No improvement requested on autonomy or lifetime

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- **Launchers specifications:**
  - Consultation/ identification of launchers roadmap performed
  - Main messages :
    - Constraints of existing launchers shall be taken into account
    - Specific orbits to optimize the top up phase with electric propulsion shall be looked at
    - Potential launcher breakthrough in the coming years : direct injection of 6 tons class satellite at similar cost
    - => Orientation of concurrent engineering phase towards
      - A full electric propulsion (Electric Orbit Raising (EOR)) , On station control, FDIR,…) optimised for direct injection
      - An optional propulsion transfer module to keep multi Launcher compatibility
  - CNES/ESA/TAS/ASTRIUM & ARIANESPACE Workshop implemented

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Neosat Architecture Main Features

q Neosat Architecture

- Allows to cover the full mission range (P/L 4-18 kW)
- Full range compatible with cheap launchers (Falcon 9) and 4m fairings launchers
- Fully Modular concept
  - Service Module
  - Repeater module
  - Antennas modules
- Full electrical platform
  - Contributes to competitiveness by reducing the S/C mass
- An optional propulsion module for transfer (ARGO)
  - Allows to speed up transfer duration (2 weeks vs 4 months)
- Thermal control :
  - With fluid loop
  - With Deployable radiator (DPR)

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2 - NEOSAT Progress Status
ARTES 14 Proposal

Based on all activities performed, the ARTES 14 proposal has been delivered around the following principles:

- **A spread of Neosat activities in a TAS/ASL common and 2 specific streams (1 TAS + 1 ASL)**
  - Specific : Operations, flight software, SA, SADM, deployable radiators, Mechanical and thermal architecture, TAS product line development
  - Common : functional architecture, common Building blocks specification, selection and procurement follow up
- **A categorization and list of Building Blocks**
  - Unified : 1 specification, 1 design, 1 qualification , 1 supplier TBC
  - Interchangeable : 1 specification, 2 designs, 2 qualifications, 2 suppliers
  - Specific : 2 specifications , 2 designs, 2 qualifications, 2 suppliers

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NEOSAT Challenges

Industrial Managers
Christophe Bauthier (TAS), Jean-Robert de Bisshop (ASL)

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Neosat Common AD approach

Objective: Establish a common set of Applicable document to be used as baseline for all Procured items

- Whenever appropriate, make full use of existing industry standards (ECSS)
- Identify and challenge any cost drivers in current primes ADs (supplier survey initiated July 13 – see dedicated slides)
- Clearly separate design guidelines from actual requirements
- Maintain and manage those ADs for the future recurring programmes

Approach and method

- Lesson learnt from existing telecom product lines taken into account
- To assess on case by case basis, the common standards being the more adequate and efficient to be used for NEOSAT development programme.

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3 - NEOSAT Challenges
Neosat Common Technical Spec

Objective: for all common building blocs, establish a technical specification applicable to both product lines

- Avoid any envelop requirement to limit the cost impact at unit level
- Identify and challenge any cost drivers in each specification
- Whenever existing product already used in industry; tune the specification to the known product performance and/or take them into account in the platform architecture.
- Common specification are to remain applicable for future Flight application beyond the first Neosat Product lines PFMs

Anticipate Specification and Building Block (BB) selection in 3 waves :

- Ø Wave 1 : BB for which common specification :
  - n Is needed urgently (on the critical path of the project) or
  - n Can be ready in a short term
- Ø Wave 2 : BB considered needed to hold System PDR's
  - n Major Subsystems and/or Building Blocks
- Ø Wave 3 : remaining BB's

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Neosat Complementary technologies

Objective: In parallel to PFMs programme, identify and develop technologies to be implemented on future flight application

- Any Promising technology with low TRL or development schedule not compatible with Neosat PFMs
- Development to be implemented with objective to reach qualification before end 2020
- Product line architectures to provision for future implementation of complementary technologies
- Any new or future product that could bring competitiveness to Neosat can be considered at later stage in the programme

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Competitiveness

A Competitiveness methodology has been put in place to monitor the competitiveness all along the program and at all levels

Based on a set of reference missions representative of the Payload Missions of tomorrow

Competitiveness work plans are implemented at Prime level

Competitiveness is the NEOSAT program main driver

Recurring cost of a Building Block will be the major criteria for selection of a supplier

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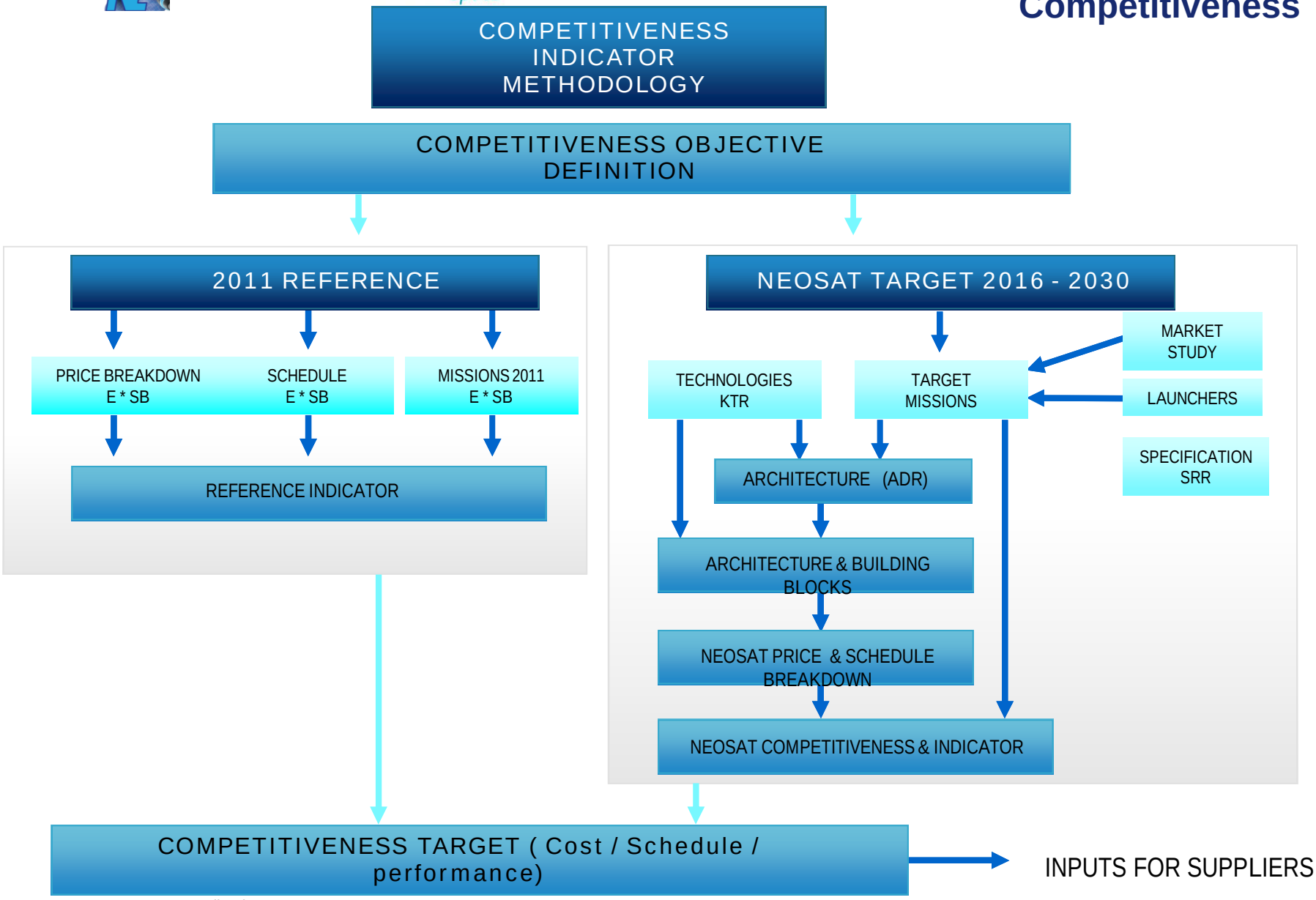
Competitiveness



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Indicators

A list of indicators allow unambiguous monitoring on how the objectives of the NEOSAT project are met.

The Indicators are grouped in the several categories:

- Ø Competitiveness
- Ø Innovation (for improvement of competitiveness)

Considering the ARTES 14 program objectives, the various indicators are also attributed different weigh factors (competitiveness being obviously the most important).

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Indicators

reduction of total cost of ownership

- Ø this indicator measures the reduction of in-orbit transponder (or equivalent) total cost of ownership (tco) for an operator.
- Ø the tco shall be at least 30% lower than the current product lines platform geostationary satellites 2011 satellite cost models, for the same reference mission, and at similar economic conditions

access to the launcher market (prime indicator)

- Ø *this indicator measures the compatibility of the platform product lines with existing and planned launchers addressing geostationary-telecommunication satellites.*

level of exclusive access to competitive feature

- Ø this indicator measures the extent to which competitive features are exclusive to neosat product lines or, on the contrary, are also accessible to competitors.
- Ø for sales of equipment outside of esa member states, it is proposed to apply royalties for recurring equipment and access to the qualification file. considering esa rules.

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Indicators

flexibility in answering to technical customers mission requirements (prime indicator)

- Ø *this indicator measures the capability of the platform product lines to adapt to the anticipated requirements at mission level of the satellite operators, present and futur.*

reduction of satellite manufacturing time

- Ø this indicator measures the reduction of the time between awarding the contract for a satellite by a customer and it's on ground delivery.
  - n effort to reduce manufacturing & test lead time at building block level

level of innovation introduced

- Ø this indicator measures the level of innovation introduced at all levels: technology, building block, subsystems when applicable, system architecture, process….
- Ø innovation is taken into account provided it leads to competitiveness improvement

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NEOSAT Way Forward

Industrial Managers
(Schedule & Building Blocks approach)
Christophe Bauthier (TAS), Jean-Robert de Bisshop (ASL)

Supply Responsibles
(Selection Process)
Bruno Feurte (ASL), Michel Fabre (TAS)

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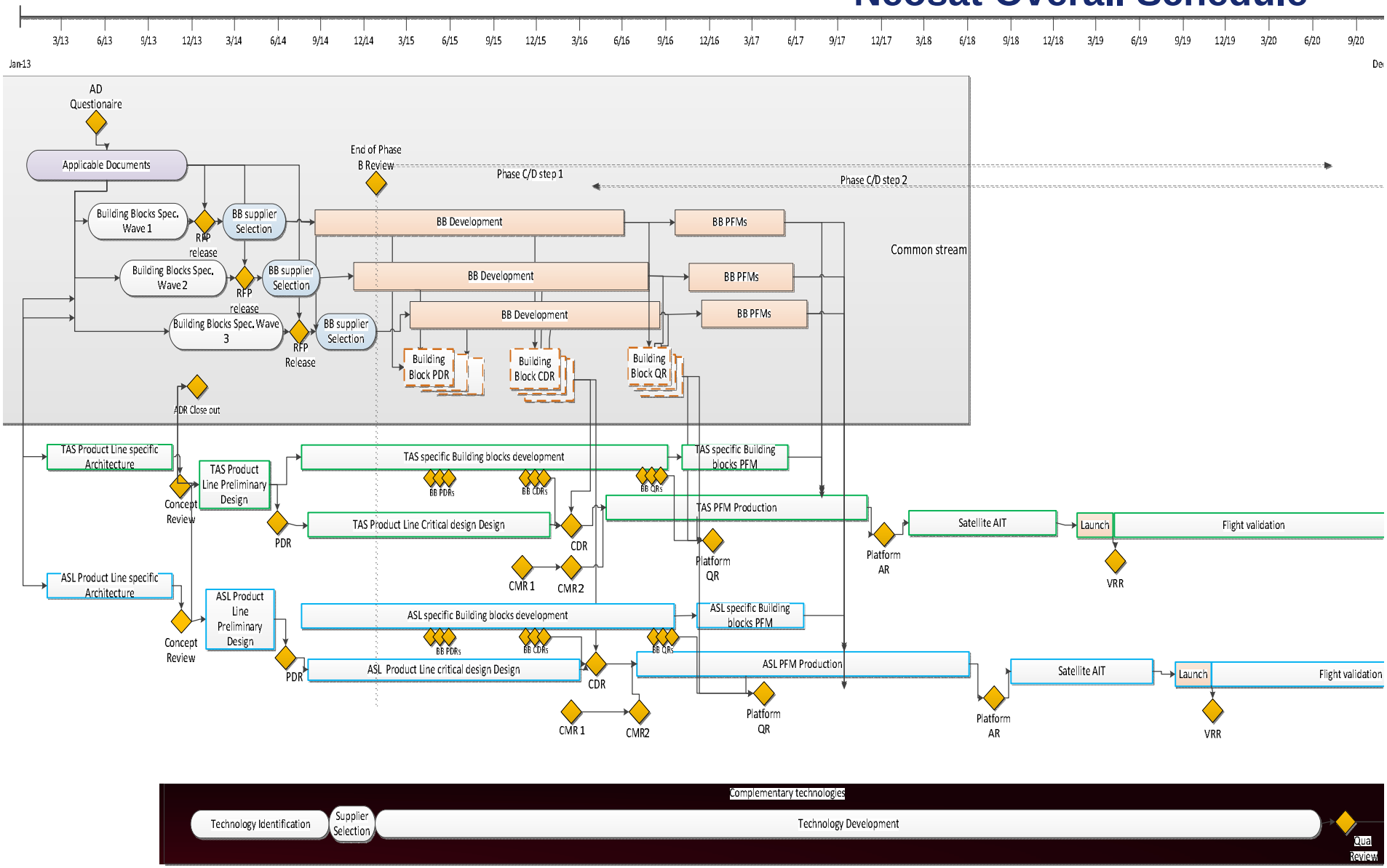
4 - NEOSAT Way Forward

Neosat Overall Schedule



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Main System Level schedule milestones:

- ADR close out in Dec 13
- System PDR in Q2 14
- System CDR in Q4 15
- Candidate Missions Reviews (CMRs) from Q4 2015
- Neosat product lines PFMs launches from Q4 2018

Main Building Block Level schedule milestones

- RFQ are issued Q1 2014 à first supplier selection end Q2 2014 (see in part 5 of presentation) all supplier selection expected before Q1 2015
- BB Qualification by Q3 2016
- BB PFMs & FMs delivery by Q3 2017

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4 - NEOSAT Way Forward

Building Blocks approach

It is foreseen for both primes to procure Building Blocks , bearing in mind the following principles:

- A) Maximize common building blocks
- B) A good way to achieve competitiveness is to maintain competition, and thus keep several potential suppliers for a given Building Block
- C) Affordability: optimize the non-recurring investment is to have a single supplier
- D) Primes will have to maintain in-house core competencies and industry production workload
- E) A risk mitigation action in case of work overload or alert is to keep several potential suppliers (as a first approach this applies to a flight set of 4 or more units, i.e. 40 units/yr)

Therefore , the following categories have been established for the Building Blocks :

- COMMON Building Blocks :
  - Unified : 1 design, answering to A), C) or E)
  - Interchangeable : 2 designs, answering to A),B),D),E)
- SPECIFIC Building Blocks : 2 designs, answering to D)

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Common Building Blocks

These BBs have a common specification (functional, performance, interfaces, AD's).

Common Building Blocks can either be:

- **Unified:**
  - One single definition/design
  - One single qualification required
  - A single supplier as baseline also, the option of double sourcing could be maintained through a built to print approach
  - Common procurement approach to be implemented
  - Single source à cost reduction by scale
- **Interchangeable:**
  - To maintain some in-house core competencies and industrial strategy, some of the common Building Blocks will be interchangeable. Each prime will maintain their in-house production. The common specification will however ensure a constant benchmarking and will represent a risk mitigation in case of potential major issue on either production line.
  - Two source with each their own design à systematic competitiveness benchmarking and risk mitigation for critical component
  - 2 qualification for non-existing units
  - Limited I/F difference to be accommodated at platform level

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4 - NEOSAT Way Forward

Specific Building Block

- Specific building blocks are unique to one of the prime.
- The applicable documents are common
- Technological predevelopments may be common or specific
- Requirements are directly driven by the definition of each product lines.
- Development & procurement of each specific building block will be performed independently by the corresponding prime.

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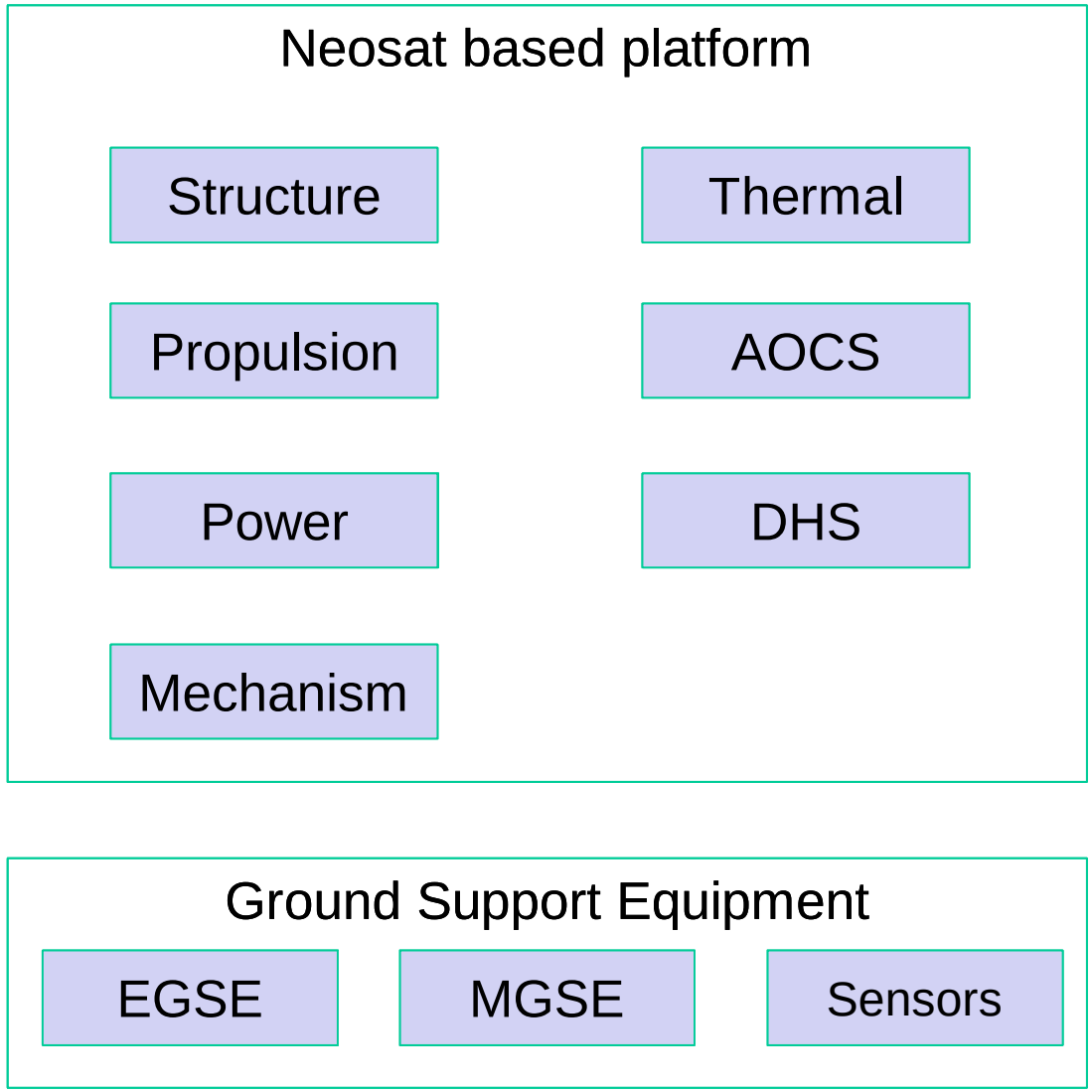
4 - NEOSAT Way Forward
Building Blocks vs architecture



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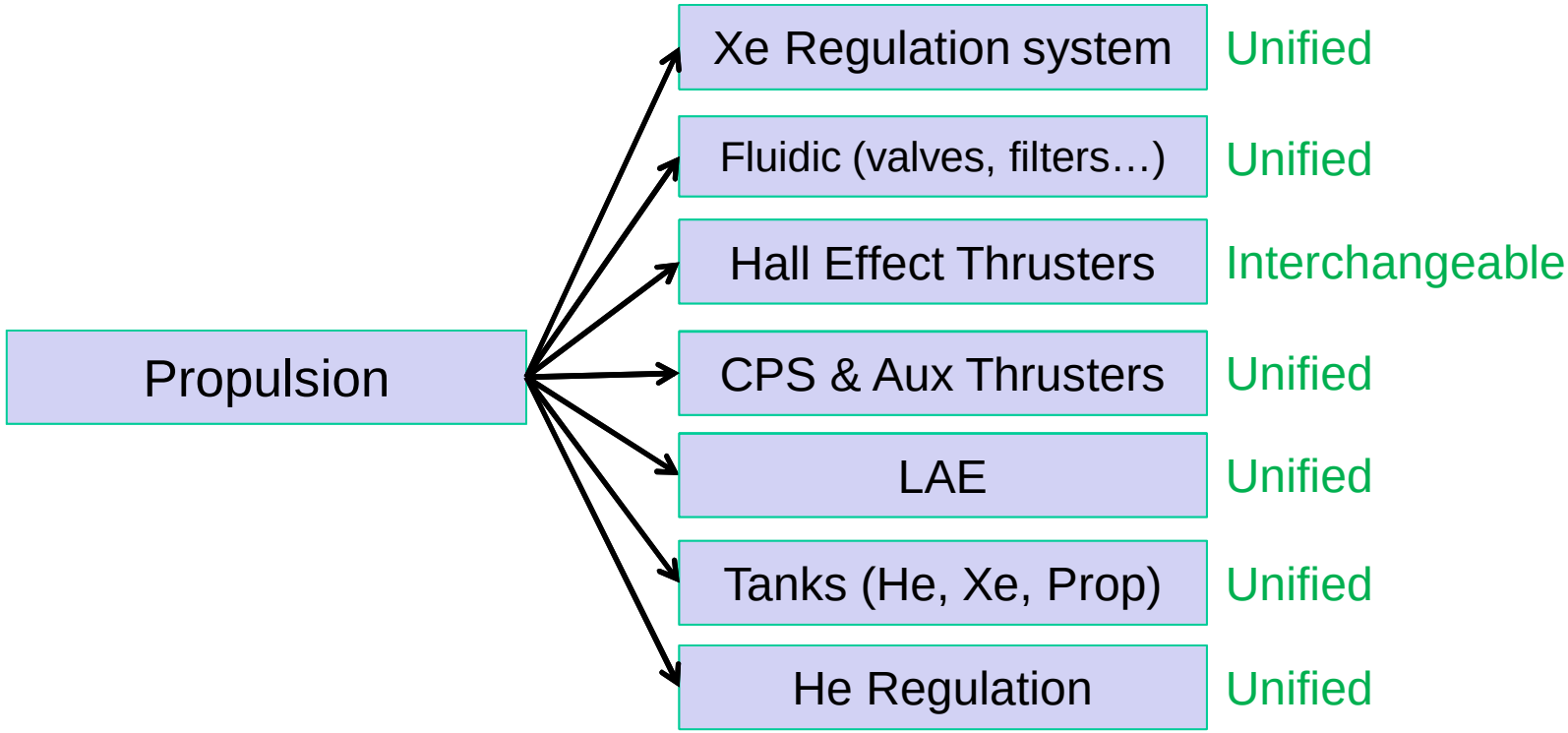
4 - NEOSAT Way Forward
Building Blocks classification

- **Propulsion components are historically similar for all primes.**
- **For some units such as (tanks, thrusters,…) , the NR effort required to qualify a unit is a strong incentive for a common/unified approach.**
- **For HET, the criticality of the unit, the potential production required for Neosat, its price and the different options available on the market justify an interchangeable approach**



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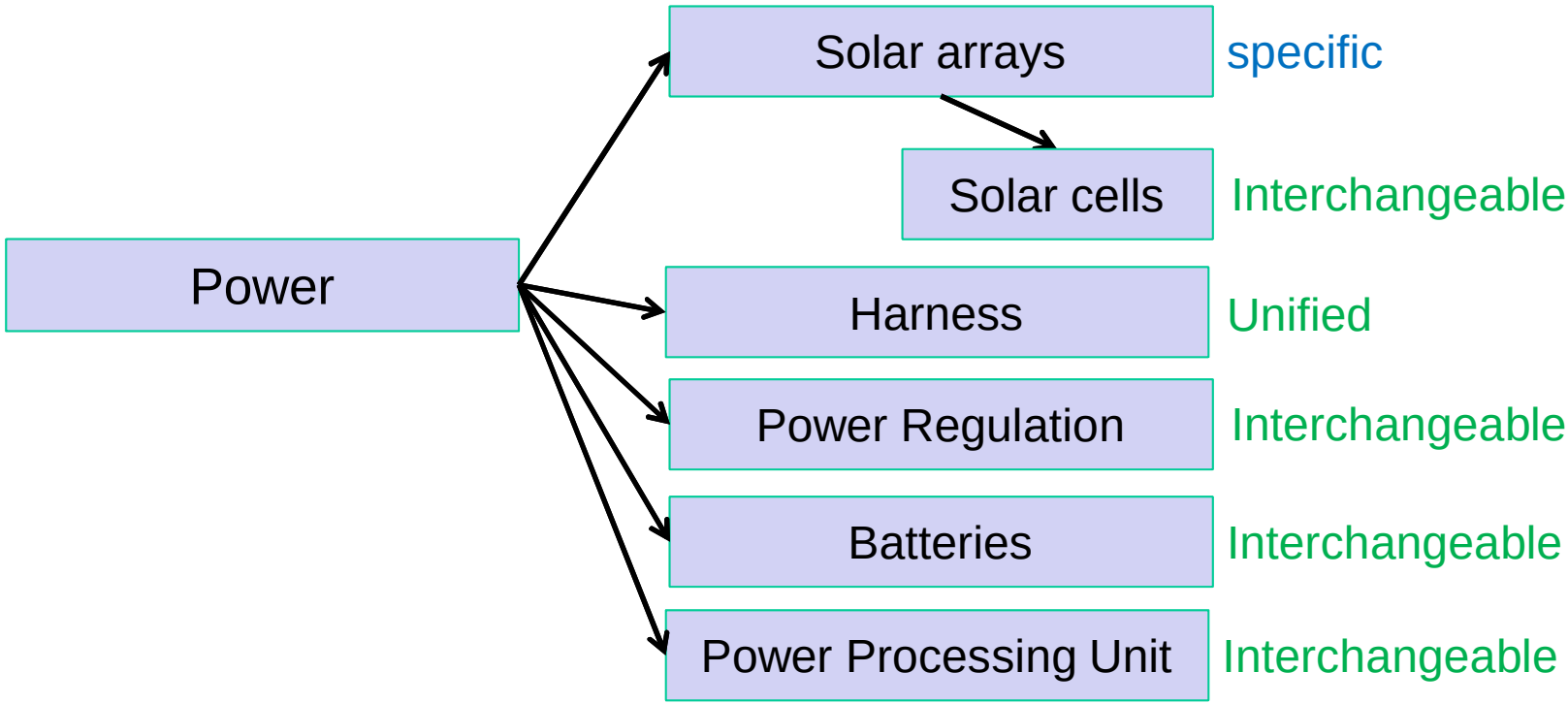
Building Blocks classification

- **Solar arrays are core competence for the primes. As such these building blocks will be specific. They will however be based on a common specification for their solar cells with a dual source approach (interchangeable).**
- **Several suppliers can be considered for batteries that are therefore interchangeable**
- **Power Processing Units are considered critical in term of production throughput and competiveness. They are therefore interchangeable**



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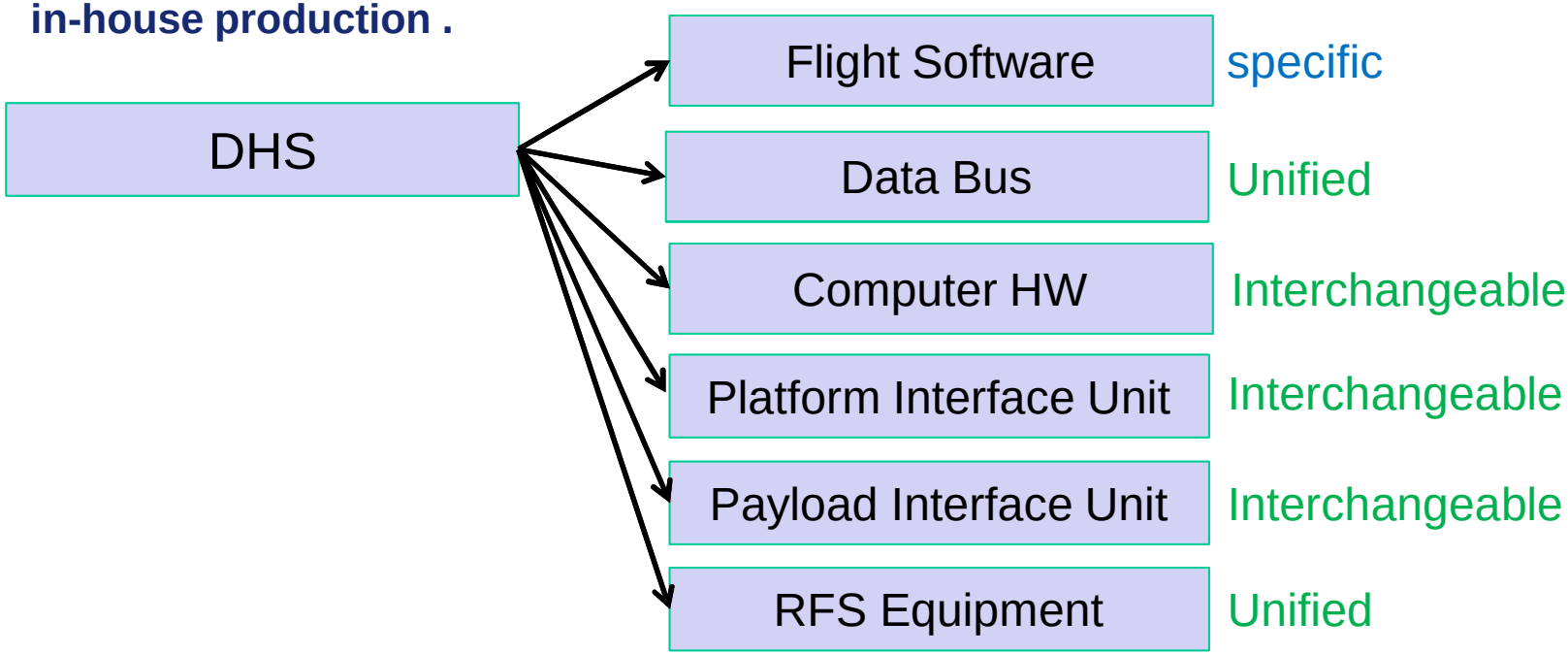
4 - NEOSAT Way Forward
Building Blocks classification

- **The on-board computer is a core competence for both primes. It has however been decided to implement a single specification for both OBC. The units will therefore be interchangeable.**
- **The flight software is key to the prime competency and performance and is therefore specific;**
- **The data bus will be unified.**
- **To maintain some in-house core competencies and industrial strategy, payload interface units (MPIU/PLIU) will be interchangeable. Each primes will maintain their in-house production .**



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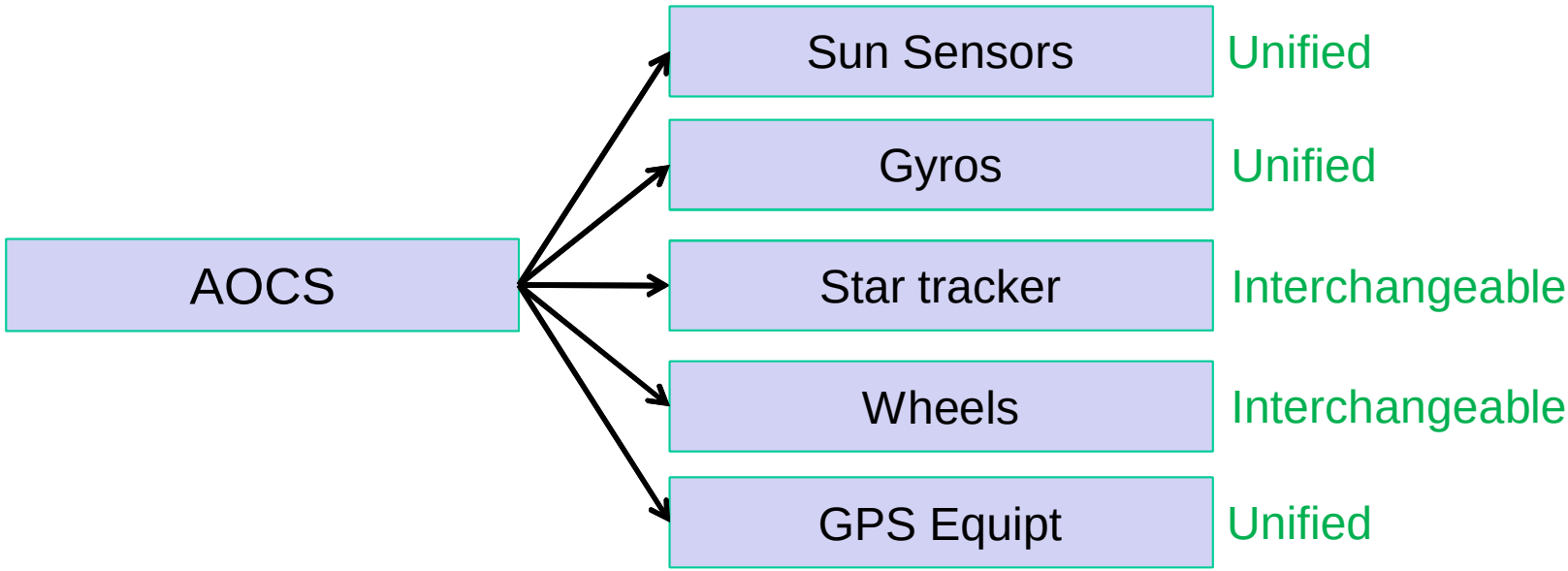
4 - NEOSAT Way Forward
Building Blocks classification

- **All AOCS components are common**
- **For critical units such as wheels or star trackers a dual source strategy is proposed to reduce industrial risk and achieve competitiveness**



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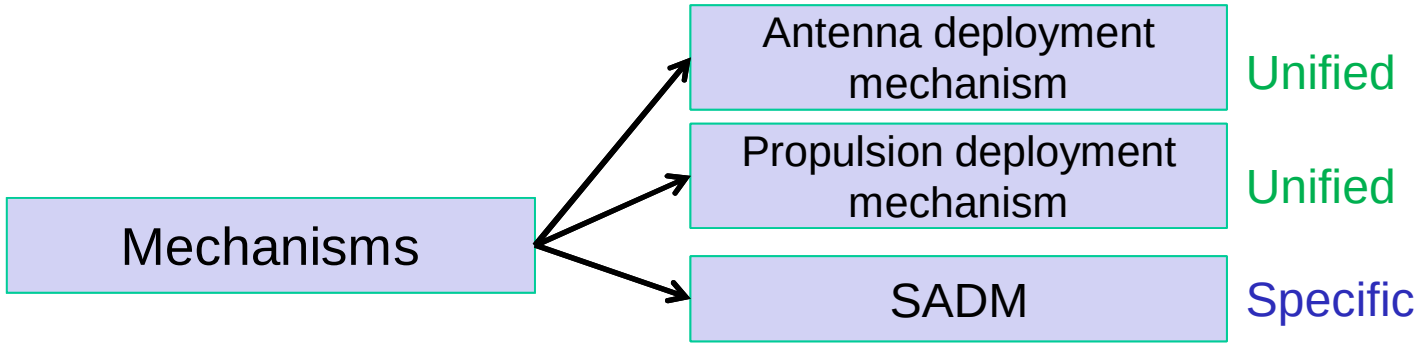
4 - NEOSAT Way Forward
Building Blocks classification

- **Deployment Mechanisms for Antenna or Propulsion Arm will be unified. Those mechanisms are usually subcontracted and would benefit from a joint definition/procurement approach.**

- **SADM are specific building blocks. Their direct interaction with specific building blocks (Solar Array, Power units) does not allow for common definition. However, key core element of the SADM (power signal slip ring) could be developed using a single definition.**



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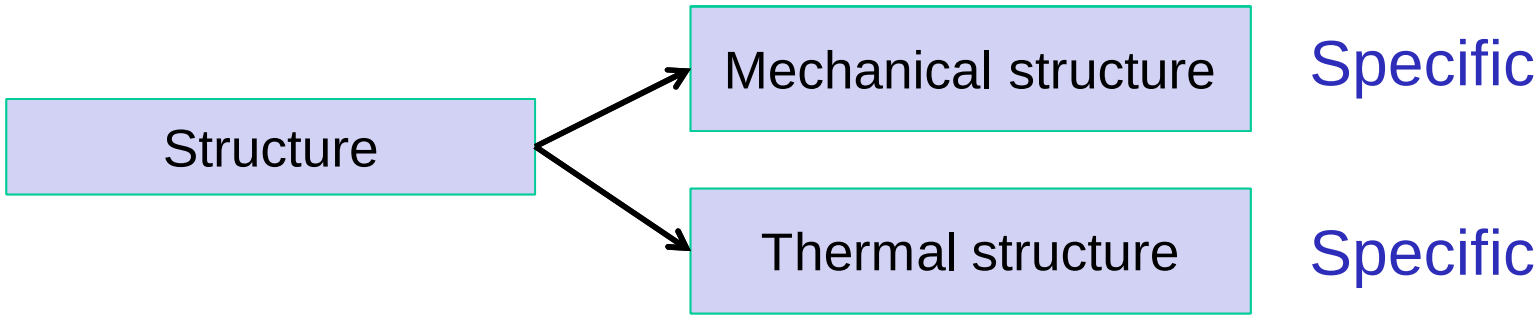
Building Blocks classification

- **The Spacecraft structure is a key differentiator for each primes. It reflects the prime core competency and performance. As such, they will be specific to each prime.**



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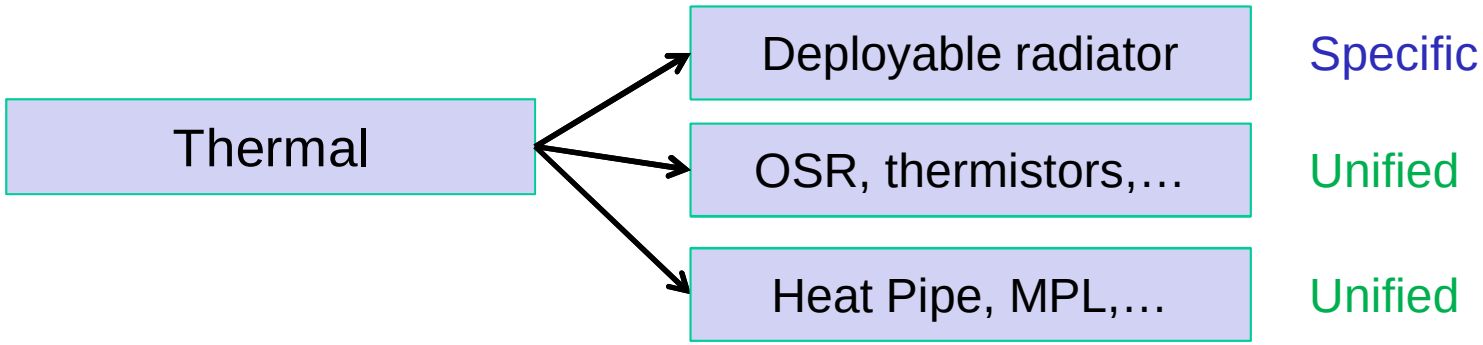
Building Blocks classification

- **The thermal architecture is specific to the product lines**
- **It will use some common elementary parts: OSR, heat pipes, mechanical pump,…**
- **The deployable radiator will be specific to each architecture.**



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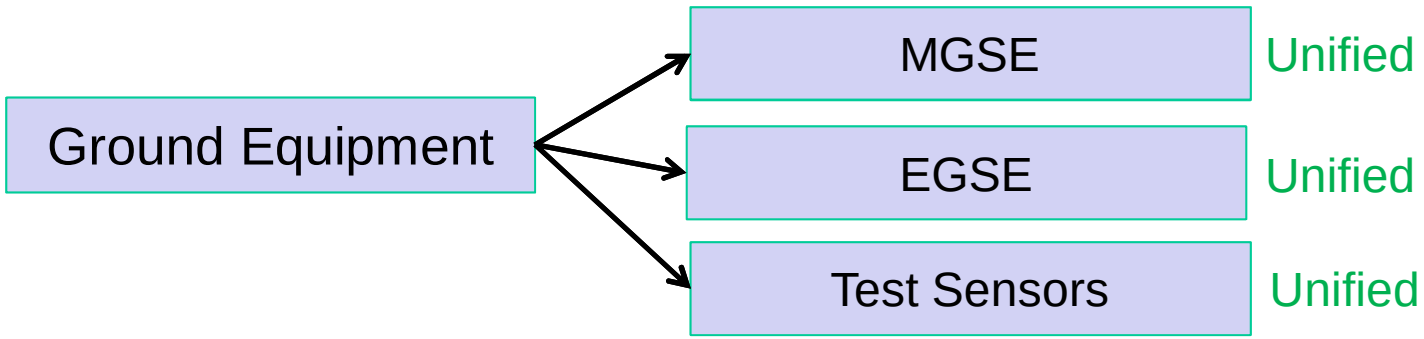
Building Blocks classification

- **The ground support equipment will common to both primes to the maximum possible extend. This will allow to maximise the return on investment for any new equipment developed for Neosat.**

- **NEOSAT Ground Support Equipment will be largely based on the EGS-CC initiative**



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Selections will be driven by a Selection and Procurement Process

- The principles guiding the selection of Building Block Suppliers for the NEOSAT product lines is derived from the Agency's Code of Best Practices
- Adapted to NEOSAT project specificities
  - Schedule
  - Competitiveness
- The process will be defined and approved between primes and agencies

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ITT/RFQ will be issued and sent

- The ITTs will cover three elements:
  - The development of the building blocks product line
  - The manufacturing of protoflight(s) equipment
  - The terms and conditions for subsequent recurring sales

- The ITT requirements will address
  - the importance of competitiveness of the products
  - long term production capabilities
  - competitiveness of recurring prices

- Per given building block, to suppliers selected by the TEB
- According to the program schedule in 3 waves
- First RFQ will be sent Q1 2014

All suppliers are fully eligible to bid

- Including non-EU suppliers
- Including suppliers belonging to countries not participating to NEOSAT program

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ITT / RFQ Data pack will include

- Cover letter
- Generic Statement of work
- Specification (including applicable documents)
- Draft subcontract
- Conditions of tender
- Selection criteria
- Closing date for receipt of offers
- Conditions for industrial agreement (recurring price, production capability, bulk procurement scenario, …)

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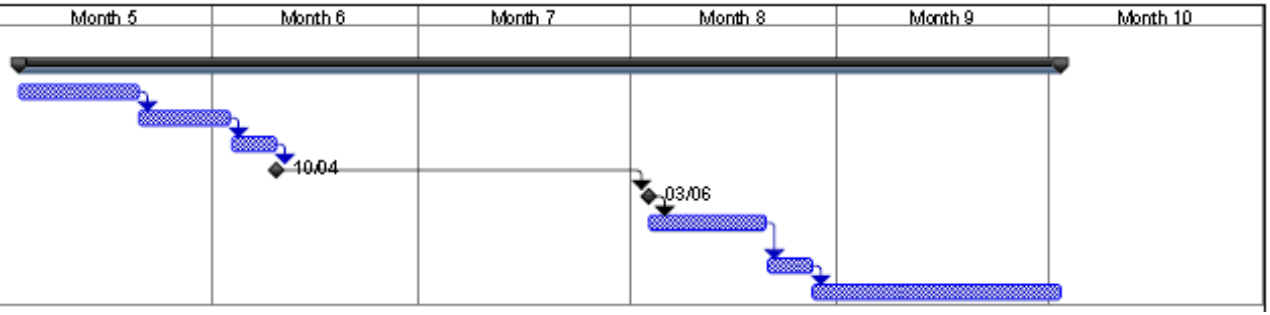
Typical ESA TEB schedule

ID	Nom de la tâche	Duration
1		
2	TEB process	22 wks
3	RFP package	3 wks
4	Review by TEB	2 wks
5	Package update	1 wk
6	RFP package release	0 days
7	Proposal reception	0 days
8	Proposal dispatch and evaluations	3 wks
9	Evaluation Boards	1 wk
10	Contract implementation	6 wks



All efforts will have to be made by all parties so that :

- **Selection of supplier is made in less than 3 months after RFQ package release**
- **That supposes that proposal is sent in less than 2 months after this release**
- **Contract will be implemented about 1 month after selection**

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Selection criterias

- **Dictated by competitiveness of recurring product lines**
- **List of criterias with corresponding weighing factors adjusted to each RFQ**
- **Major criterias**
  - Recurring price
  - Industrial credibility (in terms of space experience, quality and reliability records)
  - T&Cs for recurring sales (binding price, production capability, bulk approach, …..)
  - NR price for the development and qualification (“value for money”)
  - Affordability (budget availability for bidder country)
  - Added value on performance at system level (e.g. mass)

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Applicable documents

Quality Responsibles
Marc Vespa (ASL), Pierre Antoine Leroux (TAS)

Technical Responsibles
Jérome Lemaire (ASL), Nicolas Mosson (TAS)

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5 – Applicable Documents

Objective:

- Main goal of NEOSAT is to achieve a significant cost reduction with regards to the current market price
- To identify cost driver due to our Applicable Documents, questionnaire was sent to Suppliers Mid of July

Approach and method:

- Questionnaire was short to ensure supplier participation
- Using Alphabus, Spacebus and Eurostar current Applicable Documents
- Questionnaire was sent only to supplier who are or have been in business with TAS and/or ASL
  - 50 Worldwide Suppliers consulted
  - 60% of answers received

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5 – Applicable Documents

Three sets of Applicable Documents:

- Ø Technical AD's (Mechanical, Electrical…)
- Ø Quality AD's (Dependability, 3E parts….)
- Ø Management AD's (Generic SOW, configuration…)

Approach and method

- Ø **Common** AD's for Thales Alenia Space and Astrium NEOSAT product lines BB procurement
- Ø Lesson learnt from existing telecom product lines (SpaceBus, EuroStar, Alphabus…) and your feedback will be taken into account.
- Ø To assess on case by case, the available common standards that can be amended for NEOSAT.

  By preference orders:
  - ECSS "as is"
  - Tailorisation of ECSS
  - Existing or new TAS/AST common document (e.g: Alphabus,…)

Clarity of requirements / Just need and Competitiveness are drivers for the trade-off

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Technical Applicable Documents

- Similar documentation structure-tree as for @bus with merge of some ADs:
  - Competitive approach: only relevant AD-Engineering to be provided to equipment suppliers

- Separation between “general design & interface requirements” and “validation & verification requirements”
  - Efficiency for the maintenance and evolution of Ads at primes & suppliers level

- Mechanical levels and Thermal qualification range will be part of unit specification and not included in a generic way in one AD
  - Simpler approach for equipment supplier avoiding risk of confusion / need for clarification

- ECSS-E:

Only a few ECSS-E are directly applicable or tailored at engineering levels for databus (MIL-STD-1553, SpaceWire) and S/W engineering (ECSS-E-ST-40).
For other domains, engineering ADs includes requirements focused at unit level for a commercial telecom application, including some ECSS requirements on a case by case basis.

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Technical Applicable Documents : list of 11 + 4 ADs for engineering

- Ø GDIE general electrical requirements
- Ø GDIE power bus user requirements
- Ø GDIE generic DHS electrical I/F requirements
- Ø GDIE specific DHS electrical I/F requirements
- Ø GDIE: databus user requirements
- Ø GDIE mechanical & thermal requirements and ICD
- Ø Radiation environment requirements
- Ø EMC/ESD design requirements
- Ø EMC/ESD test requirements
- Ø SW engineering requirements
- Ø Units validation & verification requirements

- *ØMechanical mathematical model delivery requirements*
- *Ø Specific mechanical math model delivery requirements*
- *Ø Reduced thermal mathematical model requirements*
- *ØIDS elaboration rules requirements*

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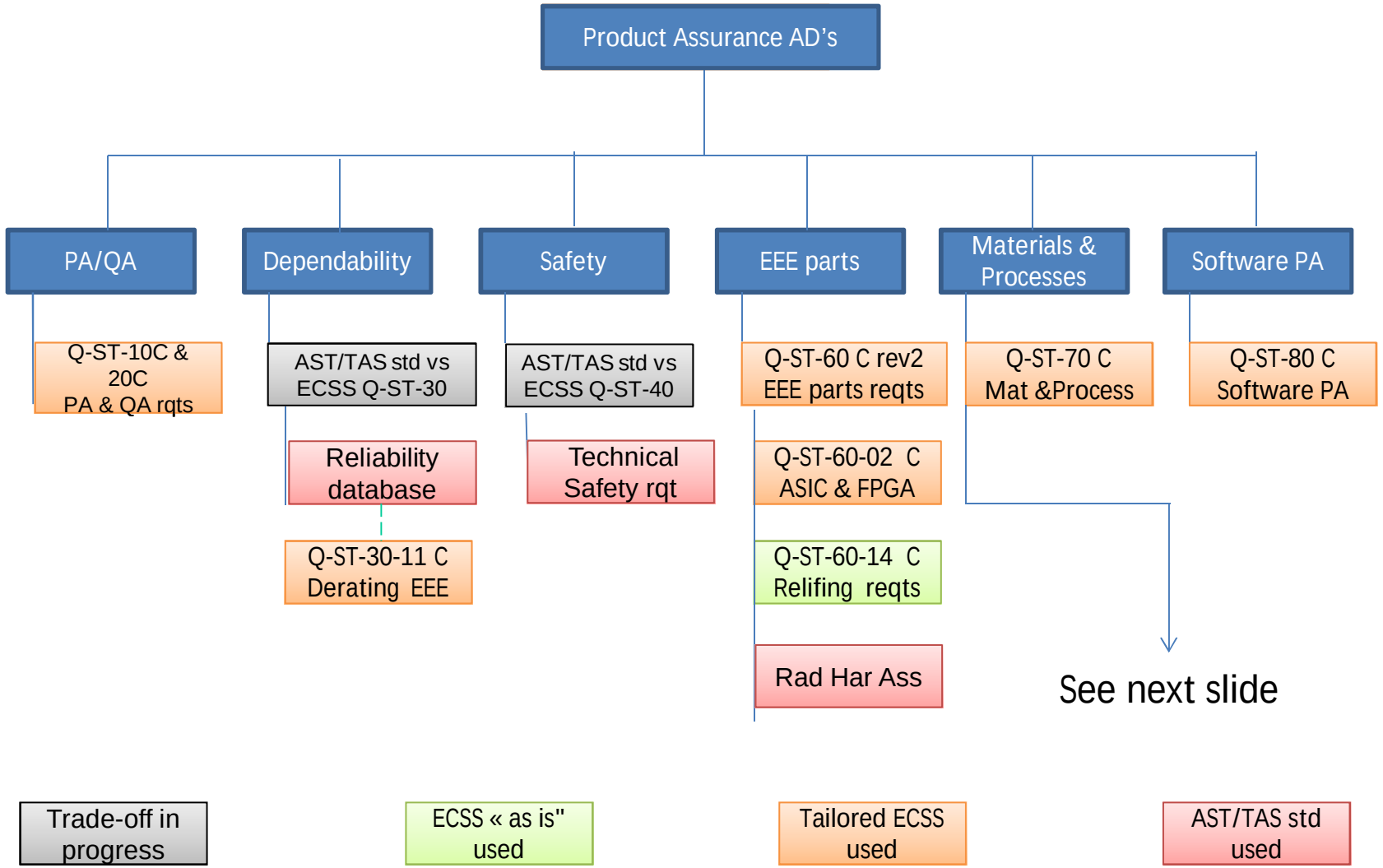
5 – Applicable Documents
Quality Applicable Documents



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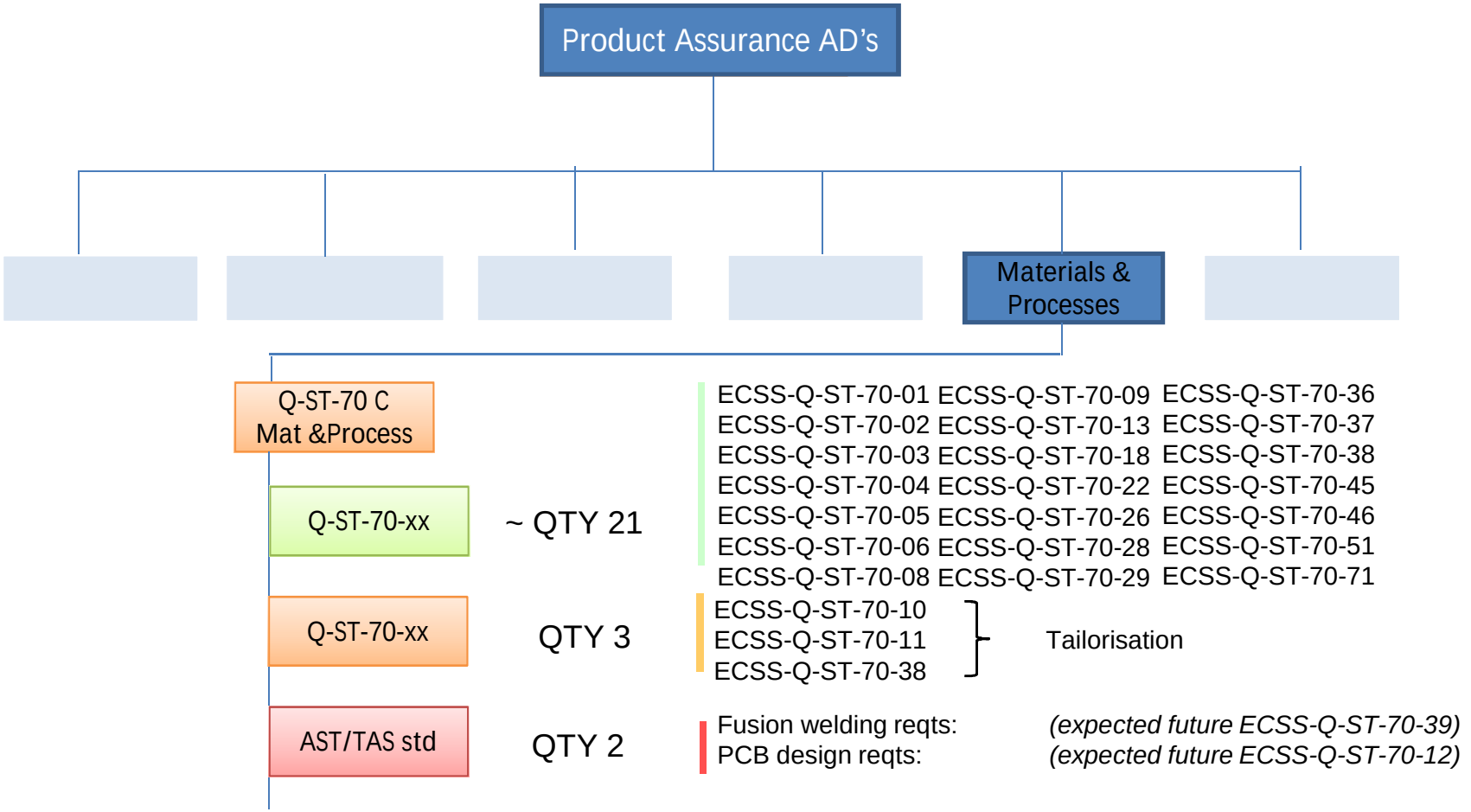
5 – Applicable Documents

Quality Applicable Documents



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Tailoring Method and Tools

METHOD

Ø Tailoring procedure has been issued (draft version): compliant to ECSS-S-ST-00
Ø ECSS's requirements need to be numbered
ØTailored document requirements need to be classified 4 classes:

A: REQ accepted from ECSS
M: REQ modified from ECSS
D: ECSS REQ deleted
N: new requirement

Ø2 possible tailoring methods depending of the ECSS document tree level:

Level 2: self-content document
Level 3: differential document

TOOLS

Ø For information, at prime level, DOORS decided to be used for management of all NEOSAT AD's

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Supplier’s survey feedback

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6 - Supplier's survey feedback

- 33 answers out of 50 to the Applicable Documents questionnaire have been received.
- For the question: *"In your experience with other customers, are TAS and/or Astrium requirements…"*

	Design rules	Mecha thermal environment	Technical specification	PA & Process	SOW
More stringent with significant cost on the unit	6	8	10	9	5
More stringent without significant cost on the unit	4	4	1	2	5
Roughly equivalent to other customers in the space	21	17	19	20	20
Less stringent	0	1	1	0	0
Blank	2	3	2	2	3

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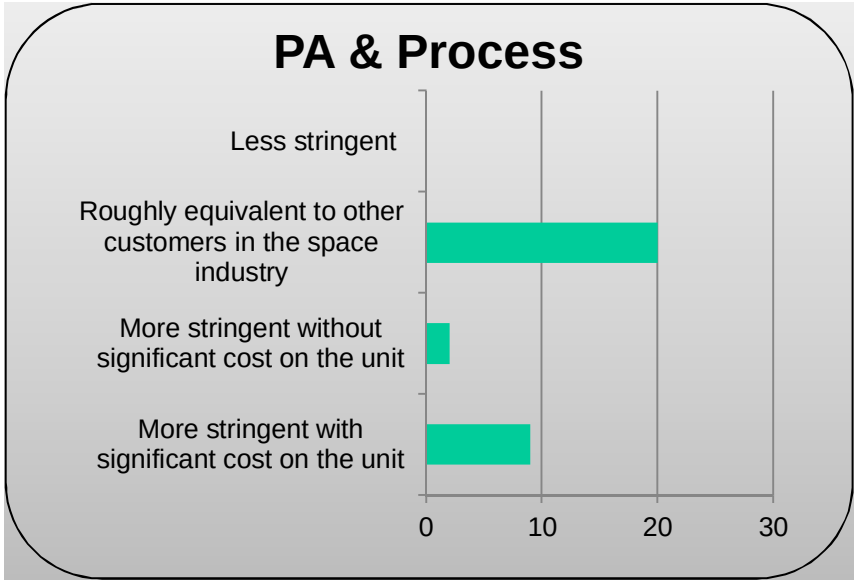
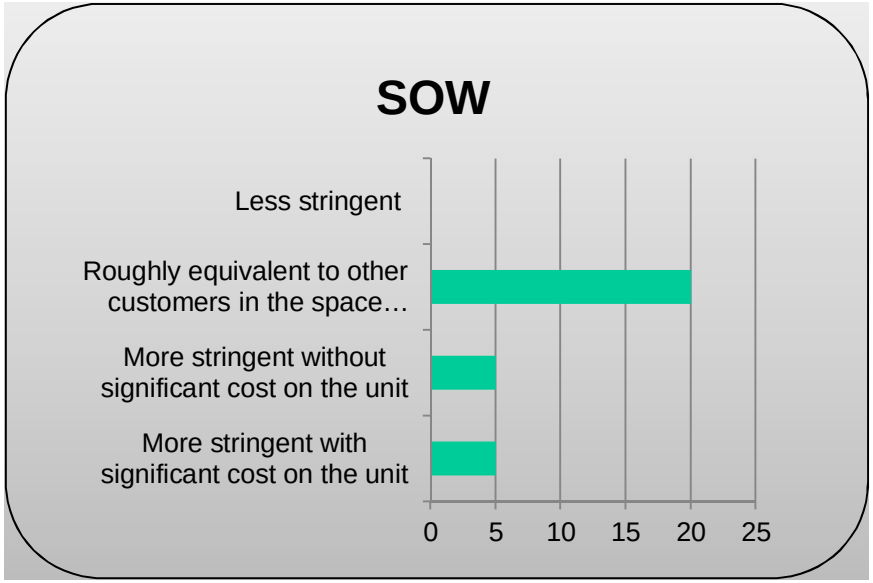
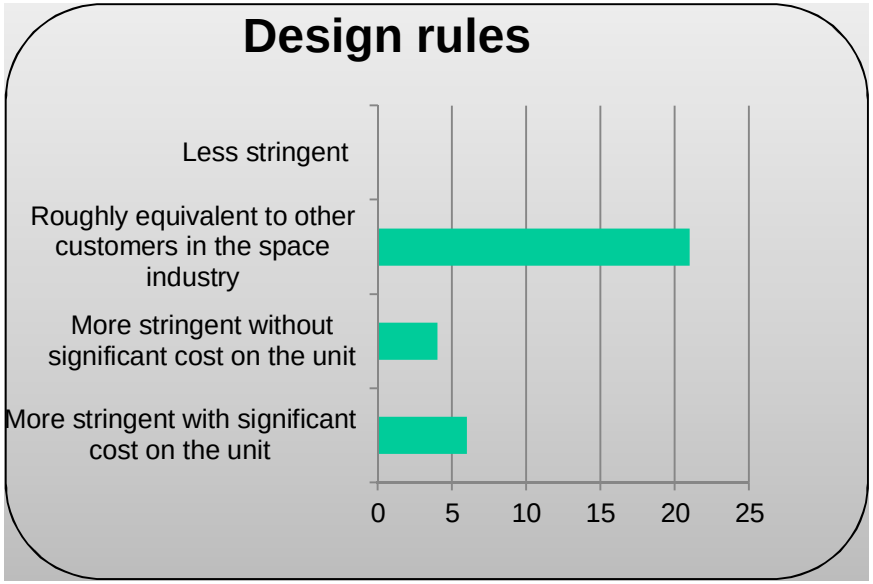
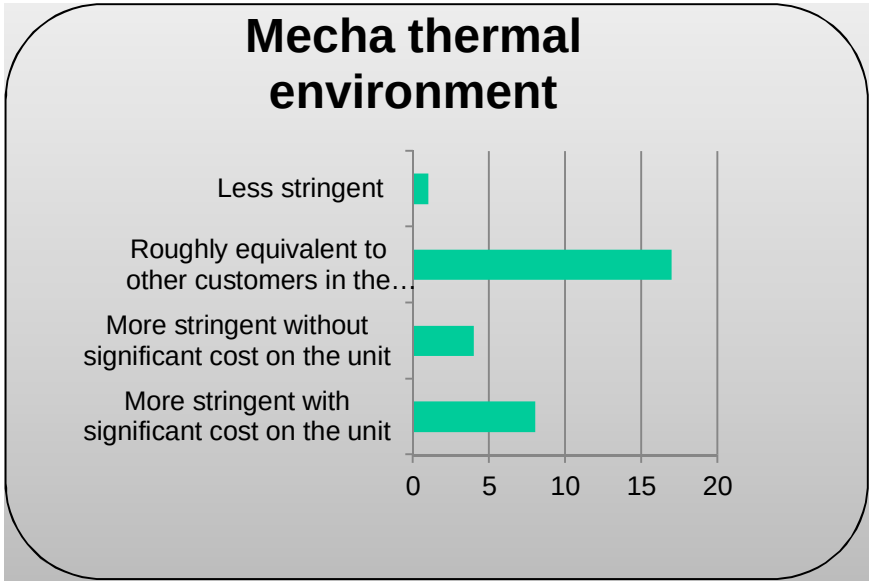
6 - Supplier's survey feedback









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- **Some examples of key elements introduced in NEOSAT engineering AD's, including main questionnaire feedbacks:**
  - Mechanical:
    - Relaxation of tolerances
    - Shock levels will be relaxed
  - Thermal:
    - Harmonized & clarified thermal margins
    - Simplified verification method for heat flux density
  - Electrical & Power
    - Relaxed & more realistic power transients
    - Separation of requirements for flight & test connections
    - More explicit & clarified options for grounding
  - Radiations:
    - 2 environments: one case for "current GTO + 5 years in GEO" missions, and a more stringent case for "full electrical transfer + 15years in GEO" missions
  - Testing:
    - Approach will be revisited to optimize the AIV from units level up to satellite level. E.g. testing approach in qualification and in acceptance.

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6 - Supplier's survey feedback

The main feedbacks received:

- Ø Improve the Applicable Document selectivity : To flow down only the requirements applicable to the product
- Ø Suppress /limit the "nice to have requirements"
- Ø Improve the design, manufacturing and test Reviews efficiency
- Ø Limit the number of Mandatory Inspection Points (MIP) or transform some of them as KIP (internal Key Inspection Point): To leave more autonomy to the supplier.
- Ø Simplify and limit the EIDP contents
- Ø Participate to the building block specification writing

These feedbacks will be taken into account as far as possible

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Questions & Answers

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Conclusion

Project Managers
Michel Roussy (TAS), Jean-Marc Stephan (ASL)

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- **A lot of progress has been made since the First Neosat suppliers day (10/11)**
  - The NEOSAT funding has been secured through the ARTES 14 line at the Cmin 2012
  - The KTR#1 & KTR#2 have identified some promising technologies
  - The System Requirement Review has been successfully held gathering the expected requirements of our major customers
  - A NEOSAT satellite architecture has been proposed in line with the competitiveness driver. (ADR"1 and ADR#2)
  - The NEOSAT proposal has been submitted to ESA in answer to the ARTES 14 RFQ

- **Short term events**
  - ARTES 14 contract signature expected before end of January 2014
  - Selection of predevelopments across Europe from Q1 2014 to Q2 1014 as part of the ARTES 14 phase B program.
  - Issue of the wave 1 Building Blocks RFP (Q1 2014)
  - Issue of the wave 2 Building Blocks RFP (Q2 2014)
  - System PDR's before end of Q2 2014
  - Selection of building blocks suppliers from Q3 2014
  - Cmin 2014 (Dec 2014)

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- **The NEOSAT success is not only related to the Satellite architecture but is strongly relying on the suppliers.**

  - Your contribution is key to the competitiveness of the Neosat derived product lines
  - We need your support and contribution to make it
    - credible,
    - sustainable
    - and competitive
  - Astrium and TAS are open to any ideas that would help make it a real success…

Thank you for your attention!

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