ESCC - Past and Future
The Component Technology Board

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As CTB chairman

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Introducing the CTB

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- Why a Component Technology Board ?
- What are the objectives and tasks of the CTB ?
- How is the CTB working ?
- What are the major stakes addressed by the CTB ?
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What is the Component Technology Board ?

- **The Component Technology Board (CTB) is a supporting unit of the ESCC**.
- **The European Space Component Co-ordination (ESCC) is a co-operative arrangement in the field of EEE component and technology** with the goal to establish a world class electronic, electrical and electro-mechanical component system, through which are provided components at competitive costs and suitable for demanding space applications.
- **The CTB is in charge of the formulation of strategic programs and work plans for technology research and development in the area of European EEE space components.**
- **It is also responsible for the harmonization and co-ordination of the collectively funded European space component and technology research and the related development, evaluation, qualification, standardization and quality assurance activities.**

Why a Component Technology Board ?

- **Availability of reliable Electronic Components is critical**.
  Almost all programs are suffering from technical and quality difficulties in component procurements with significant business impact for systems and equipment manufacturers:
  - Obsolescence issues,
  - Evolution of manufacturer strategy,
  - Major technical problems and delays,
  - Procurement issues from single-source supplier (European and non-European) or non-European suppliers.

- **Availability of adequate and enabling technologies for future missions is critical**
  - Future needs space missions require step improvements (complexity, speed, miniaturisation, reliability, power, ...) compared to current technologies.
  - Increased gap compared to non-European technologies.
    Lack of competitive solutions penalises bid competitiveness (ASIC, FPGAs, Processors, GaN….)

- **Focusing on common components and technologies is a benefit for all actors**
  - The end-user with qualified, field-proven parts,
  - The manufacturers with larger business volumes,
  - The funding organisations with an optimisation of available resources and avoidance of effort duplication.

The CTB is deemed to address these issues and propose a coordinated vision of all actors on future needs and developments for components

What are the objectives and tasks of the CTB ?

- **Identify strategically important EEE components and technologies** anticipated to become standard requirements for future space missions in synergy with other market sectors.

- **Assess the technology trends and available component and technology manufacturer's portfolios and capabilities.**

- **Establish plans to make the technology available in time, at affordable costs and desired quality level for space project users**.
  Define and monitor the required component development, evaluation, qualification, studies and research activities.

- **Propose and support initiatives for the advancement and promotion of European component and technology supply chain** to reduce European dependence for strategically important technologies.

- **Minimise the duplication of efforts and optimise the usage of available resources**.

How is the CTB working ?

- **The CTB is organised with a main board and several expert working groups addressing the different EEE domains : passive, active/silicon, hybrids & packaging, microwave, photonics, MNT, radiation, materials & processes.**

- **The CTB is composed of a balanced representation of the European Space community who intends to actively support the CTB initiative**
  - ESA and NSA representatives : (~50 people involved)
  - Space Industry (primes and equipment manufacturers) (~45 people involved)
  - Manufacturer Industry (~40 people involved)
  - Other members participating on a case by case basis (manufacturers or labs)

- **The CTB proceeds from a common agreement of the future needs and preferred solutions to be developed.**
  The key success factors for the CTB hold in the involvement of the whole supply chain (from users to manufacturers including funding organisations) and in the motivation, participation, expertise and delegation of the its expert members.

What are the major stakes addressed by the CTB ? 1/3

Develop
Next Generation Digital Technologies

- **Maintain access to a "0.18µm-like" CMOS technology for the next 5 to 10 years**, particularly for Avionics Platform Equipments
  - As a general purpose, low-cost, medium complexity ASIC and FPGA technology
  - With extension to mixed-signal capabilities to further miniaturise the analog functions

- **Enable future scientific and telecom missions with digital technologies featuring a step improvement in term of complexity, data rate and flexibility,**
  - DSM (Deep Sub Micron) 65 nm CMOS technology identified as Next Generation Digital Technology core following current 0.18µm technology.
  - Development of derived products : ASIC (~20 MGates) , HSLL (6Gbps+), FPGA (2Mgates+), DSP (1 GFlops+) started or planned
  - The main stakes here are to:
    - secure a complete end-end-end supply chain compliant with the user requirements and viable for the manufacturers
    - secure the funding required over the next 4 to 5 years
    - demonstrate the reliability and performances of such complex products
    - allow the emergence of an appropriate industrial organisation to design, manufacture and supply this type of technology and products

What are the major stakes addressed by the CTB ? 2/3

Improve performances, miniaturisation and cost of future systems

- **Improve the miniaturisation, cost, standardisation of space systems with**
  - Advanced packaging and interconnection technologies :
    - High Pin Count packages and associated assembly and PCB technologies
    - flip-chip assembly for high-speed, high complexity DSM ASICs
    - non-hermetic packages
  - Micro and Nano Technologies : mechanical, optical or RF devices
  - Introducing Mixed-ASIC technology for better integration and lower cost of analog interface units
  - Introducing new components in Power electronics for better efficiency and performance

- **Offer advanced capabilities to future payloads and instruments**, particularly in
  - Microwave with
    - Development of GaN technology which will enable a new generation of high performance SSPA.
    - continuous development of standard space-qualified microwave parts
  - Photonics with
    - Advanced laser, photodiodes and other photonics components for Telecom and Sciences applications
    - Future imaging sensors for Earth Observation and Sciences applications

What are the major stakes addressed by the CTB ? 3/3

Maintain
the reliability and affordability of future systems
and the sustainability of supply chain

- **Develop secured and sustainable sources for reliable and affordable active and passive components by**
  - Definition of qualification plan (AQP) for needed components, technologies and capabilities.

- **Understand and mitigate the effects of radiation on EEE components**
  - Knowledge of radiation environment, effects and induced failures,
  - Develop test methods,
  - Develop mitigation techniques.

- **Analyse and mitigate the impacts of RoHS and REACH directives** on the supply chain of components and materials and on Space Electronics assembly processes.
  - Mitigate the risks of using lead-free components by appropriate measures and procedures,
  - Develop knowledge of lead-free finishes, lead free assembly process, reliability of lead free assemblies

Strengths, Weaknesses, Opportunities and Threats for the CTB

Strengths

- Cohesion of European Space Component Community through ESCC.
- High motivation and implication of all actors with support of agencies, Eurospace and manufacturers.
- Strong European technology basis with key enabling technologies; DSM, ADC/DAC, GaN, active, passive and RF components, MNT.

Opportunities

- Stable, long term funding scheme for components & technologies as proposed at ESA.
- New models based on commercial technologies: use of COTS and commercial foundries.
- Cooperation with other sectors now facing similar constraints (automotive, aeronautics).
- Cooperation with non-European and/or non-Space agencies.

Weaknesses

- Availability of resources and funding, particularly in some domains (packaging)
- Very long process from technology selection
  -> to funding
  -> to development
  -> to qualification and to flight
- Main capabilities located only in a few countries with lower contribution in small countries.
- Link and impact of CTB recommandations on agencies plans

Threats

- Quick reshaping of the component manufacturing industry , with possible sudden disruption or change of the supply chain, that could endanger future plans
- Less control on the supply chain and on the reliability of technologies. Less access to information.
- Pressure on budget reducing capacity for European space developments and increasing gap compared to non-European competitors.

Conclusion

- CTB is an active and successful platform for preparing roadmaps and work plans for commonly agreed future needs.

- Transforming these plans into products available on time, at the right cost, is quite more difficult.

- **Could we still afford and succeed these developments on a European-only, Space-only basis ?**

  Should synergies and coordination be extended to other non-space sectors and non-European organisations ?

- For future, even if the European Component Supply Chain is facing threats and difficulties, there are new opportunities to pursue the main goal of the CTB :
  to ensure the availability for the European Space Community of reliable, qualified, high performance and enabling components through sustainable supply chains, supported by adequate development and qualification programs.

The challenge for the CTB is to adapt to the new context
and to keep the momentum for coordination between all stakeholders.

Thank you for your attention !

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