



eurocomp

The newsletter of the Space Components Steering Board

Introduction

Welcome to the third issue of *Eurocomp*, the newsletter of the Space Component Steering Board (SCSB). It will bring you up to date with the latest progress and developments of the various activities coordinated by the SCSB and its subgroups, the Components Technology Board (CTB) and the Implementation Team (IT).

In this issue, you will find an extensive article about the Active Microwave Component Dossier, one of the four essential dossiers making up the five-year strategic plan presented in the previous issue of *Eurocomp*. In this article the activities and plans already undertaken for this important technology area is described. In future issues we will return to the other dossiers, covering Silicon Technologies, Hybrids and Micropackaging Technologies and Photonic Technologies.

The second article brings you the details of the technical update of the ESA/SCC Specification System. It describes the intention behind this update and the technical basis used for this review of the system. This review will bring the contents of the ESA/SCC System up to date and ensure that all requirements are based on the latest knowledge of the component technology specified, and that screening and testing flows are optimised for highest reliability at the lowest cost.

In order to create a legal basis for the European Space Component Coordination, a Founding Act and

Charter has been prepared and reviewed by the SCSB. This Charter formalises the partnership in Europe between ESA, National Space Agencies, component users represented by Eurospace, and the component manufacturers. Following a legal review, the ESA Council, the Eurospace Council, National Agencies and manufacturer representatives, have agreed this document in principal. The next step will be to find a suitable day for an official signing ceremony, after which this Founding Act and Charter will enter into force.

Additionally, this issue of *Eurocomp* brings you information about the European Preferred Parts List and its website, and about the effort to achieve better coordination and recognition internationally within the area of space flight EEE components. You will also find progress reports on the updating of the ECSS Standard for Electrical, Electronic and Electromechanical (EEE) Component Requirements, ECSS Q-60, and the demonstration exercises underway at two manufacturers to prove the viability of a Qualified Manufacturers List (QML) programme in Europe.

This issue, like the previous two issues, is intentionally being given a wide distribution, since we have tried from the beginning to reach a broad audience with an interest in the European initiative for space parts. If you find this information of limited value and are **not** interested in receiving future copies of *Eurocomp*, please let us know by completing the enclosed form and returning it to the address given.

In this issue...

**The 5-Year Strategic Plan:
The Microwave Dossier**

**The Technical Updating of the
ESA/SCC System**

The Q-60 Working Group

**Demonstration of ESA/SCC QML
Qualification for an IC Manufacturer**

The European Preferred Parts List

International Recognition

The ESCC Charter

The 5-Year Strategic Plan: The Microwave Dossier

The first issue of *Eurocomp* introduced the work of the Component Technology Board (CTB) and its preparation of a 5-Year Strategic Plan for Space Components. The second issue highlighted the need for this approach, the preparation of the different plans, the key issues and the scope of the various Dossiers. In this third issue, the preparation, definition, and implementation of the Active Microwave Component programme will be presented.

Consultation with the partners

Consultation with the industrial partners is a key issue for success in the definition of the microwave programme. Eurospace representatives were therefore invited to present their component needs, but also their road map and programmatic issues with respect to component procurement, approval and application. All of this input was then collated and presented to the component manufacturers and component Research and Development entities. A set of recommendations was then derived and used as the basis for the definition of the activities.

Eurospace input

The user input was gathered from Eurospace representatives and could be summarised under three main themes: general considerations, technical performance, and policy, business and marketing.

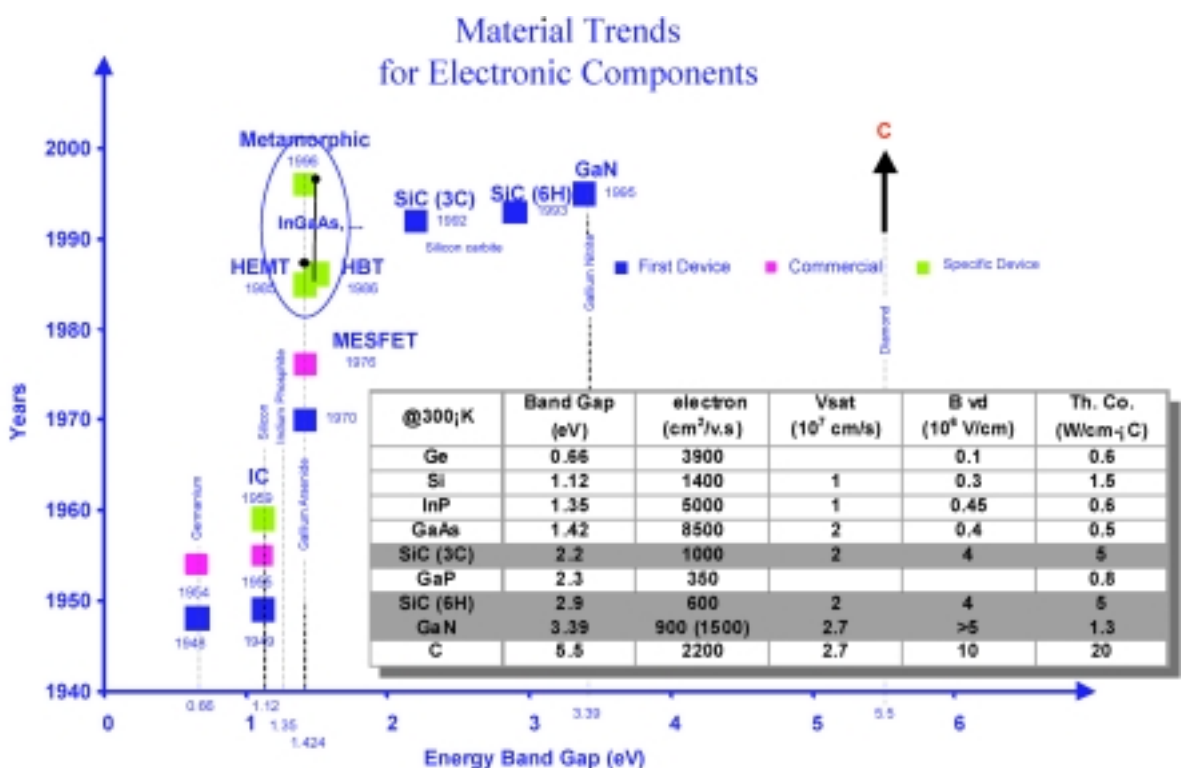
Better/faster/cheaper is the main trend governing today's space system development activities, and thus European components can only be considered if they are truly better in terms of performance, cost and delivery time.

System performance is strongly governed by the technical performance of the components. As a consequence, space-component activities will be pushed towards more advanced devices such as $0.1\mu\text{m}$ InP/metamorphic devices, HBTs, power HEMTs, etc. to maintain the competitiveness of the space system industry. Packaging, assembly and interconnection technologies have been recognised as being as important as device technologies. Finally, needs have been identified in terms of mixed analogue/digital technologies and high-speed digital technologies (SiGe/ GaAs).

"Fit to purpose" is the leitmotiv for qualification and procurement policies. Greater involvement of users in the evaluation and qualification of components was also recommended, together with stronger and better marketing efforts from the European suppliers.

Component manufacturer and R&D-entity consultation

The component industry and R&D entities were



consulted in January 1999. Component manufacturers' technology addresses, in the first instance, their commercial market. The space market is too small to be a main consideration in the industrialisation or development of processes. On the other hand, there is a general alignment between the main user needs and the GaAs foundries' priorities regarding key technologies. ESA and national-agency support in technology development and transfer, process refinement and validation was acknowledged and should be reinforced for long-term R&D development.

Wide Band Gap technology based on GaN and SiC was identified as a long-term top priority. In the short and medium term, power-HEMT and HBT are of high priority. The low-noise discrete-device market is dominated by non-European sources and there was no consensus for the need to support this area. On the other hand, most of the European suppliers consider it the metamorphic technology for industrialisation. The packaging and associated assembly issues (Flip-chip) are also recognised as a high and immediate priority.

Information exchange was recognised as a weak point. There is a general need to improve web-based information on such items as ESA and National Agency component activities and qualification product availability from the European foundries.

Recommendations

As a result of these consultations, 11 recommendations were derived, mainly reflecting activities where a common interest for users and suppliers

was identified (power HEMT, HBT, metamorphic,...). Some of the recommendations are dedicated to R&D efforts such as activities on Wide Band Gap technology and emerging technologies. Finally, two recommendations are addressing information exchange, marketing, and the promotion of European microwave components.

Implementations

Three axes - power technology, metamorphics and operational conditions - were identified as priorities for the first implementation of the programme. With the available funding, only the first two were affordable. Activities covering power HEMT, HBT, Wide Band Gap and metamorphic devices are either already underway or will be initiated soon. Strong co-ordination and collaboration between all CTB partners remains mandatory for the successful implementation of the programme.

Prospects and future initiatives

The first consultations with the space industry (Eurosace) are now two years old and the space market situation has evolved strongly since. The component development is a very fast moving area and huge progress on new technology has been achieved. It has therefore been necessary to consult with the various partners again to consolidate recommendations and priorities in preparing for the near-term future.

Readers interested in further information can contact the author at:

francois.garat@esa.int

The Technical Updating of the ESA/SCC System

It was reported in the Editorial of the first issue of Eurocomp that a number of recommendations had been endorsed by the SCAHC for implementation. One of these recommendations, referred to as R1, related in part to updating the technical and quality-assurance approach of the ESA/SCC System. The work needed to achieve this focussed on a number of different aspects:

- Assessing the effectiveness of each test in every Generic Specification.
- Incorporating up-to-date knowledge regarding failure modes.
- Removing redundant or unnecessary tests and requirements.
- Ensuring that screening and testing flows are more in line with standard practices.
- As much as possible, replacing end-item tests by in-process controls and SPC data.
- Assessing the feasibility of basing ESA/SCC specifications for passive parts on the CECC system.
- Simplifying to one testing level for parts within the ESA/SCC System.
- Improving the present system for Lot Acceptance.
- Minimising documentation, storing it electronically, and relying more on formal certification of results by manufacturers.
- Ensuring that standards and specifications for parts reflect a higher degree of delegation from customer to supplier, with reduced customer controls.
- Basing European component specifications and standards, wherever possible, on international standards, and promoting them to obtain international recognition.

Background

In general, an ESA/SCC Generic Specification proposes two testing levels (B and C) and is always organised in five charts, which are:

- Chart I: General Overall Flow Chart
- Chart II: Final Production Tests
- Chart III: Burn-in and Electrical Measurements
- Chart IV: Qualification Tests
- Chart V: Lot Acceptance Tests (LATS).

To procure an EEE part according to the ESA/SCC System, parts are tested in accordance with Charts II and III, while Chart V is applied based on sampling at the end of the process to validate the lot. Chart IV is used only to qualify the product and is not used for individual procurements.

From April 1997 to March 1998, an important technical effort was undertaken to address all of these topics and it resulted in 24 key technical proposals affecting qualification, lot acceptance and final production, which can be summarised as follows:

1. Qualification is formalised in four steps, reinforcing the first step (initial assessment).
2. A unique technical body is necessary.
3. Chart IV is modified.
4. Chart V is cancelled.
5. Qualification is maintained as long as there are no failures from periodic testing.
6. Charts II & III are merged into a single chart.
7. Only one testing level is proposed for each EEE part family.

8. The required delivered data is limited to a Certificate of Compliance (CoC).
9. ESA/SCC specifications propose the use of CECC specifications for passive components.

These twenty-four key points, approved by the Implementation Team in July 1998, were consolidated into concrete technical recommendations, which were approved by the Implementation Team between October 1998 and February 1999.

Between April 1999 and July 1999, these technical recommendations have been implemented through a very important Document Change Request (DCR) process involving ESA/SCC Basic and Generic Specifications. A total of fifty-four DCRs have been raised:

- 3 for ESA/SCC Basic Specifications
- 49 for ESA/SCC Generic Specifications
- 2 for general purposes (LAT replacement and documentation delivery).

The concrete implementation of all of these modifications is in progress by the Implementation Team.

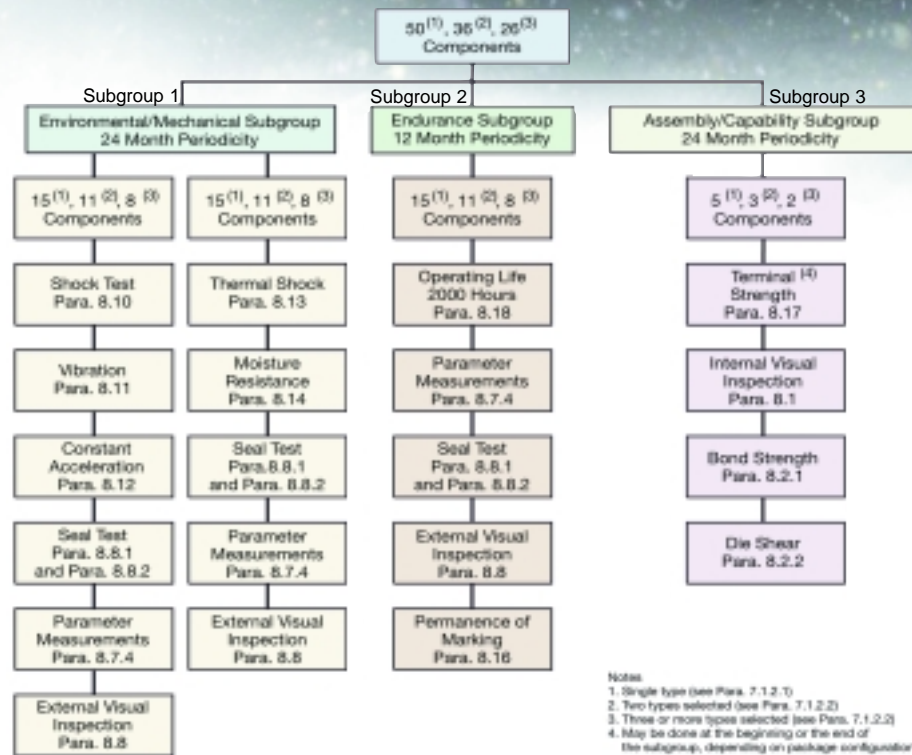
A first exercise has been achieved for ESA/SCC 9000 and 5000, which should result in release of the two specifications in November 2000. Thereafter, the implementation of all other modifications should take place in the first quarter of 2001.

Qualification and Lot Acceptance Tests (LATs)

- Qualification is formalised in 4 steps: initial assessment, manufacturer evaluation and testing assessment, evaluation testing and qualification testing.
- Qualification is associated with a customer's order.
- Maintenance of qualification is based on periodic groups leading to a modified Chart IV (there are now only two subgroups, used as periodic tests every 12 or 24 months).
- The LAT approach is cancelled. LAT tests are moved into Chart IV or production tests (LAT3 tests).
- A unique qualification authority is proposed. It will be the Executive body.

High-Reliability Production Tests

- Charts II & III are combined.
- Internal visual inspections are the responsibility of the manufacturer.
- PDA calculation is only based on burn-in rejects.
- Screening flow is updated and modified based on field returns.
- IEC test methods are introduced as the preferred test method.
- Only one testing level exists, which is close to the former Level B for active and critical passive parts, and close to the former Level C for other passive and microwave parts.
- Only a CoC is required as delivered documentation attached to the lot. Other data may be required by purchase order.
- New ESA/SCC specifications are created for passive parts, based on CECC specifications with, when necessary, additional specific tests.
- Some ESA/SCC Generic Specifications are merged into a single specification (i.e. 3001/3009, 3002/3011/3012, 3601/3602), or cancelled (3300).



Once this work is completed, the present ESA/SCC System will have been technically updated and will allow manufacturers and users to produce and use parts on a sound technical and competitive basis.

About the author:

Alain Mouton is the Expert in Parts Policy and Projects Engineering at Astrium Space in Toulouse France. He can be reached at alain.mouton@astrium-space.com

The Q 60 Working Group

Background

The European Cooperation for Space Standardization (ECSS) began in 1993 with the mission to develop a coherent, single set of user-friendly standards for use in all European space activities (ref. ECSS Newsletter, Issue 1, Summer 1999).

The aim of ECSS is to develop standards that improve industrial efficiency and competitiveness in the space industry. This has been achieved by replacing the multitude of different standards and requirements unique to each contractor or space agency, which existed in the past, with one coherent set.

The ECSS initiative sustains the involvement of each of the major space agencies in Europe and the majority of European space industry through Eurospace.

The ECSS document architecture has three branches covering the standardisation of project management, product assurance and engineering activities. For the

components, the relevant document is the ECSS Q 60 within the product-assurance branch.

A standard for space components

The first issue of Q 60, Issue A, was published in 1996 and there is a need to update the existing document to take into account the evolution in the world-wide component market, the recommendations contained in the SCAHC report, the progress in the work sponsored by the Space Components Steering Board, together with the new practices in terms of component policy.

To achieve the above goal, the ECSS Technical Panel, the body responsible for this series of standards within the ECSS, has delegated by the means of a Co-operation Agreement to the Implementation Team of the ESCC, the task of revising and maintaining the ECSS-Q-60 "EEE Component Procurement" standard.

A Q 60 working group was set up with a balanced industry and space agency membership.



The terms of reference of the working group are mainly based on the updating not only of the Q 60A level-2 document, but also the preparation of level-3 documents, which are considered as guidelines.

The level-2 standard will describe the requirements for selection, control and procurement of EEE components for European space projects. It will allow the project as a whole to meet the requirements in terms of functionality, quality, reliability, schedule and cost. Important elements for reaching the objective are:

- components programme management
- components engineering
- components quality assurance.

The requirements of the level-2 standard will be defined in terms of what must be accomplished, rather than in terms of how to organise and perform the necessary work. This will allow existing organisational structures and methods to be applied where they are effective, and for the structures and methods to evolve as necessary without rewriting the standard.

About the author:

Francis Linder, from the Centre National d'Etudes Spatiales (CNES), is the Chairman of the Q-60 Working Group. He can be contacted at

francois.linder@cnes.fr

Demonstration of ESA/SCC QML Qualification for an IC Manufacturer

The QML concept for the qualification and procurement of EEE components for space application in Europe has been initiated following one of the Space Component Ad Hoc (SCAHC) recommendations (see Eurocomp No.2). The study to assess the modifications and impact on the ESA/SCC System when incorporating the QML concept is currently under validation at Atmel Wireless & Microcontrollers and STMicroelectronics through a demonstration exercise.

The goal of this activity is to demonstrate coherent implementation of the ESA/SCC QML concept throughout the ESA/SCC System. It will also lead to a better definition of the QML requirement for ESA/SCC manufacturers to enhance future implementation.

The work of the activity is divided into two phases:

- Phase-A is dedicated to preparing for the implementation of the QML programme. As the ESA/SCC System is a coherent system in that all specifications are linked and requirements flow down, the manufacturers need to detail the work to be carried out and establish all of the related requirements for the implementation of the QML certification and qualification programme. Furthermore, the two manufacturers are invited to provide proposals to improve the implementation and requirements of the QML concept.
- Phase-B runs the programme as defined in Phase-A with the objective of demonstrating that the ESA/SCC QML programme can be

implemented in practice, for all silicon manufacturers in general, and the two manufacturers concerned in particular. The task is to focus on the identification of the manufacturer and QA interfaces and the decision points throughout the programme, while ensuring continued reporting of significant events and problem areas.



The current status is that Phase-A is about to be completed with input provided for finalisation of the QML draft specifications. Phase-B is planned to start once all the necessary specifications are issued. This demonstration will end with the formal first QML qualification of the two manufacturers.

For further information concerning this programme, please contact:

*Sylvie.gourdre@st.com, or
Monique.leseur@temic.fr*

The European Preferred Parts List : Issue 2 and the New Web Site

Issue 2 of the European Preferred Parts List (EPPL) was released in mid-October. The new inputs received to update the list are mainly from one European manufacturer proposing the introduction of new components. For parts to be entered onto the list, test data supporting their preferred status must be made available.

The main innovation of Issue 2 of the EPPL is the implementation of a new web site (same Internet address: <http://www.estec.esa.nl/qcswww/eppl>).

Many users of the list have reported some difficulty in the past in searching for a specific 'Part Type'. Since the list is divided into subgroups, every search requires a cursory knowledge of the component type and function. Also, it is not possible to search for a specification or, more generally, to apply filters and sorting of the list. This is due to the fact that the current structure is based on a series of html pages, rather than a real database.

The new web site will present the same mask as the current version, with the addition of an icon called

'search'. This icon will run a search engine, which will read the data from a list in .txt format, thus avoiding the management of more than 200 html pages. It will be possible to perform a search using one or more keys, associated with each field of the EPPL: Family/Subgroup, Part of the List, Component Type, Detail Specification, Manufacturer, Package, Description of the Component, plus a flag to select the items for which a "remark" is present in the dedicated field. The searches will be possible with the option "contains" and "starting with". The output of a search will be a list of all the items satisfying the requested search string, which is shown in a compact table. Each item will contain a link to the position of the EPPL in which that component is listed.

Management of the EPPL deployment is the responsibility of Agenzia Spaziale Italiana (ASI). The EPPL Manager Giovanni Gallina can be contacted at Top Rel S.r.l., Rome, Italy:

GGALL@toprel.com

International Recognition

The European Space Component Coordination (ESCC) and its Space Component Steering Board (SCSB) was founded following a community-wide review of the European strategy for space components. This review highlighted the need for international harmonisation and coordination and recommended that the SCSB should seek international recognition for the ESCC Specification System and its qualifications.

The first step in this direction was taken in September, when discussions were held with NASA and Jet Propulsion Laboratory (JPL). A preliminary agreement for the listing of the ESA/SCC System in the NASA Parts Risk Assessment Matrix has been reached. Discussions have also begun aimed at linking the European Space Component Information Exchange System (ESCIES) to the corresponding NASA web pages.

In addition, initial discussions have been held with the Defense Supply Center Columbus (DSCC), in the USA, regarding the possibilities of a reciprocal

listing of European ESA/SCC qualified parts and US-MIL space-level-qualified parts in each others QPL/QML lists. The intention is to make such listings in separate parts of the QPL/QML documents with a descriptive statement that these parts are under the responsibility of another qualification authority.

These initiatives have also been presented to the National Space Development Agency of Japan (NASDA) for the possibility of extending the information exchange.

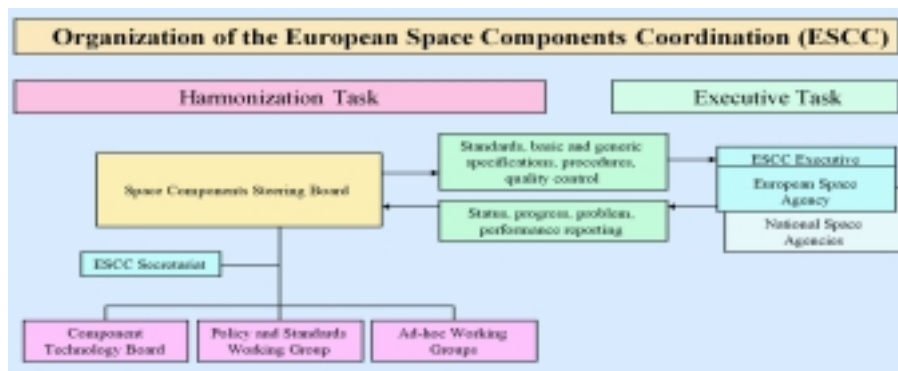
In a market with limited sources of space-qualified high-reliability components, it is becoming increasingly important that existing The European Space Component Coordination (ESCC) and its Space Component sources are recognised internationally and their products made available to the global space participants. The SCSB will continue to follow these initiatives and work for a wide recognition of all existing sources for high-reliability EEE parts.

The ESCC Charter

Over the last two years, a high level of activities within the Space Components Steering Board (SCSB) and the Implementation Team (IT) have led to the implementation of various organisational, operational, technical and quality assurance improvements to the ESA/SCC System. The important issue of the management and custody of

In order to create a legal basis for the ESCC, a Founding Act and Charter has been prepared and reviewed by the SCSB.

The charter defines the objectives and policy, the organisational and managerial structure, as well as the documentation architecture of the ESCC. As a



Charter, this document also defined the commitments, obligations and undertakings of the Participating Organisations in the ESCC, within the limits of their respective responsibilities. This document further defines the principles

and processes for the establishment and implementation of :

the ESA/SCC System has been studied by a special working group, which recommended - and the Board unanimously approved, with the consent of ESA - that the ESA/SCC System be merged with the operations of the SCSB into one common European Space Component Co-ordination (ESCC) scheme.

and processes for the establishment and implementation of :

The objective of the ESCC is to establish a world-class electrical, electronic and electro- mechanical (EEE) component system, able to provide components conforming to internationally recognised standards for increasingly demanding space applications.

- Strategic programmes and work plans for research and development in the area of EEE components for space use, which the ESCC recommends its Members to implement in a harmonised fashion, contributing their own resources and following their own procedures.
- Policies, techniques and standards for the evaluation, qualification and procurement of EEE space components.
- A unified and single European system for product specifications for EEE space components and for the execution of the corresponding qualification and certification activities.

The ESCC is a partnership activity between ESA, national space agencies, the user industry represented by Eurospace, and component manufacturers represented by selected companies. Within the ESCC, ESA should act as the legal entity charged with the qualification and certification aspects of the components.

These three main activities will be conducted under the authority of three subgroups, known as the Component Technology Board, the Policy and Standard Working Group, and the ESCC Executive, as illustrated in the accompanying diagram.

Editorial Board

John Källberg, ESA/ESTEC (NL)
John.Kaellberg@esa.int

Augustin Coello-Vera, Alcatel Space Industries (F)
augustin.coello-vera@space.alcatel.fr

Francois Linder, CNES Toulouse (F)
francois.linder@cnes.fr

John Wong, ESA/ESTEC (NL)
John.Wong@esa.int

Following a legal review, agreement in principle was reached between the ESA Council, the Eurospace Council, the national space agencies and the manufacturers' representative. The next step will be to find a suitable day for an official signing ceremony when this founding Act and Charter can signed and will enter into force. ●

Published by: ESA Publications Division

c/o ESTEC, PO Box 299, 2200 AG Noordwijk, The Netherlands
Tel. (31) 71 565 3400 - Fax (31) 71 565 5433