

# Harmonization of Thermal and Space Environment Analysis Software

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- Overview
  - Background of ESTEC Harmonisation Activity
  - Present Situation and Need for Action
  - Inauguration of Steering Board
    - Objectives, list of members, working procedures
    - First Steering Board Meeting
    - Intended activity roadmap and actions

- **Background of Harmonization Activity**
  - T&SE Tools Harmonization Roadmap was presented on December 4 + 5, 2002 to National Delegations (A, CND, DK, F, D, N, S, CH, GB were present)
  - Consensus reached that
    - Standardized model data exchange is of primary importance
    - T&SE tools are essential for space product development.
    - Long term availability of such tools is of strategic importance for European Space Industry.

- **Conclusions / Actions**
  - (1) Continue with present program of activities for data exchange standards
  - (2) Establish a „Steering Board“ involving the user community
    - Clear mandate, but following existing ESA rules
    - Study existing solutions, cost benefit of new components, Open Source S/W
    - Define architecture and interfaces of a European library of S/W components to build thermal and space environment analysis tools
    - Recommend Go / No-Go decisions for development/implementation
  - (3) Maintain existing tools until equivalent (better?) tools are available and/or required by running / planned ESA projects

- Present Situation and Need for Action
  - Many thermal S/W tools are existing, which are sometimes similar or have overlapping functionalities
  - Obviously no easy way to counteract this development
    - Quotation from a 1994 ESA study:
      - „There are a great many S/W tools in use for space-related thermal engineering, but many of them are monolithic, not easily extendible and have overlaps in functionality, leading to a lot of functional redundancy and extra maintenance effort“

**The situation 10 years later has not changed or is even worse**

- Selection of existing und future tools:
  - *ESATAN, THERMICA, ALTAN, TOPIC, ARTIFIS, CORATHERM, GAETAN, Condor, ThermXL, Cat (CAP and Power)* and many more...
  - And more to come: *Concept Design Tool, ESATAP, THERMOSS ...*
  - Immediate consequence: Data exchange tools are needed and under development: *STEP-TAS, STEP-NRF, STEP-SPE, SET-ATS, TASVERTER...*
  - Interesting to observe: A mandatory exchange tool between *SINDA and ESATAN* is yet missing

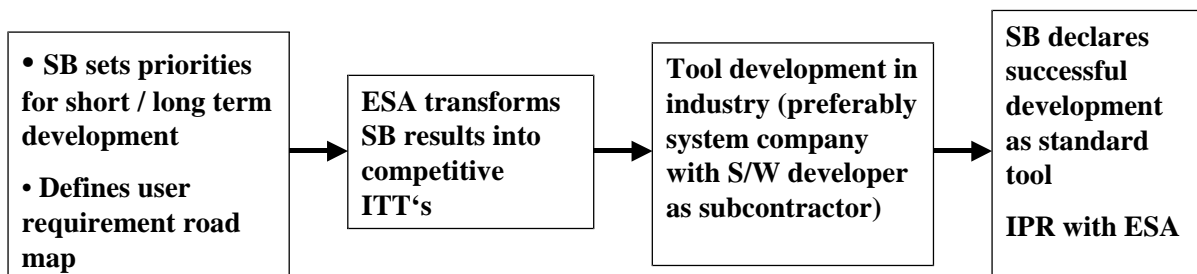
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- This situation is very surprising and not easy to understand
  - T&SE tools are more or less non-commercial in nature due to the small user group (specialization in space engineering)
  - In many cases they are developed and maintained by public funding. But then: Why so many tools??
  - There are probably two main reasons for this situation:
    - System companies develop own tools (sometimes supported by national agencies) with the intention to reach a competitive edge in the space market
    - Developments in ESA and national agencies sometimes not sufficiently based on user requirements

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- Development at System Companies
    - Development of own engineering tools is based on a wide-spread misconception that own tools improve an industry's competitiveness. The contrary is the case:
      - Development of engineering tools cost invest budget and development resources
      - Maintenance difficult and costly, developers may leave the company
      - For tools developed for a certain project: What happens after termination of the project?
      - More important: System companies need to share data and recourses with subcontractors, which would not have the same software (also system companies are currently merging)
      - As consequence data conversion tools need to be developed, which again are costly and use valuable resources

- Automotive industry as a good example: Competing companies are sitting together in an effort to harmonize true commercial engineering tools, in order to facilitates data exchange with common suppliers
- European space industry moves in the opposite direction: With no realistic need different tools are produced, which need then to be harmonized by costly data exchange tools!
- Tool Development at ESA and National Agencies (public funding):
  - Several tools have been developed, which could not be successfully introduced into the user community
  - Probable reasons:
    - User community was not really involved in the beginning and during definition of requirements
    - “Marketing“ of ready products was not sufficient
    - There is a certain reluctance at companies to get involved in new S/W, because of personnel training, compatibility with existing tool infrastructure...

**Let's continue with what we have!**

- The need for a “Steering Board“ (SB)
  - One important objective of the SB is to involve the user community from the beginning of a tool development



- The need for a “Steering Board“ (cont.)
  - We possibly need to change the way how we develop engineering tools

**The primary rule should be:**

**To develop thermal engineering tools for the user community (and not solely for the customer)**

- Developing contractors should therefore be requested
  - to communicate with the user community via a mailing list
  - to inform the community on the progress and ask for comments, discuss requirements
  - to have users test the S/W before delivery
  - to preferably use a web based information system, etc.

- Major board assignments
  - Increase user community involvement in S/W tool development
  - Conceive a concept for a common thermal / environmental S/W architecture, which is modular for selective application and successive development
  - Ensure modular architecture to define individual tasks for short / long term development
  - Implement existing and to be developed S/W for use by the entire community
  - Regulate maintenance
  - Convince companies to use common tools, which fulfill user requirements, in lieu of proprietary engineering tools
  - Care to avoid duplication. There should be only one tool for a certain functionality in this non-commercial environment

- Major board assignments (cont.)
  - Represent the user community (although not all users are members of the board)
  - Have the mandate to declare a certain tool as an engineering standard for the ESA user community.
  - Users shall preferably commit themselves to apply such tools
  - Ensure that relevant ESA ITT'S are based on Board decisions

- Organization of the Board
  - The SB consists of representatives of the T&SE user community from ESA member states
  - The SB has now 14 voting members and 8 observers
  - Members are balanced between Prime-Contractors (4), SME (3), Research Institutes (3), Agencies (4)
  - Observers are Prime-Contractors (3), Agencies (4), S/W Developer (1)
  - S/W developers are non-voting members and have status of observes
  - Voting members shall not be guided by company interests, but by the overall objective to establish autonomous European capabilities to improve competitiveness and quality
  - Members have selected *R. Schlitt* as Chairperson and *H. P. de Koning* as ESA Secretary
  - Board decisions are taken by majority voting of present voting members

- **Board Tasks**
  - The SB analyses and decides on major strategic items, including
    - User requirements
    - Development options
    - Strategy and coordination
    - Priorities
    - Interfaces
    - Maintenance
    - Distribution and support
  - The SB extends and/or amends board rules by a 2/3 majority of the voting members

- **Executive Team**
  - The SB has nominated an Executive Team (ET) consisting of three SB members (Hans Peter de Koning [ESA], Eric Werling [CNES], Darius Nikanpour [CSA])
  - The ET performs the day-to-day management of running activities
- **Board Mandate**
  - Mandated to take all decisions concerning developments of future T&SE analysis software (based on ESA's infrastructure budget)
  - ESA will make best effort to ensure implementation of decisions taken by the SB (the SB has formally no budget authority)



- First Study

- The final Harmonization meeting agreed on an initial study phase to define a development road map, which addresses the following:
  - Identify and list existing solutions and products
  - Conduct a cost benefit analysis for components and/or blocks to be developed
  - Investigate the applicability of the OSS methodology
  - Estimate total cost to completion and yearly maintenance costs
  - Establish schedule and priorities
  - Establish methodology for distribution and maintenance
- The task shall be performed as a Business Case Study
  - SOW to be established by the ET
  - Contract in DN to ASTRIUM (D, FN) and Eta\_Max (D)
- Next meeting of the SB takes place in November 03

## Board Voting Members

<i>first_name</i>	<i>last_name</i>	<i>affiliation</i>	<i>country</i>	<i>discipline</i>	<i>voting</i>	<i>remark</i>
Patrick	Hugonnot	Alcatel Space Industries	France	thermal	1	Prime contractor
Valter	Perotto	Alenia Spazio	Italy	thermal	1	Prime contractor
Burkhard	Behrens	Astrium GmbH (EAD S/S T from July 2003)	Germany	thermal	1	Prime contractor
Markus	Huchler	Astrium GmbH	Germany	thermal	1	Prime contractor
Andrew	Robson	Astrium Ltd.	UK	thermal		Prime contractor
Philippe	Chéoux-Damas	Astrium SAS	France	thermal + space environment		Prime contractor
Christian	Vettore	Carlo Gavazzi	Italy	thermal	1	SME
Eric	Wehring	CNES	France	thermal	1	Agency
Darius	Nikanpour	CSA	Canada	thermal	1	Agency
John	Sørensen	ESA TOS-EMA		space environment	1	Agency
Hans Peter	de Koning	ESA TOS-MCV		thermal	1	Agency
Holger	Sdunnus	eta_max	Germany	space environment	1	SME
Reinhard	Schlitt	UHB System	Germany	thermal	1	SME
Jean-François	Roussel	Onera	France	space environment	1	Research institute
Peter	Truscott	QinetiQ	UK	space environment	1	Research institute
Bryan	Shaughnessy	Rutherford-Appleton Labs	UK	thermal	1	Research institute
					total	14

## Board Observing Members

<i>first_name</i>	<i>last_name</i>	<i>affiliation</i>	<i>country</i>	<i>discipline</i>	<i>observer</i>	<i>remark</i>
Markus	Huchler	Astrium GmbH	Germany	thermal		Prime
Andrew	Robson	Astrium Ltd.	UK	thermal		Prime
Philippe	Chéoux-Damas	Astrium SAS	France	thermal + space environment	2	Prime
Pierre	Bouquet	CNES	France	space environment	1	Agency
Luca	Maresi	ESA IMT-TH		technology harmonisation & strategy	1	Agency
Éamonn	Daly	ESA TOS-EMA		space environment	1	Agency
Charles	Stroom	ESA TOS-MCV		thermal	1	Agency
Kevin	Duffy	Maya Heat Transfer Technologies	Canada	thermal	1	Developer
total					8	