Reliability Sector Consortia

Vision:
To provide a sound and proven methodology/guideline along an ascertained and recognized way of assessing MNT reliability will be agreed upon.

Mission:
To define the projects and initiatives that will lead customers, end users, and technology (the whole supply chain) to agree upon, support and implement the methodologies that assess reliability, as well as the necessary tools (databases, networks, tests) and required standards

Reliability Sector Consortia

Needs/lesson learned

Reusable components
Develop roadmaps
Reliability is a must
Customers are conservative
Standards are needed
Show cost/benefit to decision makers
Certificates/qualifications/rules for MEMS
Failure rates vs environments
Ageing laws
Stress screening procedure
Stakeholder liaison
Early in the developmental cycle
IP issues

Technology

Idem including software

CANEUS MNT Reliability Sector Consortium
STRATEGIC WORK PLAN

Objective:
Develop a risk assessment methodology to assess the capability of MNT for aerospace applications as far as reliability is concerned.
Identify, quantify, and specify the parameters of this methodology.

Methodology of Strategic Work Plan:
From the objective, one must start with the top-down approach and the associated needs (see the following table). The requirements of aerospace applications are obviously taken into account.

Part I: Top-down approach - gaps

Objective	Sub-topics	Needs	Examples	Examples of solution providers	**Action needed from CANEUS GAPS**
Ensure capability & reliability	• Reliability • Functionality • Manufacturability	Demonstrate all 3 Define the elements necessary for the demonstration	DO-254-like (and light)		**Apply DO-254-like (and light) on 2 / 3 examples to define the elements necessary for the demonstration**
Address Space radiation effects		• Identify sources of information • Gather first results • Identify gaps in information			

Once a demonstration (through e.g., DO254-like and –light method) is successful, one may implement MNT on aerospace applications. It is hence important to have access to the elements / parameters which are needed for the demonstration. This will define another list of needs, which may be obtained from a Bottom-up approach (see the following table).

These needs are already taken in charge by networks, companies, technology providers, and universities … All these actors do cover some of them partly, or fully. CANEUS will not do the work again. Rather, CANEUS will play the role of:
1. Listing what is needed for demonstration,
2. Telling whether these parameters are available, where (supplier),
3. And, possibly, explain how to rate suppliers (labelling),
4. Or suggest relevant standards (after analysis),
5. Identify the gaps in the necessary proofs or resources,
6. Prioritize the gaps,
7. Suggest actions (standards, common programmes …).

Part II: Bottom-up approach - gaps

Objective	Sub-topics	Needs	Examples	Examples of solution providers	**Action needed from CANEUS GAPS**
Predict reliability	Reliability assessment tools	TTF assessment tools	PoF models	LAAS, QinetiQ, Epsilon	**Matrix "who knows what"** **How to label suppliers** **Relevant standards (existing or to be created)** **Identification of gaps** **Suggest actions**
		λ assessment tools	Statistics	IMS	
		Similarity analysis	Test return data base		
	Reliability engineering tools (assessment + DfR)	Technology provider data	FIDES	Eurelnet, Euceman, EuMiRel	
		Knowledge database	REMM		
	Reliability management	Standards	IEEE1312, IEEE1413, IEC62308		
Assess & Increase reliability	Production stability	Control variation	Test structures for technology providers	LIRMM, NIST**, LNE**	
		Measure variation	Metrology	Süss/Polytec/FhG IZM/Delta	
	Failure analysis			Novamems EuFaNet	
	Screening methodology	Apply and justify accelerated tests on numerous samples	Test procedures Test standards	Serma, LNE, Bureau Veritas	
		Virtual qualification based on PoF models & parameter characterization	PoF models for each failure mechanism Material parameter database Product parameter (and variation) database	IMS	
	Assess reliability real-time & on-board – assess real life environment	TSMD, HUMS	Midisppi	MEMUNITY	
	Field return data base	From qualification, production & tests			

Advantage:

This plan has an advantage: one may begin to work without spending many resources. This means that results and deliverables are achievable, progress is possible and outputs may be put forward in front of senior executives. This should prove essential to go further.

Outputs from previous actions:

This section is a reminder of questions and issues that were previously raised during the first workshops on MNT reliability. The section intends to show how the Strategic Work Plan answers these points.

1. How to bring together existing (and various) networks, labs, university dealing with MEMS reliability (August 2006)?

   Suggested answer today: CANEUS will not bring them together – instead, CANEUS will identify them, their competences and knowledge and create a matrix of "who knows what". The "What" will be the gaps identified towards the demonstration of the capability of MNT to fly (in terms of reliability)

2. End user requirements: low volume, high reliability, specific products

   End-user requirements are taken into account into activity two

3. Proposed pilot project: fully integrated MNT reliability framework: based on an existing cluster, a future company performing reliability and testing services for MNT + world wide database exchange layout

   The idea of clustering everything together (from characterization to material databases, from Academic teams to NoE, from design software to MNT testing companies and failure analysis labs) may have been too ambitious (Toulouse 2006, Milan 2007)

4. How to disseminate EU funded data bases (from NoE, from EU project) to third part countries?

   In the "who knows what" matrix, reliable supplier of knowledge will be identified. It will then be the responsibility of each end-user to take in charge the knowledge transfer (paying fees, exchange information, licensing …). It is not part of CANEUS business. CANEUS may label "knowledge suppliers" to help end-users, no more.

5. How to share without clear identified funding?

   This first set of activities does not imply any IP, or NDA activity. The funding is the companies' own funding and should be reasonably moderate. Further, the outputs are intended to show the management that it is possible to get results, so that we may go further with more developed action plans.

Strategic Work Plan

MNT End-Users Initiative Implementation Plan

Activity one: identify acting partners (CANEUS members)

PoC should be nominated for Europe, USA, Japan, Brazil, and Canada. Consortium Director and PoC will constitute the Consortium Committee (CC-U). PoC will identify the needs (or PoC for needs), who may run a DO254-like (and –light) demo on MEMS to give the list of necessary pieces of information.

Activity two: find the parameters which are needed for a DO254 demo

End-users will run a DO254-like (and –light) demo for one MNT each. The more demos, the more pieces of information, we will get. Members will do that step on their own budget. They will not share information at system level, but only the outputs at reliability level. We are not interested in the system where they intend to implement MNT. We are rather interested in the pieces of information they require from the MNT supplier to allow the implementation.

Activity three: identifying the network of actors, their specificities, competences and knowledge

The CC-U will identify the actors and clarify their activity. CC-U will identify where the information is already available from whom:

1. Identify existing projects,
2. Clarify activity of networks,
3. Identify technology providers,
4. Identify Universities,
5. List knowledge and competences fields,
6. List existing standards.

The deliverable is the “who knows what” matrix.

In order to prepare further steps, CC-U will identify the possibilities of co-operation, and, especially the NDA or IP limitations. This is another deliverable. CC-U will work without expensive resources (phone calls, e-mail) under the member’s own funding.

Activity four: address the gaps

Once the previous tables are filled in, the gaps will emerge. CC-U will then prioritize the gaps depending on the analysis made in activity two.

Action plan and budget will then be derived by CC-U. This action plan will include proposals for funded actions under European, US or else R&D funding scheme. Co-operation and exchanges with other CANEUS partners should be included in the plan. The action plan is another deliverable.

Roadmap for implementation:

Activity	t_0	t_0 + 4 month	t_0 + 6 month	t_0 + 8 month	t_0 + 12 month
1					
2					
3					
4					

Deliverables:

1. Elements necessary for the demonstration,
2. Matrix “who knows what”,
3. How to label suppliers,
4. Relevant standards (existing or to be created),
5. Identification of gaps,
6. Suggested actions (with budget).

Example of what an action could be: suppose virtual qualifications of RF MEMS were possible (this is an area where already some results are available), then action could be to define (and demonstrate the usefulness of) an accelerated test plan to fulfil aerospace applications – demonstrate the Proof of Test (representativeness, % of failures, same failures …).

MNT Technology Developers Initiative Implementation Plan

Technology developers will develop in parallel their own network (CC-P) and start activity one, three and four (same as above).
The roadmap for implementation will be the same.

Roadmap for implementation:

Activity	t_0	t_0 + 4 month	t_0 + 6 month	t_0 + 8 month	t_0 + 12 month
1					
3					
4					

Deliverables:

1. Matrix "who knows what",
2. Relevant standards (existing or to be created),
3. Identification of gaps,
4. Suggested actions (with budget).

Example of what an action could be: define (and fill in) a field return database format, that technology providers could supply to users.

Standards and Guidelines Initiative Implementation Plan

After the first 6 months of activities of the first two groups, a clearer view of the lacking standards and guidelines will be available. Both MNT users and developers will set up a group (CC-S) to launch a standardisation activity. This group will be in charge of proposing:

1. A list of standards to be developed (chosen among the above mentioned gaps),
2. The choice of the relevant standardization bodies,
3. Draft versions of the relevant standards,
4. Action plan towards standardization (with budget).

Roadmap for implementation:

Activity	t_0	t_0 + 4 month	t_0 + 6 month	t_0 + 8 month	t_0 + 12 month
1					
2					
3					
4					

Deliverables:
1. Draft standards,
2. First actions & contacts with standardization bodies.

Example of what an action could be: draft a standard for screening tests for MEMS and / or MEMS-equipped sub-systems in aerospace applications.

Database and Technology Portal Initiative Implementation Plan

After the first 6 months of activities of the first two groups, a clearer view of the needed parameters for a database and technology portal will be available. Similarly, a clearer view of potential providers of such database and technology portal will also be available. Both MNT users and developers will set up a group (CC-D) to launch a database activity. This group will be in charge of proposing:
1. A draft specification / description of the needed database and technology portal,
2. A list of possible providers / solutions,
3. A draft implementation plan (NDA, IP, funding …),
4. Action plan towards implementation (with budget).

Roadmap for implementation:

Activity	t_0	t_0 + 4 month	t_0 + 6 month	t_0 + 8 month	t_0 + 12 month
1					
2					
3					
4					

Deliverables:
1. Draft specification of the database,
2. Draft implementation plan.

Example of questions addressed:
What kind of parameters to add in the database (images, number, text)?
Are there interactions between the tables of the database?
Which kind of request for the DB?
What kind of level of protection of the DB (secured access)?

Space Radiation Effects on MEMS Initiative Implementation Plan

Activity one: identify acting partners (CANEUS members)

PoC should be nominated for Europe, USA, Japan, Brazil, and Canada as far as Space Radiation Effects are concerned. Consortium Director and PoC will constitute the Consortium Committee Space Radiation Effects (CC-SRE). PoC will identify the needs (or PoC for needs).

Activity two: collect information

CC-SRE will collect information on the sensitivity of MEMS on Radiation:

1. Identify sources of information (labs, publications…),
2. Gather first results (failure mechanisms, sensitivity level depending on radiation nature and power as well as MEMS type (membrane, metal-metal, metal /oxyde…),
3. Identify gaps in information,
4. Action plan towards filling the gaps.

Members will do that step on their own budget. They will not share information at system level, but only the outputs at reliability level. We are not interested in the system where they intend to implement MNT. We are rather interested in the pieces of information they require from the MNT supplier to allow the implementation.

Roadmap for implementation:

Activity	t_0	t_0 + 4 month	t_0 + 6 month	t_0 + 8 month	t_0 + 12 month
1					
2-1					
2-2					
2-3					
2-4					

Deliverables:

1. Available pieces of information and gaps,
2. Action plan to fill the gaps (with budget).

Summary:

After one year, the action plans from Users and Developers may be compared and CANEUS Scientific Committee may choose and decide on further actions. After one year, one may assess whether steps have been made forward.

Activity	t_0	t_0 + 4 month	t_0 + 6 month	t_0 + 8 month	t_0 + 12 month
MNT End-Users Initiative Implementation Plan					
MNT Technology Developers Initiative Implementation Plan					
Standards and Guidelines Initiative Implementation Plan					
Database and Technology Portal Initiative Implementation Plan					
Space Radiation Effects on MEMS Initiative Implementation Plan					