

EUROPEAN SPACE AGENCY

ROBOTIC EXPLORATION

TECHNOLOGY PLAN

Addendum to November 2011 Programme of Work 2009-2014

This document is an addendum to the November 2011 Programme of Work and includes new activities in the Exploration Technology Programme (ETP, funded by MREP) that are supporting the implementation of ESA's Robotic Exploration Programme from 2009-2014.

**This document is provided for information only and is subject to future updates.
June 2012**

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Scope

This Robotic Exploration workplan update

This technology plan update is a minor addendum to the full Robotic Exploration workplan that was approved in November 2011 (ESA/PB-HME(2011)60 and ESA/IPC(2011)138) which defined the activities that are being implemented in 2012.

This addendum is being submitted for approval of a few activities that have been defined to complete satisfactorily the MREP ETP budget geo-return to the Participating States before the end of 2012. As for the previous plans, the list of activities was built using the ESA TECNET (TECHnology NETwork) process, in coordination with activities planned in other Directorates in particular HSO, and using for the best the industrial and internal studies achieved so far for future Mars missions.

The next full update of the Robotic Exploration Technology Workplan is anticipated to be prepared following the C-Min (2012).

Annex I:
List of new and modified ESA Robotic Exploration Technology Development Activities

Summary of new and modified activities seeking approval for 2012 implementation

Prog.	IPC Appr.	ESA Ref.	Activity Title	Budget				PP	C'try	SW Clause applicab.	Remarks
				2010	2011	2012	2013				
ACP	IPC	A923-001FI	Extremely low power timer board EM for landers - CCN	0	0	280	0	DN/C	AT	NA	CCN to running activity E901-001ED with RUAG (AT)
ETP	IPC	E918-001MP	Subsonic parachute trade-off and testing - CCN	0	0	350	0	DN/C	UK	NA	Only phase 1 (130kEuros) intended for 2012 of which 120k is intended for Canada.
ETP	IPC	E905-017FT	Accelerometer to TRL5 – CCN	0	0	300	0	DN/C	CH	NA	
Total				0	0	930	0				

Annex II:
**Detailed description of new and modified ESA Robotic
Exploration Technology Development Activities**

Extremely low power timer board EM for landers - CCN					
Programme:	ACP		Reference:	A923-001FI	
Title:	Extremely low power timer board EM for landers - CCN				
Total Budget:	280				
Objectives					
ASIC development and manufacturing of an extremely low power timer EM for Mars landers					
Description					
In an on-going activity with RUAG Austria an extremely low power timer EM for Mars landers, realised as a discrete solution, is under development (E901-001ED). This discrete concept is expected as a reliable and conservative solution. The aim of the proposed CCN is to develop in parallel an ASIC solution for the extremely low power timer.					
If it would be possible to have the same function and reliability with an ASIC instead of a discrete solution this would give a large reduction of size and mass. For higher TRL levels an ASIC gives also the option to include the timer function on the onboard computer board instead of on an own board which would result in an additional reduction of mass and size.					
This activity will consist of:					
- Design Trade Offs and Preliminary Design with respect to (non-exhaustive): power consumption, reliability, radiation hardness, level of integration (e.g. internal or external switcher transistor), form of redundancy					
- Detailed Design					
- Test Plan					
- ASIC Manufacturing					
- Breadboard Manufacturing					
- Test Set-Up, Test and Reporting					
- Activity Synthesis					
Deliverables					
Breadboard, a few ASICs, Documentation					
Current TRL:	2	Target TRL:	4	Application Need/Date:	2015
Application Mission:	All Mars missions		Contract Duration:	15	
S/W Clause:	NA		Reference to ESTER		
Consistency with Harmonisation Roadmap and conclusion:					
N/A					

Subsonic parachute trade-off and testing - CCN					
Programme:	ETP		Reference:	E918-001MP	
Title:	Subsonic parachute trade-off and testing - CCN				
Total Budget:	350				
Objectives					
Development of a particle imaging velocimetry (PIV) system for enhanced subsonic wind tunnel testing and testing campaign with additional subsonic parachute designs for Mars missions.					
Description					
This CCN to the running TRP activity (T918-001MP) is intended to develop a system for Particle Imaging Velocimetry (PIV) at the Canadian National Research Council (CNRC) subsonic wind tunnel, in order to enhance the quality of the test data that could be achieved for the development of subsonic parachutes for Mars EDL. The activity is divided into two phases: Phase one: Development of the PIV for the subsonic wind tunnel. Phase two: Production of a few parachute(s) with existing designs but using a material which changes color with strain to visualize the stress distribution, and test in CNRC (where the PIV will be available). Further tests (including design and manufacture) with different parachute type(s) than the one presently foreseen in the subsonic test campaign shall also be included.					
Deliverables					
Fully functional PIV system, scale-model parachutes, test data and documentation					
Current TRL:	2	Target TRL:	4	Application Need/Date:	2015
Application Mission:	Mars surface missions		Contract Duration:	18	
S/W Clause:	NA		Reference to		

		ESTER	
Consistency with Harmonisation Roadmap and conclusion:			
N/A			

Accelerometer to TRL5 – CCN					
Programme:	ETP		Reference:	E905-017FT	
Title:	Accelerometer to TRL5 – CCN				
Total Budget:	300				
Objectives					
Additional testing of accelerometer component to achieve TRL 5/6.					
Description					
This CCN is intended to cover additional testing (and possible ASIC and/ or packaging modifications if required) of an accelerometer component that is being developed in an MREP activity (E905-016EC).					
The testing shall include:					
1) Thermal environment for space and Mars entry					
2) Mechanical environment of launch, transfer and planetary EDL.					
3) Life testing (thermal cycling + high temperature accelerated life)					
4) Constructional analyses					
By the end of the activity, a pre-qualification level of the accelerometer component should be achieved.					
Deliverables					
Tested accelerometer components, documentation					
Current TRL:	5	Target TRL:	5/6	Application Need/Date:	2015
Application Mission:	All exploration missions		Contract Duration:	9	
S/W Clause:	NA		Reference to ESTER		
Consistency with Harmonisation Roadmap and conclusion:					
N/A					

Annex III

Justification for Proposed Tendering Procedure

**Justification for Proposed Tendering Procedure: DN/C
Industrial Policy Committee**

ESA Reference	Title	Firm Fixed Price (Keuro)	Proposed Bidder
A923-001FI	Extremely low power timer board EM for landers - CCN	280	RUAG (AT)

Justification:

Further development of on-going work in the MREP Extremely low power timer board EM for landers (E901-001ED) activity (300 kEuros) for work on an ASIC implementaton of the current discrete design.

**Justification for Proposed Tendering Procedure: DN/C
Industrial Policy Committee**

ESA Reference	Title	Firm Fixed Price (Keuro)	Proposed Bidder
E918-001MP	Subsonic parachute trade-off and testing - CCN	350	Vorticity (UK)

Justification:

Extension of wind-tunnel test capabilities to support further development of subsonic parachute designs for Mars landings in the frame of the running TRP activity T918-001MP Subsonic parachute trade-off and testing (500 kEuros).

**Justification for Proposed Tendering Procedure: DN/C
Industrial Policy Committee**

TRP Reference	Title	Firm Fixed Price (Keuro)	Proposed Bidder
E905-017FT	Accelerometer to TRL5 - CCN	300	Colybris (CH)

Justification:

Extension of test campaign during MREP Accelerometer to TRL5 activity (700 KEuros) in order to bring component technology to TRL5/6.