INVITATION TO THE GSTP WORKSHOP ON IN-ORBIT DEMONSTRATION

19 – 20 March
NH Conference Centre Leeuwenhorst
Langelaan,3
2211 XT Noordwijkerhout

Introduction

In-orbit demonstration is essential to de-risk innovation and accelerate the infusion of new technologies, products and practices in mainstream projects. Such innovation is essential for competitiveness of Space, of new science and service missions, and of European industry in the commercial world market.

ESA strategy for in-orbit demonstration has the following main objectives:

1. The demonstration of technology and products to acquire flight heritage and thereby reduce risk and provide confidence to customers, last step of the technology readiness ladder;

2. The demonstration of techniques, approaches and architectures to reduce the cost of developing and operating space missions;

3. The demonstration of techniques, for research, e.g. GNSS reflectometry, for services, e.g. AIS monitoring from space, for operations in orbit, e.g. rendezvous, formation flying, autonomy, agility, etc.

4. The demonstration of new architectures, board and ground, and interfaces

5. The demonstration of new ways of working, development approaches, e.g. concurrent engineering, model based systems engineering, system – software and hardware – software co-engineering, etc, AIV and OPS, digital mock up, virtual spacecraft, common core ground system software for EGSE and mission control, etc.

6. The characterization of the space / spacecraft environment and of the measurement techniques, e.g. re-entry, sloshing, etc.

The above objectives can be implemented:

- as experiments on host carriers of opportunity, mainly objective 1, or
- as small dedicated satellites addressing most of the above objectives.

For the small dedicated satellites, the Agency proposes to maintain the concept of guest payload, offering opportunities to payloads to further enhance the scope of the demonstration, e.g. the Compact High Resolution Imaging Spectrometer (CHRIS) on Proba-1 exploited the agility and precise stable pointing of Proba-1 to provide data of high scientific and application value and at the same time allowed additional verification of the platform capabilities.
For in-orbit demonstration to be efficient it must be affordable, effort commensurate with the benefits. This requires new approaches, which in turn become also objectives of the demonstration.

The proposal

The Agency is proposing to continue implementing this strategy through two Elements of the new period of the General Support Technology Programme (GSTP), GSTP-6:

Technology Flight Opportunities: Element 4

Element 4 will be re-defined to satisfy the demand from industry for opportunities to provide flight legacy to their products and to profit from the increasing opportunities for hosting payloads on commercial and institutional missions. The opportunity of a flight demo is a powerful motivator for bridging the gap between low TRL and the maturity required for adoption on missions. This latter problem has been an issue for GSTP developments for a long time.

This refocused Element 4 shall facilitate technology and products to reach the last step of the TRL ladder, by matching technologies needing such in-orbit demo with the cheapest and fastest flight opportunity available, on any mission providing the required profile (national, commercial, ESA’s, etc.). Implementation will be via periodic Announcements of Opportunity for candidate technologies and carriers. The Agency will seek possible agreements / block reservations for opportunities on regular national technology flights. Coordination of In-Orbit Demonstration efforts in Europe will be pursued, sharing opportunities, platforms, and launchers.

Breakthrough Mission Approaches: Element 5

Industry in Europe is lacking the large defence budgets that drive technology development in other parts of the world. In particular in the US, agencies like DARPA or the Air Force Lab are pushing very innovative concepts to flight demonstration that once proven are more easily adopted in main missions. The Proba-1 and -2 missions have been very successful in this sense: Autonomy in event driven operations as opposed to stored mission timeline, system – software engineering, use of autocode, share of system software across functional verification and operations, etc. are now entering mainstream missions. This does not exclude the demonstration of technology, as new techniques usually trigger new technologies as well. The Proba series has also pioneered new technologies and products such as the recent generations of ESA processors ERC-32, LEON, Li-ion batteries, etc. that have been selected in core missions precisely because of such heritage. The infusion of these technologies and practices in the main missions of the Agency is facilitated by the Technical Directorate engineering support to projects.
Element 5 shall facilitate the adoption by ESA, national and industry missions of new techniques and of approaches to mission development, integration and operations, which otherwise would not be applied because they are not yet proven. Each mission will also fly a payload of opportunity, driving new technologies and providing for new approaches also in this area. Implementation will be flexible, based on a preliminary plan of missions, but ready to react to new needs and priorities from potential partnerships or opportunities (ESA, national or industrial programmes). Industry and Research Institutions will be involved in the definition of the “new approaches” to be demonstrated, which may include procurement as well as tools and operations, in particular further autonomy. In practice the basic mission profile should never exceed the following envelope:

- Mission including launch <50 M€
- Development <2 – 3 years from PDR to FAR
- New procurement and teaming approaches
- Low cost launch
- High mission innovation content
- Hosting guest payloads that benefit from the techniques demonstrated
- Plan over 5 years as envelope with prime and back-up opportunities maintaining a regular mission rhythm.

If the budget envelope is to be exceeded this can only be done in the frame of cooperation with a partner programme. In the first quarter of 2012, the Agency will organise a workshop with Delegations, Industry, Research Centres and Academia, to identify the priorities and the best adapted funding and procurement policies for this Element.

**The workshop**

To gather the views of the stakeholders so as to be able to better define the contents of these Elements in the proposal of GSTP-6 to the coming Council at Ministerial level, the Agency is inviting your institution to a workshop to be held the 19-20 of March 2012 at NH Conference Centre Leeuwenhorst in Noordwijkerhout, The Netherlands, as per the attached draft agenda.

We would appreciate receiving your written input to udo.becker@esa.int before the workshop, stating your views on the objectives, your needs and opportunities, reflexions on implementation, etc

We have allocated time slots to research institutions, including also National Space Agencies, and industry to take the podium and present their views and reflections. We would appreciate your short 5 – 10 minutes presentation, in the relevant sessions. Presentations should be relevant to the objectives of the workshop and address the objectives of demonstration and the potential implementation:

- The needs related to the objectives, e.g. which technologies and products, which techniques, concepts and approaches, why, for when, which scope and representativeness of the demonstrations, etc
- The opportunities, e.g. carriers of opportunity, ESA, national and commercial missions, launches, logs of needs and opportunities, mechanisms for brokerage, etc
- The approach to development and operation and funding of small dedicated satellites

Off-the shelf platforms information is welcome, but will not be included in the presentations programme.

We hope seeing you at the workshop and would appreciate if you could confirm your participation to udo.becker@esa.int as soon as possible indicating also your needs for presentation at the workshop.
GSTP Workshop on demonstration of technology, concepts and engineering approaches

Objective of workshop:

Building on the results of previous initiatives and in particular of GSTP in-orbit demonstration activities, the Agency is proposing to strengthen the support to the demonstration in orbit of technologies and products, mission techniques and system concepts and development approaches. In particular, ESA intends to propose two Elements in GSTP

- **Element 4**, Technology Flight Opportunities, for the demonstration of technologies and products in host carriers of opportunity
- **Element 5**, Breakthrough Mission Approaches, for the demonstration of new techniques, concepts and approaches

The objective of the workshop is to gather the views from the stakeholders and their inputs for an initial plan for the preparation of the future GSTP Element 4 and Element 5.

**Day 1 – 19 March 2012**

13:00 Registration

13:45 Introduction and objectives of the workshop

**Element 5 Session: Breakthrough Mission Approaches**

In this session the stakeholders will exchange views on the needs, e.g. mission techniques, in-orbit operation techniques; system concepts, development and verification approaches; and implementation approaches, e.g. concurrent engineering, model based system engineering, PA tailored approach “Lightsat” concept, etc. The programmatic constraints will also be discussed. ESA will outline concepts already investigated such as Formation Flying, GNSS reflectometry, AOTF based spectrometry, ESMO (derivative of the European Student Moon Orbiter), etc

14:15 The views of Research Institutions, including also National Space Agencies

15:15 Industry views: primes, suppliers, SME, Eurospace

16:45 Coffee break

17:00 The ESA views

18:00 Session wrap up

19:00 Reception / cocktail
Day 2 – 20 March 2012

Element 4 Session: Technology Flight opportunities

In this session the stakeholders will exchange views on the needs, e.g. which technologies, which products, need dates, what should be the scope of demonstration, how should be the development and verification for flight as passengers, etc; and the opportunities, e.g. missions, platforms and launchers offered, conditions of the offer, etc and will reflect on the potential implementation

09:00 Recapitulation and objectives

09:15 The views of Research Institutions, including also National Space Agencies

10:30 Coffee break

11:00 The Industry views: primes, suppliers, SME, Eurospace

13:00 Lunch

14:15 The ESA views

15:15 Coffee break

15:45 Session wrap-up

16:15 Discussion and overall conclusions of the workshop

- Discussion of programmatic, business and funding models
- Drafting of main conclusions

17:00 End of workshop

A workshop report will be issued 2 weeks after the event. The plan is to send it to the Director’s Committee on Technology, and as an information note to the IPC.

- Participants are encouraged to submit written inputs. Research institutions and companies willing to use the podium please contact the workshop organisers.
- Presentations should be short and to the points of the workshop.
- Commercial type presentations of platforms will not be included in the presentations programme, but information material is welcome.