

**General Support Technology Programme (GSTP) Period 6  
Element 3: Technology Flight Opportunities (TFO)**

**Open Call for Technology Flight Demonstrators and Carrier Flight Opportunities**

**Introduction**

The Agency is pleased to invite European space industry, research institutions, ESA Member States and ESA directorates to submit flight requests and flight opportunities for technology demonstrators in response to this Call. Proposals may be submitted at any time during the entire period of GSTP-6 (2013-2018).

**Scope and Objectives**

The competitiveness of European space industry relies on the timely readiness of new technologies and products to be introduced on the market and be used in future missions. In-Orbit Demonstration (IOD) of these technologies and products contributes to de-risk the innovation and to accelerate development. There are two classes of IOD: dedicated small satellite systems, and experiments on host carriers (satellites, launchers and ISS). This call is targeted on the latter demonstrator class.

The successful implementation of the ESA IOD Strategy (ESA/IPC(2007)113, rev.1) therefore relies on providing maturing technologies and products with access to the relevant flight environment in the shortest time possible. This implies a coordinated European level effort for providing access to *frequent* carrier opportunities (sometimes becoming available only on relatively short timescales), and an *efficient* approach to the selection and preparation of demonstrators for flight.

The objective of this Call is therefore to:

- identify carriers (primarily spacecraft, but also launchers and sub-orbital vehicles) which can offer spare resources to embark technology demonstrators –here defined as “carrier flight opportunities”;
- identify technologies and products in need of and suitable for in-orbit demonstration –here defined as “technology flight demonstrators”;
- match technology demonstrator needs with carrier opportunities and select “Technology Flight Opportunities” for accommodation studies and, if necessary, the subsequent procurement of the flight demonstrator and carrier integration services.

Carrier flight opportunities may come from ESA operational missions, ESA IOD missions (e.g. Proba series), Member States national missions (e.g. IOD and other mission types), and commercial missions delivered by industry (i.e. commercial customer/industry allows technology demonstrators to be embarked on a paid basis in order to reduce the mission cost). Carriers may include large platforms, as well as micro- and nano-satellites (e.g. CubeSats).

Technology flight demonstrators may come from the ESA programmes concerned with technology/product development (e.g. GSTP), external to ESA via national space technology programmes managed by National Agencies, and via industry arising from their strategic in-house technology investments.

Technologies within the scope of this Call can belong to any of the 25 Technology Domains for ESA Technology Development activities and to any Service Domain, e.g. Earth Observation, Space Science, etc., with the exception of telecommunications-specific technologies/products which are the subject of a separate in-orbit validation framework within the ARTES programme.

For new technologies/products in need of a flight, typically a minimum Technology Readiness Level (TRL) of 5 or 6 shall have been achieved at the time of the request. The technology flight demonstrator shall lead to an increase in the TRL to level 8/9.

### **Responding to the Call**

Requests for technology flight demonstrators and the notification of upcoming carrier flight opportunities should be submitted to an on-line data management system provided by ESA. Only a web browser is needed to access and use the system.

User login details (site URL, username and password) for the on-line data management system can be obtained by sending an email to [TFO@lex6.edu.esa.int](mailto:TFO@lex6.edu.esa.int) with the title "User Request for TFO site: [NAME]" containing the following contact information:

User Full Name:

Function:

Organization:

Address:

Phone:

E-Mail:

Profile: Technology Flight Requests / Carrier Flight Opportunities / All

User login details and instructions on how to submit information into the two databases of the on-line data management system (Technology Flight Requests, Carrier Flight Opportunities) will then be sent by return of email.

For entries to the Technology Flight Requests database, the required information includes programmatic aspects of the demonstrator (flight readiness schedule, mission duration) and its technical data (preferred carrier type, required orbit range, required on-board resources e.g. mass, volume/dimensions and power, required interfaces).

For entries to the Carrier Flight Opportunities database, the required information includes programmatics of the carrier (required demonstrator delivery date, mission duration, pricing policy) and its technical data (carrier type, planned orbit, available on-board resources, available interfaces).

It is recognised that the information required for all fields may not be available, but users should endeavour to provide the maximum information possible in order to facilitate the ESA match-making process between flight requests and flight opportunities.

### End-to-End TFO Process

The end-to-end process for TFO is presented in Figure 1 showing the programmatic path of a technology demonstrator to flight. In a continuous implementation process, ESA will regularly monitor the TFO data management system in order to match technology flight requests with arising carrier flight opportunities, thereby identifying candidate “technology flight opportunities” (TFOs) to be proposed for accommodation studies. Technology flight requests will be assigned with a priority by ESA. Technologies resulting from developments “close to market”, e.g. GSTP 6 Element 2 and those in European Harmonization technology roadmaps and the ESCC plans will be given the highest priority. Candidate TFOs will be selected on the basis of the following criteria:

1. Priority for a flight demonstrator
2. Suitability for a flight demonstrator
3. Compatibility between flight demonstrator and carrier interfaces
4. Availability of financial and other required support.

Once candidate TFOs have been selected, rapid assessments on the accommodation feasibility will be performed, based on the demonstrator design definition files, and carrier interface definition files. For simple interfaces, ESA will organise information exchange and technical interface meetings between the demonstrator developer and carrier opportunity provider in order to confirm the accommodation feasibility.

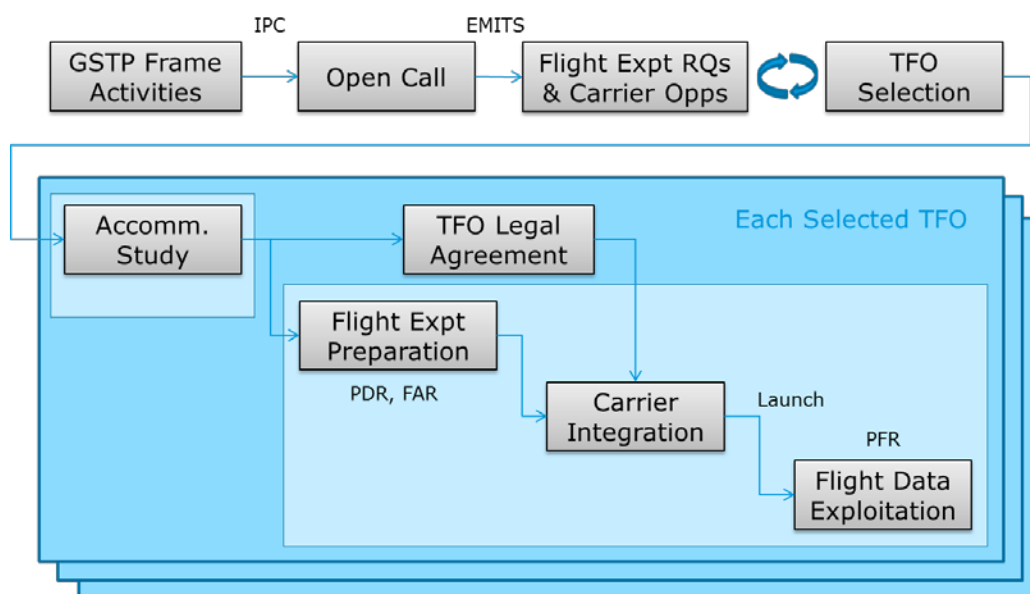


Figure 1: ESA end-to-end process for Technology Flight Opportunities

For complex demonstrator designs and/or complex interface definitions requiring more substantial effort, a small ESA study contract may be issued to the demonstrator developer (with funding support from their delegation) with the carrier opportunity provider as external service provider. An express procurement scheme will be used to minimise the time to contract kick-off. Positive results of the accommodation studies will lead to the selection of TFOs for implementation, including flight demonstrator preparation, integration of the demonstrator with the carrier, in-orbit demonstrator operation and flight data exploitation for the technology demonstration.

## **Implementation Scheme**

Upon confirmation of GSTP funding commitment by the relevant Delegation, the Agency will issue a Technology Demonstrator Implementation contract to the demonstrator developer with the carrier opportunity provider as external service provider (if the carrier flight opportunity is to be paid). The contract will follow a generic Statement of Work incorporating a lean management, engineering and product/quality assurance approach in order to enable a rapid development process. The contract will be split into three distinct phases in order to allow risks to be adequately controlled at key points in the engineering process:

1. Demonstrator design including any adaptations of existing hardware/software needed to comply with the carrier interfaces of the TFO (in the case that a further development is needed prior to demonstrator preparation, this will take place outside the TFO activity)
2. (Proto) Flight Model manufacturing, assembly, integration and verification (in case EQM or other from previous development activities is not suitable for the TFO)
3. In-orbit operations and data exploitation

The phases are concluded with the following review milestones:

- Demonstrator Design Review at the end of Phase 1 to ensure compliance of the design to its requirements and the carrier interfaces
- Final Acceptance Review to ensure conformance of the 'as delivered' demonstrator FM to its final design state, its verification status and suitability for carrier integration
- Post-Flight Review to assess the flight data analysis results with respect to the demonstrator objectives.

The carrier integration services will follow the demonstrator development phases and will cover:

1. Finalisation of the demonstrator(s) accommodation and interface definition
2. Integration of the demonstrator(s) on the carrier and interface verification
3. Launch of the demonstrator(s), flight operations and data provision

A legal agreement (herewith called a “TFO Legal Agreement”) between the demonstrator developer(s), the carrier opportunity provider and ESA will be established, based on a template provided by ESA, and will include responsibilities, mutual commitments, and data protection/IPR.

Alternative implementation schemes will be put in place for technology flight demonstrators funded under national programmes or by industry that are selected to be embarked on ESA-provided carrier flight opportunities. Developers of nationally or industrially funded demonstrators may also use the on-line TFO data management system to perform their own match-making with non-ESA carrier flight opportunities, provided that ESA is informed of any resulting implementation.

### **Contact Information**

Please address any questions or requests for clarifications relating to this Call to the persons listed below.

For technical and implementation matters, please contact:

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