



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra  
Swiss Confederation

Federal Department of Economic Affairs,  
Education and Research EAER

**State Secretariat for Education,  
Research and Innovation SERI**  
Swiss Space Office



## Call for Proposals 2020

# To foster and promote Swiss scientific and technological competences related to space activities

### Introduction

Following the past five successful editions of the MdP Calls for Proposals (Mesure de Positionnement) launched since 2010 to reinforce the technological and scientific capabilities of Swiss entities in the space sector, the Swiss Space Office of the State Secretariat for Education, Research and Innovation (SERI/SSO) is again initiating a Call for Proposals in 2020. Based on the same principle as the five previous Calls, the goal of the “positioning measure”, which is part of the National Complementary Activities for space, is to encourage the emergence of projects in space technology. It aims to develop niche sectors and to better position Swiss industrial and academic entities, particularly in the frame of ESA activities and other international programmes such as the EU Research Framework Programmes. The SSO has mandated the Swiss Space Center (SSC) to implement the Call for Proposals 2020.

### Objectives

The main objectives of this Call for Proposals are to foster and promote Swiss technological and scientific competences that have a clear potential for space products and services/applications. More particularly, this Call for Proposals aims:

- to foster the development of innovative ideas and new products related to the space sector;
- to promote the collaboration between Swiss industrial and academic partners to obtain a more stable and better structured Swiss space landscape;
- to better position Swiss industry with regard to future European and worldwide activities so as to be ready to submit competitive bids when the respective calls are published;
- to increase the technological maturity of ideas developed by academia and to promote competitive space products thanks to partnerships with industry.

## Topics

Topics to be proposed are open but must be related to the development of hardware and/or software for space applications. Preference will be given to topics linked to the priority areas according to the [Swiss Space Implementation Plan](#) (see Annex A). In addition, novel and disruptive ideas will be considered in order to foster development of niche sectors that have a clear potential to support the worldwide competitiveness of Swiss industry. Participants are also encouraged to look beyond traditional space markets. Both the development of new space technologies and of new services related to space may be proposed. With respect to the technology maturity or technological readiness level (TRL) as defined in Annex B1 (for hardware developments) and Annex B2 (for software developments), the proposed studies shall aim at reaching a TRL 3 or 4. The selected studies shall increase the TRL of already identified ideas/concepts at academic level thanks to cooperation with industry. In addition, proposals shall include a clear strategic plan indicating a roadmap to develop new products and/or new niche sectors, including funding strategies up to the final product.

## Who may apply

Only proposals submitted by Swiss academic institutions in partnership with industry will be considered. Academic partners may include laboratories from universities, institutes of technology (EPFL/ETHZ), universities of applied sciences (HES/FH), and research centers. In the frame of this proposal, a Swiss industrial partner is defined as an enterprise incorporated in Switzerland with proven development activities in the country.

In addition, the 2020 Call is also open to Austrian academic and industrial entities, as part of an agreement between the SERI and the Austrian Space Agency (FFG/ALR). A consortium of industry and academic entities may be formed between Swiss and Austrian partners, with no more than 1 Austrian partner in a consortium. For the specific rules to be observed by the Austrian partners, see "[RTI Initiative. ASAP – The Austrian Space Applications Programme. ASAP – SSO Call](#)".

In case of cooperation with a foreign partner from a country other than Austria being envisaged, it must be duly explained in the proposal, including a justification for why its proposed activity cannot be performed in Switzerland. Furthermore, its share may not exceed 10% of the amount funded by the SERI.

## Format of the proposal

The proposal shall comprise the following four main elements and shall not exceed 50 pages (including annexes):

1. Cover letter
2. Answers to the "Guidelines on positioning measure proposals for space programmes" (10 pages max)
3. Technical proposal (20 pages max)
4. Financial, management, and administrative proposal (20 pages max)

The "Guidelines on positioning measure proposals for space programmes" may be found in Annex C. These guidelines are based on the relevant ordinance defining the eligibility for subsidies, see <https://www.admin.ch/opc/fr/classified-compilation/20122266/201501010000/420.11.pdf>

The technical proposal (element 3) shall be structured according to the following main sections:

- Motivation for pursuing the proposed project (Why?)
- Technical description of the study (What?)
- Technical and/or scientific approaches selected (How?)
- Study plan logic with a clear link between the academic and industrial partners
- Work breakdown structure
- Work package description

The financial, management, and administrative proposal (element 4) shall include the following main sections:

- Structure of the team
- Experience of the bidders
- Key personnel description (with 1-page CVs)
- Detailed costing based on ESA PSS A2, A8, and A15 standard (see Annex D)
- Travel and subsistence expenses
- A payment plan in 3 instalments (in principle 40% at kick-off, 40% after a successful mid-term review, and 20% after reception of all deliverables)
- Strategic plan with a roadmap on the foreseen further technology developments, with funding resources, up to target product(s)

### **Duration of the study**

The proposed studies shall last for a maximum of 15 months from kick-off to delivery of the final report.

### **Deliverables**

- Minutes of meetings shall be submitted by the project participants following the Kick-off meeting, the mid-term and final reviews.
- A mid-term report shall be submitted prior to issuing the invoice for the 2<sup>nd</sup> instalment.
- A final report and an executive summary, describing the activities performed in the frame of the study as well as the strategy for further developing the proposed product/service towards its operational application, shall be delivered no later than one month after the end of the study.
- Progress reports shall be submitted to the SSC.

### **Financial support**

**A maximum amount of 250'000 CHF** is allocated to each selected study, to be considered as a unique subsidy, which cannot be extended. The ratio between the financial amount for the academic and industrial partners has to respect a minimum value of 1/3, i.e. at least one third of the amount has to be allocated to one of the two types of partners. The funding shall be used exclusively to pay for salaries and a limited amount for travel and subsistence expenses.

The work packages of Austrian partners, if any, will be funded directly by the FFG/ALR, up to a maximum of 100.000 EUR, and is part of the 250'000 CHF budget.

Austrian partners participating in the Call 2020 are required to state costs in CHF. The CHF/EUR rate applied will be 1:1 (1Euro=1CHF).

### **Evaluation procedure**

The technical and scientific evaluation (of elements 3 and 4) will be organized by the Swiss Space Center on behalf of SERI/SSO. Analogous to the ESA system, the evaluation procedure will be based on a set of evaluation criteria (see below). A committee consisting of both national and international recognized experts will evaluate the proposals. The Swiss Space Center will transmit a recommendation to the SERI/SSO based on the results of the technical and scientific evaluation. For the proposals that will have a positive recommendation, SERI/SSO will evaluate the answers to the “Guidelines on positioning measure proposals for space programmes” (element 2) as described in Annex C. This evaluation includes the consultation of federal organisations concerned, in particular the Swiss National Science Foundation (SNF) and InnoSuisse. The final funding decision lies entirely with the SERI.

## **Evaluation criteria**

In evaluating the proposals (elements 3 and 4), the following criteria will be applied:

1. background and experience of the study team members
2. potential for innovation of the topic proposed
3. quality and suitability of proposed programme of work
4. adequacy of management, costing, and planning for the execution of work

The numbers of proposals that will finally be selected for funding by SERI/SSO will also depend on the available credit at the time the decision will be taken.

## **Value Added Tax, Intellectual Property Rights and Confidentiality**

The funding of the Swiss Confederation for successful proposals is a subsidy based on a decision, and is not subject to the value added tax (VAT).

The intellectual property rights (IPR) will entirely belong to the authors of the proposals. A signed Intellectual Property (IP) agreement, as reached by the project partners, shall be submitted at the kick-off meeting, together with an overview of all IPR issues anticipated to arise (Software licences etc.).

General information about the funded projects will be publicly available. However, in exceptional cases, a proposer might wish to restrict the level of information to be published. Such restrictions shall be duly justified in the proposal and will be determined at the kick-off meeting.

Finally, anyone involved in the evaluation process and not member of the Swiss Public administration shall sign a non-disclosure agreement to ensure confidentiality of the projects proposed in the frame of this Call.

## **Schedule**

- 19 February 2020: Publication of the Call for Proposals 2020
- 21 April 2020: Deadline to submit the proposals to the Swiss Space Center
- 28 August 2020: Funding decision by SERI
- Sept-Oct 2020: Kick-off meetings
- 1 November 2020: Start of study
- Dec. 2021-Jan. 2022: Final review (including technical presentation and strategic outlook)
- 31 January 2022: End of Study / All deliverables submitted
- February 2022: Presentation of project at the Swiss Space Center (public event)

## **Submission of the proposals**

**Only proposals received by Tuesday 21 April 2020 at 23:59 (CET) will be accepted for evaluation.**

Each proposal, written in English, shall be submitted in electronic format (PDF) and shall consist of two separate files:

- A file with the complete proposal with the four elements
- A file containing only element 2 (Annex C)

to the following address:

Swiss Space Center

Julien Bonnaud

Email: [julien.bonnaud@epfl.ch](mailto:julien.bonnaud@epfl.ch)

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## **Questions and requests for clarifications**

Any questions related to this Call for Proposals shall be submitted to Julien Bonnaud.

The answers will also be published on the Swiss Space Center's website <https://www.spacecenter.ch/activities/fundingopportunities/mdp/> as well as any relevant information.

## **Annexes**

- Annex A: Priority areas according to the Swiss Space Implementation Plan
- Annex B1: Technological readiness levels (TRL) for hardware developments
- Annex B2: Technological readiness levels (TRL) for software developments
- Annex C: Guidelines on positioning measure proposals for space programmes
- Annex D: Financial forms based on ESA PSS A2, A8 and A10 standard

## **URL**

This document and all the annexes may be downloaded in electronic format from <https://www.spacecenter.ch/activities/fundingopportunities/mdp/>

## Annex A

### Priority areas according to the Swiss Space Implementation Plan (SSIP)<sup>1</sup>

- Priority area A:  
**High-precision mechanisms and structures**
- Priority area B:  
**Atomic clocks**
- Priority area C:  
**Photonics**
- Priority area D:  
**Technologies for scientific instruments**
- Priority area E:  
**Technologies for user-funded applications**

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<sup>1</sup> [https://www.sbf.admin.ch/dam/sbf/en/dokumente/webshop/2017/ssip-2018-2020.pdf.download.pdf/SSIP\\_Broschuere\\_e.pdf](https://www.sbf.admin.ch/dam/sbf/en/dokumente/webshop/2017/ssip-2018-2020.pdf.download.pdf/SSIP_Broschuere_e.pdf)

## **Annex B1**

### **Technological readiness levels (TRL) for hardware developments**



# Technology Development

**Breadboard Model:** Any equipment or part of it which is functionally and electrically representative of flight H/W and which is used to validate a new or critical feature of the design. There are no specific requirement for configuration and interface control.

BB

**Elegant Breadboard:** EB refers to an equipment between a BB and EM. It is built using commercial grade components and a configuration close to that of the FM. In other words, it is not a BB with physically separated units interconnected by cables and wires but a fully integrate unit in a configuration and with interfaces representative of the FM. There are no specific requirements for configuration and interface control.

EB

TRL 1

**Basic principles observed and reported**

This is the lowest “level” of technology maturation. At this level, scientific research begins to be translated into applied research and development. Examples might include studies of basic properties of materials (e.g., tensile strength as a function of temperature for a new fiber).

TRL 2

**Technology concept and application formulated**

Once basic physical principles are observed, then at the next level of maturation, practical applications of those characteristics can be ‘invented’ or identified. For example, following the observation of high critical temperature (H<sub>tc</sub>) superconductivity, potential applications of the new material for thin film devices (e.g., SIS mixers) and in instrument systems (e.g., telescope sensors) can be defined. At this level, the application is still speculative: there is not experimental proof or detailed analysis to support the conjecture.

TRL 3

**Analytical and experimental critical function and/or characteristic proof-of concept**

At this step in the maturation process, active research and development (R&D) is initiated. This must include both analytical studies to set the technology into an appropriate context and laboratory-based studies to physically validate that the analytical predictions are correct. These studies and experiments should constitute “proof-of-concept” validation of the applications/concepts formulated at TRL 2. For example, a concept for High Energy Density Matter (HEDM) propulsion might depend on slush or super-cooled hydrogen as a propellant: TRL 3 might be attained when the concept-enabling phase/temperature/pressure for the fluid was achieved in a laboratory.

TRL 4

**Component and/or breadboard validation in laboratory environment**

Following successful “proof-of-concept” work, basic technological elements must be integrated to establish that the “pieces” will work together to achieve concept-enabling levels of performance for a component and/or breadboard. This validation must be devised to support the concept that was formulated earlier, and should also be consistent with the requirements of potential system applications. The validation is relatively “low-fidelity” compared to the eventual system: it could be composed of ad hoc discrete components in a laboratory. For example, a TRL 4 demonstration of a new ‘fuzzy logic’ approach to avionics might consist of testing the algorithms in a partially computer-based, partially bench-top component (e.g., fiber optic gyros) demonstration in a controls lab using simulated vehicle inputs.

**Engineering Model:** An EM shall be fully representative of FM except that a lower standard of electrical components may be used. The standard of these components shall be the highest achievable within the schedule constraints. Any and all redundancy which will be in the flight standard model shall be provided in the EM unless otherwise agreed with the customer. If redundancy is not required in the EM by the customer, switching functions associated with redundant functions shall be demonstrated and dummy hardware may be required to ensure the EM is representative for certain tests. A clear statement of the EM as designed / as built status shall be made available by the supplier.

EM

TRL 5

**Component and/or breadboard validation in relevant environment**

At this, the fidelity of the component and/or breadboard being tested has to increase significantly. The basic technological elements must be integrated with reasonably realistic supporting elements so that the total applications (component-level, sub-system level, or system-level) can be tested in a 'simulated' or somewhat realistic environment. From one to several new technologies might be involved in the demonstration. For example, a new type of solar photovoltaic material promising higher efficiencies would at this level be used in an actual fabricated solar array 'blanket' that would be integrated with power supplies, supporting structure, etc., and tested in a thermal vacuum chamber with solar simulation capability.

**Engineering Qualification Model:** An EQM shall be fully representative of FM except that a lower standard of electrical components may be used. The standard of these components shall be the highest achievable within the schedule constraints but using the same manufacturer, the same type and the same package as for the FM. Only the testing and the screening of the parts might be different compared to the FM. Any and all redundancy will be in the flight standard model shall be provided in the EQM unless otherwise agreed with the customer. If redundancy is not required by the customer, switching functions associated with redundant functions shall be demonstrated and dummy H/W may be required to ensure the EQM is representative for certain tests.

EQM

TRL 6

**System/subsystem model or prototype demonstration in a relevant environment (ground or space)**

A major step in the level of fidelity of the technology demonstration follows the completion of TRL 5. At TRL 6, a representative model or prototype system or system — which would go well beyond ad hoc, 'patch-cord' or discrete component level breadboarding — would be tested in a relevant environment. At this level, if the only 'relevant environment' is the environment of space, then the model/prototype must be demonstrated in space. Of course, the demonstration should be successful to represent a true TRL 6. Not all technologies will undergo a TRL 6 demonstration: at this point the maturation step is driven more by assuring management confidence than by R&D requirements. The demonstration might represent an actual system application, or it might only be similar to the planned application, but using the same technologies. At this level, several-to-many new technologies might be integrated into the demonstration. For example, an innovative approach to high temperature/low mass radiators, involving liquid droplets and composite materials, would be demonstrated to TRL 6 by actually flying a working, sub-scale (but scalable) model of the system on a Space Shuttle or International Space Station 'pallet'. In this example, the reason space is the 'relevant' environment is that microgravity plus vacuum plus thermal environment effects will dictate the success/failure of the system — and the only way to validate the technology is in space.

The EQM shall be subjected to the full equipment level qualification test sequence. EQM shall be built to full flight standard in accordance with the PA and CDAM requirement except for EEE parts. Interchange ability status shall be identified. Testing shall be in accordance with supplier issued plans approved by the customer. Test reports shall be produced and issued.

**Qualification Model:** The QM shall be built to full flight standard in accordance with the PA and CADM requirement imposed on FMs. Flight standard parts shall be used. QMs shall be subjected to full qualification testing.

QM

The customer shall approve the relevant test planes and report to establish acceptance of the qualification status.

Following the successful qualification testing, the QM is not considered suitable for use on the satellite.

Protoflight Model: The PFM shall be built to full flight standard in accordance with the PA and CDAM requirements imposed on FMs. Flight standards parts shall be used.

PFM

TRL 7

**System prototype demonstration in a space environment**

TRL 7 is a significant step beyond TRL 6, requiring an actual system prototype demonstration in a space environment. It has not always been implemented in the past. In this case, the prototype should be near or at the scale of the planned operational system and the demonstration must take place in space. The driving purposes for achieving this level of maturity are to assure system engineering and development management confidence (more than for purposes of technology R&D). Therefore, the demonstration must be of a prototype of that application. Not all technologies in all systems will go to this level. TRL 7 would normally only be performed in cases where the technology and/or subsystem application is mission critical and relatively high risk. Example: the Mars Pathfinder Rover is a TRL 7 technology demonstration for future Mars micro-rovers based on that system design. Example: X-vehicles are TRL 7, as are the demonstration projects planned in the New Millennium spacecraft program.

PFMs shall be subjected to protoflight qualification testing. The customer shall approve the relevant test plans and reports to established acceptance of protoflight qualification.

Following successful PFM testing, the PFM shall be used during PFM testing of the satellite PFM and shall successfully withstand these environmental tests in order to achieve full qualification.

If more than one of the same standard equipment is required for use on the satellite, only one of these needs to be a PFM; the other ones need only to be acceptance tested, unless otherwise specified by the customer.

Flight Model: The FM shall be built to fully flight standard in accordance with PA and CADM requirements. Flight standard parts shall be used.

FM

TRL 7

see above

Flight models shall be subject to flight acceptance testing. The customer shall approve the relevant plans and report to establish that testing is performed to the required level.

TRL 8

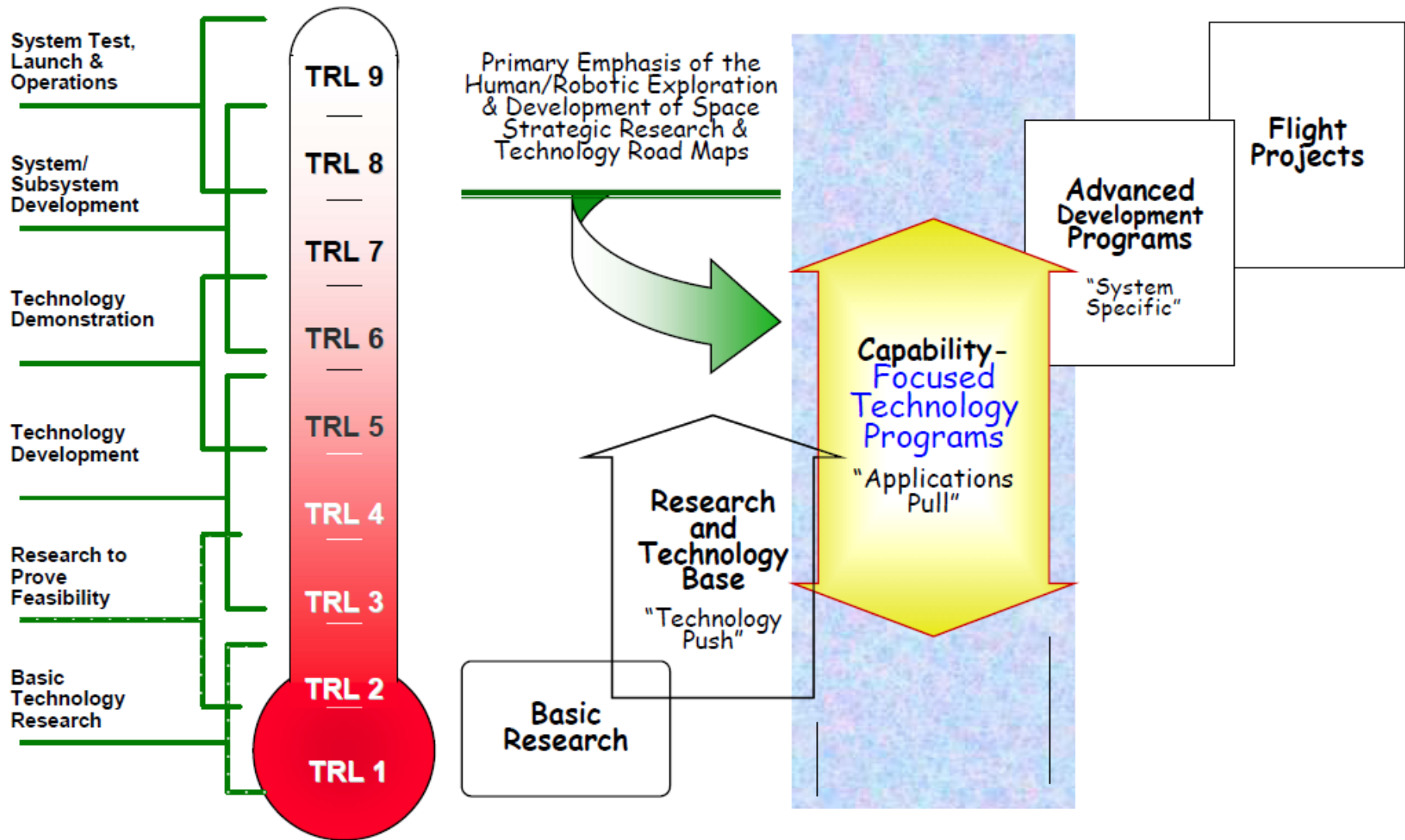
**Actual system completed and "flight qualified" through test and demonstration (ground or space)**

By definition, all technologies being applied in actual systems go through TRL 8. In almost all cases, this level is the end of true 'system development' for most technology elements. Example: this would include DDT&E through Theoretical First Unit (TFU) for a new reusable launch vehicle. This might include integration of new technology into an existing system. Example: loading and testing successfully a new control algorithm into the onboard computer on Hubble Space Telescope while in orbit.

TRL 9

**Actual system "flight proven" through successful mission operations**

By definition, all technologies being applied in actual systems go through TRL 9. In almost all cases, the end of last 'bug fixing' aspects of true 'system development'. For example, small fixes/changes to address problems found following launch (through '30 days' or some related date). This might include integration of new technology into an existing system (such operating a new artificial intelligence tool into operational mission control at JSC). This TRL does not include planned product improvement of ongoing or reusable systems. For example, a new engine for an existing RLV would not start at TRL 9: such 'technology' upgrades would start over at the appropriate level in the TRL system.



## **Annex B2**

### **Technological readiness levels (TRL) for software developments**

See:

Annex B - Correspondences for the use of TRLs for software in ESA programmes  
of the "[Guidelines for the use of TRLs in ESA programmes](#)", starting at page 13

## Annex C

### Guidelines on positioning measure proposals for space programmes.

#### Introduction

The present guidelines and eligibility conditions for grants in terms of the “Positioning Measure” are based on the “National Complementary Activities” pursuant to the Federal Council Dispatch on Education, Research and Innovation and the Ordinance to foster research and innovation (RS 420.11). The aim of this Positioning Measure is to fund innovative studies that will enable Swiss companies and research institutes to prepare themselves in view of European institutional programmes, especially of the European Space Agency (ESA) and the EU Research Framework Programmes.

#### Eligibility conditions

Grants are awarded to applicants:

- Whose studies will benefit Switzerland as a whole
- Who would otherwise be unable to obtain adequate and timely funding from another source
- Who can guarantee that grants will be used in an efficient manner and that administrative procedures will be kept to a strict minimum

#### Questions to be answered

1. Identity and contact information of main applicant (project manager)
2. Identity and contact information of project partners
3. Experience that the applicant and project partners have in the field of which the study will be conducted
4. Brief description of the study, including budget, duration and human resource requirements
5. Strategic plan with a roadmap on the foreseen further technology developments, with funding resources, up to target product(s)
6. Amount of funding requested
7. Other sources of own or third-party funding (if applicable).

## **Annex D**

### **Financial forms based on ESA PSS A2, A8 and A15 standard**

An electronic version of this document in Microsoft Excel format may be downloaded from <https://www.spacecenter.ch/activities/businesswithesa/> (title "PSS Forms").