



Call for a Fast mission opportunity in ESA’s Science Programme for a launch in the 2026-2028 timeframe

1 EXECUTIVE SUMMARY

The Director of Science of the European Space Agency is soliciting the scientific community in ESA’s Member States for proposals for a “Fast” (F) mission to be launched in the 2026-2028 timeframe. The programmatic context for the present Call is described in Section 2 and the boundary conditions are described in Section 3. The proposal submission process will be based on a 2-phase approach as described in Section 5 and according to the timeline indicated in Section 8.

2 PROGRAMMATIC BACKGROUND

The ESA Science Programme is based on long-term planning of scientific goals. The Cosmic Vision plan (available as ESA BR-247) was established in 2005 on the basis of a bottom-up process that started with a consultation of the broad scientific community and contains the wide-ranging and ambitious scientific questions to be addressed by missions in the ESA Science Programme.

Large (“L”) and Medium (“M”) missions are the foundation of the Science Programme, ensuring European leadership in a number of fields. Focused, smaller missions of opportunity have also been a feature of the Programme’s structure since the early days and have provided a fertile ground in the past for experimenting with new approaches without putting the Programme’s foundation under discussion.

Through the present Call the Director of Science of the European Space Agency is soliciting the scientific community in ESA’s Member States for proposals for the competitive selection of a “Fast” (F) mission to be launched in the 2026-2028 timeframe. This Call aims at defining a mission of modest size (wet mass less than 1000 kg), to be launched towards the Sun-Earth L2 Lagrange point as a co-passenger to the ARIEL M mission (or possibly to the PLATO M mission), whence it would reach its target orbit or destination with its own propulsion system. Any scientific goal and spacecraft technical configuration will be considered, including missions aiming at multi-point scientific measurements (e.g., Near Earth Objects or Main Belt comets, considered in the studies performed by ESA following the “Call for new

Science Ideas” released in 2016). The proposers are invited to carefully consider the technical guidelines provided in the Annex attached to this Call for defining mission concepts that are technically feasible within the Call programmatic boundaries.

The selection will be based on the 2-phase proposal process described in Section 5, with the schedule indicated in Section 8.

3 BOUNDARY CONDITIONS

The boundary conditions to which proposals will have to comply to be considered feasible under the present Call are spelled out in the present section. The Call is open to all areas of space science.

3.1 Cost and schedule

The present Call solicits proposals for a “Fast” (F) mission with a cap of 150 M€ to the ESA Cost at Completion (CaC). The CaC will not comprise the launch (given the passenger launch on either PLATO or ARIEL), but will include all other mission elements that are under ESA responsibility, such as the cost of the overall development of the spacecraft and the mission’s nominal operations. The CaC can include a contribution to the payload, including the case of a mission with payload fully funded by ESA (à la Gaia).

Proposals with a cost below the CaC cap would be considered with no prejudice. Proposals with a cost to ESA exceeding the cap will be considered as non-feasible.

The Call is dedicated to stand-alone ESA-led missions. Proposals for contributions to partner-led missions are outside the scope of this Call and will not be considered.

The mission will be implemented under a fast scheme, with a total development duration from the early candidate selection to launch of less than 8 years.

The mission will be implemented through a design-to-cost approach, preventing cost overruns.

3.2 Technology Readiness Level

To achieve the targeted launch date with the attendant short preparation phase, the mission concept and the spacecraft design must rely on demonstrated basic technologies from the early phases. Proposed missions must rely on technologies that will reach TRL 5-6 (ISO scale) by the end of the short preparation phase and before the mission adoption. Considering the limited time available between the selection of the mission candidate following this Call and its adoption, the mission must rely on available technologies already at the time of the proposal, although mission-specific technology verifications can be foreseen during the preparation phase as long as feasible within 2-3 years.

3.3 Mission profiles

The Call is open to all areas of space science, and the mission will be selected among feasible proposals on the basis of its scientific merit.

The spacecraft will be launched to the Sun-Earth L2 Lagrange point as co-passenger to the ARIEL mission (in stacked configuration) and must therefore be ready for launch by the end of 2027. A launch as a co-passenger to the PLATO mission may be considered as an option, depending on development schedule and mass compatibility.

The spacecraft being released at the Sun-Earth L2 Lagrange point will make use of its autonomous propulsion first to reach its operational orbit or target (as relevant), and then during the subsequent mission operational phases.

The proposed mission can be based on single spacecraft or on multiple spacecraft such as mother-daughters spacecraft configurations, with the mother-craft ensuring the transfer to the operational orbit and providing communication capabilities to Earth, and daughter-craft elements being probes carrying scientific instrumentation (such as small-sats or a surface package). Technical guidelines and examples of possible performance for the mother-daughters spacecraft configuration are provided in the Annex for various targets. Different targets and configurations for the mother-craft and/or probes (e.g., for a multi-target visit in the case of planetary science missions) can be considered subject to their compatibility with the Call boundaries.

The spacecraft wet mass – including autonomous propulsion and potential probes – shall not exceed 1000 kg (excluding the launcher adapter).

3.4 Member States contributions

Proposers are invited to provide a clear description of the expected Member State contributions, e.g. to the science payload or the ground segment. Acceptance of a proposal does not constrain ESA to adhere to the proposed scheme, which will however constitute a starting point for the selected mission. Member State contributions and endorsements are further addressed in Section 6.

3.5 International collaborations

The present Call is open to international collaboration, and European-only missions as well as ESA-led missions in collaboration with international partners can be proposed. Proposers are invited to provide a clear description of the expected contributions from international partners. The Agency would contact international partners mentioned in the proposal to verify the feasibility of the proposed scheme.

4 SCIENCE MANAGEMENT

Proposers must clearly explain their science management concepts, including their proposed approach to data ownership and broad community involvement. For the selected mission a Science Management Plan will be prepared by ESA in coordination with a Science Study Team; this plan will undergo revision by the Science Advisory Structure of the ESA Science Programme and approval by the Science Programme Committee (SPC).

5 PROPOSAL SUBMISSION PHASES

The selection will be based on a 2-phase proposal process. Following reception of mandatory brief “Phase-1 proposals” (see Section 5.1 for details) a first technical and scientific screening of the proposed mission concepts will be performed by ESA (for the mission profile and implementation aspects) and by a peer review committee under the responsibility of the ESA Science Advisory Structure (for the scientific goals). Proposers whose Phase-1 proposals will have been considered likely to meet the technical feasibility and whose science case will be considered sufficiently competitive by the scientific peer review will be invited to a dedicated workshop (see Section 5.2 for details). At this workshop the feasibility of the individual ideas will be discussed in detail, following which, the proposers will be invited to submit a detailed “Phase-2 proposal” (see Section 5.3 for details).

The Phase-2 proposals will be subject to a detailed technical and programmatic screening by ESA for assessing their feasibility and consulting the potential partners to the mission during the evaluation phase. Following this technical and programmatic screening, the selection process will be based on the scientific merit of the proposals, assessed through peer review under the responsibility of the ESA Science Advisory Structure.

5.1 PHASE-1 PROPOSALS

5.1.1 Content and submission of Phase-1 proposals

The deadline for submission of Phase-1 proposals in response to the present Call is stated in Section 8. Late submissions will not be considered. Proposals will be accepted exclusively in electronic PDF format, submitted via the interface available at <https://www.cosmos.esa.int/web/call-for-fast-mission-2018>. Phase-1 proposals will be limited in length to 10 A4 pages, with a minimum font size of 11 pt, and a maximum file size of 50 Mbytes. Proposals with file size in excess of this limit will be rejected by the submission system.

The submission deadline will be implemented strictly. Proposers are invited to submit their Phase-1 proposals well in advance of the deadline.

Phase-1 proposals must contain all the information indicated below. Proposals missing one or more of the indicated elements may fail the initial technical, programmatic and scientific screening. The suggested number of pages for each topic is indicative. Proposers are thus free to give more emphasis to one topic with respect to others. However, the total number of pages in the proposal is a hard limit; proposals exceeding the total page limit will not be considered for evaluation.

Phase-1 proposals must be structured to contain the following information:

- Cover page: including proposal title and name and full contact information of Lead Proposer;
- Back cover page: List of core team members (names and institutions) insofar as known/available;
- Section on scientific goals of the mission (3 pages);
- Mission configuration, including mission profile, payload/instrument configuration,

technology, etc., with specific reference to the boundary conditions indicated in Section 3 (3 pages);

- Potential management structure, payload consortium/consortia composition and expected main funding agencies involved in the payload provision, including eventual (if applicable) proposed international collaboration elements (2 pages).

It is understood that the proposal’s structure and content may evolve between submission of the Phase-1 proposal and submission of the Phase-2 proposal, e.g., in terms of detailed technical configuration, payload consortia composition, or presence of possible international partners. The Lead Proposer and the proposal’s title identified in the Phase-1 proposal, however, must remain the same throughout the process.

Phase-1 proposals will be made available by ESA to Member State agencies, SPC delegations and international partners (if applicable); hence ESA cannot guarantee their confidential treatment.

Any further communication between ESA and the proposing team will only take place through the Lead Proposer.

Failure to submit a Phase-1 proposal by the deadline stated in Section 8 will prevent teams/proposers from the possibility of submitting a Phase-2 proposal.

5.1.2 Evaluation of Phase-1 proposals and following steps

Phase-1 proposals will be subject to a technical and programmatic screening by ESA to evaluate their compatibility with the boundary conditions indicated in Section 3. Phase-1 proposals that will have been considered to likely meet the technical feasibility will be subject to a scientific screening performed under the responsibility of the ESA Science Advisory Structure.

The results of the Phase-1 selection will be communicated to the competing teams and only proposers whose Phase-1 proposals will have been considered to likely meet the technical feasibility and whose science case will be considered sufficiently competitive by the ESA Science Advisory Structure will be invited for the next steps of the process.

5.2 WORKSHOP IN PREPARATION FOR PHASE-2 PROPOSALS

Proposers whose Phase-1 proposals will have passed the Phase-1 selection will be invited to a dedicated workshop in preparation for Phase-2 proposals.

The purpose of the workshop will be to discuss in detail, collegially but also with individual sessions for each team, the feasibility of candidate missions with the ESA engineering team, in advance of the submission of the “Phase-2 proposal” (see Section 5.3 for details).

The date and location of the workshop will be communicated to the Lead Proposers.

5.3 PHASE-2 PROPOSALS: STRUCTURE, CONTENT, PAGE LIMITS AND SUBMISSION

The deadline for submission of Phase-2 proposals in response to the present Call is stated in Section 8. Late submissions will not be considered. Proposals will be accepted exclusively in electronic PDF format, submitted via the interface available at <https://www.cosmos.esa.int/web/call-for-fast-mission-2018>. Proposals will be limited in length to 50 A4 pages (not including annexes), with a minimum font size of 11 pt, and a maximum file size of 100 Mbytes (including annexes). Proposals with file size in excess of this limit will be rejected by the submission system.

Phase-2 proposals not preceded by a corresponding Phase-1 proposal that has passed the Phase-1 screening will not be considered.

The submission deadline will be implemented strictly. Proposers are invited to submit their proposals well in advance of the deadline.

Proposals must contain all the information indicated in Section 5.3.1. Proposals missing one or more of the indicated elements may fail the technical and programmatic screening. The suggested number of pages for each topic is indicative, unless otherwise stated. Proposers are thus free to give more emphasis to one topic with respect to others. However, the total number of pages in the proposal is a hard limit; proposals exceeding the total page limit will not be considered for evaluation.

5.3.1 Topics to be covered in the proposal and page limits

- Cover page (1 page, mandatory limit): must clearly indicate the proposal name and the name of the Lead Proposer. Any other information is optional;
- Contact information page (1 page, mandatory limit): must clearly indicate the contact information for the Lead Proposer. The proposal must explicitly state the availability of the Lead Proposer to support the study activities by making available at least 20% of his/her time throughout the study period. Note that the Lead Proposer will be the formal point of contact between the Agency and the proposing team throughout the study phase;
- Executive summary (2 pages, mandatory limit): should contain a summary of the proposal, allowing the reader to gain a preliminary understanding of the proposal’s content upon reading;
- Science case (10 pages, suggested length): should clearly address the scientific rationale for the proposed mission, explaining the broad context, the progress in the relevant field that the proposed mission will achieve, the need to perform the relevant measurements from space, the eventual synergy with other facilities (ground- and space-based), etc. It is suggested to assume that the relevant readers will be scientists from other fields of space science, hence not necessarily experts in the field;
- Scientific requirements (5 pages, suggested length): should explain how mission science objectives flow into scientific requirements, what are the required measurements, and how these translate into instrument requirements. For the selected mission the information provided in this section will constitute the starting point for producing the Science Requirements Document, the Mission Requirements Document and the Payload Definition Document. Content of this section should be understandable by both scientists

and engineers;

- Proposed scientific instruments (14 pages, suggested length): should explain, following on the definition of scientific requirements, what instrument(s) will be needed to achieve the required measurements. While the proposal is not intended to contain engineering blueprints, the information provided should allow readers to assess feasibility and maturity level of the proposed instruments. Relevant information about, e.g., TRL, heritage, etc. needs to be provided. To allow a proper technical evaluation of the proposal the following information needs to be provided:
 - Measurement principle/detection concept;
 - Block diagram: main building-blocks and subsystems, including software;
 - Design description (down to major subsystems) and operating principle;
 - Performance budgets;
 - Required resources: volume, mass, power, data transmission;
 - Specific/critical interface requirements to the spacecraft and environment constraints, e.g. accommodation, integration, cooling, pointing, contamination and cleanliness, radiations, magnetic cleanliness, etc.
 - Specific calibration needs (on ground and in orbit);
 - TRL assessment per unit and relevant heritage.

The credibility of the payload development schedule will be an important selection criterion. The proposers are encouraged to make use of existing instruments where possible, if needed with limited changes. A new development can be acceptable if it relies on strong heritage and fully available technologies. Limited delta-verifications and pre-developments can be envisaged during the definition phase. The payload definition level must reach Preliminary Design Review (PDR) status before the mission adoption. ESA is ready to fund the instrument detailed design and pre-developments during this phase for securing the payload development schedule. The proposal should contain a payload development plan, including pre-development needs. Please refer to the Annex guidelines for further details.

- Proposed mission configuration and profile (10 pages, suggested length): with reference to the mission constraints indicated in Section 3, this section should contain a description of the proposed mission needs, including the transfer to operational orbit, together with the system level requirements imposed by the mission concept (e.g., pointing requirements, sun aspect angle constraints, specific observing modes, etc.). Relevant options and trade-offs should be identified. A concept for the operations should be provided, describing the mission phases from launch to end of life (e.g., as relevant: observing strategy, measurement sequence, specific modes for science or calibration aspects, spacecraft disposal at end of life, etc.). Technical details should be provided as far as available, including possible spacecraft design, requirements/description of major sub-systems and estimation of key budgets (possibly by benchmarking with previous missions and/or by relying on the guidelines reported in the Annex). In case of proposals based on mother- and daughter-craft, the information should be provided for all the elements;
- Management scheme (5 pages, suggested length): proposers should spell out the proposed procurement scheme for all mission elements, indicating which elements are proposed to be ESA-procured and which procured by nationally funded consortia or international partners (if applicable). The consortia organisation and the distribution of

tasks and responsibilities (work breakdown structure for the core team with key persons) should be detailed, for both the Phase A/B and subsequent phases. The proposers are also invited to detail where relevant any specific task they believe should be achieved during the Phase A/B, in addition to the regular study activities, for the purpose of the mission selection. Should the mission be proposed as an international collaboration, the proposed collaboration scheme should be described in this section. Proposers should describe the proposed science management plan (data policy, community involvement, etc.) – see Section 4;

- Costing (2 pages, suggested length): while proposers are not expected to provide detailed costing information about the proposed mission, they should argue convincingly that it can be implemented within the 150 M€ ESA CaC ceiling (see Section 3.1);
- Bibliography: not required but encouraged. The list of references can be included as an Annex; it will not count against the page limits.

An eventual list of supporters should be clearly marked as annex to the proposal, and thus will not count against the proposal page limits.

Details on Letters of Endorsement from Member State agencies are given in Section 6. They are not required at the time of the submission of the proposal, but they are mandatory by the deadline stated in Section 8.

ESA will share the proposals with Member State agencies and with SPC delegations, e.g., for the purpose of discussing their commitment, as well as, when applicable, with the proposed international partners. Therefore, ESA cannot ensure the confidentiality of the submitted material.

6 PROPOSAL ENDORSEMENT BY NATIONAL FUNDING AGENCIES

ESA Science missions are, in general, collaborative undertakings between ESA and its Member States (as well as, in a number of cases, international partners). For the majority of missions, the relative share of responsibilities between ESA and the Member States is based on ESA procuring the spacecraft and the launch vehicle, and being also responsible for the launch services and for the operations.

Payload elements are in most cases procured under the responsibility of scientific consortia funded by Member State agencies, with a varying degree of ESA involvement, with some missions featuring payloads which are funded entirely by the Member States (and in some cases with the contribution of international partners) and other missions featuring payload for which the procurement is shared between ESA and the nationally funded consortia.

In view of the tight development schedule of the mission, ESA will take charge of the definition phase of the science instruments, including the payload elements that would be provided by the Member States, and the breadboarding activities or predevelopments that must be initiated before the mission adoption for securing the schedule.

ESA will also offer the possibility of having (part of) the payload procurement for this opportunity managed and funded by ESA, within the mission’s CaC cap. Therefore, within

the Call’s cost cap, proposers will be allowed to propose any possible payload procurement scheme, ranging from full funding of the payload by ESA to nationally funded payload through hybrid schemes that can see a varying involvement of ESA in the payload procurement (both in terms of funding and management).

The science ground segment of ESA science missions is in most cases procured under the shared responsibility of ESA and of the Member States, with ESA responsible for the science operations and nationally funded consortia contributing to instrument-specific data processing and calibration activities. In some cases, the scientific data processing might be almost entirely performed by nationally funded consortia (e.g., like for Gaia through the Data Processing and Analysis Consortium).

Proposers will have to clearly indicate the proposed share of responsibilities between ESA and the Member States (and eventual international partners), by indicating which mission elements they propose to be procured under their responsibility with funding from the Member States and which elements they propose to be ESA-procured.

The proposal must define a Lead Proposer (who shall be the formal point of contact between the Agency and the proposing team during the study phase for selected proposals), include a definition of the payload consortium or consortia (or core consortium) and provide the foreseen distribution of tasks and responsibilities within the consortium (in the “Management” section of the proposal).

It is not planned to issue an “Announcement of Opportunity” for the payload of the mission selected for study. Hence (while susceptible to evolution if necessary) the consortium or consortia defined in the “Management” section of the proposal will be tasked with carrying out the study activities for the selected proposal.

ESA intends to implement a consultation phase with Member State agencies (and if applicable, with international partners) during the proposals submission process. Proposers are strongly recommended to interact with their funding agencies already at the beginning of the Phase-1 proposal preparation to verify their readiness to support the proposal. Letters of Endorsement from Member State agencies will be required after the Phase-2 proposals submission. The Letters of Endorsement will have to be addressed to the ESA Director of Science and sent directly by the Member State agencies by email to the address endorsement-fast@cosmos.esa.int, by the deadline indicated in Section 8.

Endorsement by international partners, if applicable, will be discussed directly by ESA with the concerned partners.

The Letters of Endorsement will have to state the readiness of Member State agencies to undertake the necessary action to secure funding for the study (Phase B1, subject to the mission selection) and implementation (Phases B2/C/D/E/F, subject to the mission adoption) of the nationally provided mission elements falling under their responsibility, contingent on the consolidation of the cost figures for all nationally funded mission elements.

It is understood that commitments by funding agencies may not be achievable already at the time of the submission of the Letters of Endorsement. However, proposers must strive to demonstrate the funding and feasibility of the proposed payload complement by showing the presence of at least a “core consortium” (e.g., for missions with an integrated payload

complement) or a “core payload complement” (e.g., for missions featuring several individual instruments), and by providing a credible development schedule. It is understood that the funding scheme of the nationally provided mission elements may require consolidation during the study phase prior to the mission selection.

Assessment of the adequacy of the proposed consortium as demonstrated by its preliminary definition, including a distribution of tasks and responsibilities within the consortium supported by the submitted Letters of Endorsement will form an important part of the proposal’s technical and programmatic evaluation.

7 PHASE-2 PROPOSAL EVALUATION AND FURTHER STEPS

Valid Phase-2 proposals (i.e., those received by the deadline indicated in Section 8 and supported by Letters of Endorsement from Member State agencies as indicated in Section 6) will be subject to a detailed technical and programmatic screening by ESA, aiming at ascertaining the compatibility of the proposed mission with the Call’s boundary conditions.

Proposals which will be found to be incompatible with the Call’s programmatic boundaries (i.e., with the budget ceiling indicated in Section 3.1, or with the planned schedule), or which do not provide the required endorsement for the mission elements proposed to be nationally provided (or provided by international partners) will be marked as “unfeasible” and will not be subject to the scientific peer review.

Proposals that are considered feasible will be submitted to a scientific peer review process conducted under the responsibility of the ESA Science Advisory Structure. Based on this evaluation, the ESA Director of Science plans to select one proposal for a study phase.

A written debriefing will be provided to all proposers, comprising in all cases a short technical and programmatic assessment of the proposal, as well as, for the proposals which were submitted to the scientific peer review, a scientific evaluation. No face-to-face debriefing meetings are planned.

The nominal timeline of the study phases for the selected mission is summarised in Section 8. The proposal selected for a study phase will be first subject to a Phase 0 study (using ESA Concurrent Design Facilities, and possibly complemented by focussed assessments) involving the payload consortia in the preliminary definition of the mission concept and requirements. Following the Phase 0, and assuming no showstoppers are identified, the mission candidate will undergo a dedicated independent “Mission Definition Review” (MDR), for evaluating the technical and programmatic status of the mission (including the science payload and the credibility of the required pre-developments if applicable). If the review demonstrates that the candidate mission is compatible with the Agency requirements for the F mission, the mission will be subject to scientific peer review involving the ESA Science Advisory Structure to ascertain that the mission scientific objectives are achievable and remain compelling. Based on the recommendations from the ESA Science Advisory Structure, the Director of Science will propose to the SPC to select the mission candidate for the Definition Phase (Phase A/B). Should the MDR be unsuccessful or the scientific assessment not positive, the study will be terminated.

To ensure a definition of the payload at the same level with that of the rest of the space

segment, enabling a solid and well-informed decision at the end of the Phase A/B, the Agency will fund the study of nationally-provided mission elements (e.g., scientific instruments) for the mission candidate that will be selected through the present Call, in close cooperation and in coordination with the Member States that will fund the same mission elements for the subsequent phases (Phase C and following), should the mission be adopted for the F mission opportunity. The Phase A/B study approach will be discussed with the consortia during the Phase 0 (once the payload preliminary concept is sufficiently well established for the selected proposals) with the details possibly depending on the characteristics of the proposal.

8 DEADLINES AND SCHEDULE

Activity	Date
Release of the Call for F mission	16 July 2018
Phase-1 proposal submission deadline	25 October 2018 – 12:00 (noon) CEST
Phase-1 proposal assessment	November 2018
Workshop for Phase-2 proposers	11 December 2018 (TBC)
Phase-2 proposal submission deadline	20 March 2019 – 12:00 (noon) CET
Letters of Endorsement deadline	10 April 2019 – 12:00 (noon) CEST
Proposal evaluation and scientific ranking	April – July 2019
Phase 0 study	July – December 2019
Selection of candidate mission	February 2020
Phase A/B industrial kick-off	September 2020
Mission adoption	November 2022
Mission CDR	June 2024
Spacecraft launch readiness	December 2027