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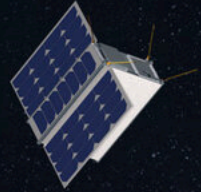
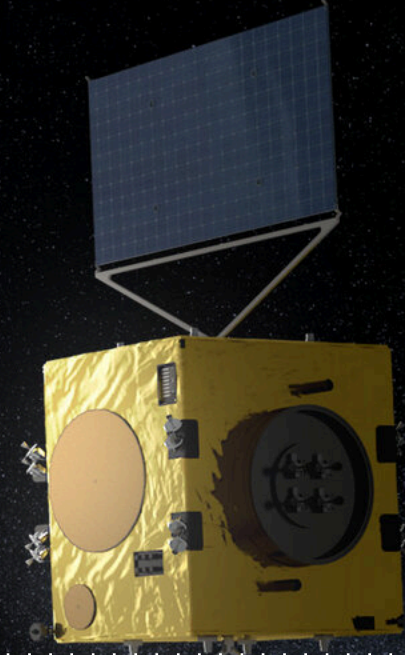


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First SMPAG NEO threat exercise

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ASI delegation, ESA delegation

Space Mission Planning Advisory Group, 13-14/10/2021



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INTRODUCTION

The SMPAG introduced the proposal for such an exercise, following its 16th meeting, to the Scientific and Technical Subcommittee of COPUOS as part of its reporting.

The **first SMPAG NEO threat exercise** will focus on the inter-agency procedure to organise a coordinated response to the threat

Primary objective

- to define the tasks required for a SMPAG coordinated response to the Exercise NEO threat
- to define which entity/ies would be responsible for these tasks.
- to identify the procedures internally to each SMPAG member to propose a response to the SMPAG

Secondary objective

Aside the minimum aim of the exercise described above, a **desired but not requested aim** of this first SMPAG exercise is to simulate and perform the actual tasks or part of them for the selected threat scenario. This secondary objective can be done collaboratively between contributing SMPAG members.

In its report in 2021, the Committee on the Peaceful Uses of Outer Space (COPUOS) noted ..."that SMPAG had proposed the idea of performing an exercise aimed at testing its real-world capabilities to support planetary defence in the case of an actual threat, and that the Italian Space Agency would organize a splinter meeting to evaluate the proposal, define timelines for the exercise and identify contributing agencies." (A/76/20, para. 112)

Objectives

- [...] The objectives of SMPAG are to develop cooperative activities among its members and to build consensus on recommendations for planetary defense measures.

Scope

- (e) Develop decision and event timelines for a variety of potential Earth impactors and trajectories identified in the applicable reference missions.



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NEO TARGET SELECTION

- According to the “Status report on work package 5.1 from workplan "Recommended criteria and thresholds for action for a potential NEO impact threat", SMPAG-RP-003/1.0, 2018 Oct 18” the criteria for a response to a potential NEO impact threat is
 - Minimum diameter **50 m**
 - **1% impact chance within 50 years**
- For this exercise a synthetic NEO is selected taking a real asteroid **close to the top of the ESA NEO risk** list but with a synthetic magnified higher impact risk: **2021QM1**.
- The diameter is about **50 m**, with possible impact in April 2052. The currently computed impact probability of 1/3322 is **synthetically increased to 1/32**.



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EXERCISE TASKS

- The **first sprint** will focus on the national organisation and coordination and on defining the lists of tasks to be performed in response to a real threat scenario.
- To harmonise the national (SMPAG-level) efforts into a SMPAG coordinated action this must be organised at communication level, technical level, decision level. The **second sprint** will focus on discussing how the coordination is done among different SMPAG delegations.
- The **third sprint** will deal with communication and coordination issues within SMPAG.

Task 1 List the required tasks for a coordinated response to the threat.

- A non-complete list of tasks is reported here below as example. It is asked to each delegation to complete this list.
 - Refinement of risk of impact, Improved orbit determination, Trade-off of possible mission architectures and deflection strategies, Selection of the deflection strategy and eventual investigation mission, Perform mission analysis of selected mission, Perform system design of selected mission, Approval at SMPAG-member level of the proposed mission, Others...

Task 2 List the entities involved at national (SMPAG-member) level for the completion and coordination of these tasks at national (SMPAG-member) level

- List all the different entities involved at national (SMPAG-member) level for the completion of this tasks, describe how the coordination of these tasks is performed at national level.
- Explain which tasks can be performed at national level as there is internal capabilities to perform them and for which tasks there is no internal capabilities.

Task 3 Explain the internal (SMPAG-member) procedure for performing and advancing the tasks identified at Task 1 at national (SMPAG-member) level

Task 4 Identify the tasks distribution among SMPAG members for a coordinated NEO response

- The tasks identified in Task 1 need to be coordinated and performed in a collaborative effort at SMPAG level. To this aim this Task will identify the tasks distribution among multiple SMPAG members for a SMPAG NEO response and will discuss how the coordination at the level of SMPAG members is achieved.

Task 5 Identify data exchange mechanics and formats

- For a fruitful collaboration the data exchange mechanics need to be defined together with the data formats. This task will be completed through a discussion at the SMPAG level.

Task 6 Define the milestone for inter-SMPAG-member coordination

- Define the milestones during the mission planning and preparation for communication and discussion within SMPAG in a real threat case
 - Define the required milestones for communication and data exchange during the response
 - Define the time schedule and milestones for coordination with other delegations
 - Define the communication channels within SMPAG
 - Define how the coordination with IAWN should be implemented
 - Recall how a decision is taken in SMPAG and propose approaches for ensuring an easy achievement of consensus within SMPAG. For example, the steering group at SMPAG coordination might be performed by the SMPAG chair.

Task 7 Define the communication lines within a real threat event

This Task will review and consolidate the communication procedure of an impact hazard at SMPAG level, in collaboration with IAWN and communicating such options to member states at COPUOS STSC.

Task 8 Procedures in case of failures of the deflection action

- This task will define the procedure in case of failure of the first deflection mission achieved through the previous task. This Task will define a back-up procedure if the deflection mission fails including:
 - Asteroid/fragment re-entry coordination
 - National security coordination
 - International security coordination



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EXERCISE ORGANISATION

- The SMPAG NEO threat exercise will be performed
 - through monthly telecons among participating SMPAG members and
 - through work at the national SMPAG-member level work
- The SMPAG NEO threat exercise will be organised in 3 sprints each of them Kicked-Off (KO) and completed by a SMPAG telecon. Additional ad-hoc splinter meetings will be organised at need.

Sprint 1/3

- Aims:
 - Compare the task lists defined by each SMPAG member [Task 1]
 - Compare and discuss the entities involved at national (SMPAG-member) level for the completion and coordination of these tasks at national (SMPAG-member) level [Task 2]
 - Compare and discuss the internal (SMPAG-member) procedure for performing and advancing the tasks identified at Task 1 at national (SMPAG-member) level [Task 3]
- KO: 5 Nov 2021 [TBC]
- END: 23 Nov 2021 [TBC]

Sprint 2/3

- Aims: Discuss how to compare the results and procedures derived at national level in the SMPAG
 - Identify the tasks distribution among SMPAG members for a coordinated NEO response [Task 4]
 - Identify data exchange mechanics and formats [Task 5]
- KO: 23 Nov 2021 [TBC]
- END: 14 Dec 2021 [TBC]

Exercise organisation

Sprint 3/3

- Aims: Define the milestones for inter-SMPAG-member coordination
 - Define the milestone for inter-SMPAG-member coordination [Task 6]
 - Define the communication lines within a real threat event [Task 7]
 - Procedures in case of failures of the deflection action [Task 8]
- KO: 14 Dec 2021 [TBC]
- END: 18 Jan 2021 [TBC]



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EXPECTED OUTCOMES

- The output of the exercise will be a final report containing all the output of Sprint (1/3) on the national coordination, print 2/3 on SMPAG collaboration and sprint 3/3 on SMPAG coordination and communication. The report will have single delegation part and SMPAG part depending on the tasks.
- During the whole exercise each participating delegation will be requested to input contributions using a template for that will be shared.
- The results of the analysis and the collective analysis of each delegation will be coordinated in a unique presentation at SMPAG meeting in Feb 2022. The next SMPAG meeting will take place during the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space on 7-18 February 2022 in Vienna VIC.
- The desired output of the first SMPAG NEO threat exercise is to draft a:
 - Single delegation (SMPAG members) coordination plan
 - SMPAG common coordination plan
- The resulting report and presentation could form a conference paper for information under NEO agenda item of the Scientific and Technical Subcommittee of COPUOS.



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NEXT STEPS

Next steps

- Send your comments to: camilla.colombo@polimi.it
- Proposed next steps:
 - Deadline for comments: 31 Oct
 - KO meeting Sprint 1/3: 5 Nov
- After the meeting (tomorrow) you will receive:
 - Revised exercise document
 - A Form to collect the participating delegation
 - A Form to gather the input for sprint 1/3



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