

Proposal for Forming an IAA Study Group SG 4.22

Title of Study:

Through Optimization of Aerospace Trajectories

Proposer(s):

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Primary IAA Commission Preference:

Commission 4: Space System Operation & Utilization

Secondary IAA Commission Interests:

Commission 3: Space Technology & Systems Development

Members of Study Team**Chair:**

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Co-Chair:

Alexander Filatyev, Prof., Central Aerohydrodynamic Institute (TsAGI), RUSSIA

Secretary:

Olga Yanova, Dr., Central Aerohydrodynamic Institute (TsAGI), RUSSIA

Other Members:

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TBD

Short Description of Scope of Study

Overall Goal:

(Expected scientific or practical benefit of the study group's efforts)

The analysis and improvement of advanced methods for elaboration of a rigorous approach to the through optimization of branching trajectories of space transportation systems (STS), including injection into an orbit, interplanetary flights, reentry of separated parts and vehicles, emergency trajectories and probability processes.

The methods are supposed to give the possibility of using adjoint variables as sensitivity functions (one of the basic Pontryagin maximum principle properties). Also the possibility to develop methods for global optimization, in particular to estimate the number of local optimal solutions arising in different aerospace problems. These methods may have both analytic and geometric foundations.

Current trends of broad cooperation among specialized scientific institutions as well as geographical expansion of the aerospace corporations have forced development of the new approaches to integrated and multidisciplinary optimization. The new approaches must allow for combining diverse programs intended for detailed single-discipline investigations into a unified framework.

Intermediate Goals:

- to evaluate the advanced methods in trajectory optimization;
- to examine various space mission requirements and the techniques of considering constraints in optimization algorithms;
- to exchange the personal achievements and elaborate the practicable unified approach;
- to coordinate the efforts of the specialists for development of optimization procedures applied to aerospace systems.

Methodology:

(Email works, workshops, stand alone conferences, interim publications, etc.)

- regular e-mail communication and webinars;
- collaboration to be held in the course of annual IAC and other international meetings (including the separated sessions or roundtables):
 - 7th European Conference for Aeronautics and Space Sciences (Milan, July 2017);
 - 9th International Aerospace Congress (Moscow, August 2018);
 - Annual IAA Symposium on Safety, Quality and Knowledge Management.

Time Line:

(Cannot exceed three years)

- 1st Meeting, October 2017 at IAC, to identify Study items;
- 2nd Meeting, March 2018 in Paris, to discuss Preliminary Materials of the Study;
- 3rd Meeting, September 2018 at IAC, to work through the key sections;
- 4th Meeting, March 2019 in Paris, to discuss the Preparatory Study;
- 5th Meeting, September 2019 at IAC, to summarize conclusions and recommendations;
- 6th Meeting, March 2020 in Paris, to present the Academy Report.

Final Product (Report, Publication, etc.):

- Study Report.
- Publications of report information in appropriate journals.

Target Community:

- Scientific and engineering aerospace organizations.
- Space policy makers and local authorities responsible for space system developing.

Support Needed:

- None identified at the present time.

Potential Sponsors:

TBD

To be returned to the IAA Secretary General Paris

by fax: 33 1 47 23 82 16 or
by email: sgeneral@iaamail.org

Date: August 2017

Name:

(No Signature required if document authenticated).