



International Aeronautical Federation (IAF)
International Project/Programme Management Committee (IPMC)

2023 Young Professionals Workshop Statement of Work

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Table of Content

- 1 Introduction
 - 1.1 Scope
 - 1.2 Background for the Workshop
 - 1.3 Reference Documents
 - 1.4 WOC Organization
 - 1.5 Acronyms and Abbreviations
- 2 Objectives of the Workshop
- 3 Topic Descriptions
 - 3.1 Topic 1 – Role, effects and ramifications of in-person interactions in a digital team
 - 3.2 Topic 2 – Online PM and collaboration tools
 - 3.3 Topic 3 – Knowledge continuity in space organizations
 - 3.4 Topic 4 – Making Model Based System Engineering a reality
 - 3.5 Topic 5 – Business innovation in commercial space
- 4 Requirements for Management, Meetings, Deliverables and Reporting
 - 4.1 Management
 - 4.2 Mentor
 - 4.4 Deliverables
 - 4.5 Reporting
 - 4.6 Evaluation by IPMC

1 Introduction

1.1 Scope

This Statement of Work (SOW) describes the workshop activities to be executed and the deliverables required by the IAF's International Project/Programme Management Committee (IPMC) with respect to a set of recommendations that shall be derived to support ongoing development of Young Professionals in the international space industry and the development of the next generation workforce.

1.2 Background for the Workshop

Young Professionals throughout the space industry face daily challenges when it comes to making the transition from their student careers to their professional careers, and from starters to experienced professionals and leaders. These challenges arise from either their perceived, or demonstrated, lack of professional work experience as students and continue into the first five to ten years of their careers. Early career professionals are not only faced with the steep learning curves associated with obtaining real-world skills but are also faced with the need to earn the respect of their more experienced colleagues.

In recognition of these challenges, the IPMC member organizations welcome the active participation of early career employees in identifying challenges, opportunities, and new approaches to nurturing a highly motivated and experienced aerospace workforce. These efforts are being pursued through workshops involving selected Young Professionals and overseen by an appointed organizing committee. The expected output of these workshops are observations, conclusions and recommendations that can be employed by aerospace organizations to ease the transition of Young Professionals into their careers, and to facilitate transfer of know-how to new generations of workforce. The workshop observations and recommendations can also benefit early career employees by helping them navigate and advance in the early stages of their careers.

1.3 Reference Documents

The following documents can be consulted by the workshop participants as they contain relevant background information. These documents can be consulted on the [2023 IPMC YP Workshop Delegates Folder](#).

Reference Documents			
No.	Title	Author	Date
RD1 to RD11	IAF-IPMC Young Professionals Workshop – Workshop Results Report (issues from 2012 to 2022)	Workshop Delegates	2012 - 2022
RD 12	Five Years of IAF IPMC Young Professionals Workshop	Birgit Hartman and Maarten Adriaensen	2016
RD 13	The Future Workforce on Learning From and With Peers While Navigating Through The Era of Space 4.0	Birgit Hartman and Marie Botha	2018

1.4 WOC Organization

The WOC is the Workshop Organizing Committee, consisting of previous attendees. The WOC team can be reached via ipmc.yp.workshop@gmail.com

1.5 Acronyms and Abbreviations

IAC	International Astronautical Congress
IAF	International Astronautical Federation
IPMC	International Project/Programme Management Committee
SOW	Statement of Work
WOC	Workshop Organizing Committee
YP	Young Professional (participants - delegates)

2 Objectives of the Workshop

The goal of the IPMC YP Workshop is to gather inputs from Young Professionals in the international space community to gain the knowledge they need to better develop and empower the next generation workforce. For that purpose, the conducted research by the working groups is intended to produce thoughtful and well-rounded observations and recommendations on the assigned topics.

The observations and recommendations will be gathered in the IPMC YP Workshop report and delivered to the IPMC participants, their member organizations and the other member organizations of the IAF. The YP Workshop report will also be made publicly available on the IAF website (www.iafastro.org).

3 Topic Descriptions

For the purposes of the workshop, delegates are allocated into separate groups, each of which will be responsible for one of the topics hereunder.

3.1 Topic 1 – Roles, effects and ramifications of in-person interactions in a digital team

The space sector has been embracing the transition to digital ways of working. This happened due to a synergy of concauses, among which we can certainly mention the requirement for social isolation brought by COVID-19, the push for digital transformation of organizational processes and project tasks, and the need to attract and engage a globally distributed workforce.

As a consequence, there are more and more delocalized teams, composed of people who are working together and interacting solely via digital tools. This is true both on an international scale but also for colocated teams, physically close to each other. This has inevitably affected professional and social interactions in the workplace.

The key assignment to be addressed by delegates in this section is:

Which are the roles, effects and ramifications of in-person interactions in a digital team? How does this mode of working affect the execution of space projects? Which is the first-hand experience of Young Professionals in this context?

A key success factor for this group is to look for real-life examples, by taking into account and comparing testimonies from senior colleagues who experienced in-person non-digital interactions for most of their professional lives and testimonies from younger peers who entered the workforce after remote collaboration and globally distributed teams became the norm. Young Professionals are also encouraged to share how they perceive social interaction (or lack thereof) in their jobs and what it means for their professional lives.

The following elements could be considered in the research:

- How in-person vs digitally-mediated social interactions affect the commitment and the team spirit of new hires or new team members.
- How it could be possible to measure the effect on project execution of having or not having in person interactions (taking into account all three axes, i.e. quality, cost and timeliness of project outcome).
- What is the impact of workforce delocalization on professional training, and especially which is the difference in outcome for onsite versus online training.
- How do managers and workforce in the space field feel about hybrid working ethics in the post-COVID workplace.
- What can be done to maximize the meaningfulness and satisfaction of work life by taking best practices and benefits of both in-person and digital interaction.

Young Professionals may consider remote work in the space sector completely normal. At the same time, digitalization may have brought a change in the job market and in their careers. Delegates are therefore encouraged to share and reflect upon their different experiences, to seek the opinions and points of view of their senior colleagues, and to propose their own understanding of how this change in social interaction is shaping space projects and their teams.

The presentation at the workshop should present sound recommendations on how to successfully negotiate this change and its impacts on projects and workforce.

This is a new Topic that has not been researched in previous workshop editions. Delegates shall nonetheless consider results from the 2020 report on “How do fragmented, remote, delocalized and virtual teams affect the way space projects are managed?” and from the 2021 report on “Management of remote collaboration in the space industry”. In addition, delegates shall consult reports from previous years to better understand how to shape and convey their recommendations.

3.2 Topic 2 – Online PM and collaboration tools

Today, most of us are familiar with working from home, company policies are put in place to standardize this hybrid approach of working. The effects of the global pandemic have drastically shifted work culture, forcing everyone to find new ways of doing the jobs normally performed in the office surrounded by peers. The global pandemic accelerated existing trends in remote work, and forced accelerated automation.

Collaborative online tools have surged as a result, and while the choices are endless, it has become difficult to navigate and choose wisely what tools to use. While these online collaboration tools are new to the aerospace sector, other sectors, like the software industry, have been using these tools well before the pandemic. Security, safety, accessibility, but also ultimate ownership are important aspects to consider for the international collaboration across the aerospace sector.

The key assignment to be addressed by delegates in this section is:

Which type of online PM collaboration tools are available, keeping in mind the organizational security levels? What online tools fit what kind of international aerospace project? Which analysis of the benefits and drawbacks are to be considered?

A key success factor for this group is to focus on the assessment of the type and features of tools, rather than listing the existing online collaborative tools. The group is encouraged to draw from real life project experience, challenges as well as successful online collaboration, both within one's organization but also international collaboration.

The following elements could be considered in the research:

- Obstacles when collaborating across companies.
- Tools available for collaboration in a safe manner, considering data uploaded, firewalls, etc.
- What payment schemes (if any) are necessary for types of tools / versions / upgrades / number of users / etc.
- Benefit analysis of the usage of online PM and collaboration tools vs. offline versions.
- Consideration of using online tools that are not managed by one's own company, considering the discontinuation of tools, outdated supports, lack of data security.
- Security issues for different types of tools and managing compliance.
- Drawbacks of online tools (smaller company have less funding available to pay fees for tools).

Young Professionals are expected to review the available online collaboration tools, and not only focus on the ones they know. Delegates are therefore encouraged to interview or investigate tools used in one's organization and include first-hand feedback on the usage of tools for specific types or projects.

The presentation at the workshop should present sound recommendations on the analysis of the tools, advantages and disadvantages, an analysis of the threshold of usage, cost and benefits.

This is a new Topic that has not been researched in previous workshop editions. Delegates can nonetheless consult reports from past years to better understand how to shape and convey their recommendations. The group is also invited to discuss this topic with the workshop's Topic 1, to ensure that the topics complement each other, instead of duplicating the research. Topic 2 focuses on the tools, where Topic 1 focuses on the human aspects of online working conditions.

3.3 Topic 3 – Knowledge continuity in space organizations

While Generation X, Millennials, and Generation Z, have been discussed, analyzed and reported on, on various occasions and in various topics, the Baby Boomers have been left out. The situation in today's global workforce shows a strong and consistent "retirement wave".

The retirement wave brings many challenges and changes to today's work life, but it also sparks many opportunities. How can the space industry not only capture tacit knowledge, which is gained through years of experiences, but also the explicit knowledge that proves invaluable for the success and growth of the business?

The key assignment to be addressed by delegates in this section is:

How can Tacit and Explicit knowledge be captured, documented, and used? What needs to change to incorporate Knowledge Continuity to the critical path? What tools and processes need to be put in place to incorporate knowledge capture and transfer to our day-to-day activities?

A key success factor for this group is to go beyond the theory and demonstrate real-life examples, situations and recommendations that can be implemented in projects, and processes. Delegates

shall also keep into account the various types of knowledge involved in space activities. The delegates may consider developing procedures, guidelines or tools to capture knowledge to ensure knowledge continuity.

The following elements could be considered in the research:

- Which types of knowledge (procedural, technical, implicit, explicit...) are involved in different organizations and projects.
- How to determine different needs / requirements for knowledge retention and sharing in different projects or different project phases.
- How to retain the types of knowledge of senior and experienced professionals, convincing PMs to prioritize time and effort.
- How to calculate a return on investment of the above, what are the advantages to retain knowledge.
- Which are cultural, procedural and corporate changes required to include knowledge continuity in the critical path.
- What is the impact of workforce delocalization on professional training, and especially which is the difference in outcome for onsite versus online training.
- Which are tools and requirements for knowledge sharing.
- How to build a process for knowledge capture and sharing.
- How to ensure standardization of processes to ensure most effective use of knowledge sharing.

Young Professionals are invited to review extensive documented reports available online. However, the results and recommendations should be based on firsthand and real life examples, the young professionals are encouraged to interview senior professionals and come with concrete results.

The presentation at the workshop should present sound examples and recommendations on what can be done to retain knowledge from senior professionals about to retire.

This Topic is part of the broader field of Knowledge Management, which has already been researched in previous workshop editions. The delegates are advised to not repeat previous recommendations. Delegates shall also consult reports from past years to better understand how to shape and convey their recommendations.

3.4 Topic 4 – Making Model Based System Engineering a reality

Model Based System Engineering (MBSE) is an approach to engineering that uses models to describe, develop, maintain and document the technical baseline of a system across its entire life cycle, from requirements definition to design development, analysis, implementation, verification and operations. By adopting models over documents to represent the definition of a system, MBSE offers a single, always consistent source of truth through which trade-offs and change impact analyses are more easily performed than via a document-based approach.

In the space field, research and discussion about MBSE has been going on since the mid-2000s. The advantages of this approach are well recognized, and the technical community is looking into digital threads and digital twins as a way to feed actual real-world data into MBSE. However, companies and institutions still rely heavily on traditional documentation and have not yet fully embraced the potentialities of MBSE.

The key assignment to be addressed by delegates in this section is:

What is the actual status of implementation and use of MBSE in the space field? Which MBSE lessons learned (both success stories and failures) can be found in actual space projects? How is it possible to enhance dissemination and adoption of this approach?

A key success factor for this group is to move beyond the theoretical framework of MBSE and look into real-world applications and their results. The team must also understand if and how the local culture affects the deployment of Model Based System Engineering.

The following elements could be considered in the research:

- What is the status of adoption of MBSE in the space field and if there are noticeable differences among academia vs industry vs agencies.
- What type of space projects is most suitable to adopt the MBSE approach and why.
- Which bottlenecks or barriers prevent wider adoption of MBSE in real space projects.
- Which catalysts and motivators lead to successful deployment of MBSE in real space projects.
- Why and how should project managers support the transition to MBSE.

Space Agencies are playing their role in supporting Model Based System Engineering. For example, since the end of 2021 ESA has been requiring MBSE application on all future mission studies (pre-phase A and phase A). Since 2016 NASA has been nurturing a MBSE community of practice and supporting infusion of MBSE in actual programs. However, a normative approach from the agencies may not be the one and only solution. Young Professionals are entering the workforce unbiased by how things have been done in the past decades. Delegates are therefore encouraged to analyze how MBSE is playing out in the space field and to bring forward their recommendations on how to accelerate any positive outcome.

The presentation at the workshop should pinpoint recommendations to remove obstacles, accelerate and better manage deployment of MBSE in space projects.

This is a new Topic that has not been researched in previous workshop editions. Delegates shall anyhow consult reports from past years to better understand how to shape and convey their research and recommendations.

3.5 Topic 5 – Business innovation in commercial space

To quote an article by the Adecco Group “Today, the space economy, which generates innovative value-added products and services based on space infrastructures and digital technologies, is no longer just the frontier of technological innovation, but also of business innovation, with substantial opportunities for companies, institutions and citizens.”

Although market size is still to be determined, companies are venturing in the so-called “New Space Economy” era, moving away from traditional HW manufacturing and vending schemes and experimenting with service provision.

The relationship between public and private actors in the space field is evolving, and several different schemes for Public Private Partnerships are emerging, leading to a change in the type of contractual schemes behind space projects. Risk allocation, identification and management of revenue streams and ownership of intellectual property rights are the three major variables that are being experimented with.

The key assignment to be addressed by delegates in this section is:

Which commercial space axis is showing the highest degree of business innovation? Which business models are becoming dominant in the New Space Economy? What is the effect of new ways of doing business on the executions of space projects?

A key success factor for this group is to investigate domains other than Telecommunications (e.g. Earth observation, space transportation, human spaceflight...), trying to understand how business innovation is taking place and which new business models are emerging. Young professionals are expected to focus on one agreed domain and investigate the impact by looking at a limited selection of examples to analyze the below considerations.

The following elements could be considered in the research:

- Which domains are more viable for commercial undertakings and why.
- How public bodies are interacting with the commercial space sector.
- What is happening to project management in commercial space, especially in context where the business model is different from the usual hardware purchasing contract.
- How are market dynamics (pricing, demand...) changing, if at all, in the New Space Economy.
- Which new schemes are emerging among space players (e.g. cooperation, oligopoly, proliferation...) and what does it mean for the industry.

Young professionals are entering a job market where commercialization of space has taken hold and is growing. They are key stakeholders in this new era where cost/price reduction, reusability and sustainability are shaping the industry. Delegates are encouraged to compare their different

experiences and understanding of the space market, and to seek real-world examples (case studies) of disruptive business models being applied in the space field.

The presentation at the workshop should also provide sound recommendations for PMs to better adapt their management style and methods to commercial space projects.

This is a new Topic that has not been researched in previous workshop editions. However, delegates shall consult reports from past years to better understand how to shape and convey their recommendations.

4 Requirements for Management, Meetings, Deliverables and Reporting

4.1 Management

Each topic group shall have an appointed group leader who will be responsible for overseeing the timely execution of the tasks assigned to that group. The group leader will represent his or her group at all relevant meetings with the WOC. At such a time when the group leader cannot attend a meeting, the group leader should appoint an ad hoc representative. The group leader shall be the main point of contact between the group and the WOC.

Duties of the group leader include:

- Establishment of a project schedule including major milestones and deliverables
- Scheduling and execution of regular group meetings
- Representation of the group at all relevant meetings of the WOC
- Accountability for all group deliverables and their quality

Each group shall have an appointed rapporteur who will be responsible for the compilation and distribution of group minutes of meeting and papers.

The group leader will be in charge of organizing the team as they wish, provided the various tasks will be shared between the team members and all deliverables will be submitted timely.

4.2 Mentor

Each topic group will be assigned a Mentor.

A mentor is an experienced professional who has years of valuable experience, built profound knowledge on the topic, and should be considered as the voice of reason and the group's "reality check".

The mentor is requested to share their insightful knowledge with the Young Professionals; guide them through the topic; highlighting important aspects to be researched, suggest literature reviews, the right questions to ask when interviewing peers, etc. If time permits, the mentor can be invited to proofread the deliverables.

Depending on the group's requirements, the mentor can be present at each meeting, or regularly attend meetings. This will be up to the mentor and the group to decide.

The groups are invited to listen to the mentor and take their input to heart.

The mentor's role is not necessarily to promote their own organization, but to share their inputs to the groups based on their overall experience and acquired knowledge.

4.3 Meetings

Each topic group is required to hold regular meetings (advised is at least weekly during the first few weeks, twice per month during the central months, and again weekly in the weeks leading up to submission deadlines and the workshop) to ensure project tasks are on schedule and in line with WOC expectations. One member of the WOC is to be in attendance regularly during these meetings to offer guidance and insight as requested by the group members. However, it is the task of the group leader to define a meeting agenda and moderate the meeting.

A Kick-off Meeting will be held in April to officially begin the pre-workshop activities. All delegates and members of the WOC are expected to be in attendance. Those who cannot attend must inform their group leaders. Group leaders who are not able to attend must inform the WOC and appoint a representative in their place.

The workload of the workshop is estimated at 4 hours per week per person, with peaks just prior to the workshop to ensure timely finalization of the paper and presentation.

Group meeting minutes and actions are expected to be made available on Google Drive.

Group leaders are expected to submit their final input to the IPMC YP Workshop 2023 report one week before the workshop, please refer to section 4.4 as described below.

4.4 Deliverables

Each group shall provide a detailed analysis of their group's topic, which will be used for the 2023 report.

The following list of deliverables shall apply:

1. Draft paper, including the full and complete outline of the paper (see section 4.5 below) – due week 28.
2. Draft presentation, overview of the intended content and format – due week 28
3. Final paper shall be written in line with the IAC published guidelines – due week 37
4. Final presentation – due week 38

As much detail as possible should be provided in all major deliverables. As a rule, enough detail should be provided in each document such that a reader who was not involved in the research can clearly follow the steps taken in the research in order to reproduce the results.

4.5 Reporting

As the individual papers of the different groups will be inserted into one final paper to the IPMC, a unified structure, format, and referencing style has to be adopted.

The delegates are required to write the paper as per IAF instructions. Details on how to prepare and submit the final paper as well as the presentation material will be available on www.iafastro.org by mid-April, 2023.

The WOC therefore will communicate these details separately to the delegates.

4.6 Evaluation by IPMC

The final paper will be edited by the WOC before the end of 2023. Once finalized, the final consolidated report will be distributed to the IPMC members. The final report will also be distributed to all IAF member organizations and published on the [IAF website](#), accessible to the general public.