



International Astronautical Federation
International Project / Programme Management Committee

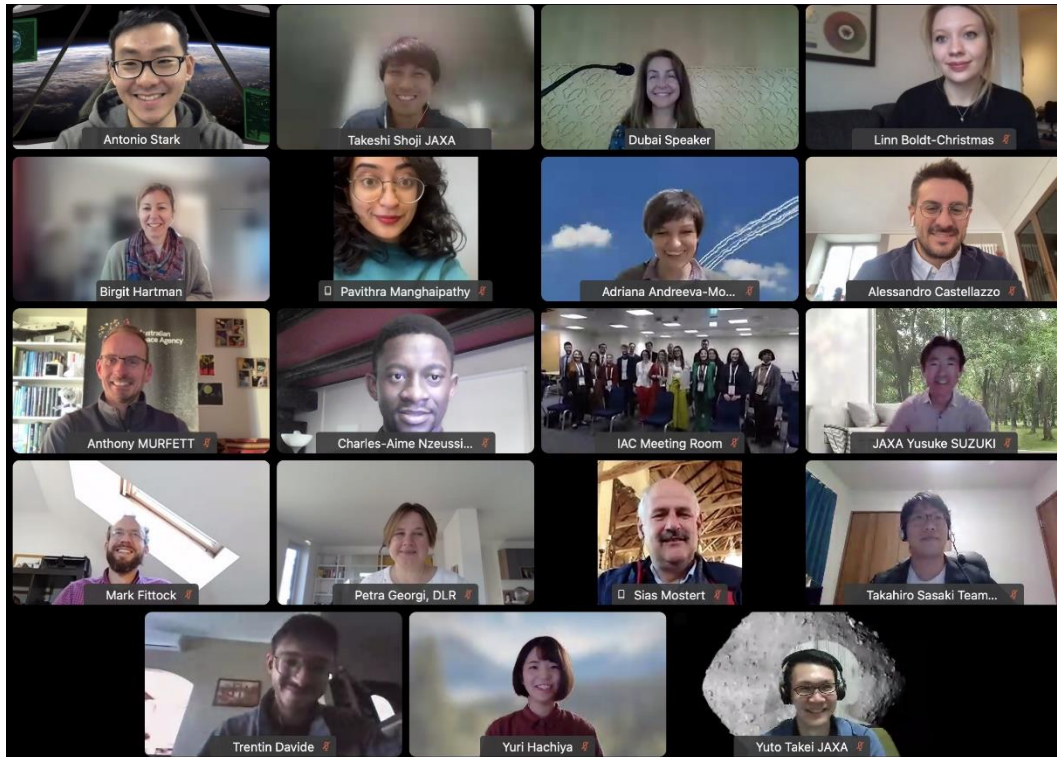
IAF-IPMC Young Professionals Workshop 2021

Workshop Results Report

Workshop Organizing Committee

ipmc.y.p.workshop@gmail.com

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The 2021 IPMC Young Professionals Workshop Delegates
on 24 October 2021 during the hybrid (online + in-person) Final Event

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1. Executive Summary

The International Project / Programme Management Committee Young Professionals Workshop (IPMC YP WS) sought to gather ideas and recommendations from early career employees in the international space community and provide the IPMC and IAF member organizations with greater knowledge, insights, and perspectives to better develop and empower the next generation of space program employees. The IPMC was supported in this effort by a group of young professionals who participated in previous workshops and served as the Workshop Organizing Committee (WOC) to manage the overall process and finalize preparation of an overall report.

The workshop began in the second quarter of 2021 with the nomination and selection of participants who were assigned to working groups, each focusing on one of five discussion topics. During the ensuing months these groups discussed and investigated the topics and reached conclusions. The groups compiled their results, findings and recommendations into reports and video-presentations. Major outcomes were then presented and discussed live with the IPMC members, workshop delegates and guests during the final event held in conjunction with the 72nd International Astronautical Congress.

Following the workshop, the WOC prepared this final report with a summary of the results and recommendations.

Topic 1: Management of remote collaboration in the space industry

The team started by acknowledging that the COVID-19 pandemic has forced much of the space sector to extend work methodology to include **more remote collaboration**, and that this change has led to an **increase in productivity of around 40-50%**

Via literature review, interviews and reflection on their own first-hand experience, the team identified **four key elements capable of driving this improvement**. The four elements have been further detailed and proposed as recommendations for the betterment of remote collaboration in the space industry:

- **Health, balance and socialization** when working remotely: allocating time and resources for counselling services and health awareness initiatives, including remote employees in social activities, adapting anti-harassment policies to remote working, implementing a flexible remote working policy based on trust and tailorable to each employee's schedule, needs and roles.
- **Technology** for remote collaboration: utilizing Enterprise Content Management workflow tools, collaborative version control, etc., to automate documentation processes and streamline all areas of the space sector bureaucracy, communicating transparently about tool adoption to prevent disconnects between different entities' IT security policies in international consortia, allocating funding and manpower to adopt new training and collaboration tools.
- **Training and soft skills** for remote collaboration: offering training courses on soft skills and effective management practices to avoid pitfalls associated with remote communication.
- **Knowledge sharing** in a remote environment: encouraging employees to maintain availability in forums or group chats, proposing virtual lunch seminars for both work and

non-work topics, fostering regular dialogue between upper management and employees (particularly with new staff), actively using outreach opportunities to secure knowledge exchange with external stakeholders.

Topic 2: Attracting and managing diversity in order to create successfully inclusive teams

The team decided to focus the research on the role of middle management in the implementation of Equality, Diversity, Inclusion (EDI) as a business catalyst.

They see **middle managers as the real “tactical layer,”** responsible for carrying out policies that directly affect the lives of employees that they closely interact with. Their key role must be recognised and valued in order to support the **cultural shift necessary for EDI to be understood and embraced.** Nevertheless, all employees should be fully involved in these initiatives to achieve full success, because everyone is fundamental to bringing this change.

The team recommends the following levers for a successful management of EDI:

1. **Define a clear strategy with concrete and reasonable EDI goals and targets to be met within a specific deadline:**
 - EDI goals should be incorporated into the annual performance reviews for employees of all levels, with a clear definition of the evaluation and rewarding system for the achievements of all defined targets.
 - All employees should be given a clear explanation of the need for change and EDI implementation, and be provided with the correct tools, instruments, and training to better understand, implement and foster EDI.
 - Hiring practices should be improved in order to minimize biases in the recruitment process and to diversify the hiring pool.
 - A shared and inclusive working language should be adopted and encouraged within the workplace.
2. **Foster a safe and supportive work environment by using empathy and emotional intelligence, as well as strengthening trust and collaboration.** To this end:
 - An inclusive and welcoming environment should be created within working groups by improving communication, empathy, cooperation and the understanding of EDI policies and their impact on teams' dynamics.
 - Dedicated EDI roles (“EDI champions”) should be created by paying careful attention on understanding how they can dedicate the proper time to EDI initiatives in parallel with their daily tasks.

Topic 4: Knowledge management for Generation Z: how, when, and what do Young Professionals choose to learn?

By performing literature review and semi-structured interviews with experts from space agencies, space industry, academia, and representatives of Generation Z (born in between 1997 and 2010), the team derived four actionable recommendations for organizations to adapt their Knowledge Management (KM) system to the needs of Gen Z.

1. Appeal to Gen Z's intrinsic motivation and enable social networking. For Gen Z, knowledge needs to be quickly accessible and ready to be used “on demand.” It is

recommended to **enable employees to dedicate 10% of their working time to intra- and inter-organisational initiatives** and to offer opportunities to interact with senior executives and gain access to senior-level knowledge.

2. Motivate Gen Z by creating positive learning experiences and leaving room for self-reflection. To do so, **inject some sense of meaningfulness and fun into the flow of everyday work**. The use of engaging content and format will facilitate the absorption of knowledge and strengthen the effectiveness of the whole knowledge-sharing environment.
3. Embrace technology and use it to digitize and streamline processes, while always keeping them human-oriented. To achieve that, **fully integrate the KM processes into the established working processes** and at the same time promote an open-minded approach based on respectful and reciprocal listening and helping.
4. Allow Gen Z to set boundaries and have a greater degree of self-directed work. **Empower employees through “no meeting Fridays”** and send a clear message that it is okay to set time aside on the calendar. Limit the formal knowledge management/transfer to the very essential knowledge, as most knowledge requires individual interpretation and integration into the previously learned and experienced.

In conclusion, organizations that want to effectively integrate their young generation workforce need to tailor their knowledge management environment to the motivators of young professionals, namely meaningfulness and fun.

Topic 5: Project management practices for enabling short-term and rapid turnaround activities for space projects

The team acknowledged that traditionally the aerospace business is characterized by a risk-adverse development approach leading to high standards for quality and reliability with the ultimate goal to reduce the risks. The team also postulated that a change in project management towards Short-term Rapid Turnaround Activities (STARTAs) can certainly benefit the aerospace business, especially in the frame of the emerging commercial New Space economy.

However, the aerospace sector can only benefit from the adoption of a STARTA approach for project management in planned incremental introductions. In fact, noticing that STARTAs do not have consistent success in application along the entire product cycle, most companies consider STARTA approaches at the beginning of product development, and then transition to the traditional waterfall development approach for the end stretch of the lifecycle. What emerges as the best option is a hybrid process that meets the needs of the old and the new.

The team's recommendation is that **project methodologies will have to segment and be selected for the unique requirements of each stage of the product cycle, applying appropriate approaches for maximum project success**. Optimum project management will involve setting flexible parameters in a decision-tree, aligned to customer and market needs, and to the entity's own prototyping and production capabilities.

In the end, the team's output is a series of guided analysis steps and decision-trees that can guide project managers in the selection of the most appropriate management methodology based on key questions in 5 major project areas:

- 1) Project context assumptions (in particular, geographical theater and funding models)
- 2) Team organization

- 3) Problem parameters (in particular, effect of changing requirements and deliverable product type)
- 4) Project lifecycle timeline
- 5) Flexibility of at least one among the main project parameters (cost, quality, time, and scope of work)

STARTA approaches can definitely be a key tool to remain competitive in the business, encourage and support innovation, and move towards an aerospace industry that is adapted to dynamic needs and the ever-growing market.

Topic 6: Successful outreach practices in the space sector

The team recognized that the space sector can simultaneously boast about its high visibility and appreciation by the general and specialized public alike, while suffering from a multitude of shortfalls and inadequacies. The ever-increasing commercialization of space, disaffection for the techno-scientific process, as well as the immediacy of information dissemination have both positive and negative aspects. For example, there is better viralized access to target audiences today, but the other side of that is audience distrust because of the “fake news” phenomena.

These require radical overhauls of outreach practices that too often lack proper planning, execution or rigorous evaluation—even if some jewels of good practice shine light on promising paths ahead. Successful outreach initiatives require a clear definition of goals from the onset. **Establishing adequate, standardized and meaningful metrics to assess effectiveness is paramount.** The combination and cooperation of communication and technical expertise is effective in improving the outreach of space activities. The possibility of improvement comes from the two domains that information belongs to: knowledge and skill that can be trained and educated on the one hand, and will and experience that are difficult to develop and acquire on the other.

Outreach is not ancillary, but rather an integral part of most space activities.

Successful outreach practices make successful program/project managers, and vice versa. Not only is it easier to work with good communicators, but business also thrives further. **Hybrid figures where communication and technical expertise are formally pursued should be prioritized for PMs, through training and closed-loop outreach.**

Aware that proper tailoring is mandatory in a good outreach strategy (target public, context, aim...), proper implementation, efficacy measurement and ROI analysis techniques are of paramount importance to ensure continued organizational support, attainment of objectives and public awareness towards a more representative, inclusive and thorough “space literacy.”

2. Introduction

On 24 October 2021, a group of 32 international young professionals—working in space agencies, companies and professional organizations—met to participate in an annual event sponsored by the International Project / Programme Management Committee (IPMC) of the International Astronautical Federation (IAF) as the culmination of a 5-months-long workshop. The workshop was planned and organized by a team of alumni working in collaboration with the IPMC. The final event was held in affiliation to the 72nd International Astronautical Congress (IAC), and carried out in hybrid fashion, with simultaneous online and in-person attendance.

The IPMC, which brings together representatives from more than 20 IAF member space agencies, companies, and professional organizations, meets semi-annually to exchange experiences, best practices and to collaborate on projects that nurture the global space workforce.

The IPMC Young Professionals (YP) Workshop is an annual initiative, and its final event is held just prior to the IAC. The IPMC selects a small group of young professionals who previously participated in a YP Workshop to serve as the Workshop Organizing Committee and help the IPMC organize and manage the event. The 2021 Workshop Organizing Committee (WOC) members were:

Adriana Andreeva-Mori	Correspondence Manager
Linn Boldt-Christmas	Communications Manager
Mark Fittock	Operations Manager
Birgit Hartman	Strategy and Implementation Manager
Takeshi Shoji	Delegates Manager
Eleonora Zeminiani	Project Manager

The Workshop Organizing Committee members were also asked to closely follow the development of the discussion topics, guide the discussion group deliberations, and prepare this final report. The 2021 IPMC Young Professionals Workshop attracted thirty-two early career employees from government, industry, research, and professional organizations throughout the world. Each of the participants was nominated by an IAF member organization to attend the workshop in response to a call for nominations.

The workshop participants selected one out of five discussion topics to be researched in smaller discussion groups that met virtually during the period from June to October, in preparation for the final event. For further information, please see Chapter 3: Workshop Activities and Virtual Sessions Collaboration.

The results of these investigations and deliberations, with associated observations and recommendations, are presented in this report. The ideas and views expressed herein are those of the participants as individuals and do not necessarily reflect the views or positions of the IPMC, the IAF or its member organizations.

3. Workshop Activities and Virtual Sessions Collaboration

In Spring 2021, the Workshop Organizing Committee (WOC) published the Statement of Work (SOW) and Call for Delegates and then collected candidatures and applications.

After the selection of the delegates, the WOC administered a questionnaire to obtain information, including profiles of each delegate, along with their preferred social networking tools, professional capabilities, and personal hobbies. This information helped establish a basis for assigning the delegates into the various topic groups. Each participating young professional expressed particular interest in one of the proposed topics. In addition to their topic interest the participants could express their desire to function as either a team leader or a rapporteur.

The Young Professionals Workshop is a several-months long initiative gathering a globally distributed and diverse group of delegates. To establish relationships among the delegates and promote teamwork on the assigned topics, the WOC encouraged use of online virtual, social and collaborative tools, such as Slack, Google Docs and the scheduling tool Doodle. Delegates were also free to propose and use other tools of choice, such as WhatsApp, Teams and Miro.

The goal was twofold: on one hand to facilitate “breaking the ice,” and on the other hand to initiate and maintain group conversations around the chosen discussion topics.

The WOC then organized a first meeting via WebEx to introduce the Statement of Work and explain in detail the expectations, goals, timelines, and deliverables. This was also a good time for the delegates to ask any questions, and to share their initial thoughts and ideas.

Each group was assigned a topic leader and a rapporteur. The topic leaders were responsible for producing requested deliverables and for managing other related discussion group tasks. The topic leaders were also the main point of contact for the WOC. The rapporteurs were asked to document the discussions and the progress made and ensure consistency of the deliverables with respect to the SOW requirements.

The virtual sessions process began in early June 2021. Until the final event in October, the delegates were asked to work on their single-team topics. Discussion group meetings were facilitated via videoconference and digital collaboration tools, which allowed young professionals to self-organize teamwork in line with their availability. Documents, such as mid-term reports and project execution plans, were submitted as deliverables and shared via folders in Google Docs. This proved to be a good approach to have material always accessible by delegates, mentors and WOC representatives around the world. The teams conducted in depth investigations, held various interviews, and shared their own day-to-day experiences working in the space industry as young professionals. As a platform for collaboration among the participants from diverse locations globally, the virtual sessions worked well and were a mean to bring the delegates together and facilitate the research prior to the live final event.

Mentors have been key contributors to the success of the initiative. Mentors are senior professionals with specialized insight into the topics being investigated.

Mentors were selected by the WOC in Spring 2021 by collecting volunteer applications and by scouting suitable profiles and connections. A dedicated orientation session (once more, an online virtual meeting) was held between the WOC and mentors, to introduce the purpose and inner

workings of the workshop and to better explain to the mentors what was expected from them. One or two mentors were assigned to each topic group, with the objective to offer advice and steering, evaluation of ongoing research, critical assessment of results and recommendations. Mentors were the “critical voice” that helped the delegates measure their work against the typical key drivers of project management (cost, schedule, quality) and build the case for their proposals by discovering weaknesses and clearly identifying the possible “return on investment.”

Mentors were in contact with their assigned topic group (through the topic leader) and each team agreed on a preferred pattern of attendance. Some teams worked more closely and more often with their mentors, involving them in every teleconference and every discussion, while others established recurring checkpoints spaced out by periods of autonomous research.

In any case, young professionals and mentors were able to form fruitful alliances to improve the value of workshop outcomes and to collectively grow the space community. They also greatly contributed to the quality of the final event where they had a chance to discuss live the results of their own and other teams’ research.

Mentors for the 2021 IPMC YP Workshop were:

Andrew Aldrin	Director of the Aldrin Space Institute at Florida Institute of Technology
Michael Bell	Chief Knowledge Officer, Program Manager LLIS at NASA
Sias Mostert	Chairman of SCS Aerospace Group, Founder of Space Advisory Company
Anthony Murfett	Deputy Head of the Australian Space Agency
Sabine Riek	Administrative Project Manager in DLR PMO
Thomas Sinn	Founder and CEO of DcubeD
Susan Snyder	Lead for the NASA Chief Knowledge Office

4. IPMC YP Workshop reaching young professionals worldwide

In the ten editions of the workshop since 2012 the workshop has had 316 participants from 12 different countries on average.

Based on the location of the IAC, the WOC observes the following:

- The nationality of the participants shows a direct link to the location, i.e. more Asian Nationalities at IAC Beijing, a majority of Europeans at IAC Bremen, etc.
- The cost of accommodation and travel is an important decision factor for young professionals to attend.
- Visa requirements can prevent young professionals from attending.
- Virtual collaboration sessions and virtual final events allow attendance of a larger pool of delegates, by cutting out travel expenses and associated limitations in Company's sponsorship budget.
- Travel limitations linked to COVID-19 preventive measures at Company or Country level still heavily affected the possibility for young professionals to attend the final event in-person.

Once more, the workshop proved that younger generations and their smart work approach are intrinsically resilient and more efficient in face of challenging boundary conditions such as delocalized teams and travel limitations.

The delegates to the 2021 IPMC YP WS have tackled the topics proposed in the SOWs with effort and dedication, reflecting on the complexities of project, people and knowledge management in current times and in the global pandemic.

2021 marked the 11th anniversary for the IPMC and the tenth occurrence of the YP WS. Young professionals accepted the challenge and demonstrated successful teamwork and brilliant results despite challenging, volatile and uncertain circumstances.

5. Group Topic Results

The 2021 IPMC Young Professionals Workshop dealt with five different topics pertaining to project/program management, people management, knowledge management. During the final event, the five discussion groups met in a plenary live session for the first time and presented their findings to the other groups along with several IPMC representatives and a general audience. The topic reports prepared by the five groups, together with each group's concluding observations and recommendations, are presented below. Due to the amount of information gathered, this report is a concise compilation of the results. Links to full research material can be found in the concluding chapters.

5.1 Management of remote collaboration in the space industry

Remote collaboration is defined, for the purposes of this report, as: "Working in a team in which the members lack the possibility to directly interact in an in-person environment, but have the capability to reach all their project goals."

Today's space sector would not exist without the concept of remote collaboration. Most large space projects foresee the interaction of several companies or entities, oftentimes operating from different countries. However, the recent evolution of the space sector towards remote, delocalized teams has been greatly accelerated by the need to cope with the exceptional crisis brought by the COVID-19 pandemic.

In fact, the COVID-19 pandemic has forced much of the space sector to extend the working methodology, particularly for internal company collaboration. The social distancing and stringent restrictions put in place by governments to combat the spread of the virus has greatly impacted all activities that were previously performed in-person and in the office between colleagues.

Among the results of the analysis conducted, the team found that remote collaboration has led to an increase in productivity of around 40-50%. Four key elements capable of driving this improvement have been identified and are presented as recommendations for the betterment of remote collaboration in the space industry: mental health, balance and socialization; use of innovative tools; training in soft skills and remote collaboration; and knowledge sharing in a remote environment.

These recommendations were reached through the following methodology:

1. In the Statement of Work, the team was presented with nine recommended areas for investigation. Drawing on an initial literature review and background knowledge of the team members from their different companies and organizations, these elements were merged into several subtopics. Each of these subtopics was led by at least one team member.

2. A detailed literature review was carried out for each subtopic. This review primarily consulted academic publications and articles into the topic of remote work and other remote collaboration, as well as reports from organizations and consulting companies, news articles, and other web reporting. The team observed a lack of scientific studies specifically focused on remote collaboration in the space industry; therefore, many of the references cited discuss the topic more generally. Interviews with space industry leaders have been used to supplement this lack of space-specific sources.
3. Interviews were held with several managers and other leaders in the international space industry. These interviews were conducted by asking questions on subtopics relevant to the perceived expertise and experience of the interviewee and were largely conducted in a conversational and adaptive style to reveal more interesting insights and experiences.
4. The results of the interviews were combined with the information gathered from the literature review into the discussions, conclusions, and recommendations in this report.

To improve the management of remote collaboration and provide actions to managers and other leaders in the space industry, the following recommendations have been proposed:

1. Health, balance and socialization when working remotely

It seems probable based on research, interviews and prevailing opinions in the sector that a hybrid model of remote working is likely to continue beyond the COVID-19 pandemic.

The team recommends allocating time and resources for counselling services and health awareness initiatives to support remote employees (particularly those working remotely long-term, e.g. during launch campaigns or for personal needs), and to include remote employees in social activities (such as “digital croissant” meetings). Any anti-harassment policies should also be inclusive of remote work.

Moreover, the team suggests implementing a flexible remote working policy that allows those who can work from home (most staff working in non-operational roles, i.e. in the office and not in the lab or in the field) to do so on a hybrid basis, according to a schedule that suits their needs and their roles.

In the cases in which some tasks cannot be fulfilled remotely or workers are required to be on-site to allow the organization to meet its mission, goals, or stakeholder expectations, it is important to present a valid and convincing argument about how the hybrid structure is not workable and why it may adversely affect the organization's business. Consideration should be given to the possible modifications or partial accommodations that could still be made to compromise and show trust in workers.

2. Technology for remote collaboration

From the research conducted, the team identified a wealth of tools on the market to support remote collaboration, however there are also gaps in the market, and this offers an opportunity to borrow successful solutions from adjacent fields and industries (a process usually called “spin-in”).

It is recommended to utilize Enterprise Content Management workflow tools, collaborative version control and other existing collaborative software to automate document processes and streamline design and development in all areas of the space sector bureaucracy.

Managers leading consortia or programs should take a transparent, leading role in tool adoption to prevent a disconnect between different entities' IT security policies. Also, funding and manpower should be invested to spin-in and adopt new training and collaboration tools such as training for virtual presence.

3. Training and soft skills for remote collaboration

Many potential pitfalls associated with remote communication have been investigated, such as: miscommunication, a reduction in the non-verbal aspects of conversation, and a lack of engagement during meetings. The team recommends resolving these issues by providing training courses for employees on soft skills for remote collaboration (e.g. verbal/non-verbal communication), and encouraging effective management practices when communicating remotely, such as optimizing meeting frequency, reviewing processes for remote collaboration, and identifying the 5 Ws (Why, What, When, Where, Who) and 1 H (How) to compose the right communication strategy.

4. Knowledge sharing in a remote environment

The loss of knowledge exchange is an often-cited concern of managers when discussing remote working. Psychology research shows that chats at the water fountain can be just as important as planned communication because it facilitates informal connections. The team recommends encouraging employees to maintain availability in forums or group chats (e.g. by implementing an enterprise knowledge management tool), organize virtual lunch seminars for both work and non-work topics, utilize matchmaking features of virtual event tools to facilitate random encounters, and organize regular dialogues between upper management and employees, particularly with new staff.

It is also recommended to actively use outreach opportunities to secure knowledge exchange with external stakeholders, both to gain feedback on the project from external entities and to boost internal comprehension of the project and improve morale.

In conclusion, the COVID-19 pandemic has been a challenging but extremely useful testbench to verify how the space sector can perform in a world where remote working is an increasing methodology.

Tools to facilitate cooperation will continue to play a key role in enabling remote working and collaboration; some tools have been identified to digitize workflows and improve knowledge transfer, some others to create remote events that facilitate socialization between participants.

The attention of a remote collaboration strategy should focus on people, all of whom play an essential role and who's health and flexibility should be supported, especially when they work remotely. Training should be provided for remote communication. Effective management processes should be implemented to optimize the communication chain.

The team stresses the importance of replicating pre-pandemic methods of random knowledge exchange in the remote collaboration space (e.g. with forums, group chats or virtual lunch seminars). In addition, it should be noted how outreach activities can provide the opportunity to communicate remotely, receive feedback on the audience's perception of projects, and improve internal understanding of work.

These recommendations, if put in place, will help the international space industry to continue to adapt to the new post-pandemic remote collaboration paradigm by reformulating the working methodologies of space entities to be more collaborative, more attentive to employee welfare, forward-thinking in terms of technology, and adapted to remote communication and knowledge sharing.

5.2 Attracting and managing diversity in order to create successfully inclusive teams

The team of five young aerospace professionals leveraged their diverse profiles, experiences and perspectives when researching how to address Equality, Diversity and Inclusion (EDI), to bring a strong positive human and business value to the aerospace sector.

EDI has become a topic discussed worldwide and a large part of aerospace companies' top management has positioned itself favourably. Nevertheless, many barriers to effective EDI implementation still exist, especially for an industry historically lacking many types of diverse demographics, for example non-white ethnic groups and women (OECD, 2021). In particular, EDI efforts in medium to large entities very often break down in the link between top and middle management. Research clearly demonstrates that middle managers, responsible for taking executive strategies and objectives and translating them into sets of goals for their departments, very rarely efficiently commit to EDI targets. At the middle management level, EDI could be perceived as an abstract concept or not as a priority (Wheeler, 2019). This report aims to target top and middle managers within the aerospace sector, willing to learn more and embrace the benefits of EDI.

In a global study (Hunt et al., 2015), it was found that organizations were 25% more likely to outperform on profitability for gender diverse executive teams and 28% more likely for gender-diverse boards. Moreover, a Boston Consulting Group study (Lorenzo et. al, 2018), evidenced that companies with more diverse management teams have 19% higher revenues due to innovation. This is significant because growth in tech companies and start-ups is driven by innovation. Sakpal also states that 75% of organizations with frontline decision-making teams reflecting a diverse and inclusive culture will exceed their financial targets in 2022 (Sakpal, 2019). Diversity is, indeed, an integral part of a successful revenue-generating business. (Eswaran, 2019).

However, if not managed properly, poor EDI practices may impact organization performance (Patrick & Raj Kumar, 2012) and business results. Therefore, understanding EDI benefits and identifying the main implementation barriers are the first steps necessary to establishing successful EDI practices. It is essential to adapt different EDI action plans to the entity/institution context and develop them through the right conditions.

The assessment performed has led the team to strongly recommend the following to promote EDI within organizations:

1. **Define a clear strategy with concrete and reasonable EDI goals and targets to be met within a specific deadline:**
 - EDI goals should be incorporated into the annual performance reviews for employees of all levels, with a clear definition of the evaluation and rewarding system for the achievements of all defined targets.
 - All employees should be given a clear explanation of the need for change and EDI implementation, and be provided with the correct tools, instruments and training to better understand, implement and foster EDI.
 - Hiring practices should be improved in order to minimize biases in the recruitment process and to diversify the hiring pool.
 - A shared and inclusive working language should be adopted and encouraged within the workplace.
2. **Using empathy and emotional intelligence to foster a safe and supportive work environment by as well as strengthen trust and collaboration.** To this purpose:
 - An inclusive and welcoming environment should be created within working groups by improving communication, empathy, cooperation and the understanding of EDI policies and their impact on teams' dynamics
 - Dedicated EDI roles ("EDI champions") should be created by paying careful attention on understanding how they can dedicate the proper time to EDI initiatives in parallel with their daily tasks

When the top management decides to embrace, foster and implement EDI in a well-defined internal pyramid corporate hierarchy, a clear and reasonable strategy needs to be embedded within the annual business strategic agenda. Poorly managed EDI efforts can become quite counterproductive. Furthermore, the organizational and cultural contexts, as well as awareness of the different EDI barriers, shall be considered to define effective EDI policies. However, the EDI effort in medium to large entities very often breaks down in the link between the top management and middle managers, reluctant to commit to EDI, considering other tasks of higher priority within their daily operations. Addressing this is critical for EDI implementation.

Middle managers are the real "tactical layer," responsible for carrying out policies that directly affect the lives of employees they closely interact with. Their key role must be recognised and valued in order to support the necessary cultural shift for EDI to be understood and embraced.

Nevertheless, all employees shall be fully involved in these initiatives to have full success, because everyone is fundamental to bringing this change.

Starting with top managers, it is their responsibility to communicate to all other layers the givens and areas of discretion in terms of executing strategy. So, when it comes to EDI goals, it is their duty to properly define them, assign the right priority, and explain the rationale behind their choices. EDI targets must then be incorporated into the annual performance reviews for employees of all levels, with a clear definition of the evaluation and rewarding system for their achievements. Additionally, no change can be expected without providing the correct tools, instruments, and training to better understand, implement and foster EDI.

For middle managers, five golden rules have been identified: 1. Start with active listening; 2. Slow down and stop multitasking; 3. Try walking in others' shoes; 4. Be curious about others; 5. Avoid making assumptions. Before applying any measures, they need to start by adapting their mindset first, especially by working on emotional intelligence and communication. This is just the first step towards a safer and supportive work environment, where empathy and emotional intelligence are used to strengthen trust and collaboration within working teams.

Finally, all employees should have the possibility to contribute and to commit to EDI (becoming "EDI champions") and must be provided with the correct tools, resources, and support to become positive role models for others and responsible for instilling a diverse and inclusive workplace culture.

EDI is a powerful subject to focus on when seeking to boost business. Nevertheless, it is far from trivial to successfully manage and implement an EDI effort without a detailed and well-designed plan that counts on the full investment of middle management layers.

5.3 Knowledge management for the Generation Z: how, when, and what do Young Professionals choose to learn?

The team decided to focus the research on young professionals' motivators for learning and knowledge sharing, and how organizations can leverage them.

Knowledge is perceived as a key resource that can bring continuous competitive advantage (Drucker, 1993). As such, knowledge management (KM) is recognized as one of the key differentiators in the 21st Century to allow technology-dependent businesses to sustain their competitive edge (Harvey, 2005). Research has demonstrated that active and effective knowledge management can aid organizations in solving problems, improving performance, or in achieving their key objectives (Darroch, 2005). However, research also highlights that, too often, KM initiatives are not able to achieve their desired outcome as organizations struggle to establish an effective knowledge management environment (Harvey, 2005).

A previous study (Lin, 2011) examined the influence of several factors, including employee motivation, on knowledge management implementation levels. It identified three critical

challenges that organizations face while dealing with knowledge management implementation:

- the human resource challenge, which involves understanding what motivates and drives the employee to participate in the development of knowledge management initiatives;
- the social challenge, which discusses the concept of social networking to boost knowledge sharing;
- the strategic challenge, which underlines the development of technology and human-oriented strategies to facilitate knowledge sharing between employees.

In a nutshell, literature confirms that there is a strong association between both employee intrinsic and extrinsic motivation and the level of knowledge management implementation.

In addition, previous International Project/Programme Management Committee (IPMC) reports have highlighted that to be effective, knowledge management techniques must be adapted to people's preferences and a "one size fits all" approach to KM often fails. Furthermore, it has been pointed out that learning approaches vary between generations. Consequently, organizations often face a very peculiar challenge, as young professionals (YPs) seem to have different motivators for learning and knowledge sharing when compared to their older peers.

The team performed their research by building on existing literature and previous IPMC reports. Furthermore, ten semi-structured interviews with experts from Space Agencies, Space industry, academia and representatives of Generation Z (born in between 1997 and 2010) were conducted. The desk research and the interviews are the basis for four actionable recommendations that were derived and that enable organizations to further improve their knowledge management system, especially adapting it to the needs of Generation Z.

Recommendation 1:

For organizations, it is key to establish an effective knowledge sharing culture within the organization by appealing to Gen Z's intrinsic motivation and enabling social networking. Furthermore, it is important to keep in mind that for Gen Z knowledge needs to be quickly accessible and ready to be used "on demand".

To achieve that, it is recommended to **enable employees to dedicate 10% of their working time to intra- and inter-organizational initiatives** to follow their intrinsic motivation and build their social network.

As an example of an intra-organizational initiative, organizations should host Knowledge Café's sponsored by a senior executive to allow all levels of employees to interact, gain access to senior level knowledge, and build strong networks within the organization.

Recommendation 2:

For organizations it is key to understand that motivating Gen Z means creating positive learning experiences and leaving room for self-reflection. Furthermore, organizations should focus on common motivators and values to overcome intra- and intergenerational differences.

To achieve that, organizations should make their knowledge management approaches human-oriented. Meaning that organizations have to know the purpose and objective of KM processes, listen to their employees reacting to them and adapting them when necessary. That can be achieved by **injecting some sense of meaningfulness and fun into the flow of everyday work.**

As an example, adapting a KM process to Gen Z could mean to get rid of people sitting and listening to lectures. Instead, for example, a session that introduces the role of KM in the organization and how it is used should be turned into a scavenger hunt. The absorption of knowledge will be facilitated by using iconic space programs as templates, utilizing videos and animated graphics. A positive learning experience strengthens the effectiveness of the whole knowledge-sharing environment in the organization.

Recommendation 3:

It is important for organizations to understand that while technology is a primal and deeply ingrained part of today's young generation, human interaction is still a key aspect and motivator for Gen Z. Organizations should embrace technology and use it to digitize and streamline processes, while always keeping them human-oriented. To achieve that, it is recommended to **fully integrate the KM processes into the established working processes**. As an example, that could mean to appoint knowledge champions within teams and establish knowledge management communities that are fully integrated in the social and professional networks, such as slack channels. In combination with the first recommendation to enable employees to dedicate 10% of their working time to follow their intrinsic motivation, this helps to get people involved and make KM a fundamental part of the organization.

Furthermore, effective knowledge sharing requires a safe virtual and physical KM environment.

KM should promote an open-minded approach based on respectful and reciprocal listening and helping. A suggestion is to establish “failure nights” to share professional failure and lessons learned, while also, in line with the second recommendation, using methods of communication, such as storytelling, that appeal to Gen Z’s motivation to learn while being entertained.

Recommendation 4:

For organizations, it is fundamental to understand that empowering Gen Z also means setting boundaries, while simultaneously allowing them a greater degree of self-directed work. Furthermore, to effectively facilitate knowledge sharing also means to limit the formal knowledge management/transfer to the very essential knowledge as most knowledge requires individual interpretation and integration into the previously learned and experienced.

To achieve that, it is recommended to **empower employees through “no meeting Fridays”** and send a clear message to them that it is okay to set time aside on their calendar. In addition, the main element of knowledge transfer has to be voluntary, e.g. conducted in the 10% of the working time given to employees as suggested in the first recommendation.

In conclusion, organizations that want to effectively integrate their young generation workforce need to tailor their knowledge management environment to the motivators of young professionals, namely meaningfulness and fun. Furthermore, the interconnectedness of the recommendations shows that KM needs to be integrated coherently across the entire organization. Doing so will allow organizations to make better use of their existing and incoming workforce and will help them to achieve their key objectives and sustain their long-term competitive advantage.

5.4 Project management practices for enabling short term and rapid turnaround activities for space projects

Short-term Rapid Turnaround Activities, or STARTAs, have been used throughout project management history. The last half-century, however, has seen the concept take on new vigor in fields of technological innovation, startup management, and even as a general philosophy of the management class. While some use “lean” or “agile” in referencing this concept, this paper uses the term STARTAs as a more encompassing term to avoid discussions too specific in the use of either terminologies.

A deep analysis of the aerospace industry status quo was conducted first, describing why the aerospace industry has been one of the late adopters of STARTA management, and the diversity of its potential applications. Based on the industry analysis, STARTA applications and their costs and benefits were characterized. Finally, aerospace industry representatives were interviewed to find both successful and unsuccessful applications of STARTAs, with the aim to find and recommend a generalized problem solving approach for senior project managers.

1. Aerospace Industry Analysis

Aerospace industry is a highly specialized sector of modern industry and traditionally applies the *V model* for the development of its products—an approach that encompasses both a *top-down* and a *bottom-up* methods. Aerospace has traditionally been a field in which customers are not only the ones who commission the industry for the delivery of a system but are also technical partners for the development of such system, especially in the first branch of the *V model* life cycle.

The aerospace industry has a focus on applied research and development (as opposed to basic research), which points towards improving existing product development processes, as opposed to investigating new ones.

An emerging industry trend is decentralization from government-oriented programs, to private sector-driven processes, as well as a healthy balance on international partnerships for interoperability and transferring risks and costs across markets.

Across the board there is a general increase in space budgets over the years.

2. STARTA Approaches

STARTA approaches are used in almost all areas of the aerospace industry. While the success of STARTA approach varies across cases, STARTA applications are found across the three pillars of strategy, finance, and technology.

For strategy, the success of STARTA applications comes in markets with high volatility in which first-mover advantages are the greatest. STARTAs fail when they are used for long-term initiatives. Also, STARTAs show greatest efficiencies when fostering innovation and developing new operational methods, but have significant limitations in making them profitable at a scale.

The research finds that the most successful NewSpace firms are ones that use STARTAs to enter and capture market shares, but also wield conventional strategies to deal with longer-term risks to defend those market segments once captured.

3. Success Stories

Interviews with traditional space agencies showed that almost all project management activities are using a waterfall (traditional) approach due to the scale and complexity of projects, or the difficulties of having in-house production systems and ensuring safety. On the other hand, all of the New Space interviewees' projects are successfully using or at least attempting STARTA approaches. Out of all the interviews conducted in the frame of this study, the most interesting case highlighted that European startups are often following a hybrid approach of STARTA and waterfall, which means that their project management approach can be either STARTA or traditional depending on their needs. This case could be one of the solutions to overcome the challenges of each STARTA and waterfall development.

4. Recommendations

The recommendations provided as a result of the research have been presented through a 5-step process detailing the project management journey along with considerations that would aid the decision-making process. In the end, the team's output is a series of guided analysis steps and decision-trees that can accompany project managers in the selection of the most appropriate management methodology based on key questions in the following areas:

- 1) **Assumptions and Considerations.** Focusing on the starting point of a project, several assumptions need to be accounted for before proceeding with the implementation of an appropriate STARTA. Two key factors, geographical theater and funding models, were identified as being critical to the decision-making process. The geographical theater outlines examples of locations where STARTAs have either failed or seen limited success because of the local environment. While the funding model poses key questions to project managers who need to consider the available funding opportunities in order to determine the timeline and applicable STARTAs based on the flexibility granted.
- 2) **Team Organization.** According to different assumptions and constraints, an ideal team organization can be implemented. This organization and the associated work culture shift that would be induced would promote cross-functional skills, more in-house design and production capabilities and a more integrated and iterative design process.
- 3) **Problem Solving.** It is possible to identify how changing requirements (design and test optimization) affect the choice of suitable STARTAs, mainly narrowing down the focus to model-based systems engineering, optimization techniques, prototyping, agile manufacturing, etc. Additionally, the identification of the deliverable product type steers the choice of appropriate STARTAs. The decision is based on historical applications in the software industry and on industrial examples of (limited) success with hardware development in the aerospace industry. A Decision Tree was created to point project managers towards a selection of STARTAs. The Decision Tree lists the most common financial and technical questions that pose challenges, along with a few choices of applicable STARTAs with risks described. Project managers can refer to the list and identify which STARTA approach best fits their plan.
- 4) **STARTA Implementation into Project Timelines.** It is important to evaluate how STARTAs fit into the bigger project lifecycle timeline and how a hybrid approach could

be the optimal solution. Because of several variables that affect the implementation of STARTAs throughout an aerospace project's life, STARTAs are generally recommended in the design and testing phase, while a shift to the traditional waterfall approach is recommended closer to product release.

- 5) **Final STARTA Approach Decision.** A global overview on the main project parameters, cost, quality, timeline and scope of work, is also a key driver in selecting the best management methodology. In a traditional project management approach, these parameters are fixed. When determining whether a traditional or a STARTA approach is more suitable for a project in the development phase, it is key to determine whether quality and risks are two critical parameters for the product or not. If not, then STARTA can be implemented.

In conclusion, the team acknowledged that the aerospace sector can only benefit from the adoption of a STARTA approach for project management in planned incremental introductions. In fact, noticing that STARTAs do not have consistent success in application along the entire product cycle, most companies consider STARTA approaches at the beginning of the product development, and then later resort to the traditional waterfall development approach for the end stretch of the lifecycle. What emerges as the best option is a hybrid process that meets the needs of the old and the new.

The team's main recommendation is that **project methodologies will have to segment and consider the unique requirements of each stage of the product cycle and apply appropriate approaches for maximum project success.** The optimum project management will involve setting flexible parameters in a decision-tree, aligned to customer and market needs, and the prototyping and production capabilities.

STARTA approaches can definitely be a key tool to remain competitive in the business, encourage and support innovation, and move towards an aerospace industry that is adapted to dynamic needs and the ever-growing market.

5.5 Successful outreach practices in the space sector

The work took into account several points of view gathered through direct experience of team members, taking advantage of their diverse, rich, and global backgrounds to bring forward a unique perspective from five different continents. Furthermore, research involved interviews with key personalities in various branches of the space sector, representing many aspects of current space endeavours, some of them even concurrently: public, private, institutional, corporate, educational, developmental, industrial, Western, Eastern, African, European, American, Asian.

Bibliographic literature research has also been employed to highlight, provide further support, or expand the aforementioned methodology.

Recognizing that outreach is vital to the space sector—being an integral, necessary and worthwhile part of most technical and scientific endeavours—the team chose a research path aimed at providing recommendations as to a very specific inquiry: ***“How can outreach be improved by exploiting a combination of technical expertise and communication expertise in teams or organizations?”*** The topic has been investigated along the following axes.

1. Combination of technical and communication expertise as essential for space outreach

In this regard, the team explored the relationships between technical staff in the space sector and communicators, including hybrid figures, as well as how to train, educate, or foster collaboration and cooperation between them. Indeed, one key conclusion is that both figures are needed, and different ways to enable that cooperation are explored in a variety of contexts. This also ties in with the question of outreach being a project-led or organization-led endeavor, with one key aspect of said initiative being the staffing behind it, as well as its composition, motivation and drive. Also, the team explored the potential of outreach initiatives to ameliorate the inequalities of scientific communication in social contexts, where it traditionally has not been, or is still not being, favored. Focus has been placed on particular key examples in Kenya, Guatemala and Italy, and in relation to initiatives from the EU, Japan and the USA.

2. Outreach efficacy measurement, evaluation, and implementation of closed-loop outreach

The team also explored how outreach efficacy can be measured in all senses: e.g. from an economic point of view through return on investment (ROI), or from the weight of its educational and communicational benefit. In this respect, the concept of Key Performance Indicator (KPI) has been introduced and proposals have been put forward regarding KPI definition, measurement, and eventually evaluation, ideally feeding back into “*closed loops*” of outreach for the same sources that started them. This characteristic is considered a hallmark of effectiveness in outreach. As is becoming generally accepted in the leading outreach organizations in the space sector, data analysis and management are key areas of improvement.

Excessive positivism in outreach is another key point that relates to the above. KPIs cannot be faithful or useful if outreach only focuses on successes, real or perceived, while sweeping challenges under the proverbial rug.

The concepts of “*minimum knowledge level*” for staff specialized in both technical or communication fields, as well as “*procedural understanding*,” have been introduced within this discussion. The minimum knowledge level of each staff’s understanding of their complementary discipline is a key parameter of outreach to keep communication on the same track.

3. Management of outreach’s return on investment

The different facets of ROI definition, justification and evaluation have been pondered from the different perspectives gathered throughout the report (corporate, institutional, educational, etc.). A clear link to inclusivity and diversity in outreach can also be realized for those not traditionally engaged in it, along with the preceding conclusions regarding collaboration and cooperation, as a further return on the investment. The team reimaged both definitions, enlarging them from the usual narrow definitions based on short-term, quantifiable impacts, and recommends pursuing further objectivity, traceability, reproducibility, and accountability in measuring performance of outreach initiatives.

The above discussion has then been distilled into a set of recommendations:

- ❖ Structure outreach within companies more explicitly and portray it as a valid activity to be developed by interested employees. At the same time, mind the *minimum knowledge level* for employees engaging in outreach, in both communication skills and technical skills.
- ❖ Move away from basing outreach in just dry press releases or pure information communication. Personal stories, human sides, and relatable aspects achieve meaningful engagement. Offer information, fascination and identification for the audience.
- ❖ Projects shall be allocated a proper outreach budget and should include a certain number of technical staff who possess outreach interest or extensive experience in outreach activities. Project managers should encourage technical staff to participate in outreach activities.
- ❖ Assign a hybrid figure who participates both in the project as well as the organization's public relations, or contract with vendors who can respond and disseminate the project's situation flexibly.
- ❖ Remain sincere with yourself during outreach activities! People engaged in outreach need to be genuine with their public, but more so with themselves in order to determine the weak or strong points of each outreach initiative, and its effectiveness as a whole.
- ❖ Disseminate information so that recipients perceive the project as their own, having a sense of involvement. Try to exceed expectations of supporters and the public by disseminating information that is “qualitatively” different and rare, for example that which can usually only be experienced inside the project.
- ❖ Invest in data management and analysis and correlate your KPIs. Naïve “common sense” approaches might work sometimes, but will not suffice in the long run.
- ❖ Steer clear of imprinting an excessive positivism on outreach. In the long run it can harm branding and lead to a reduced trust in the organization's truthfulness.
- ❖ Focus on the return for the organization, but do not dwell on competition or confrontation: instead foster collaboration and cooperation. A successful space outreach is indisputably also an inclusive one.
- ❖ Successful outreach practices make successful program/project managers, and vice versa. Not only is it easier to work with good communicators, but business also thrives further. Developing PMs into hybrid figures who possess both communication and technical expertise should be a goal, attainable through training and closed-loop outreach.

In conclusion, the space sector today requires radical overhauls in its outreach practices, which too often lack proper planning, execution or rigorous evaluation—even if some jewels of good practices shine light on promising paths ahead. Outreach is not ancillary, but rather an integral part of most space activities.

Aware that proper tailoring is mandatory in a good outreach strategy (target public, context, aim, etc.), proper implementation, efficacy measurement and ROI analysis techniques are of paramount importance to ensure continued organizational support, attainment of objectives and public awareness towards a more representative, inclusive and thorough “space literacy.”

6. General Concluding Observations

Every year the IPMC YP Workshop topics are carefully chosen in close collaboration with the committee members. The topics represent the interest and challenges that the aerospace industry and organizations face on a daily basis.

The 10th edition of the IPMC YP WS had to deal with the lingering effects of the COVID-19 pandemic. Young professionals were encouraged to use their first-hand experiences, their informed opinions, and their fresh ideas to provide an insightful analysis of the research themes.

The young professionals have a clear view of how the space sector is changing and how to navigate in this change. They carefully take stock of what is happening in the market and suggest tailored approaches to renovate our organizations' processes towards more agile and fast-paced models. YPs are digital natives and appreciate having "on demand" learning opportunities, but they also value human interaction and communities where knowledge can be disseminated. They are intrinsically motivated and appreciate freedom to self-direct their work, but they also look for meaningful exchanges with senior professionals. YPs have strong opinions on how organizations should show trust in their employees and nurture their wellbeing, especially in a world increasingly characterized by remote work. They recognize the relevance and value of diversity, and they believe middle management can play a key role in building a more inclusive workplace. Also, YPs are passionate about communicating their endeavors and they believe business can greatly benefit from outreach when it is carried out with a structured, objective, and synergic approach.

The delegates explain to us how young and senior professionals together can improve the meaningfulness of our work relationships, the performance of our projects and the success of our organizations.

We invite the IAF's IPMC committee members and the young professionals to further discuss the findings of these topics and find a way to implement the recommendations in their respective organizations. The recommendations are evident, well thought out, and based on examples, experiences and input from a truly global perspective.

7. List of Workshop Delegates

First Name	Last Name	Organisation
Lucia	Bonventre	Agenzia Spaziale Italiana
Rosa	Tagliamonte	Agenzia Spaziale Italiana
Frank	Gallagher	Australian Space Agency
Andreas	Flock	DLR
Per	Braig	ESA
Raphaëlle	Leglise	ESA
Nicole	Majska	ESA
Audrey	Maltier	ESA
Zach	Rowland	ESA
Yuri	Hachiya	JAXA
Takahiro	Sasaki	JAXA
Yuto	Takei	JAXA
KangSan	Kim	KARI
Alice	Pellegrino	QinetiQ Space
Nicole	Beale	SGAC
Katherinne	Herrera	SGAC
Seth	Nyawacha	SGAC
Charles-Aimé	Nzeussi Mbouendeu	SGAC
Ruvimbo	Samanga	SGAC
Ekaterina	Seltikova	SGAC
Pavithra	Manghaipathy	SSC
David	Bravo Berguno	Thales Alenia Space
Alessandro	Castellazzo	Thales Alenia Space
Ramon	Gomez Moya	Thales Alenia Space
Ilaria	Gorga	Thales Alenia Space
Nadia	Perreca	Thales Alenia Space
Andrea	Rampa	Thales Alenia Space
Genny	Scalise	Thales Alenia Space
Davide	Trentin	Thales Alenia Space
Paola	Breda	Universität der Bundeswehr München, Neubiberg
Coraline	Dalibot	WIA (Women In Aerospace) Europe
Sarah	Lappin	WIA (Women In Aerospace) Europe

8. Previous Workshop Reports

All previous IAF's IPMC Young Professional Workshop reports are available on the IAF website, please follow this [link](#).

9. Acknowledgements

The workshop organizing committee greatly appreciates the support of the IAF, the IPMC, and all their affiliated organizations who nominated delegates for the 2021 edition. The WOC would like to warmly thank the mentors for their inspiring and selfless support to the young professionals. The WOC also thanks the IAF Secretariat for their continued interest and assistance in including the workshop among the IAC satellite events.

The workshop organizing committee also extends a special thank you to the 2021 cohort of delegates, who put great effort into providing quality results and recommendations, and navigated with tenacity and flexibility the uncertainties of the current aerospace world.

The WOC is looking forward to the future with preparation for the next workshops and the continuation of the implementation of previously presented recommendations. The WOC, in close collaboration with the IPMC, strives to advance on the development and empowerment of the next generation space workforce.

10. Full topic reports

The full reports per topic are available via the following [link](#).