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International Programme / Project

Management Committee

Young Professionals

Workshop 2015

Workshop Results Report

Workshop Organizing Committee

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Group photo of the delegates and speakers attending the 2015 International Programme/Project Management Committee's Young Professionals Workshop held on 11 October 2015 in the Jerusalem International Convention Centre.

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1. Executive Summary

On 11 October 2015, a group of 25 young professionals – working in space agencies, companies, and professional organisations located in 15 countries and six continents – met to participate in a workshop organised by the International Programme/Project Management Committee (IPMC) of the International Astronautical Federation (IAF). The workshop was planned and organised by a team of young professionals working in collaboration with the IPMC. It was held at the International Convention Centre in Jerusalem, Israel, in connection with the 66th International Astronautical Congress (IAC).

The YP Workshop – the fourth in a series of annual workshops organised by the IPMC – sought to gather ideas and suggestions from early career employees in the international space community and provide the IPMC and IAF member organisations with greater knowledge, insights, and perspectives that can help them 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 Organising Committee (WOC) to manage the overall process and final preparation of a workshop report. The Boeing Company and the Japan Aerospace Exploration Agency also supported the Workshop by providing refreshments and a working luncheon during the participants' deliberations.

The workshop itself represented the culmination of an initiative that began in the second quarter of 2015 with the nomination and selection of workshop participants who were then divided into working groups focusing on three discussion topics. Over the ensuing period, these groups discussed – mostly through virtual online discussion sessions – and investigated the topics and reached preliminary conclusions. The groups later met face-to-face for the first time at the workshop, finalised their recommendations, and presented the outcome to the entire workshop along with several representatives of the IPMC.

Following the workshop, the WOC prepared this final Workshop Results Report, which provides a detailed summary of the results and recommendations.

Topic 1 - Mentoring Program Business Plan

Mentoring programs have been hailed as an important human resource management strategy, a career tool, and a workplace learning activity in a variety of organisational settings such as hospitals, large corporations, schools, universities, and government departments. There are many definitions for the term “mentoring”, but commonly it can be defined as *“A formal and mutually-agreed process by which a more experienced member of the organisation (e.g. company, government agency, etc.) is paired with a less experienced member of that same organisation.”*

While the benefits of such programs are generally perceived by both young professionals and hosting organisations, few analyses exist on the concrete **quantitative** and **qualitative** benefits of such programs.

Group 1 identified and analysed the key benefits, both qualitatively and quantitatively, of existing mentoring programs, focusing on:

- The benefits of mentoring programs, not only within the aerospace industry but across various sectors
- Previous YP Workshop output analysis;
 - Management benefits
 - Formal vs. information programs
- Monetary and resource investment from various companies and organisations (including retention/attrition rates, annual promotion rates, job satisfaction, etc.)
- Cost Benefit Analysis (CBA) and Return on Investment (ROI) are considered powerful tools for measuring the viability and effectiveness of a mentoring program. The following can be considered;
 - Time spent mentoring or being mentored and not performing other duties
 - Any specialised training provided for the mentors / mentees
 - Logistical costs for facilities, travel, allowances, etc.
 - Administrative costs of scheduling and/or use of materials to support the process
- Identification of a mentoring program template that can be used to build a business plan with;
 - Industrial Analysis - what kind of organisation will benefit most from a mentoring programme
 - Identifying a Business Plan.

The group concluded that there is no one template that fits all the different organisations within the Space Sector. Depending on the business, the business plan template needs various adjustments.

Design and Planning	Management and Operations	Evaluation
<ul style="list-style-type: none"> ● Overall Purpose ● Goals and expected outcome ● Target population ● Type of mentoring ● Nature ● Resource requirements ● Promotion and Communication 	<ul style="list-style-type: none"> ● Matching mentors-mentees ● Orientation and Training ● Development plans (Integration) ● Monitoring 	<ul style="list-style-type: none"> ● Measuring success according to goals and expectations ● Follow-up

Topic 2 - Aerospace Decision Factors for Young Professionals

Group 2 focused on quantification of the relevance of decision factors that influence young professionals to enter or leave the aerospace sector. In addition, the group assessed the desirability of the aerospace sector in general.

The following methodology was used to collect the information:

- Review previous studies show among other important findings;
 - Availability of global literature (most studies are limited to the US)
 - Regional differences when operating internationally
 - High attrition rates for female and minority employees
- In-depth interviews with various target groups that can specify their motives to choose a career in the Aerospace sector, to start the career or to leave
- Initial survey among a limited group of young professionals and aerospace employers.

Within the time and resource constraints leading up to the YP workshop, Group 2 researched question topics, created an online survey, distributed the survey, analysed the results, and presented findings. Based on the preliminary findings from this research, the following observations have already derived:

- Interest in aerospace aroused early;
 - By what age aerospace students and professionals became interested in aerospace
 - Which are the most effective means of arousing interest
- Lack of information on career options;

- Check which channels are most effective e.g., career fairs
- Implication in schools and universities to present the breadth of possible careers in aerospace, specifically for women and minorities
- Investigate ways of presenting “hands-on” work at university
- No perceived role-models for women and minorities;
 - Improve and increase communication on women and minorities in aerospace
- High dropout rate of young professionals;
 - Understand the key factors, e.g., Salary - but linked to global satisfaction? Start-ups vs. Multinationals? Academia vs. industry?
 - Investigate mentoring and career development programs for young professionals
 - See Group 1’s work on “The Business Case for Mentoring Programs” for more information on the key benefits of existing mentoring programs
- High dropout rate of women and minorities;
 - Understand the key factors
 - Training on “natural bias”, specifically for interview panels and hierarchy
 - Supporting young professionals and female groups within the organisation
- Updated survey to be sent out via IPMC contacts to reach extended survey group.

The discussion group proposes that a version of the initial survey be distributed via the IPMC, after the YP workshop, to aim for a larger number of participants and potentially statistically important results, taking into account the comments and discussions of the YP workshop and the feedback on the YP workshop report to IPMC.

Topic 3 - Rapid Engagement and Accelerated Learning

Group 3 concluded that successfully engaging and supporting the learning of young professionals must not be in isolation but rather in strong collaboration with other key workforce groups. The topic addressed the following specific areas:

- Enabling effective collaboration channel between experienced professionals and young professionals, based on common interests, in order to facilitate the retention and transfer of lifelong experience to new employees
- Helping early career employees rapidly acquire the knowledge and skills required by their organisations
- Ensuring that young professionals with sufficient skills and relevant experience can replace experienced professionals in the aerospace field retiring in the coming years.

The group suggested the following factors that contribute to determine the success of mentoring programs: management support, cultural compatibility, and alignment to global trends (work-life balance, social media, and the use of technology).

The recommendations to quickly and effectively engage the next generation workforce, the group has focused on six projects that are believed to enforce this ideas are:

- Book of success: A document that attempts to provide answers to everything YP's "always wanted to know but were reluctant to ask." The book can be used as a guide, based on the experiences of the already established professionals.
- Learning partnership: The idea is to build collaboration between a young professional and an experienced professional over a period of three months.
- World Café sessions: These sessions will bring together professionals from different departments of one organisation to share their experiences and success as well as their failure stories as "lessons learned."
- Project incubator: Teams of YP's are given specific, practical assignments to solve in three months using hands-on and project management experiences.
- Awareness campaign: The aim is to guide young people towards space careers.
- Gamification: A learning technique that encourages participation in specific tasks and activities that quickly links smaller tasks to larger goals through leveraging the participants' love of competition and reward by offering them instant, positive feedback.

This workshop report discusses the perspectives, interests, observations, and recommendations of the participating young professionals in the hope that interested management officials in the member organisations of the IPMC and IAF will recognise and further consider the ideas presented. The resulting discussions can lead to a better understanding of both individual and organisational needs in the space sector and, the workshop participants' hope, to further development and implementation of the Workshop observations and recommendations.

2. Introduction

The IPMC Young Professionals (YP) Workshop is an annual initiative of the International Project Management Committee (IPMC) of the International Astronautical Federation (IAF). The IPMC – which brings together representatives from more than 20 IAF member space agencies, companies and professional organisations – meets semi-annually to exchange experiences and best practices and to collaborate on projects that nurture the global space workforce.

The YP Workshop is held just prior to the IAF's International Astronautical Congress

(IAC). The IPMC selects a small group of young professionals who previously participated in an YP Workshop to serve as the Workshop Organising Committee and help the IPMC organise and manage the event. For the 2015, the Workshop Organising Committee (WOC) members were:

- Birgit Hartman (ESA): WOC Project Manager
- Lisa Antoniadis (Swiss Space Centre): WOC Logistics Manager
- Kevin Shortt (DLR): WOC Technical Manager
- Maarten Adriaensen (ESA): WOC Executive Editor
- Anne Caraccio (NASA): WOC Communications Manager

The Workshop Organising 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 2015 IPMC Young Professionals Workshop attracted 25 early career employees from government, industry, research, and professional organisations throughout the world. Each of the participants was nominated by an IAF member organisation to attend the workshop in response to a call for nominations issued end of April 2015.

The workshop participants selected one of three discussion topics to continue in smaller discussion groups that met virtually during the period prior to the actual workshop session. (Please see Section 3: Virtual Session Collaboration and Pre-Workshop Activities, below.) The results of these investigations and deliberations and associated observations and recommendations are presented in this report. The ideas and views expressed herein are those of the participants as individuals. They do not necessarily reflect the views or positions of the participants' employers, the IPMC, the IAF or its member organisations.

3. Virtual Session Collaboration and Pre-Workshop Activities

Since the Young Professionals Workshop is only a one-day event, the Workshop Organising Committee (WOC) felt it was necessary to establish in advance foundational relationships among the delegates who would attend through virtual tools. With a globally distributed and diverse group, the WOC elected to encourage use of online social and collaborative tools, such as Skype, Facebook, and Google Docs and the scheduling tool Doodle to facilitate “breaking the ice” and to initiate group conversations around the chosen discussion topics.

After the delegates were selected, the Organising Committee administered a questionnaire to obtain information including individual delegate profiles for the workshops handbook, along with their preferred social networking tools and professional capabilities and personnel hobbies. This information helped establish a basis for grouping the delegates into the various topics. The participating Young Professionals each expressed particular interest in one of the proposed topics. In addition to their topics, the participants could express their desire to function as either a team leader or a rapporteur.

The WOC then organised a first meeting via Skype for each group to introduce the Statement of Work (SOW) 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 selected 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. These documents were helpful to ensure all of team members understood the status of the deliberations.

The virtual session process began in July 2015. Until the October Workshop, the delegates were asked to work on their individual topics. Discussion group meetings were facilitated via Skype and scheduled mostly through Doodle, which allowed delegates to self-organise times in line with their availability. Documents, such as mid-term reports and project execution plans were submitted as deliverables and shared under folders in Google Docs. This proved to be a very helpful and reliable tool and was easily accessible by delegates around the world. The teams then 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 tool for collaboration among 30 participants from diverse locations globally, the virtual sessions worked well as a means to bring the delegates together prior and facilitate the research prior to the Workshop.

4. Discussion Group Results

During the 2015 IPMC Young Professionals Workshop, the three discussion groups met face-to-face for the first time, finalised the results of their discussions, and presented their findings to the other groups along with several IPMC representatives. The topic re-

ports prepared by the three groups, along with each group's concluding observations and recommendations, are presented below.

Due to the amount of information gathered, this report consists of a detailed but selected compilation of the perspectives, observations and recommendations developed for the Workshop. Additional information including discussion group report materials prepared by the Workshop participants can be obtained using the links provided in Chapter 8 of this Report.

4.1. Topic 1: The Business Case for Mentoring Programmes

Keeping Millennials Working for You Rather than for Your Competitor

4.1.1. Introduction

Mentoring programs have been hailed as an important human resource management strategy, a career tool, and a workplace learning activity in a variety of organisational settings such as hospitals, large corporations, schools, universities and government departments (Ehrich, 1999). There are many definitions for the term "mentoring" (Matthews, 2003), but for the purpose of this report, mentoring is defined as *"A formal and mutually-agreed process by which a more experienced member of the organisation (e.g., company, government agency, etc.) is paired with a less experienced member of that same organisation."* (Matthews, 2003)

Mentoring programs can gradually lead a mentee from an initial stage of dependence and task-oriented learning activities to a stage of increased independence, confidence, and competence. Mentors do not only provide their technical expertise to the mentees, allowing them to reduce their learning curve. They also provide access to their network and greater internal visibility. Mentoring programs have been associated with an increase in job satisfaction, promotion rates, work success, income, and retention rates. These elements contribute to making an organisation more attractive and competitive. The benefits are highly valuable for the space sector, where the industry as a whole has an aging workforce and the need to recruit young professionals is high.

Several organisations in the space sector have created mentoring programs aimed at transferring knowledge from experienced staff to young professionals. This includes not only the technical expertise but also the company values, beliefs, professional contacts, etc. While the benefits of such programs are generally accepted, few analyses exist on the concrete quantitative and qualitative benefits of such programs. As such, this current paper aims at ***providing elements to develop an evidence-based business plan***

that can be proposed to companies thinking of starting a mentoring program for young professionals starting a career in the space sector.

A business plan, built on the *qualitative* findings of the many previous studies and substantiated by *quantitative* results from existing mentoring programs from various industries, can be highly influential in convincing organisations to adopt new programs or even bolster existing ones.

4.1.1.1. Scope

The scope of this document includes identifying and analysing the key benefits of existing mentoring programs. This analysis spans various sectors and both public and private organisations.

The review of existing mentoring programs aims at identifying the rationale and Return on Investment (ROI) for organisations to invest resources into mentoring programs. The section identifies the types of organisations that could benefit from a mentoring program and the form of mentoring that would be most suited for each kind of organisation. Additionally, tangible benefits for a company choosing to run a mentorship program are highlighted.

4.1.1.2. Motivations and Objectives

The motivation behind this report is to quantify the key benefits of mentoring programs for both your professionals and small, medium, and large host space organisations, which:

1. Do not have a mentoring program implemented at all, or;
2. Already have some programs implemented but are seeing limited success from it or simply want to bolster their efforts.

The objective is to identify the business case for a mentoring program, develop the business plan, and derive from the business plan a high level template for mentoring programs suitable for the space industry. A consistent insight into the financial benefits, the cost trade-off, the competitive advantages, and the effectiveness of mentoring programs should convince potentially interested space agencies, companies, and research organisations to invest in them.

4.1.1.3. Methodology

In order to achieve the objectives mentioned, the report:

- Reviews the outputs from IAF working groups from previous years
- Reviews existing mentoring programs within the space industry and other eligible sectors (academia, public, private and international organisations)

- Lists the key benefits of the mentoring programs identified
- Analyses specific case studies with quantifiable results
- Analyses the case study results and the transferability of the lessons learned to other organisations within the space sector
- Proposes a template mentoring program.

4.1.2. Review of Previous Work

4.1.2.1. Observations from Previous YP Workshops

The issue of mentoring programs within private companies, universities, and international organisations within the aerospace sector has been tackled in previous editions of the YP Workshop. Although no business case has been produced to foster the establishment of mentoring programs within such organisations, the previous YP workshops identified some key features of mentoring programs and also surveyed existing programs aimed at training young professionals.

In 2012, one of the working groups addressed the question of “How can mentors help with young professional development and how should such schemes be encouraged within organisations?”. The group indicated that a workforce generational gap exists within the aerospace sector. Mentoring programs help aerospace organisations to fill this gap, by facilitating the transfer of individual and organisational knowledge, encouraging continual learning, and promoting the introduction of new and innovative ideas. It was concluded that while formal mentoring programs are being created by several large organisations, “more often it is through informal or serendipitous opportunities that young professionals are exposed to potential long-term mentors”.

In 2013, one of the working groups surveyed existing mentoring and shadowing programs in different organisations in the space sector. The group highlighted the fact that approximately 10% of the aerospace workforce in the U.S. is currently eligible for retirement and that this number is expected to grow in the coming years. It identified many aerospace organisations with different sizes that have some type of formal mentorship programs aimed at transferring personal and organisational knowledge from senior to junior staff. These programs increase the attractiveness of the organisation to potential employees, accelerate the integration of new staff, and ensure the preservation of internal knowledge. The group considered that mentoring programs have benefits in terms of knowledge transfer and employee retention. 30% of respondents to the survey implemented by the working group declared that the lack of a mentoring relationship had strongly influenced their decision to leave an organisation.

The group identified several mentoring programs according to geographic areas. These include formal programs, such as the NASA FIRST, the Professional Internship program

(PIP) for entry-level NASA engineers, and the NASA Systems Engineering Leadership Development program. Informal mentoring programs were judged to be even more effective than formal programs to achieve knowledge transfer and to retain employees. The working group considered that the informal approach is better suited for smaller organisations, but can also work in large companies/agencies provided they have an established culture of mentorship. Indeed, knowledge transfer and employee development can only occur when a 'culture of mentoring' emerges and is cultivated within organisations.

The 2014 YP workshop had a discussion group focusing on the theme "Starting a Career in Aerospace". The group considered several practices from academia, industry, and government to attract, recruit, and train early career employees. The group pointed out that early career employees in aerospace sometimes suffer from a mismatch between their technical training and the tasks assigned to them. Another discussion group tried to answer the question, "What management approaches could be more efficient to enable collaboration and competition within the organisations to boost performance?". The group identified existing mentoring programs aimed at fostering the development of new employees. These include for instance JAXA, which organises training sessions and interviews with university students as part of their hiring processes and the Australian Government Agency CSIRO, which also has a Young Professional program called CMP. ESA offers internships and the YGT program. Within the industry, Airbus DS sponsors a Graduate program, the VIE program, offering young professionals the opportunity to develop their technical or business skills abroad, and the PROGRESS program, a Professional Graduate Entry Support Scheme.

4.1.2.2. Management Benefits From a Business and Financial Perspective

The following non-exhaustive list includes the identified benefits resulting from mentoring programs:

Branding, Recruitment and Onboarding: Mentoring programs show to potential employees that the organisation invests in their personal and professional success, which helps in attracting the best people. Once recruited, a mentoring program enables new hires to understand the organisation and to adapt to the corporate culture faster, making the onboarding process more efficient. Studies show that the first month of a new hire or new assignment is critical to the overall success of that employee's tenure with the organisation. Mentoring provides a key resource to new employees during this crucial learning phase.

Development of High Potentials and Talents: Mentoring enables employees to reach their full potential in terms of both personal and professional development. Participants

of mentoring programs do not only enhance their main competencies; they also have the opportunity to develop leadership and teamwork skills, their ability to compromise, and their self-awareness. All of these hard and soft skills add value to the organisation and lead to an enhanced ROI per individual.

Employee Retention: Employees thrive at organisations where they see themselves achieving their career goals and receiving the guidance they need to grow. Employees participating in mentoring programs have a higher job satisfaction. Higher job satisfaction leads to increased productivity and reduced turnover. Attrition rates in organisations having mentoring programs are lower than in those that do not. Having low attrition rates translates into lower staff replacement costs.

Employee Productivity: Mentees develop direct, hands-on skills tailored to their individual needs, on a just-in-time basis. As a result, employees are fostered to perform to their highest ability. The reverse process is also important to note, i.e., the mentor can be exposed to newer problem-solving paradigms by the mentee.

Knowledge Sharing and Succession Planning: The knowledge retained in individuals is one of the most valuable assets of an organisation. When individuals leave, this valuable information may leave with them. Mentoring programs allow and encourage employees to share knowledge and skills. This is an effective mechanism for grooming employees to fill key roles as part of the organisation's succession plan.

Performance and Employee Engagement: Companies benefit from mentoring programs through better educated, trained, and engaged employees. Mentors can help protégés to shorten a learning curve by teaching specific job skills or prevent missteps by sharing lessons learned. Mentors can also boost career development by providing feedback and encouragement. A mentee can spark a mentor's creativity or re-energise her career by discussing new ideas, sharing contacts, or exploring new technologies or programs together.

Diversity and Inclusion: A diverse workforce is required to stimulate innovation, cultivate creativity, and steer business strategies. Mentoring empowers a diverse range of employees to share their opinions, ideas, knowledge, and experiences by creating an environment of trust, belonging and support for a diverse workforce. The effects of diversity mentoring help corporations differentiate themselves from their competition and gain new clients while providing long-term support for their employees.

4.1.2.3. Can mentoring programs provide a competitive edge?

Mentoring for leadership development can become a point of competition. A lack of leaders means organisational directionless-ness and eventual failure. Cutting talent and leadership development out of the budget is a fear-driven move that will curtail any organisation's ability to compete in the long run (Insala, 2014).

From an organisational perspective, the current millennial generation of employees presents serious challenges. The culture of 'job-hopping' and high demands for their workplace leads to reduced retention rates compared to employees from earlier generations. This makes the positive effects of mentoring to retain employees even more important, since mentoring can minimise the risk of having a competitor benefitting from the investments made in the employee's development. Getting access to the best fresh professionals and maintaining an organisation's knowledge base can make the difference for the introduction of new technologies, new policies, or simply a new point of view. This counteracts the trend for stagnation and inflexibility of organisations.

4.1.3. Analysis of Mentoring programs

This section builds on the case studies conducted in the frame of the YP workshop research. The link to the work group reports on concrete examples of mentoring programs and trends in mentoring programs can be obtained in chapter 8, annex B. The case studies quantify various factors of mentoring programs implemented by various industries.

4.1.3.1. Formal vs. Informal Mentoring programs

Although establishing a formal definition for mentoring is not an easy task, there are mainly two different approaches when it comes to mentoring. Their trade-offs can be categorised accordingly:

- The **Formal** approach consists of a company or institution establishing a structured and "formal facilitated process that can be managed or monitored" (Namin-Hedayati, 2013). "The formal mentoring process would pair a newly recruited employee with a more experienced staff, with the intention to share his/her skills, knowledge and experience ... Ideally, pairing a manager (mentee) with a supervisor (mentor) would help this promotional strategy in the form of making mentoring work most effectively" (Namin-Hedayati, 2013).

The main advantage of a process-based mentoring program is that it benefits companies in the long run by reducing the cost of off-site training of employees and future managers (Clutterbuck, 2004, p. 31).

Formal mentoring relationships allow the early career employees to acquire more insights into the company's management process early on. In return, mentors have an opportunity to identify highly talented professionals early on in their careers, and to put them on the right track to a leadership position within the company in a shorter period of time.

- The **Casual or Informal** approach takes away the formal structure and process involved in the formal mentoring concept (e.g., the pairing does not need to occur at the corporate, HR-level). The mentor/mentee relationship evolves with time, and either or both sides control its pace, although it tends to be led by the mentor in the majority of cases. Informal mentoring can be found in multiple forms including:
 - A pairing of peers or a 'buddy' arrangement for either mutual support at the school or college level: in this case, the mentoring relationship tends to be based on a win-win approach, where both parts share their strengths and sharpen each other.
 - A pairing between professionals early in their careers in industry, and interns or fresh-out-of-college employees: in this particular case, the mentee gets the opportunity to have a go-to 'buddy' in a brand new environment for technical questions as applicable but also for social integration into the company.
 - A pairing between early-career professionals and more senior professionals: this case is observed when a more senior employer takes a junior one under 'his wings' to pass on technical knowledge and good working habits.

With regard to the mentee, when the mentoring relationship is not restricted to hands-on experience and technical field pairing, the benefits of increased social inclusion outweigh the benefits of increased technical knowledge because the mentee gets more exposure to the culture of the company. This promotes a better understanding of the philosophy and mission of the company, which in turn can increase the retention rate of young professionals that has been shown to decrease dramatically with millennial employees. "In fact, 91% of Millennials expect to stay in a job less than 3 years (Forbes), while the cost of replacing a Millennial employee ranges from 15 000 to 20 000 USD (Millennial Branding)." (Jenkins, 2015)

To summarise, whether formal or informal, mentoring leaves both mentor and mentee with a substantial win-win trade-off (Lewis, 2000, p. 10), as long as both parties are well briefed on how the relationship may develop (Clutterbuck, 2004, p. 117). Mentors get the experience to grow into better managers in the short or long term. If the mentoring relationship is based on hands-on experience, mentees get faster acquainted to their new positions and responsibilities. When the relationship is not limited to hands-on experience, the main advantage is an increase in networking opportunities in general, as

well as an increase in the social integration of the employee into the company's culture. Companies also benefit from the mentoring relationship. By trading off a small 'chunk' of working hours to support training for mentors and mentor/mentee meeting times, companies get in exchange: lower costs for classes and training of newer employees and rising managers, as well as an increased integration of new employees into the company's mission statement and culture, which in turn can contribute to higher retention rates.

4.1.3.2. How to Calculate Cost-Benefit and Return on Investment

Cost-Benefit Analysis (CBA) and Return on Investment (ROI) are powerful tools for measuring the viability and effectiveness of a mentoring program.

CBA estimates if the benefits outweigh the actual costs of the actions taken, considering one-shot or on-going costs and long-term benefits not realised immediately. Closely related, but slightly different, the ROI relates the amount of the benefits to the amount of the costs.

The benefits gained from investing in mentoring programs have been explored in Appendix A. Among the costs of mentoring programs, the following can be considered:

- The time spent mentoring or being mentored and not performing other duties
- Any specialised training provided for the mentors/mentees
- Logistical costs of facilities, travel (if appropriate), allowances, etc.
- Administrative costs of scheduling and/or use materials to support the process
- Any other costs associated with not performing the training internally but externally, such as fees of external coaches

To conclude, a mentoring program can be considered as an investment. Hence, as most investments, it is meant to produce a return. In this respect, research has demonstrated a positive correlation between the implementation of successful mentoring programs and corporate results. Consequently, we may infer that by not implementing such programs, many organisations are not maximising their return on the human capital employed. In other words, talent is under-utilised, thus compromising the financial performance of the organisation.

4.1.4. Building a Mentoring program

4.1.4.1. Industry Analysis

The group of organisations involved in space activities as a whole is a diverse mixture of players, largely composed out of space agencies, technical and consultant industry, associations and professional societies, research and development centres, and univer-

sities and outreach centres (e.g., museums). As an example, for the 280 members of the International Astronautical Federation (as of August 2015), the breakdown of those organisations leads to a share of 50% for the space agencies and space industry; 30% for the R&D institutes, universities, and educational outreach centres; and 20% for the remaining group of associations and societies. From a mentoring perspective, organisations belonging to all three groups can benefit from one or more mentoring techniques described in previous chapters.

Many of the large (1000+ employees) industrial and governmental organisations, including agencies and universities, have some form of mentorship program in place, often of the informal type. Also smaller research institutes have mentorship programs in place, mostly under the form of a formal internship program, which does not necessarily lead to continued employment in the same organisation afterwards. Mentorship programs are a rare occurrence for associations and societies, due to their organisational setup, apart from occasional internships.

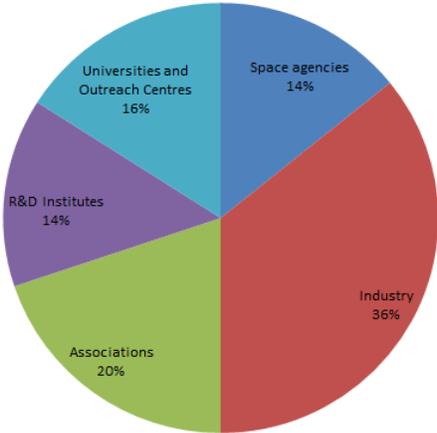


Figure 1: Breakdown of IAF member organisations by type

Given the different size, goals, and organisational structures of players in the space sector, designing a mentoring program that fits everyone is not opportune. However, issues such as knowledge retention and attracting suitable staff are the same for all organisations from the largest satellite integrators to small volunteer-based companies. Therefore, it is within the IAF's mandate to promote and to foster cooperation to exchange lessons learned on mentoring programs among its members. To reach this goal, a template mentoring program can be envisage with options to tune to the specific needs of each organisation.

4.1.4.2. Identifying a Business Plan for a Mentoring program

The effectiveness of mentoring programs depends on their adequate design, planning, management, execution, and evaluation. A business plan is a valuable tool to articulate such key aspects. The following section provides an overview of the various aspects to be taken into consideration when developing a mentoring business plan. The information contained in this business plan can be tailored to each organisation’s needs and can be strategically aligned with the organisation’s core values and mission. Each section of the business plan contains examples gathered from our research and case studies. The various components of the mentoring business plan have been grouped in the three areas below (additional research information included in workshop group final report and can be consulted via WOC).

Design and Planning	Management and Operations	Evaluation
<ul style="list-style-type: none"> ● Overall Purpose ● Goals and expected outcome ● Target population ● Type of mentoring ● Nature ● Resource requirements ● Promotion and Communication 	<ul style="list-style-type: none"> ● Matching mentors-mentees ● Orientation and Training ● Development plans (Integration). ● Monitoring 	<ul style="list-style-type: none"> ● Measuring success according to goals and expectations ● Follow-up

Table 1: Mentoring plan template used to development business plan

4.1.5. Conclusions

This section of the YP Workshop final report has explored the benefits of mentoring programs. It has built on the previous YP Workshop output on mentoring programs and provided **quantitative** evidence on the benefits that have been defined **qualitatively**. It has quantified the monetary and resource investment put into mentoring programs. In addition, it has looked at the success metrics and benefits provided by these investments, such as retention/attrition rates, annual promotion rates, job satisfaction, etc. The report went further to provide a way to perform a CBA and calculate ROI.

The last chapter was used to identify key elements in setting up a template for a mentoring program. It is not possible to have one template that fits all space organisations. The proposed approach is to take the proposed template and tailor it to the organisation's needs. Each organisation has to consider the quantitative data provided in this report and build or improve their mentoring program accordingly. From this, the business plan will have to be developed on a case-by-case basis.

The IAF can develop this further next year by taking the proposed template and going to companies within the aerospace industry to develop the details. If an organisation does not have a mentoring program, then it would be interesting to fill in the template with their requirements. If the organisation already has one, then the focus can shift more towards the evaluation part in order to assess how well the mentoring program has done.

In summary, the benefits of mentoring programs are demonstrated given the amount of quantitative data and valuable sources identified in the report and within the reference section. The key is to tailor the program to the organisation's needs.

4.2. Topic 2: Aerospace Decision Factors for Young Professionals

4.2.1 Introduction

To determine the factors that drive young professionals to work and develop themselves in the fascinating realm of the aerospace industry, this discussion group focused on every characteristic associated with it: passion, dedication, and excellence.

In the next paragraphs, objectives are presented that are planned to achieve by completing the report and an analysis is presented by reviewing the types of young professionals who choose a career in aerospace. To collect the data needed for this topic the discussion group has conducted in-depth interviews, surveys, and the analysis of survey results, introducing and diving deeply into these data.

4.2.2 Objectives

The first objective was to provide young professionals and employers with an understanding of the key decision factors that lead young professionals to pursue a career in aerospace. At the same time, the goals were to provide insight into present-day opportunities, benefits, and expectations in this sector. The second objective was to present findings that encourage young women professionals to join the aerospace sector; currently, women are underrepresented in this sector. Finally, the third objective was to

bring young people into the Science, Technology, Engineering, and Mathematics (STEM) disciplines to be able to compete in an emerging global economy and participate in a multi-national aerospace sector. The overarching objective of this topic builds upon previous literature by conducting surveys and interviews and presenting findings and recommendations from these data collection instruments.

4.2.3 Review of Previous Work

4.2.3.1. Conclusion

The aerospace industry faces key questions with respect to its young professionals and the future generation of talent. However, current literature that addresses these questions is often geographically limited (e.g., United States) and, at times, highlights issues without identifying the causes. Whereas a review of the literature demonstrates a U.S.-centric focus among aerospace and young professionals, the Universum study (5) shows that, although Millennials are more globally minded than previous generations, they are not a homogeneous group. There is no one-size-fits-all solution to attracting and retaining aerospace talent worldwide. Although aerospace companies can be nationally or regionally specific (e.g., European), companies must be aware of what is important to young professionals in their area, and must consider regional differences when operating internationally. Current literature does not specifically provide this information from a global standpoint. In addition, current literature identifies a number of issues facing the aerospace industry with respect to its young talent, including a high attrition rate of young professionals, particularly high attrition rates of female and minority employees that may not specifically identify the principal causes. These issues raise a number of questions: What leads young professionals to leave aerospace within five years of entering the industry? What are the factors that lead to women and minorities exiting the aerospace sector?

These considerations have led to the conclusion that a short, widely distributed survey on the key topics identified during this literature search can produce a more international and quantitative response as it pertains to key decision factors for aerospace young professionals entering or exiting the aerospace industry. Table 1 is derived from the results of the literature review, linking categories of young professionals to applicable issues, potential causes of these issues, and questions that can help quantify the importance of the decision factors linked to the issues.

Table 1. Results of Literature Survey

Category	Issue	Potential Causes	Decision Factors (Questions)
Group 1: Aerospace Students	Small percentage of people who pursue aerospace degrees	Lack of career information and role models, leading students not to choose a STEM field	<p>→ When did students first develop an interest in aerospace?</p> <p>→ Do they follow the media coverage of aerospace events launches (e.g., Ariane 5, Atlas V, or Falcon 9)?</p> <p>→ Are they aware of how aerospace careers places with respect to other information technology industries in terms of salary?</p>
	High dropout rate of people who pursue aerospace degrees	Lack of “hands-on” training during degrees lead STEM students to lose interest	<p>→ Can students name five aerospace companies?</p> <p>→ Can they name five aerospace job titles?</p> <p>→ Have they had contact with aerospace employers through their degree course?</p>
		Women and minorities, underrepresented in STEM, more likely to drop out	<p>→ Can students name a female or minority aerospace professional?</p> <p>→ How much would they agree with the statement, “Aerospace is a good career prospect, especially for women”?</p>

Group 2: Aerospace Young Grad- uates	Choice to work in aero- space or oth- er STEM field	Aerospace is attrac- tive but so is the in- formation technolo- gy field	<ul style="list-style-type: none"> → How did they find out about their current employer? → What are the top three attributes of an aerospace job? → What are the top three attributes of a career in information technology? → If the respondent has a non-STEM degree, why did they choose to work in aerospace?
		Current generation interested in job sat- isfaction, work-life balance, etc.	<ul style="list-style-type: none"> → What are the top three factors for which they are looking in their first job? → How does aerospace rate on these factors? → How does information technology rate on these factors?
Group 3: Aerospace Young Pro- fessionals	High volun- tary depar- ture rate of young pro- fessionals	Millennials are more flexible and mobile than previous gen- erations, willing to change jobs and leave a sector if they are dissatisfied	<ul style="list-style-type: none"> → What are their top three satisfac- tions/dissatisfactions with their current role? → Would they consider leaving aero- space, if so for which sector? → Do they feel the “lived” experience of the company is in line with its ex- ternal image? → Do they manage to keep a good work-life balance? → Do they feel that they spend enough time with friends and family?

		Fast career progression is expected, frustration with overly static organisations, lack of new challenges	<p>→ How do they rate their organisation on a static-dynamic scale?</p> <p>→ How happy are they with their career progression compared to expectations?</p> <p>→ Would they agree with statements, such as “I lack the recognition I feel I deserve for the role I perform”?</p> <p>→ How would they rate their direct superior for things such as “Technical knowledge”, “People management”, “Understanding how to get the best work out of me”?</p>
	High departure rate of women and minorities	Women may struggle in masculine environments	<p>→ How have careers developed towards more managerial/project roles? Remained technical?</p> <p>→ How do they feel about the gender and ethnic mix within the company?</p> <p>→ Does it have an impact on their work?</p>
Group 4: Aerospace Employer	Need to ensure largest possible “talent pool”	Need to be present at an early age to attract talent and keep students	<p>→ How do companies reach out to students?</p> <p>→ Which means of communication do they focus on?</p> <p>→ Do they have partnerships with universities?</p> <p>→ Do they have programs, such as internships, specifically for students?</p>

	Need to attract the best talent	Recruitment practices need to be more holistic - presentation of the company and colleagues, job offer needs to be more than a salary	<p>→ What do they look for in potential new-hires? People with previous work/aerospace experience?</p> <p>→ How long does the recruitment process take - how many interviews? How much time spent in interviewing candidates?</p> <p>→ Do they feel they need to differentiate themselves from other employers?</p> <p>→ If so, how do they do this?</p> <p>→ Do they work to project a brand image of their company?</p>
	Need to maintain and develop young professionals	Career development	<p>→ What are the top three strengths/shortcomings of current young professionals?</p> <p>→ Do they have an active programme in place for young professionals career development?</p> <p>→ Do they consider there is an issue with young professionals leaving their company, or the industry in general?</p> <p>→ What are the reasons they think that young professionals leave?</p>

4.2.4. In-depth Interviews

The in-person or remote interviews were conducted during the data collection process. The target audiences were people from each identified group in Table 1. Two people from each group were selected to obtain qualitative, in-depth answers to the highlighted topics.

4.2.4.1 Synthesis

The outline of questions asked to Groups 1, 2, and 3, can be reviewed in chapter 8, Annex B. An outline of questions for Group 4 is available in Annex C. The full transcript of in-person and remote interviews is available in Annex D.

4.2.4.2. Conclusions

This section provides an overview of responses collected from our interviews.

Group 1 – Students

- Interest in aerospace can start from a young age: “rockets as cool machines,” but also other interests.
- Choice of an aerospace degree can be limited by availability/locations of courses, interests of course leaders/research principles.
- “Take it or leave it” attitude can remain in studies and when thinking about a career. Students are open to switch if “subject matter is more compelling.” “Aerospace gives jobs an edge, but it isn’t the be-all-end-all.” Some respondents were “not so interested in aerospace to say for sure that’s what you want to do in the next 50 years.”
- Other industries had the perceived potential to be more attractive than aerospace for “pay, location, people, control over project.”
- Prospects of aerospace seen to be healthy; space particularly is seen as a slow-growth industry with a high average employee age; this is also an opportunity - “most current space employees are old so they will need replacements”
- The lack of diversity in this sector is recognized: “White or Asian; mostly male.”

Group 2 – Young Graduates

- External events in the late 1990s influenced interest in the subject.
- The place of study was influenced by available courses.
- Interest in space drives the choice to work in aerospace, although something like the broader aeronautical sector or renewable energy may be considered for their convenience.
- Dissatisfaction that their current job is not building on previous experience. Many of the roles and skills needed in aerospace are not being taught at university.

- Members of this group have a positive outlook on the growth in the aerospace sector; however, they are also realistic about spending their entire career in aerospace: “A whole career is long.”

Group 3 – Young Professionals

- Personal and family interest in the subject are drivers to study aerospace.
- Choice of university is influenced by the potential for international collaborations.
- Interest and “prestige” of an aerospace project are the main drivers for accepting roles; technical, hands-on aspects but also international collaboration, large working perimeter.
- Salary package, working environment, personal constraints are also considered.
- Lack of interesting jobs in the domain of interest, limited locations, frustration due to a perceived slow career advancement, including lack of responsibilities and gaps between “process and reality,” can lead to young professionals leaving aerospace
- Satisfactory career progression achieved through changing roles and between companies; however, young professionals can feel “lost” in large companies and institutions.
- No overt discrimination against women was noticed though a number of small elements indicate that aerospace is still geared towards men: aerospace is not representative of society from a demographic standpoint.
- Positive outlook on the sector, but it needs to go out and attract the next generation.

Group 4 – Aerospace Employers

The two interviewees from Group 4 came from very different company backgrounds, a European agency and a start-up. It was very interesting to directly compare their responses, this is presented in a table in Annex E, an excerpt is presented below.

Category	European Space Agency	Swiss Space Systems
Recruitment - Requested Attributes	Technical skills along with interpersonal relationships and ability to work in a multicultural environment	Engineers that can work with uncertainty (many have only worked on established programmes), fluency in English and Python
Specificity of company	Candidates have to understand that ESA handles projects and programmes, not really hand-on	The particularity of S3 is well recognised by candidates - "usually it is because we offer something a bit different in the aerospace sector in the EU that candidates want to work for us".
Career development	"Individual Development Process" is currently being put in place	No specific programme but periodic evaluation and mentoring

Table 2. Excerpt of Aerospace Employers Interviews

4.2.5. Decision Factors for Young Professionals: Survey

The study approach, survey tools, surveyed population, and more are described in Annex F. Two surveys, both derived from Table 1, were prepared. Survey 1, distributed to Groups 1, 2, and 3 (Aerospace students, graduates and young professionals), is available in Annex G. Survey 2, distributed to Group 4 (Aerospace employers), is available in Annex H. Both surveys were distributed via the private networks of the group members.

4.2.6. Survey Results

4.2.6.1. General Presentation of the Results

As this survey was conducted as a test group and only represents a fraction of the total number of people active within the aerospace field, it cannot be considered statistically representative. A majority of participants were located in Western Europe with the distribution between target groups heavily weighted towards young professionals. This survey provides interesting indications of decision factors on why young professionals enter or exit the aerospace industry. A larger-scale study may provide a more in-depth view of the results of this small-scale study. One example of this is perceived attributes of the industry. As shown in paragraph 4.6.1.2, the three groups of survey 1 see "challenge", "project variety", and "excitement" as favourable attributes associated with the aerospace industry compared to other sectors. These three attributes are also seen as the major underlying reasons of working within aerospace or (in the case for students) for studying aerospace.

Survey 2 targeted aerospace companies. This survey had the smallest number of participants. Surveys were collected anonymously, and only few conclusions can be drawn

from these results. Because of the nature of the subjects in these groups, namely large- and small-scale companies, it becomes difficult to have a significant number of participants in order to draw any statistically sound conclusions. A second issue was that there was a substantial difference between the needs of a multinational corporation relative to a small consulting firm. Whereas a smaller company can be seen as a singular entity in the market, large-scale companies have widespread demand with multiple recruitment needs in several countries. One approach might be to weight each company participating in any survey based on their number of employees or to treat local offices as separate participants.

4.2.6.2. Detailed Analysis of the Results

The analysis of the survey results are detailed in Annex I, the full results are available in Annex J. A short summary of what is considered to be the most interesting findings are given below:

- Recent graduates
 - Motivations for joining aerospace are challenge, project variety and excitement
 - Top 3 satisfactions for non-aerospace employees: Salary, work environment/culture and challenge.
- Young professionals
 - Motivations for working in aerospace are challenge, project variety and sense of contribution
 - Reasons for leaving aerospace: salary, leadership opportunities, work environment/culture.

4.2.6.3. Proposal for Survey Continuation

Within the time and resource constraints leading up to the IPMC YP workshop, the discussion group have researched question topics, created and distributed an online survey, analysed the results and presented our findings in this paper. The proposed survey to be distributed will be prepared after the YP workshop, in order to take into account the comments and discussions of the workshop and follow up discussion with IPMC delegates. Annex K includes our “Proposal for Survey Continuation.”

4.2.7. Conclusions and Recommendations

The work performed within this topic has shown that interest in space can be catalysed by role models, whether they be friends, family, or teachers. Moreover, interest in this field can be driven by specific events. However, the subject, research, and job itself, must be engaging and compelling. Other industries (e.g., information technology, broader aeronautics, robotics, renewable energy, etc.) are also of interest. Space is at-

tractive by the very nature of its work but passion for the subject can be overturned if companies from other industries offer better location, pay, projects, or simple convenience. Based on the findings of this work, a map was developed of the decision factors for young professionals in aerospace. See Figure 1.

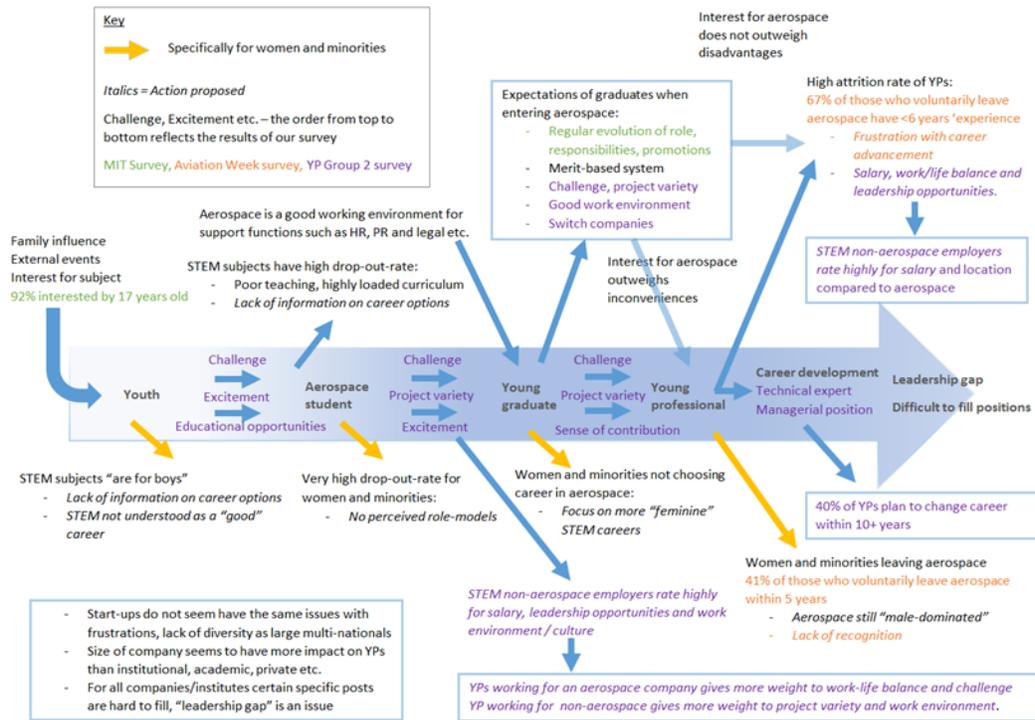


Figure 1. Map of Decision Factors for Young Professionals in Aerospace

From this schematic the following recommendations can be derived:

Proposed Actions

In Italics are questions that could be asked in the proposed survey continuation.

1. Interest in aerospace aroused early
 - a. Check by what age aerospace students and professionals became interested in aerospace
 - b. Check which are the most effective means of arousing interest
2. Lack of information on career options:
 - a. Check which channels are most effective, e.g., career fairs

- b. Implication in schools and universities to present the breadth of possible careers in aerospace, specifically for women and minorities.
 - Presenting aerospace is “good” career in terms of small wage gap etc. compared to “feminine” subjects such as biology
 - Linked to points 2.c and 3.a
 - c. Investigate ways of presenting “hands-on” work at university:
 - Organise industry/institution/laboratory visits for students
 - Offer guest lecturers with hands-on experience to universities
 - Offer more “hands-on” internships, e.g., satellite AIT
3. No perceived role-models for women and minorities
- a. Improve and increase communication on women and minorities in aerospace, e.g.:
 - Continue and improve social media presence of female and minority astronauts
 - Compile a list of female and minority experts for media interventions
 - Interventions in schools and universities to always include at least one female and/or minority staff member
4. High dropout rate of young professionals
- a. *Understand the key factors e.g., Salary - but linked to global satisfaction? Start-ups vs. Multinationals? Academia vs. industry?*
 - b. Investigate mentoring and career development programs for young professionals
 - See Group 1’s work on “The Business Case for Mentoring Programs” for more information on the key benefits of existing mentoring programs and the presentation of a mentoring program template, as well the 2013 IAF-IPMC Young Professionals Workshop Report (Please see Chapter 8, below.)
5. High dropout rate of women and minorities
- a. *Understand the key factors*

- b. Training on “natural bias”, specifically for interview panels and hierarchy
 - c. Supporting young professionals and female groups within the organisation
6. Updated survey to be sent out via IMPC contacts to reach extended survey group.

4.3. Topic 3: Rapid Engagement and Accelerated Learning

What can be done to quickly, effectively, and fully engage the new workforce and accelerate the learning process of Young Professionals in the space sector?

4.3.1. Introduction

Young professionals in today’s aerospace workforce tend to be vocal, driven and often very eager to achieve success and take their place as valuable members of their organisation’s team. The employers of these young professionals are also taking a fresh approach to integrating recently hired employees. Most space organisations face challenges maintaining critical skills and knowledge as older, highly experienced employees prepare to retire. Many of these organisations are expressing interest in new, innovative approaches to the training of early career employees.

The main question addressed by this discussion group was: **“What can be done to quickly, effectively, and fully engage the new workforce and accelerate the learning process of Young Professionals in the space sector?”**

While current young professionals in space organisations are the main focus of this project, the discussion group believes that successfully engaging and supporting the learning of young professionals must not occur in isolation but rather in strong collaboration with other key workforce groups – experienced professionals and students as part of the future workforce. The topic addresses the following specific areas:

- Enabling effective collaboration channels between experienced and young professionals, based on common interests, in order to facilitate the retention and transfer of lifelong experience to new employees;
- Bringing young professionals up to speed;
- Increasing the number of young professionals that have sufficient skills and relevant training to work in the space industry to compensate the wave of retirements.

The discussion group believes that the success of their proposals is dependent on the following environmental factors:

- Management support: Many times, Employee Engagement and Learning & Development projects have a long-term return on investment (ROI) focus the calculation of which can be difficult since there are many intangible benefits and indirect impacts associated with organisation key performance indicators. Management vision and attention to qualitative benefits are as important as pure ROI focus for the success of these projects;
- Cultural compatibility: Projects in general require a certain match between their content and approach and the broader organisational environment, but employee engagement and development initiatives are even more sensitive to external factors. A highly hierarchical, silo organisation, for example, will, from the start, limit career development opportunities, which involve rotation. In a similar way, the organisation's appetite for change and flexibility [e.g., flexible hours, work from home] will propel or weaken these projects;
- Alignment to global trends: Specifically, to those trends which transcend the work-life barrier, like use of new technology, e.g. social media. As examples, effectively embedding platforms such as Yammer or LinkedIn or utilizing crowd-sourcing and gaming environments have been shown to significantly impact the success rate of engagement and development related projects.

4.3.2. Approach

The present work is focused upon two questions, that the discussion group believe are at the core of identifying the right initiatives to engage young professionals and accelerate their development:

- What are the “game changers” in order to enable Rapid Engagement and Accelerated Learning [REAL] in the current work environment or young professionals?
- What are the common values young professionals share with their experienced peers or with students in the field of aerospace that can bridge the collaboration and enhance the sharing of experiences?

4.3.2.1. REAL ‘game changers’

When looking at a young professional's journey in the organisation, one can start from the role they have been assigned to and identify the requirements that need to be met in order for them in order to perform at “meets expectation” (or “exceeds expectation”) in their role. Early on, recommendations should be proposed for fulfilling these requirements from the perspective of:

- Knowledge needed – which further splits into organisational specific actions and themes (e.g., vision, mission, values, decision-making framework, who's who, etc.)

- Skills needed - which are further defined into hard/technical skills and soft/ social skills
- Experiences needed – which ensure either that the role related events/ situations will not be the first time the young professionals have had that experience or that past experiences have helped build the maturity to be able to face new situations effectively.

Out of this, the top two ‘game changers’ that are believed to have the highest impact on REAL, are organisational knowledge and experiences (not skills), as in the figure below.

EXAMPLE		Knowledge	Maturity	
Role	Requirements for role performance	Knowledge needed	Skills needed	Experiences needed
Project Manager	<ul style="list-style-type: none"> • ... • ... 	<p>Organization related:</p> <ul style="list-style-type: none"> - vision, mission and values - How decisions are made in the organization - Who's who in the org <p>Role related:</p> <ul style="list-style-type: none"> -.... -.... 	<ul style="list-style-type: none"> • Decision making • Dilemma/ Problem/ risks identification & solving • Conflict & escalation management • Effective communication & constructive feedback sharing • Dealing with multiple stakeholders with potentially conflicting expectations • Foster team-work and collaboration • Presentation skills • Analytical skills 	<ul style="list-style-type: none"> • Decision making – why are decisions made in a certain way? • Solve a dilemma [VUCA] • Failure • Networking [who's who] • Confidence

Figure 1: Example of requirements for a project manager

4.3.2.2. Bridges between young professionals (YP), experienced professionals (EP), and future professionals (FP)

While the focus of this topic is oriented towards young professionals, engagement and learning cannot happen in isolation. Peers must be sought in the environment of the aerospace organisations, in order to identify and leverage those experiences and relationships – the two most impactful learning channels for young professionals. As such, the common values around which these three core groups rally are PASSION, BIG DREAMS and DEDICATION.

Examples of bridging relationships that can be successfully pursued among the three groups are shown in Figure 2 below.

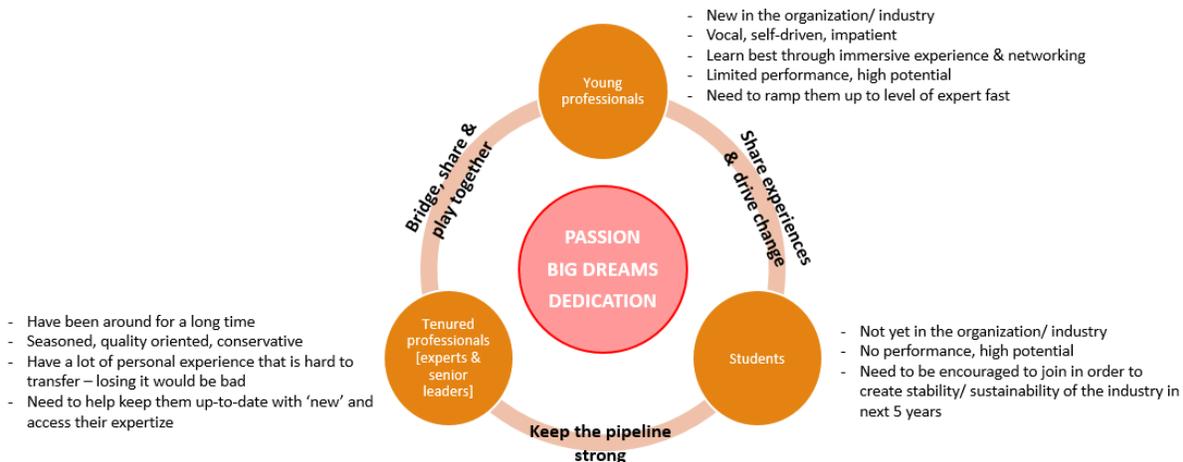


Figure 2: Bridges between Young Professionals (YP), Experienced Professionals (EP) and Future Professionals (FP)

4.3.3. REAL project proposals

The six project proposals shown in Figure 3 below were identified during a series of topic 3 discussion group brainstorming sessions. They are classified according to the nature of the relationship they involve. These proposals will be discussed individually in the following sections of this report.

	Bridge, share & play together	Share experiences & drive change	Keep the pipeline strong
Direct & hands-on experiences	1 ‘Book of success’	4	5 Online game
Networking	2 121 Learning partnerships	Projects/ Innovation incubator	6 Awareness campaign
	3 ‘World Café’ sessions		

Figure 3: REAL Discussion Group Project Proposals

4.3.3.1. Book of Success

The Book of Success is the answer to “everything YP’s ever wanted to know without daring to ask”. This book is a “welcome guide”, based on the experiences that the EP’s

acquired in the organisation. It aims to be an open source of information, collecting the knowledge from experts by capturing their feedback from live sessions on what is currently working or not and providing relevant advice to deal successfully with potential challenges.

These good practices and lessons learned are transferred to the YP's after their arrival into the organisation in order for them:

- First: to orient themselves to the content and learn to use it as an efficient Start-up Kit to ramp-up quickly within their new environment,
- Second: to start contributing to the continuous update of the book, using it as an effective tool for developing skills and create rapid engagement in facing challenges,
- Third: to enhance the book with their own experiences with new lessons learned for the future YPs newcomers.

As a starting point in the elaboration of the Book of Success, the list of topics will be compiled from surveys organized with several EP's, asking for their inputs about the content of what would be useful to share, as:

- The way of doing things in the organisation, e.g., life in the organisation and the organisational culture, values, missions and vision, who is who, basic administrative procedures;
- Internal processes related to technical activities, e.g., meeting management, project reviews, space standards, procurement;
- Interaction with external entities/bodies/institutions;
- Integration in the local community of the surrounding area or country.

The implementation is planned to occur over one year in creating the book, not including the continuous improvement that will be made to it afterwards. It would involve three to four people with different responsibilities, such as book leader for the overall organisation and coordination of the book, book initiator for the giving inputs on the content, book creator for writing, and event organiser to organise live sessions around the book. Upon completion of each chapter as per the agreed topics, the content will be summarized into an e-book format and made available to young professionals online. Additionally, contributions to the book's elaboration and continuous improvement will be awarded as a motivator for YP's and EP's.

4.3.3.2. Learning partnerships

Learning partnerships represent a new version of the traditional relationship of mentor-mentee, updated to include the idea of EPs learning from YP's.

Based on the concept of 'speed work dating,' a YP is paired up with a volunteer EP for three months, during which they teach each other topics of mutual interest. Some examples for topics that could be explored during such partnership include:

- YP expertise: social networks, innovative technology, new software and applications;
- EP expertise: corporate knowledge, project management, systems engineering.

The partnership involves relationships between equals, which means that in the learning sessions the teaching time is equally divided between the two participants.

After three months, the learning partner changes. The idea is to keep rotating partners to increase the exposure to topics and help YP's increase their network.

The advantages for the organisation and the YP and EP involved include:

- Exposure to topics of interest and practical ways in which they are handled by experts;
- Team building through networking and relationship building inside the organisation;
- Reinforcement of organizational culture;

An implementation plan to pursue this concept might take into account the observations and recommendations shown above in the Topic One discussion of Mentoring.

4.3.3.3. World Café sessions

The 'World Café' concept can be utilized in order to bring together experienced professionals and young professionals from different departments of an organisation (or different organizations sharing common interests) and have the EPs, and the YPs, share their experiences and success/ failure stories in a context that focuses on learning.

This World Café sessions concept can contribute to the rapid ramp-up of YP's through discussions that expose them to real-life challenges and to how experienced colleagues handled them. Such sessions can also provide opportunities to build relationships within and among participating organizations.

World Café sessions can also provide opportunities for storytelling, an activity that both the teller and the audience find gratifying. This can strengthen the cohesion of employees and can be seen as a team-building activity.

4.3.3.4. Projects Incubator

In this concept teams of YP are given specific, practical assignments to solve in three months using hands-on and project management experiences. The agency or company then provides the infrastructure, including an open innovation platform, website, collaboration tools and specifies the governance model.

The projects incubator can be implemented according to the following steps:

1. Collect Challenges: the organisation identifies issues to be solved from on-going projects, R&D departments, headquarters. The organisation can request ideas through an internal web-based open innovation platform. This platform can be designed based on the idea of OpenIDEO and the NASA International Space Apps Challenge
2. Publish challenges on the platform.
3. Establish teams of YP's based on their interests and expertise on the platform.
4. The YP team creates a concept and proposes the idea to the person or department (issue owner) who provided the challenge and to other employees in organisation on the platform. If the issue owner accepts the idea, the YP team receives support for prototyping.
5. YP Team creates the prototype and tests it in the real job environment.
6. Based on the prototype and test results, the YP team presents its results to the management of the organisation. Executives judge the solutions and implement them.

The added value of the projects incubator for YPs is a real project experience in safe environment for three months. YPs can think, plan, and act by themselves. They may in some cases experience failure. They can also have the chance to get funding and execute the project.

Organisations have the possibility to address specific problems which otherwise might not be turned into projects. The project incubator can generate ideas and encourage innovation from YPs.

4.3.3.5. STEM Awareness Campaign

Recognizing that STEM activities are already underway in most of the major space-faring countries, the Discussion Group participants believe that expanded STEM awareness activities are needed to encourage young people to pursue careers in space. Such activities might include:

- *Social media engagement* – Unique and memorable 'hash tags' that can be used to identify space engagement opportunities
- *Space brand* – Focus on the value and popularity of space 'brands', especially those of space agencies and large companies.
- *Space events* -- Outreach events can be planned around the releases of major movies, TV shows, etc.

4.3.3.6. Gamification

Usually described as “the application of game elements to non-game contexts” (Knewton and Technology Advice), gamification in simpler terms describes applying the features that we enjoy about games to ordinary, everyday tasks. Gamification can thus encourage participation in specific tasks/activities through leveraging our love of competition and reward by offering participants instant, positive feedback that quickly “links smaller tasks to larger goals.” (Technology Advice)

The Discussion Group considered two approaches to implementing Gamification:

1. One approach could involve a short-term, national strategy that makes use of games that are already available. The Kerbal Space Program game is a current example of the type of game that allows players to build spacecraft and fly them, take on new missions and research new technologies, and excitingly, discover the universe.
2. Another approach could involve a longer-term, international strategy that makes use of a newly developed game. The ideal outcome of this phase is the development of a game that connects young space enthusiasts with their peers around the world. This game would be mobile and ideally linked to a social media platform making it free and playable online (no downloading required).

The value of gamification, for both the students/future young professionals as well as the space organisations investing in them, is numerous. For the students there is the overt benefit of learning about space and its various related subject matter and career opportunities, which in turn may inspire passion and interest in pursuing a career in the industry. These games teach future young professionals important skills that will prove invaluable to their future careers and potential to be successful in the industry such as problem solving, calculated decision-making (strategic thinking and risk analysis), team work, introspection (behavioural tendencies, strengths and weaknesses) and more. For the organisations involved, the games can interest young people in the topic of space. This in turn can stimulate young people to seek space careers and generate greater public awareness in and support for space and related science and technology activities.

4.3.4. REAL Group Conclusions

The participants in the REAL discussion group believe that these six concepts, briefly summarized below, merit further consideration and possible implementation by space organizations interested in pursuing rapid engagement/accelerated learning strategies.

Concept 1 – Book of Success: a ‘welcome guide,’ based on the experiences that the experience professionals acquired in the organisation. It aims to be an open source of information, collecting the knowledge from experts by capturing their feedback from live sessions on what is currently working or not and providing relevant advice to deal successfully with potential challenges. This solution is of great value to the YP’s learning curve but also to the organisation by capturing the knowledge from experts and sharing it before their retirement to ensure the continuous transfer of their know-how as a on the most efficient way.

Concept 2 – One-to-One Learning Partnerships: Short-term learning relationships conducted between one YP and one EP, in which each teaches the other a topic of interest. This is a collaborative win-win solution that ensures that each party is getting something in return for the experiences/ knowledge they share. The benefit of this is that it encourages networking and relationship building across an organisation while contributing to the creation of a learning culture.

Concept 3 – World Café Sessions: Networking events (either face-to-face or virtual) in which YP’s and EP’s come together to share their experiences and best practices via storytelling. This approach contributes to the rapid ramp-up of YP’s through discussions that expose them to real-life challenges and how experienced colleagues handled them. Such sessions can also provide opportunities to build relationships within and among participating organizations.

Concept 4 - Innovation Incubator: Arrangements under which YP’s work on specific, practical assignments and get hands-on experience on project management in a safe environment. Apart from the practical learning that contributes to the YP’s ramp up, this concept can generate answers to problems within the organisation that otherwise might not be turned into projects. And the concept can stimulate organizational innovation.

Concept 5 – STEM Awareness Campaign: A multi-action awareness campaign to communicate with and encourage students to pursue careers in science and engineering fields. This concept seeks to encourage the young learners to pursue STEM related education. It also promotes the attractiveness of space careers and seeks to enhance public interest in and support for space organisations.

Concept 6 – Gamification: This concept can involve a space related gaming competition with student participants, one that engages them in the space domain and attract them into space careers. This solution is intended to nurture a sustainable pipeline of students, who will join the space workforce in upcoming years. The concept can help foster relevant skills development from early ages and create awareness/visibility of space domain.

5. Concluding Observations

The space sector involves a very dynamic, active and challenging work environment. The desire of young professionals to grow into and succeed in the space sector work environment is very strong and clear. This report provides a number of detailed observations and proposals that space agencies, companies and research organisations can pursue to better develop and empower their early career of employees.

The ideas discussed and recommendations included in this report will also hopefully stimulate further discussion among young professionals and their employers in the global space community. In that regard, the Young Professionals Workshop participants hope that some of the results of the 2015 Workshop deliberations will be considered further by the IPMC member organizations and during future Young Professionals Workshops organized by the IPMC.

6. List of Workshop delegates

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DLR	Ms	Caroline Thro
Eurisy	Ms	Grazia Fiore
ESA	Mr Ms Ms Ms Mr Mr	Aleix Hernandez Aline Decadi Karina Sanchez Kate Underhill Nicolas Verstappen Stijn Lemmens
Arianespace	Mr	Raphael Perino
Space Foundation	Ms	Jillianne Pierce
Hewlett-Packard Company	Ms	Andreea – Mihaela Chirita
JAXA	Mr Mr	Yasuyoshi Hisamoto Yuta Nakajima
KOC University	Mr	Ozan Kara
OGSystem	Mr	Paul Warren
Political Science Department of Stellenbosch University	Ms	Leehandi De Witt
Science and Technology Policy Institute	Ms	Emily Nightingale
Surrey Satellite Technology Limited	Mr	Nimal Navarathinam
Swedish Society of Aeronautics and Astronautics	Mr	Oscar Hag
University Politecnica of Bucharest	Mr Ms	Adrian Danciu Silvia Nechita
Yuzhnoye State Design Office	Mr	Vadym Demchenko

7. References

Topic 1 – Mentoring Programme Business Plan

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8. Background Information

2012 IPMC YP Workshop report

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2013 IPMC YP Workshop report

<https://drive.google.com/open?id=0B7hwsnasZpIZYkl0R1ZoRDVWTUE>

2014 IPMC YP Workshop report

<https://drive.google.com/open?id=0B7hwsnasZpIZUC02eVZ4NC1rTTA>

2015 IPMC YP Workshop – Background Materials

Topic 1 Mentoring Programme Business Plan

- Full report

<https://drive.google.com/open?id=0BzVrYyiAgrgJTFhHY05vZfVmNTA>

- Annex

- A - Mentoring Programme Case Studies

<https://drive.google.com/open?id=0BzVrYyiAgrgJZmprWmgwODdnODg>

- B - Trends in Mentoring Programmes

<https://drive.google.com/open?id=0BzVrYyiAgrgJSWduX1NMSXFic2s>

- C - Cost Benefit Analysis Calculations

<https://drive.google.com/open?id=0BzVrYyiAgrgJZjZuYWJfaWtjNXM>

- Detailed Elements of Mentoring Programme Business Plan

<https://drive.google.com/open?id=0BzVrYyiAgrgJYUxwNEh6ekwwb2c>

- E - References

<https://drive.google.com/open?id=0BzVrYyiAgrgJMXJncVI4UFMtV28>

Topic 2 Decision Factors for Young Professionals

- Full report

<https://drive.google.com/open?id=0B7hwsnasZplZM29EQ20tSHQ5Snc>

- Annexes

- Annex A – Literature Survey

<https://drive.google.com/open?id=0B7hwsnasZplZbGV5UVY0QVE2UEU>

- Annex B – Interview Questions Group 1-3

<https://drive.google.com/open?id=0B7hwsnasZplZYUJjOXF6MDdUTFk>

- Annex C – Interview Questions Group 4

<https://drive.google.com/open?id=0B7hwsnasZplZUkNuaHByVGg0Q0U>

- Annex D – In depth Interview

<https://drive.google.com/open?id=0B7hwsnasZplZR203bnJJTU5GRVk>

- Annex E – Aerospace Employers Interview

<https://drive.google.com/open?id=0B7hwsnasZplZaXFV2F1ZlptODQ>

- Annex F – Survey Set-up

<https://drive.google.com/open?id=0B7hwsnasZplZQjdra3NDUXVZQmc>

- Annex G – Survey Groups 1-3

<https://drive.google.com/open?id=0B7hwsnasZplZaVJrNmc3TktSVXc>

- Annex H – Survey Group 4

<https://drive.google.com/open?id=0B7hwsnasZplZMHRRM1FvcVRsMzQ>

- Annex I – Detailed Analysis of Survey Results

<https://drive.google.com/open?id=0B7hwsnasZplZTnpTOUZ3a2k2MEE>

- Annex J – Analytics of Survey Results

<https://drive.google.com/open?id=0B7hwsnasZplZWWt3S0tuelZ6c3M>

- Annex K – Proposal for Survey Continuation

<https://drive.google.com/open?id=0B7hwsnasZplZRFFYYI9qc09wbUU>

Topic 3 Rapid Engagement and Accelerated Learning

- **Additional Background**

https://drive.google.com/open?id=1A1SLRkTmF_4CC5jK7hiMwEUK8hgbl_CsejaFaLlOiGk