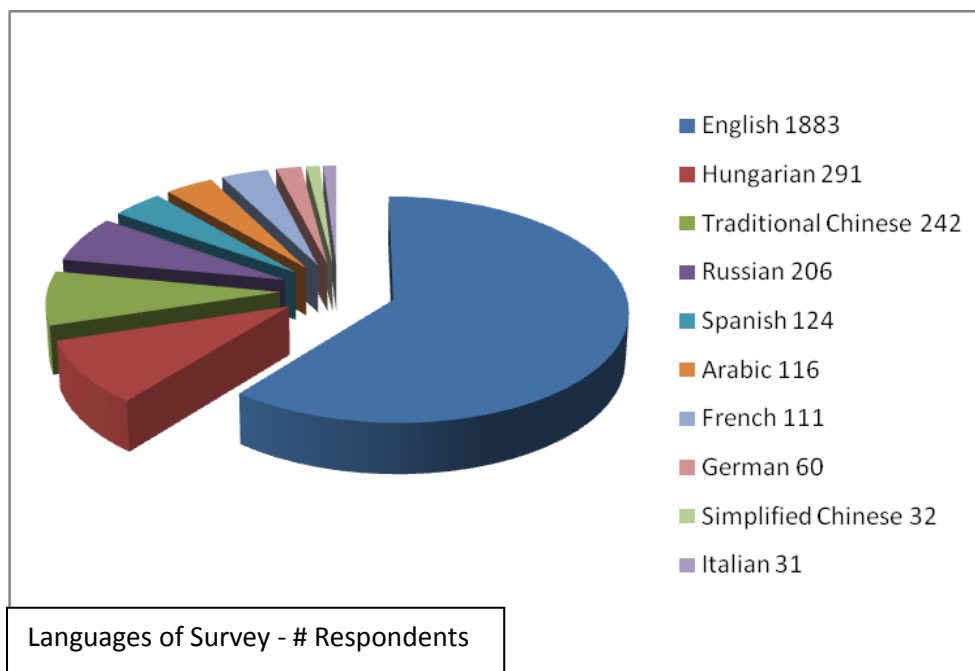


International Academy of Astronautics Cosmic Study:



SPACE EXPECTATIONS: SHAPING THE NEXT FIFTY YEARS



15 March 2011

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The International Academy of Astronautics (IAA) a non-governmental organization recognized by the United Nations was founded in 1960. Since that time, IAA has brought together the world's foremost experts (1216) in the disciplines of astronautics on a regular basis to recognize the accomplishments of their peers, to explore and discuss cutting-edge issues in space research and technology, and to provide direction and guidance in the non-military uses of space and the ongoing exploration of the solar system. The purposes of the IAA, as stated in the Academy's statutes are to foster the development of astronautics for peaceful purposes, to recognize individuals who have distinguished themselves in a branch of science or technology related to astronautics, to provide a program through which the membership can contribute to international endeavors and cooperation in the advancement of aerospace science, in cooperation with national science or engineering academies. Dr. Madhavan Nair (India), is president of the International Academy of Astronautics.

Cosmic Study:

***SPACE EXPECTATIONS:
SHAPING THE NEXT FIFTY YEARS***

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Executive Summary

The purposes of the International Academy of Astronautics are to foster the development of astronautics for peaceful purposes, to recognize individuals who have distinguished themselves in a branch of science or technology related to astronautics, to provide a program through which the membership can contribute to international endeavors and partnerships in the advancement of aerospace science, while in cooperation with national science or engineering academies. This report is a reflection of those goals as it summarizes two studies that positively involved the general public with the space community. For most of its 50 years, the International Academy of Astronautics (IAA) has brought the world's foremost experts in the field of astronautics together on a regular basis to investigate major questions related to the profession. The Academy is helping to formulate the future by conducting and reporting on two major projects recognizing the positive impact that space activities have upon society.

Cosmic Study: Space Impact Upon Society – elicited personal views from world leaders, recognized authorities and influential personalities as well as space experts in response to the statement "I believe that space activities are impacting society through....." Their personal statements were placed, unchanged, on a specially created Web site (<http://www.spaceandsociety.org>), as well as the Academy Web site (<http://iaaweb.org/content/view/229/356/>),

Cosmic Study: Space Expectations –determine the expectations, understanding and backing of society vis-a-vis space programmes and policies through a global survey. The questionnaire can be found at www.space-expectations.org.

Education or transmission of knowledge from one generation to the next has been the driving force behind the progress of humankind. The duty of every generation is to educate the following one. Space is not only a fantastic tool for inspiring and educating youth but also, because of the many disciplines and expertise that space developments require, the profession is a rewarding destination. The last 20 years, however, have brought about a new era of space exploration, images of distant stars and galaxies, international cooperation and a focus on our own planet. Both governments and the general public are today increasingly realizing the enormous potential of space and just how it is being integrated into everyday life.

The results from these studies should help encourage space agencies and governments, as well as private companies, to continue their space programmes and exploration efforts because, even though they might be expensive, for the most part they have the backing and support of the public.

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1.0 INTRODUCTION

As the 21st century gets further underway, the impact of space activities upon the welfare of humanity will only increase. It has been acknowledged that one of the most significant events of the 20th century was when humanity left its ancestral home and stepped onto the surface of another celestial body. We can imagine that during the 21st century human expansion and insight into the cosmos will produce some of the more significant events of this new century.

The period between 1957 and 1991 saw the dawn of the space age with flights to the planets, footprints on the moon, and global communications; however, this history of space was anchored in the global cold war with its massive budgets for military space exploitation. The last 20 years, however, have brought about a new era of space exploration, images of distant stars and galaxies, international cooperation and a focus on our own planet. In the not too distant future we may have unlimited, clean, solar energy from space powering our industries as well as heating and lighting our homes. We may become tourists in Earth orbit or on the Moon. We may carry out extra-terrestrial mining and even introduce the development of a multi-planet economy. In addition to the enormous knowledge that space exploration has already delivered, space technologies have become integrated into everyday life so deeply that modern society could not function without them. Weather, telecommunications, environmental analyses and national security are only the most obvious space technologies that humanity relies on, though spin-offs and transfers from space to non-space sectors provide many additional indirect benefits. Research and development organizations, including space agencies, must continually adapt to an environment which their very successes transform:

- Emergence of new user communities,
- Introduction of new public and commercial services,
- Advent of new operators, citizens' dependence on services using new space systems

As a consequence, space agencies are becoming part of a political, economic and social frame. Indeed, this new global framework is continually evolving, creating new needs and opportunities, but also giving rise to constraints and shifting responsibilities. The activities of space agencies show very clearly how space is impacting society. The European Space Agency (ESA), for instance, combines responsibilities in three distinct areas:

- Basic activities required to develop and maintain the fundamental elements on which a space policy depends for its implementation (access to space, the technology base, industrial capabilities, ground facilities);
- Inspirational activities of sciences and human and robotic exploration; and
- Utilitarian activities – developing space systems to support public services (such as meteorology, environment, disaster management, education, energy, agriculture) and commercial offerings (telecommunications, navigation and imagery) for the benefit of the citizen.

As a result of such activities, both governments and the general public are today increasingly realizing the enormous potential of space and just how it is being integrated into everyday life. For its part, the European Union is being confronted with a quantum shift due to globalization and the challenges of a new knowledge-driven economy. Its own space priorities have led the EU to conclude an agreement with ESA for efficient and mutually beneficial cooperation relating to initiatives in telecommunications and navigation,

global monitoring for environment and security, and exploration – areas all geared to the needs and requirements of society. Space activities stimulate the development of new technologies - as an innovation factor, as a competitiveness factor and as a key to the consolidation of industrial capabilities, without which there are no space activities.

Education is also an integral part of space activities. Education or transmission of knowledge from one generation to the next has been the driving force behind the progress of humankind. The duty of every generation is to educate the following one. Space is not only a fantastic tool for inspiring and educating youth but also because of the many disciplines and expertise that space developments require. Furthermore, the introduction of space incubators will afford young entrepreneurs the opportunities to take space technologies and create new products and services for the non-space sector – thus adding even more value to space investments.

For most of this time, the International Academy of Astronautics (IAA) has brought the world's foremost experts in the field of astronautics together on a regular basis to recognize the accomplishments of their peers, explore and discuss cutting-edge issues in space research and technology, and to provide direction and guidance in the non-military uses of space and the ongoing exploration of the solar system. The Academy is helping to formulate the future through recognition of the positive impact that space activities have upon society and, with the assistance of dedicated study teams, has initiated two major projects to this end. The first, already completed, elicited personal views from world leaders, recognized authorities and influential personalities as well as space experts in response to the statement "I believe that space activities are impacting society through....."; while the second is trying to determine the expectations, understanding

and backing of society vis-a-vis space programmes and policies.

2.0 IMPACT OF SPACE ACTIVITIES UPON SOCIETY

The impact of space activities upon society has largely been measured in quantifiable terms. How many spacecraft have been launched by a given country? How many phone calls are made over a satellite? How many lives are saved by hurricane-watching satellites? How much money was spent on space inside a country or by a corporation? The problem with this approach is that, generally, the value to humanity is not measured. And as space endeavours are, for the most part, funded through taxes from the general public, it then becomes inevitable that the value and benefits of such space activities must be justified. While not itself in a position to justify these things, the International Academy of Astronautics believed, nevertheless, that it would be of interest (and serve a real purpose) if somehow the reasons for, and results of, space exploration could be presented to both the non-space sector and the public at large.

Accordingly, in 2001, the Academy initiated a study project to look at the impact that space was having on society as a whole – as seen through the eyes of a very diverse set of people. The project was carried out by a dedicated Study Team and the idea was that personal insights and views from world leaders, recognized authorities and influential personalities, as well as space experts, would be sought in response to the following statement:

"I believe that space activities are impacting society through....."

Even though the Study Team tried to employ the theory of six degrees, which suggests that everyone in the world is

connected to everyone else through no more than six connections (or degrees), it proved very difficult to elicit responses from members of government, politicians and leading industrialists. However, with persistence, a number of replies were received from interesting personalities who felt they had something to say across a range of topics. Indeed, the success of the project can be measured by the value of the respondents and the insights they provided.

The Study Team stressed to those invited to contribute that the intention was to illustrate to the general public that space activities have a positive impact upon everyday life and society. Their personal statements were placed, unchanged, on a specially created Web site (<http://www.spaceandsociety.org>), as well as the Academy Web site (<http://iaaweb.org/content/view/229/356/>), as an assessment of and reflection on the impact of nearly fifty years of space flight upon society.

Nearly one hundred responses were received, over half of which were selected for inclusion in a special book published by the European Space Agency.¹ Replies were chosen, as submitted, to portray the authors' own views about the impact of space activities. The respondents ranged from a student, to a famous science fiction writer and the Secretary General of the United Nations. The authors, representative of many of the nations of the world, are diverse in jobs and lifestyles; but, together in their beliefs in the beauty and scope of space, in their hopes for the future, and in their recognition that the human race has an unlimited future. Tellingly, none of the responses portrayed a negative impact, for instance that space activities were a waste of money - on the contrary, all were very positive.

The study, the Website and the subsequent book provide an insight into the opinions and views of individuals

regarding space activities and the impact they are having on society and every day life. Some of the respondents work or have worked within the space field, others have not. Some responses are borne of experience and first hand knowledge of space programmes, others are considered judgments of how they believe space has been of benefit to the world – by providing opportunities and challenges, stimulating jobs, extending knowledge and education, making available enhanced services and technologies, and fostering international cooperation.

Although space programmes are expensive, and the public might query why so much money is spent on space (especially human spaceflight), the respondents are very positive in their views that space has contributed significantly to humankind. The responses to the study provide a rich catalogue of the ways in which space activities have helped and improved society – providing communication and educational services in remote areas, bringing entertainment to the masses, creating new materials for stronger and more durable structures, providing meteorological data so ships can be safer at sea, monitoring the threat of pollution, enhancing medical instruments for better health-care, enabling hikers and skiers to be located when lost, and many more.

If there is a conclusion to be drawn from the first study and the responses received, it is that space activities impact society in diverse ways – and not only the obvious ones like provision of telecommunications and weather forecasting, but also less obvious ways such as the relentless quest for knowledge about our planet's place in space and time. The path to gaining this knowledge winds through scientific as well as technical discoveries that, in their turn, benefit society in many ways. The camera in space developed to take pictures of far distance galaxies is reborn as a medical instrument to detect lymph node cancer.

The instruments on an orbiting spacecraft designed to find out more about the structure of planets can be packaged into a portable device for identifying the minerals in rocks on Earth. The sun's rays can be harnessed to provide cheap and abundant solar energy to warm and light our houses. None of these things would have been possible without space activities. The search for life also drives space exploration. Are we alone in the Universe? Are we unique? We will never rest until we know. So this drive spawns high-tech robots and samplers, hardware and software – all of which will ultimately be spun back into mainstream consumer, medical electronics and gadgets which will make life on Earth better.

3.0 SPACE EXPECTATIONS

During the last fifty years, we have sent spacecraft to the far reaches of outer space, man has walked upon the Moon, satellites have monitored the well-being of our planet, we have a permanent manned laboratory in space, global communication has been facilitated, and everyday life has been improved in countless ways through the transfer of space technologies. Space technologies and services are used in many non-space applications such as medicine, automobiles, textiles, housing, sports, water recycling. Indeed, many of these space spin-offs are dramatically, but unobtrusively, benefiting society not only by providing new reliable and robust products and services, but also by stimulating economic growth, innovation and job opportunities. But what are society's expectations from all these space activities?

Space activities have historically been based upon technological successes with science and exploration leading space activities toward major projects throughout the solar system. Periodic disconnects have occurred as the public suddenly sees major successes and

cheers or sees failures and asks tough questions like why and how much? Following on from the IAA's recent study on the "Impact of Space Activities upon Society," described above, this study sponsored by the Academy essentially turned the previous study around in order to determine the depth of understanding and backing that is out in the public. The study hoped to describe society's expectations from space programmes, and ascertaining how society could become more involved in space exploration. The next step would be to merge these thrusts so that projects could be positioned to fulfill public expectations, maintain their interest and excitement; and thus, be supported (both financially and intellectually) by the public.

3.1 Approach

The approach taken by the IAA Study Team was to develop a survey that would be aimed at the general public to determine their understanding and expectation of space activities. This survey would then be distributed through various national networks and organizations (including space agencies) to diverse groups including: high schools and universities; art, cultural and heritage bodies; as well as the public at large. To avoid a plethora of responses, replies would be sought as much as possible from groups of people, e.g. students would be asked to provide a reply from their class as a whole rather than individually. For the public response, students would be requested to ask their parents to respond to the survey. This would give the study team several sets of inputs from different age groups from around the world. The intention was to collect the inputs via a Web-based form to minimize the paperwork and thus ascertain the views on what people around the world in all walks of life think about and expect from space research, development and exploration.

3.2 Questionnaire

The questionnaire went through several iterations and testing before it was deemed ready for release. Initially it contained a brief description of the project and its anticipated outcome and use on the first page, but this was eventually taken out as it was felt it might lead or cause the respondent to answer in a different way. In addition to basic demographic questions relating to gender, age, nationality, occupation and highest level of education, the final version comprised six categories pertaining to Space in general;

- Government involvement in space activities;
- Understanding space
- Using space;
- Space exploration;
- I would like to go into space myself; and
- My expectations of space activities.

Within each of these categories, there were a number of statements for each of which the responder could tick a box saying:

- Strongly Agreed with the statement,
- Tended to Agree,
- Neither Agreed nor Disagreed,
- Tended to Disagree and
- Strongly Disagreed.

The questionnaire [to be found at (www.space-expectations.org)] was initially made available in the six Unesco languages, namely English, French, Spanish, Russian, Chinese and Arabic. A Simplified Chinese version was also included. In late 2008, versions in Hungarian and German were also provided by volunteers, and in early 2009, an Italian version was also subsequently added. The inclusion of these additional languages, together with a more concerted effort to distribute the web site for the

questionnaire as widely as possible, helped to boost the numbers of people replying. Efforts to have the questionnaire translated into Japanese and various Indian dialects were unsuccessful, although there was an offer to have it translated into Serbian.

A huge effort to distribute the questionnaire globally was undertaken. To elicit support, members of the Study Team mailed a covering letter with details of the project and Web site to scores of universities in all parts of the world. UNESCO undertook to distribute it to all the education ministries and schools in its Member States; the IAA and IAF were asked to announce it on their Web sites; the AIAA placed the website on its daily newsletter multiple times; ESA and NASA were similarly contacted to announce it on their Web sites and share it with educational institutes and youth groups with whom they were in touch; as were the Space Generation Advisory Council (SGAC) and the International Space University (ISU). And contact was taken with the world body responsible for Boy Scouts and Girl Guides with the aim of getting the questionnaire distributed to scouts and guides worldwide. Most of these corporate channels (with the exception of the SGAC and ISU) proved somewhat unproductive which is rather disappointing considering the value such a survey could bring.

3.3 Web Site Design

A special Web site (www.space-expectations.org) was created for the Space Expectations Survey, with a multimedia slide show as the home page. The various slides illustrate different aspects of general “expectations” the public may have about space development and exploration. The last slide is linked to the “Take the Survey” entrance page where one may select the appropriate language version. An “About Us”

information page listing details about the project, the Study Group, the International Academy of Astronautics and the European Space Agency, a “Contact Page” and the “Take the Survey” make up the general structure of the Website front-end. When the survey is completed the User is returned to the website with a “Thank-You” page in their appropriate language.

3.4 Survey Methodology

It was determined by the Academy Study Group that the best way to develop the project and to reach a large audience was via an online Internet platform that incorporated interactive survey technology. The requirements were for an attractive website that would enable the general public to access the survey in a variety of languages. The domain name “space-expectations.org” was registered in January 2006, a virtual server with a basic informational web site was brought online, and an investigation and experimentation of survey software commenced and ran for the remainder of that year. The software needed to not only collect responses to the questionnaire but also enable some form of analysis accessible by the project leaders, as well as support multiple languages. Initially, the Open Source software phpSurveyor 1.00 was selected as the best candidate and after obtaining some experience with the program the English version of the Space Expectations Survey was installed.

It soon became obvious by both using the software and via the online forum that the software was limited in terms of customization and optimization for implementation in various languages. Due to the issue that a specific language implementation would require knowledge of that specific language, and the limitation that all of the UNESCO languages were not available in stable versions, the search for alternative software was commenced

and various commercial survey applications were reviewed. The software that appeared to meet all of the necessary criteria was Survey Monkey. Adding a new survey in a Western language (English, French, Spanish) was straightforward with the user friendly Administrator Interface. In addition to the translation of the questionnaire, all the navigational and instructional tags had to be translated and installed. Once this was done, the translators were asked to review the Survey in their respective language and send corrections and suggestions. The non-Western languages (Arabic, Russian, Chinese Simplified and Chinese Traditional) proved to be much more difficult to install. Unfamiliarity with the specific language was, of course, a major reason; however, in the case of Arabic and Chinese, the left to right instead of right to left made even “cut & paste” a very difficult and unreliable task. Consequently, these language versions required a lot of additional input by the translators in order for them to read and function satisfactory. In addition to the volunteers from within the IAA Study Group, assistance was also forthcoming via UNESCO, ESA’s Moscow Office and the Space Generation Advisory Council.

Beta “test” surveys were installed in each designated language and when all corrections were made and approved the statistics were deleted and the surveys were switched to “live” status. Besides the online interface for viewing and analyzing the responses to the survey, it is possible to export Excel and PDF versions of the results for off-line analysis and reporting. The intention was to launch the site during World Space Week at the beginning of October 2007, however, it was later that month when it was finally made publicly available. The Space Expectation Survey ran through the fall of 2009 under Academy sponsorship. Beginning in 2010, the survey site was managed by the Space Generation organization.

4.0 GENERAL DEMOGRAPHIC ANALYSIS

Within the first month of going live in late 2007 nearly 1500 people had completed the Space Expectations survey. Through the summer of 2009, the number doubled to some 3100 with the breakout for each questionnaire as shown in the figures:

Of course, not everyone answered every question and not everyone completed the questionnaire in their own language. For instance, some Chinese filled in the English questionnaire as did Swiss and Italians (before the Italian version as available) amongst

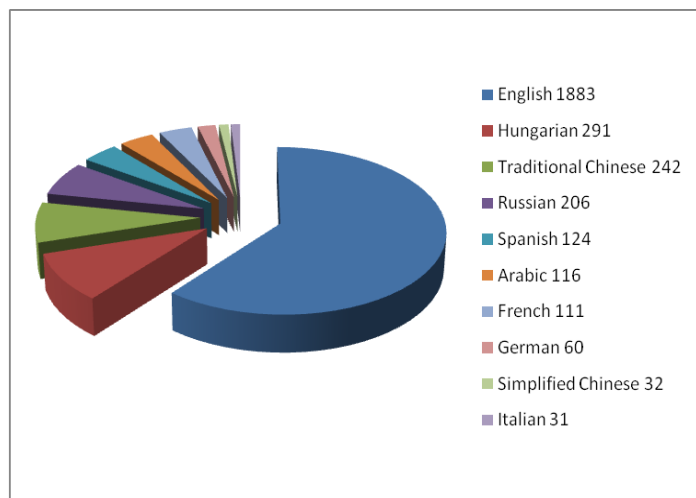


Figure 1: Language Breakout

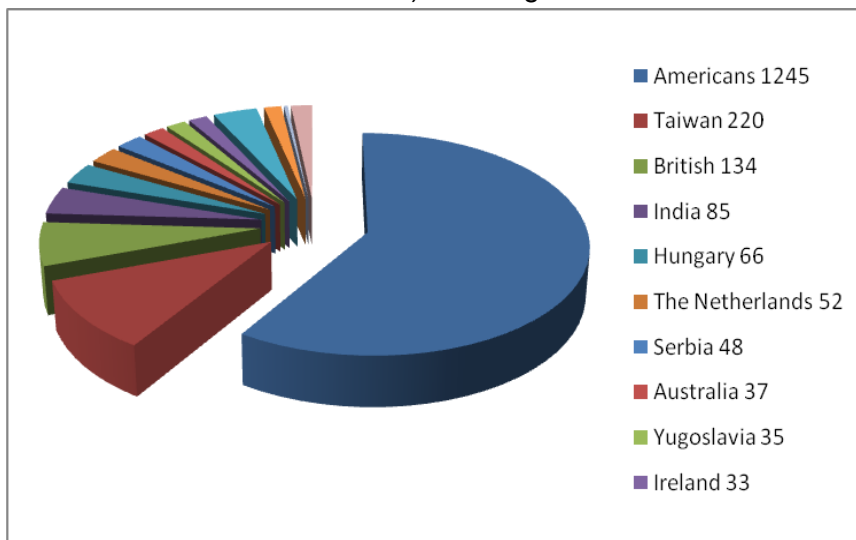


Figure 2: Nationality Breakout

Notes: - Taiwan completed the Traditional Chinese version - British nationality completed the English survey - Hungarians completed both before and after the Hungarian version was online - 30 Germans completed before version, with 47 after language added - Belgians completed the French version - of the Canadians, 8 of 37 completed the French version - with over half the people replying to the Arabic questionnaire were from Saudi Arabia and Kuwait.

others and of those completing the Russian language questionnaire only three quarters gave their nationality as Russian. However, the survey was heavily populated with male English speakers with the results reflecting in the results of the survey.

Questionnaires were returned by people of over 100 different nationalities. The most productive being the Americans who returned just over half of the English questionnaires (1245, 54%).

The relatively good response (in terms of ages and occupations such as students, libraries/museums, art, education) from certain countries (or nationalities) such as Serbia, Yugoslavia, Taiwan, Iran, Kuwait, Greece and India illustrate excellent efforts by individual Study Team members. Regarding the ages of those completing the questionnaires, 46% of the English were between 26-45, as were 47% of the French, 52% of the Russian, 62% of the German, 69% of the Simplified Chinese

and 71% of the Italian. On the other hand, some 65% of the Arabic were under 25, in fact 19% were under 17. Likewise 71% of the Traditional Chinese were under 25 as were 68% of the Spanish (10% under 17).

Around 70% of all respondents were, not surprisingly, male – although 52% of those completing the Italian questionnaire were female, as were 47% of those replying to the Traditional Chinese version (virtually all from Taiwan) and 44% of those responding in Arabic. Concerning level of education, of those replying to the English questionnaire some 46% had a Masters or PhD degree, while 35% of French, 36% of German and 66% of Simplified Chinese respondents had such degrees, compared to only 18% Spanish, 15% Russian, 14% Arabic, 13% Italian, 12% Traditional Chinese and 6% Hungarian respondents. On average about one third of all respondents had either not (yet) finished or else had completed secondary/high school (but did not have a degree of any kind). The percentage was as high as 57% for Hungarian, 38% for German, 37% for Spanish and 34% for Arabic – this compares to only 17% of respondent to the English questionnaire and 0% for Simplified Chinese. This could show either a low level of educational achievement for those respondents, but it is more likely to be that the questionnaires were in fact completed by school children and those still studying at university.

When it came to occupational field, some 30% of those completing the English questionnaire said they worked in aerospace, while 19% of the Russians worked in telecommunications. No less than 26% of those completing the Arabic questionnaire were working in education, 19% of those completing the German version were in media and some 16% of the Italian respondents were working in public administration/civil service.

In so far as the English questionnaire was concerned, the responses relating to age, education and

occupation were not really what was wanted. The Study Team anticipated, and hoped for, responses from young people and wanted to avoid getting numerous answers from older, highly educated people working in the aerospace field. Such people were already involved in space and thus presumably were predictably positive and would consequently agree strongly with many of the statements. The reason for this high aerospace connected response was undoubtedly due to the fact that the Space Generation (comprised of young adults with a common interest in space) were instrumental in getting the questionnaire translated into several languages and subsequently distributing them to their members, particularly in the USA. However, for most of the other language questionnaires there was a significant proportion of students who replied. For instance, no fewer than 63% of those completing the Traditional Chinese questionnaire (mostly from Taiwan) said they were students, as did 61% of those completing the Spanish questionnaire and 34% completing the Simplified Chinese one., and 22% of those doing the Hungarian version. These figures compare to 19% students for the English language questionnaire.

4.1 ANALYSIS OF ENGLISH QUESTIONNAIRE

Given the demographic breakdown of those completing the English language questionnaire, then it comes as no real surprise to learn that the figures show that in general the majority of respondents tended to agree with the statements. Indeed, there is very little change in percentages even after one year and twice as many respondents.

- Almost 83% of respondents thought space was exciting

- 75% strongly disagreed that space research was a waste of money.
- 66% strongly agreed that products derived from space as well as space technologies themselves were useful in everyday life and contributed to the improvement of life.
- Over 85% agreed that space had improved their lives.
- 74% strongly agreed that their country should play an active role in space activities – partly because space helped create new jobs and encouraged young people to become scientists and engineers.

Again, the vast majority of respondents strongly wanted their country to be involved and spend money in the main activities of Earth observation (81%), navigation (76%), satellite communications (74%), and exploring the universe with robots and telescopes (72%). Regarding funding, 61% strongly believed that the money spent on space benefits society, 60% also strongly agreed that spending on space activities should be increased. Over three quarters of people replying strongly believed that space should be used for peaceful purposes and that weapons of mass destruction in space should continue to be banned. Nearly two thirds were of the strong opinion that exploration of planets could lead to the discovery of new resources, but only slightly more than one third were strongly in favour of actually commercializing or exploiting these resources – though overall 18% tended to disagree to a greater or lesser extent that nations should be able to.

Just over half agreed that space exploration should be done by robots (30% were undecided), whereas 45% strongly agreed that humans in space are needed for exploration activities with another 36% tending to agree with the statement. Responses to the English questionnaire also revealed that three quarters of respondents thought humans should return to the Moon (52% strongly)

and establish a base there (50% strongly) and similar numbers said humans should go to Mars (52% strongly) and establish a base there (45% strongly). They were pretty much split when it came to deciding whether human space travel would be common in their life-times - though only 28% didn't think it likely.

In so far as going into space was concerned, two thirds agreed that the general public should be able to fly into space. 79% said they would like to go there themselves – mainly for personal reasons: to view the Earth from space (78% strongly agreeing) and to have new experiences (76% strong). Two thirds or so wanted to explore other worlds or experience weightlessness. Over half wanted to gain knowledge about themselves and the world while a few more wanted to contribute to science. To go because they wanted to be among the elite was not really a strong consideration for the English questionnaire respondents. Over 40% of those replying (24% strongly) said they would participate in a planned one-way human mission to space – though an equal number said No way!

Regarding their own expectations, most people expected space activities and systems to increase our general scientific and technical knowledge (84% strongly), allow us to gain a better understanding of the universe (79% strongly), contribute to monitoring environmental change on Earth (77% strongly) and enable us to have a better understanding of the Earth (74% strongly). About two thirds expected contributions to disaster prevention & management and monitoring & preventing pollution, as well as improving daily life through space spin-offs, while at least half of the replies strongly agreed that space activities could support agricultural development and food production, provide medical breakthroughs, and protect earth from asteroids. They were more pessimistic about space activities being able to provide solutions for waste disposal (nuclear, chemical, biological).

4.2 ANALYSIS OF OTHER LANGUAGE QUESTIONNAIRES

The results from the other language questionnaires are pretty much in agreement with those from the English version. This is partly because of the nature of the questions and partly due to the way they were framed. There are some cultural or national differences and these can largely be attributed to the fact that many more students outside the aerospace field completed the non-English questionnaires. Interestingly only 1% of those completing the Spanish questionnaire (compared to 18% for Italians, 13% Arabic, 10% German and 10% Hungarian) strongly agreed that their country was a space faring nation – they clearly do not know much about their own national efforts and those of the European Space Agency to which Spain, Italy and Germany belong. On the other hand, 58% of the respondents to the Simplified Chinese version (mainly from China) knew their country was a space faring nation, as did 72% of the Russian respondents, and 42% of those completing the French version (though, of course, not everyone filling in the French questionnaire was actually a French national).

As with the English questionnaire, very high percentages from all the other language questionnaires found space to be very exciting – except for those completing the Spanish version where the percentage was a little over one half compared to well over three quarters for everyone else. Otherwise everybody wanted pretty much the same thing as the respondents to the English questionnaire when it came to whether their country should be involved in space and on what space activities their governments should spend money. For example, 61% of those completing the Arabic questionnaire strongly agreed their country should play an active role in space, as did 56% of

those completing the Hungarian questionnaire. Compared to all the other language versions, the Traditional Chinese (and to a somewhat lesser extent the Simplified Chinese) questionnaire had far fewer people answering that they strongly agreed – more people preferred to use the option that they tended to agree. Thus only 44% of the Traditional Chinese respondents strongly agreed with the statement that WMD be banned in space (compared to 67% of Simplified Chinese and 84% Arabic and 83% Russian). Further, only 22% Traditional Chinese tended to strongly agree that more money should be spent on space activities, compared to 42% for Simplified Chinese. Of course, as noted, the vast majority of those completing the Traditional Chinese questionnaire were from Taiwan, and as that country does not have an active space programme then such less strong responses are to be expected.

Respondents to the Arabic and German questionnaires were 100% agreed that space should be used for peaceful purposes. And most other countries were only slightly less convinced. When it came to exploiting resources on other planets, fully 71% of Arabic respondents strongly agreed that nations should be able to exploit these resources with a further 18% tending to agree. This figure contrasts greatly with the responses from the other surveys who generally seem to feel that nations should not really exploit these extra-terrestrial resources (55% Spanish respondents strongly agreed resources should be exploited, as did 46% Russian respondents, 44% Italian, 39% English, 37% Hungarian, 33% French, 25% Simplified Chinese, 20% German and 18% Traditional Chinese). However, if the percentages of those just agreeing (as opposed to strongly agreeing) that resources should be exploitable are added in then the picture changes – for instance, in this case fully 74% Italian, 71% Russian, 60% French and 53% German believe in exploitation as do 68% English.

And as for wanting to go into space – as expected with so many younger people answering the non-English questionnaires - in just about every case over three quarters wanted to go. Breaking it down for the reasons, most people strongly wanted simply to view the Earth from space (82% in case of Russian responses, 81% for Arabic) – though, as ever, Traditional Chinese respondents were not quite so definite with only 50% strongly agreeing that they wanted to view the Earth from space. Arabic and Russian respondents were among the highest for strongly agreeing (78% and 73%) that they wanted new experiences). Interestingly, the Traditional Chinese questionnaire had the highest number (69%) of people who agreed that they would like to go into space to be among the elite, closely followed by the Arabic (64%). Status was much less important for others: 37% Hungarian, 30% English and only 17% German, 15% Russian and Spanish, 13% French, 12% Simplified Chinese and a mere 4% Italian.

A surprising number of people said they would be prepared to participate in a one-way human mission into space. These include 51% of the Hungarian responses, 46% of the French and 42% of the Russian, Arabic and English ones – though 69% of Italian respondents did not want to go on such a one-way trip, nor did 59% of Simplified Chinese nor 56% of the Spanish. The overall tendency of the Traditional Chinese responses (40%) was also not to make such a trip, as were those of the Germans.

In general, respondents believed that human space travel would become common place during their lifetimes: 81% of Traditional Chinese respondents thought this would be the case, as did 79% Simplified Chinese, 66% Hungarian, 65% Spanish, 61% Arabic, 49% German, 40% Russian, 39% Italian – compared with 51% English. On the other hand, only one quarter of the French respondents thought this would happen.

Coming to their own space expectations, the results from the other versions of the questionnaire are pretty much in line with the English except in a few instances. For example all were much more in agreement than the English that space activities and systems should provide solutions for waste disposal (nuclear, chemical, biological). The Arabic community was the highest here, with 54% agreeing strongly and 29% tending to agree – compared to 33% and 25% of all the English respondents. This was also highly important to the Traditional Chinese (42% and 32%), the French (38% and 26%) and even more so to the Spanish (56% and 24%). The Arabic respondents were also strongly hopeful (62%) that space efforts could protect the Earth against asteroid impacts. And for the most part most non-English respondents did not have so many expectations as the English (53%) regarding whether we can find life elsewhere in the universe. The exceptions were the Hungarians (65%) and the Russian and French (56% each) – countries very much involved in SETI. This was, however, a fairly low priority compared to the other more useful and beneficial things that space exploration could offer such as increasing our general scientific and technical knowledge and gaining a better understanding of the universe and in particular the Earth. Oddly enough, apart from perhaps monitoring environmental change, such things ranked higher than medical breakthroughs, agricultural advances and space spin-offs to improve daily life for respondents to not only the English questionnaire, but also all the other language versions. And in each case the number of answers was similar – around 80% for each.

5.0 FINDINGS

The intention of the Space Expectation study, conducted by members of the International Academy of Astronautics as part of its space activities and society endeavours, was to try and get a feel for how young people, in particular, thought about space programmes and activities and what they considered the future might hold for them. They seem to understand and accept that, despite the high costs of space activities, there is a tremendous return to the community in terms of jobs, technological know-how and scientific knowledge. People in general, from all walks of life and from all corners of the globe, appear to be very positive toward space activities and their individual expectations for the future. Indeed so many want to go into space themselves and believe that the general public should have the opportunity to fly in space, that this augurs very well for the fledgling space tourist industry.

However, although space activities have a positive and beneficial impact on everyday life and society, this does not seem to be reflected too much by the responses to certain questions in any of the various questionnaires. Perhaps this reveals a need for more public awareness of space spin off and technology transfer activities, in addition to the publicity which surrounds the glamour of space exploration.

One additional objective of the study group was to transition this survey tool to an organization that can continue to use it. Indeed, the Space Generation has stepped up to the challenge and is now running the website and providing insight on the results through activities with academia. At least two studies at the graduate level are being conducted using the results of the study and survey results.

The results from this study should help encourage space agencies and

governments, as well as private companies, to continue their space programmes and exploration efforts because, even though they might be expensive, for the most part they have the backing and support of the public.

6.0 REFERENCES

- 1) *The Impact of Space Activities upon Society*. ESA, 2005. ESA-BR-237

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Appendix A: Members of the Study Group

www.space-expectations.org

Co – Leads for the study

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Members

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Appendix B: English Version of Questionnaire

My Space Expectations -- Demographic Questions

Age

Possible Responses: under 12, 12-17, 18-25, 26-45, 46-59, over 60

Gender

Possible Responses: Male / Female

Nationality

Possible Responses: List of UN countries (pull down list)

Education What is the highest level of education you have achieved to date?

Possible Responses: not finished high school, completed secondary/ high school, professional diploma, college/university degree, higher/advanced degree (Masters/PhD)

Occupation

Possible Responses: student, aerospace, pharmaceuticals, manufacturing, energy, education, agriculture/fisheries, management, banking/finance, marketing, media, legal, telecommunications, defence, health, government/civil service, maritime/shipping, aviation, electronics, retail, automobile, library/museum, arts, retired, spouse/partner (use standard pull down list, but put student first)

Space Expectations Questions

Table Q-1: General statements about space

Do you agree or disagree with the following?	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
I consider my country a space faring nation					
My country should play an active role in space activities					
Space activities have improved my life					
Space is exciting					
Products derived from space research and development are useful in everyday life					
Space technologies are contributing to the improvement of life on Earth					
It is important to better understand the universe and our place in it					
It is important to try and discover whether extraterrestrial life exists					
I value the role that space plays in society as a whole					
Space encourages young people to become scientists and engineers					
Space helps create new jobs					
In the future, I will be working in a space related field.					
The general public should be able to fly in space					
Space research is a waste of money					

Table Q-2: Government involvement in space activities

I would like my country to be involved and spend money in the following space activities:	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
Using satellites for communications (e.g. telephones, television, radio, etc)					
Using satellites to observe Earth from space (e.g. weather forecasting, natural disaster, climate change monitoring, farming, and peace keeping)					
Using satellites for navigation (e.g. GPS, automobile, shipping)					
Exploring the universe with robots and telescopes					
Sending people into space					
Building satellites					
Operating space systems					
Building rockets to launch satellites into space					

Table Q-3: Understanding and using Space

Do you agree or disagree with the following statements ?	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
UN Space Treaties should continue to ban weapons of mass destruction in space					
Space should be used for peaceful purposes					
Exploration of planets could lead to discovery of new resources (e.g. minerals, energy, water etc)					
Nations should be able to commercialise these new resources					
Space projects offer good opportunities for countries to work together and build strong links					
The money spent on space benefits society					
Spending on space activities should be increased					
Spending on space activities should be decreased					

Table Q-4: Space Exploration

Do you agree or disagree with the following statements?	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
Space exploration should be done by robots					
Humans in space are needed for exploration activities					
Humans should go back to the Moon					
Humans should establish a base on the Moon					
Humans should go to Mars					
Humans should establish a base on Mars					
In my lifetime, I expect human space travel to become common place					

Table Q-4: Public spaceflight

I would like to go into space myself Yes No

If no go to 'My expectations of space activities'; If yes, continue below

I would like to go into space myself:	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
To view the earth from space					
To experience weightlessness					
To contribute to science					
To gain knowledge about myself and the world					
To have new experiences					
Just to say I've done it					
To explore other worlds					
To be among the elite					
I would go on a one-way mission into space					

Table Q-5: My expectations of space activities

I expect space activities and systems to:	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
Increase our general scientific and technical knowledge					
Contribute to disaster prevention and management					
Contribute to monitoring environmental changes to the Earth					
Support agricultural development and food production					
Contribute to monitoring and preventing pollution					
Improve daily life through space spin-offs					
Provide medical breakthroughs and develop new health care systems					
Protect the Earth from asteroid impact					
Enable us to have a better understanding of the Earth					
Allow us to gain a better understanding of the universe					
See whether we can find life elsewhere in the universe					
Provide solutions for waste disposal (nuclear, chemical, biological)					
Provide nothing whatsoever					