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FROM NATIONAL SECTORIAL SPACE STRATEGY TO INTERNATIONAL COOPERATION TO RACE INTO OUTER SPACE

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Abstract

A new era in human endeavor into outer space is commencing. The signs are quite visible that the move into outer space beyond earth orbit space stations and lunar bases is in dire need for real international cooperation and involvement. The immense amount of required knowledge and human and financial resources needed and the ever increasing challenges of travelling into space and landing on outer planets is beyond any single state.

Budget and plans announced for NASA in 1984 was a sign of continued desire to carry a space programs as mere national activity. Plans by china and India for lunar activities all showed a new stage for a new space race. However, new NASA budget announced recently showed both a push for more private sector involvement in launching business, and an eye toward international cooperation.

Here, with the believe that international involvement and cooperation is a must for future space activities, after a short review of the history of international cooperation in outer space utilization, some concepts for general and legal frameworks and existing impediments for setting the stage for a long waited leap in space cooperation are examined.

Major Space Activities

In recent years, space activities in different countries have increased rapidly. Here we review programs and activities of some of these countries: In China, government organizations include:

China National Space Administration (CNSA), Commission of Science, Technology, and Industry for National Defense (COSTIND),and the China

Academy of Space Technology (CAST). China's goals include facilitating economic development, ensuring self reliance, promoting national prestige, and projecting power. Programs focus on space applications, such as remote sensing, communications, navigation, and space science and technology. Funding for space is part of military budgets, which are only partially disclosed. The country launched its first astronaut (taikonaut) into Earth orbit in 2005, conducted an anti-satellite (ASAT) test in 2007 on an aging weather satellite, and performed its first spacewalk in 2008. The manned space flight program is operated by the Chinese Manned Space Engineering Office (CMSEO), which is within the People's Liberation Army (PLA) [1].

The European Space Agency (ESA) is the primary space actor in Europe, with 18 member states obligated to contribute a set amount, based on the gross domestic product, for core programs, such as space science. Voluntary contributions can be made to other programs, such as human space flight, research, or telecommunications. Several Europian countries have taken lead in space activities, each with a particular niche. Policy and implementation of space activities in Europe is coordinated between ESA and the European Commission.

France's national space agency is the Centre National d'Etudes Spatiales (CNES), which provides partial funding for Arianespace, the commercial entity that manufactures and operates the Ariane launcher. The country's focus is on access to space, civil applications of space, sustainable development, science and technology research, and security and defense [1].

The German Aerospace Center (DLR), which carries out research and development work in aeronautics, space, transportation, and energy, is Germany's national space agency. The agency focuses on observing the Earth and universe, research for protecting the environment, and development of environmentally-friendly technologies to promote mobility, communication, and security [1].

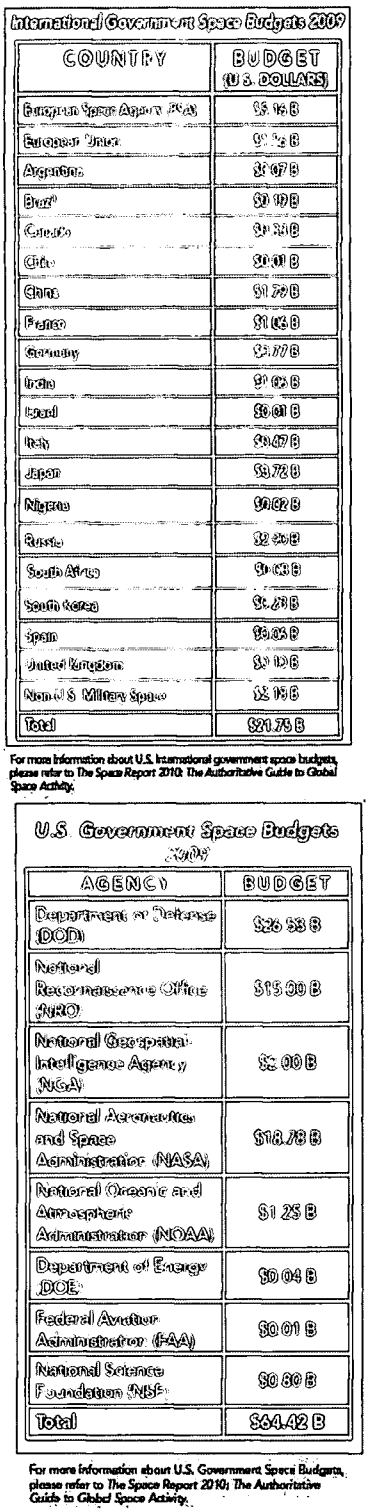
Italy's national space agency is the Agenzia Spaziale Italiana (ASI), which promotes, coordinates, and conducts space activities in Italy, including space technology. ASI is working on the Vega small-class launcher for ESA.

The U.K. Space Agency was launched in March 2010 to replace the British National Space Centre and to bring all U.K. civil space activities under one single management. It coordinates U.K. civil space activity, supports academic research, nurtures the U.K. space industry, raises domestic and international awareness of U.K. space activities, works to increase understanding of space science and its practical benefits, and inspires the next generation of U.K. scientists and engineers. The U.K. has developed niche expertise in small satellite technology and recently published a 20-year strategy to grow the U.K. space industry [1].

Russia's space program is organized around the federal space agency, Roscosmos, as well as a branch of the armed forces dedicated to all military satellites and launch facilities. The agency focuses on practical applications, such as communications, remote sensing, and navigation. Its main priorities include replacing aging satellite fleets, space sciences, and human spaceflight. Russia provides additional crew and cargo transportation to and from the ISS, as well as logistical support, and continues to build on Soviet-era space expertise and capabilities, particularly in human spaceflight [1].

Governmental space budgets are shown in Figure (1) . United state's budget is

more than three times of other countries but, experience from international space station show that space projects cannot be carried out out by an individual country.



International Government Space Budgets 2009

COUNTRY	BUDGET (U.S. DOLLARS)
European Space Agency (ESA)	$5.16 B
European Union	$[illegible] B
Argentina	$[illegible] B
Brazil	$0.19 B
Canada	$[illegible] B
Chile	$0.01 B
China	$1.79 B
France	$1.43 B
Germany	$[illegible] B
India	$[illegible] B
Israel	$0.61 B
Italy	$0.47 B
Japan	$3.72 B
Nigeria	$0.02 B
Russia	$[illegible] B
South Africa	$[illegible] B
South Korea	$[illegible] B
Spain	$0.85 B
United Kingdom	$[illegible] B
Non-U.S. Military Space	$[illegible] B
Total	$21.75 B

For more information about U.S. International government space budgets, please refer to The Space Report 2010: The Authoritative Guide to Global Space Activity.

U.S. Government Space Budgets (FY09)

AGENCY	BUDGET
Department of Defense (DOD)	$26.53 B
National Reconnaissance Office (NRO)	$15.30 B
National Geospatial-Intelligence Agency (NGA)	$[illegible] B
National Aeronautics and Space Administration (NASA)	$18.78 B
National Oceanic and Atmospheric Administration (NOAA)	$1.25 B
Department of Energy (DOE)	$0.04 B
Federal Aviation Administration (FAA)	$0.01 B
National Science Foundation (NSF)	$0.80 B
Total	$64.42 B

For more information about U.S. Government Space Budgets, please refer to The Space Report 2010: The Authoritative Guide to Global Space Activity.

Figure (1) governmental space budget[1]

Not shown here is the budget spent in space development program in developing countries. The manpower also involved in of considerable dimensions. Most these resources are sent on aquiering the technologies already full developed, and does not add to the humane knowledge and abilities.

International Collaboration frame work

In 2004 [1], we debated on new trend of countries space strategy and argued that NASA strategy and roadmap which had been announced by former USA president. We noted that the space plans of pioneer countries, mostly emphasized on a national program that could increase chance of a new space race. There, we offered response of other countries to new NASA's plan that had targeted come back to Moon and beginning of journey to Mars before 2030. Immediately, after publishing of that plan, other countries such as Russia, India, china and EU responded by announcing of their own space strategies. Following the presentation of our paper at IAF 2004, many papers and articles entitled "New Space Race" were publish that argued the new space strategies could boost a new space race and cause world resources and budget spent inefficiently. At the time we suggested an international collaboration in space program and emphasized on necessary of all nations and countries presence in a collaborating program.

In May 2007, The International Space Exploration Coordination Group (ISECG) was established in response to "The Global Exploration Strategy: The Framework for Coordination" developed by fourteen space agencies and released, these agencies are shown in Fig (2).

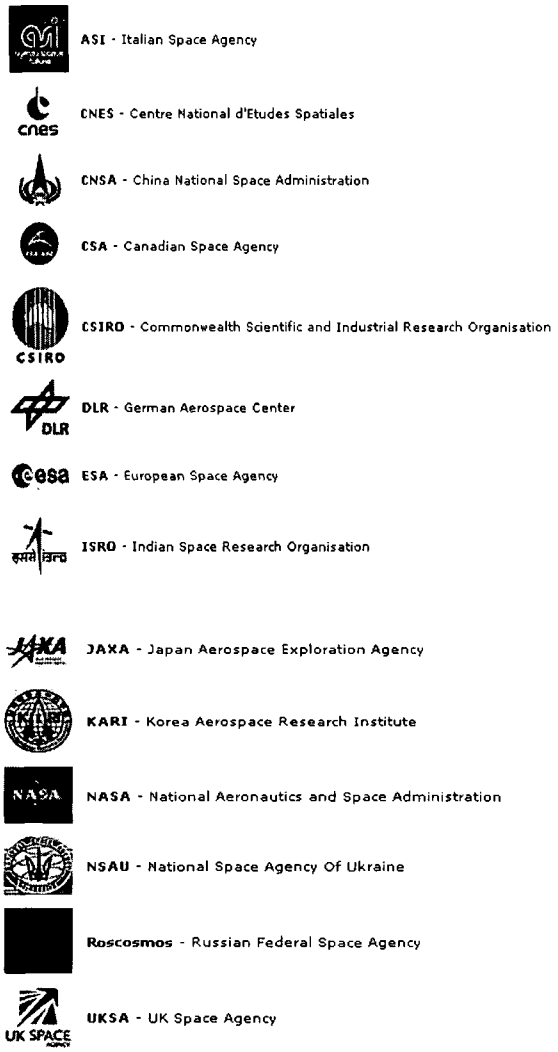


Fig. (2) Fonder of ISECG in alphabetical order: ASI (Italy), BNSC (United Kingdom), CNES (France), CNSA (China), CSA (Canada), CSIRO (Australia), DLR (Germany), ESA (European Space Agency), ISRO (India), JAXA (Japan), KARI (Republic of Korea), NASA (United States of America), NSAU (Ukraine), Roscosmos (Russia). "Space Agencies" refers to government organizations responsible for space activities[3]

This GES Framework Document articulated a shared vision of coordinated human and robotic space exploration focused on Solar System destinations where humans may one day live and work. Among the many Framework Document findings was the need to establish a voluntary, non-binding international coordination mechanism through which individual agencies may exchange information regarding their interests, plans and activities in space exploration, and to work together on means of strengthening both individual exploration programs and the collective effort [2].

In 2008, in recognition of widespread support of an eventual human mission to Mars, a proposal was made for ISECG to further elaborate the perspectives described in the Framework Document, "Mapping the Space Exploration Journey." Thus, an ISECG effort referred to as Mapping the Barriers to Human Exploration has begun with the goal of identifying the significant, known technological and operational challenges associated with extending human presence to various destinations in the Solar System [2].

This activity was progressed with the publication of an International Astronautical Congress (IAC) paper co-authored by several ISECG members entitled "From LEO, to the Moon and then Mars: Developing a Global Strategy for Exploration Risk Reduction" [3] The paper examined Mars mission scenarios developed by NASA and ESA, and discussed conclusions regarding key challenges needed technologies and associated mission risks. The paper discussed both the importance of using the International Space Station as a platform for space exploration risk reduction and how the global exploration community could develop lunar exploration elements and architectures that enable the long term goal of human missions to Mars. The paper also discussed the logic and strategy for addressing technological, operational and programmatic challenges by using Low Earth Orbit and lunar missions to enable the long term goal of exploration of Mars and other destinations within our Solar System [2].

However, ISECG is a new and significant step in space collaboration but it needs to improve its mission and vision to involve other countries in this collaboration.

China was the main driving force behind the October 2005 establishment of the Asia-Pacific Space Cooperation Organization (APSCO), an initiative for regional multilateral cooperation. This organization grew out of a 1992 joint proposal by China, Pakistan, and Thailand to create a framework for multilateral cooperation concerning small satellite development and training in the Asia-Pacific region.

The realization of this partnership was apparently accelerated by the success of China's human spaceflight project, and it reveals China's eagerness to actively take the lead in space development efforts in Asia. The original signatories of the APSCO convention, which was signed in Beijing in October 2005, are China, Pakistan, Thailand, Indonesia, Bangladesh, Mongolia, Iran, and Peru. Nations that have participated in the organization as observers include Brazil, Argentina, Malaysia, the Philippines, Russia, and Ukraine.

Need for New International Look

All these show two points. Firstly, the financial and human resources dedicated to space activities and projects in notably high. Secondly, in all planning and decision making levels the need for international cooperation is not only felt, but is shaping the stage very rapidly. However, one thing is missing is the properly noting that this is not just the budget which is not managed efficiently, but also the manpower resources are not utilized effectively from an international view point.

This new paradigm of international cooperation and involvement, among other issues, present many challenges and new concepts and debate in international law.

How national budget are going to be coordinated to prevent parallel and unnecessary technology development, while national interest are satisfied?

Conclusion

No doubt that international cooperation among states is essential for farther development of space activities specially for exploration and exploration of planets beyond our solar system.

Most of the mission such as human lunar mission, and low orbit mission by man has to be done by private sectors.

Above the regional cooperation among states, an international cooperation which fully represent the interest of all countries has to be establish to the best use of all resources specially man power and avoid parallel programs and unnecessary competition.

References

1- Introduction to Space Activities, Space Foundation, [available online]: www.SpaceFoundation.com

2- The 2009 Annual Report of the International Space Exploration Coordination Group, Released December 2009.

3- K. Laurini, NASA; B. Hufenbach, ESA; B. Schade and P. Weber, DLR; A. Lorenzoni, ASI; October 2009