

A Perspective on Space Collaborations: Looking Ahead at the Global Challenges and Opportunities

Vincent C. Boles
AIAA, Vice President – International

The Aerospace Corporation
General Manager – Advanced Technology Division



I began my Aerospace career very early working with spacecraft hardware as a high-school summer hire in Southern California with what was then the Hughes Space and Communications Company. My 35 year career has since spanned working on commercial, civil, and defense space systems and programs; domestic and international. Space initiatives and activities have always held an interest for me, not only from their technological challenges, but also from their breadth of applications from which we benefit in so many ways.

Years Experience: 35
Years at Aerospace: 27

Experience Summary

Mr. Boles volunteers service to the American Institute of Aeronautics and Astronautics (AIAA) on the Board of Directors as Vice-President – International and as Chairman for the International Activities Committee.

Mr. Boles volunteers service to the Governor's office of the State of Virginia as Board Chairman for the Mid-Atlantic Regional Spaceport (MARS) responsible for the commercial launches from Wallops Island, Virginia.

Mr. Boles has 30 years technical and management experience in space systems and technologies, procurement and acquisition, program and project management, and marketing and business development. He has keen insight into international, commercial, as well as US Civil and IC/DoD space programs and initiatives. His expertise spans the areas of Space Technology, Telecommunications, Remote Sensing and Geographic Information Systems, Navigation, ISR, System Architecture Planning and Development, Technology Applications, and Risk Evaluation.

Mr. Boles joined The Aerospace Corporation in 1981. He currently serves as General Manager of the Advanced Systems and Technology Division, which pursues and evaluates new and innovative technology for future space systems applications. Mr. Boles provides an integration function for space technology across intelligence, military, civil and commercial space systems.

For 8 years before joining Aerospace, Mr. Boles held industry engineering and management positions in related communications and spacecraft development functions at Hughes Aircraft, Western Union Space Communications, and Bell Laboratories

Mr. Boles received his M.S. in Electrical Engineering from Stanford University in 1977 and a B.S. in Electrical Engineering from the University of Southern California in 1976. He is also a graduate of the Brookings Institute and the Leadership Development Program from the Center for Creative Leadership.

Mr. Boles served as corporate representative to the International Astronautical Federation (IAF), as well as, Chairperson of the International Cooperation and Competition Committee of the International Space Plans and Policies Symposium for the International Academy of Astronautics (IAA) where he is a lifetime member.

My perspectives on global space collaborations captured here are derived from experiences and insights obtained throughout my career. I address some forward looking prospects underlying global space collaborations and discuss some of the more probable opportunities likely to be advanced through collaboration. I also address the challenges and uncertainties involved. These are solely the author's viewpoints.

Global space collaboration and cooperation has been a long tradition of our industry, but it has progressed significantly on both bi-lateral and multi-lateral levels, especially since the 1980's. Cooperation and collaboration are now a critical element of each major space-faring nation's current strategic plans. International cooperation has become an increasingly important part of today's space programs and will likely remain such, especially for civil and commercial space initiatives; less so for some nations defense and specific military applications. Collaboration efforts have traditionally been driven by needs for achievements of a technological nature or one of a national policy basis. While these are strong ingredients of any collaboration or partnership, times have changed where these drivers alone may no longer be sufficient or adequate to sustain future mission and application expectations and needs, especially given the magnitude of the initiatives and opportunities.

Many symposia, conferences and papers have been developed or written which address international space cooperation and collaboration and various models or frameworks from which they are derived or could benefit. These typically address management of the classical parameters (cost, schedule, performance) which is no longer sufficient without also managing the political climates which impact collaborations. I extend these parameters even further by addressing collaboration from a broader perspective of the likely global trends, market influences and resource considerations.

It's no doubt that space and space derived technology has greatly benefited and influenced human's quality of life. Further, international space collaborations will continue to be driven and initiated strongly through the knowledge, leadership, and insights from the space agencies of both their individual technological strengths and weaknesses, and their national political climate. It will always be the case that international space collaborations entail considerable extra resources, time, and effort to implement.

However, as we look ahead, several prevailing factors and influencing global market conditions will likely influence collaboration efforts the next several years.

Resources and market issues

- Among many advanced space-faring nations their space sector industrial bases have contracted through the Prime contractor to second and third tier supplier levels creating various shortages in competition and supplier vendors for space qualified parts and materials. This will influence elements of collaboration through the economics of supply and demand seeking alternatives resources.
- The advanced science, math, and engineering skilled workforce required for the sustainment and growth of the space sector is reshaping due to the aging and retirement of early space pioneers. In nations with developing space programs, the problem is less severe; however, the knowledge and experience base is still maturing. Younger professionals are more mobile and this often is challenging to an organization's stability and knowledge capture and retention.
- Many global problems aren't reliant solely on space based solutions. Multi-System integration with intelligent automation that cuts across, space, airborne, UAV, maritime, and terrestrial systems for convergence is often necessary. This will have the tendency to expand traditional space collaboration on a broader market scale and complexity as other industrial sectors are likely to be involved.

Economics and public perceptions

- Space endeavors remain expensive and under strong public scrutiny for their cost when evaluated against their perceived rewards and benefits to society. Societies needs and public interests support will become more influential in national and space agency directions, priorities, and funding. While many society questions and perceptions can be answered, it will require sustained efforts to develop and send national and coordinated international messages into appropriate public forums.
- The current global monetary and fiscal crisis is reshaping national priorities with government's attention being occupied on what they perceive as immediate and essential society needs. At the moment, and for the likely next 2 -4 years, a significant part of the world is or will be under a fiscal crisis resulting in contractions on many sector levels not seen in decades. Because today's trade economies are so global, the effects ripple and the growth recovery transitions will likely be protracted. This could strain the prospects of some country's and agency's ability to undertake programs or missions without collaboration for both economic relief and political acceptance.
- Economic and mutual needs may initiate a shift on a global scale towards smaller low cost application and mission specific systems and their corresponding space based solutions. If cost effective, this could enhance the collaborative affordability factor and may spawn solutions that other industry's may utilize and benefit, thus expanding markets beyond their immediate application as has been seen for navigation systems applications.

Political, National and International considerations

- There appears more public reception for individual national civil space programs today when linked to civil security, climate change, or disaster management. Defense and military space programs acceptance remain a public perception challenge because of the inability for governments to openly detail their specific missions, value and applications.
- The United States, with a shift of administration, has a much stronger potential to become more actively engaged on some of the broader global issues and initiatives that have space implication, such as climate change and earth observation, energy, and safety and disaster management. The new administration has indicated their openness and priority to addressing these matters and separately for an effective space program.
- All nations benefiting from commercial and security related space activities must evaluate their positions and concerns about the increased risk of collisions with debris; further, increased from the Chinese ASAT test. The international community will have to address this matter from the context of endangerment to human spaceflight and other space activities and for the preservation of the space environment for future generations.
- As collaborations move forward, there are an enhanced set of national participants among the ranks of significant and viable space faring entities from which collaborations can be assimilated. We can expect to see the potential for the embracement of cooperation and collaboration among country's and agencies from the regions of: US & Canada, Europe & Russia, Asia Pacific Region (Japan, India, China, and Korea). While broader international issues may create challenges for collaboration, organizations like the United Nations - Committee on the Peaceful Uses of Outer Space (COPUOUS) can help shape policy from which they can proceed.

- The role and use of national and international aerospace professional societies, academic, and space policy institutions to assist in shaping global and in-country messages can be very effective and powerful resources to address global topics facing many nations. These organizations provide a means for global challenges to be addressed more comprehensively and less unilaterally.

Collaboration Opportunities

Notwithstanding the resources and market issues, economic and public perception, and political aspects and challenges mentioned, there are opportunities and thrusts which are likely to drive and benefit on a collaborative nature:

- Space Exploration and observation is and will remain an area where achievements and progress can be extended the most through collaboration at all levels. The challenge facing this area is one of agreements on mission directions and priorities such as lunar or solar systems and beyond.
- Cost effective, space transportation will continue to be achieved on a global collaborative level. New market entrants make this a strong part of consideration from the outset.
- Social systems for societal needs will likely have the greatest opportunity over the next several years for being receptive to public appreciation for startup, continuation and operational application. In particular those programs or missions in the areas of, or address issues related to: Climate change and earth observation, and energy resources and conservation will be the most likely to prevail.
 - Other global themes and drivers which will stimulate areas for collaboration on a lesser scale are likely to be in disciplines that involve or employ:
 - Terrorism & Security concerns
 - Improved computing capability and use of information and knowledge management capabilities for both collaborative efforts and public outreach
 - Navigation for Air traffic growth and congestion
 - Light weight materials and structures
 - Multi-System integration with intelligent automation
 - Nanotechnology being adopted on a more expanded basis

Closing thoughts

Collaborations on space activities will continue to be an established and growing component of the industry. While there are several challenges facing the space industry such as aging skilled resources, contracting industry suppliers, a downward global fiscal situation, and perceptions on value to society, these also make for conditions where opportunities for collaboration will have a better chance to advance. Several opportunities have been identified where collaboration is more likely to prevail amidst all the challenges, and to occur among a broader set of applications and space capable participants.