

***Design of a Mechanism to Organize International Collaboration on Space Exploration***  
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I. **Introduction**

In the three years since the Vision for Space Exploration announcement, NASA has engaged other space agencies in informal discussions on goals, capabilities, and timelines for future space exploration, particularly focused on the Moon. Until recently, most of these multilateral discussions have been organized as one-time activities, occurring as conferences, workshops, and informal meetings.

Thus far, loose and informal discussions have sufficed because no agency, including NASA, had defined its goals for going to the Moon nor developed an architecture to support those goals. This situation, however, is changing.

Throughout 2006, a group of 14 space agencies, led by NASA, worked to develop a Global Exploration Strategy. The core component of the Global Exploration Strategy is a framework document outlining the rationale for space exploration as a global community and why the Moon is a critical first step. Other components of the Global Exploration Strategy include a set of Lunar Exploration Themes and Objectives that answer the questions, “Why explore the Moon?” and “What can we accomplish through lunar exploration?”

Using the Global Exploration Strategy as a starting point, NASA during the second half of 2006 defined its priorities for lunar exploration and an architecture baseline for accomplishing these goals. While NASA was the first to develop such plans, unveiling them at the 2<sup>nd</sup> Space

Exploration Conference in December 2006, other agencies are following suit; in 2007 many will develop their own proposals for exploring the Moon and other destinations.

As more nations create plans for lunar exploration and, hopefully, gain political and programmatic support for their exploration programs, international collaboration for space exploration should increase. The reasons for international collaboration are well known; collaboration can increase the total resource level available for exploration, eliminate duplication of efforts, and improve international relationships, among other things.

But international collaboration, especially in a multilateral fashion, does not happen by accident. International collaboration must be initiated by at least one player, and can be facilitated by collaboration mechanisms to promote, facilitate, and govern international interactions.

To this end, this paper looks at the desirable features of a multilateral international collaboration mechanism to formalize the series of informal discussions that have occurred among the space agency community in the past three years. A more formal mechanism can give structure and regularity to nascent international collaboration efforts.

The desired features for the a mechanism are captured as a set of criteria for participation by all the major space powers. These criteria were developed by synthesizing information obtained in interviews of space agency and government representatives.

For the purpose of this paper, “international collaboration” is used as a general term to mean all types of interactions between space agencies or nations. Interactions could be as loose as coordination of independent missions and roadmaps or as tight as cooperation on specific missions and projects. Where on this “collaboration scale” a mechanism will fall is, in part, determined by the specific criteria outlined here.

## II. **Desirable Criteria for an International Collaboration Mechanism**

The United States and many spacefaring nations around the world are currently considering if and how they could be involved in an international collaboration mechanism for space exploration. Currently, no nation has an official position on what the desirable criteria of the mechanism would need to be in order for it to join.

For this section of the paper, therefore, unofficial positions for the United States and other nations are constructed by integrating official government statements and interview responses from individuals representing either space agencies or national governments. The information contained here, while perhaps reflective of what a national position could be, is influenced by the opinion of the interviewees and not intended to substitute for national policy.

### ***From the Perspective of the United States***

The United States is the only nation that currently has a political mandate to pursue human space exploration beyond low Earth orbit. As such, NASA enjoys a large budget, relative to other space agencies, and NASA is actively developing plans to initiate a new era of manned space exploration with a return to the Moon.

NASA has also been actively engaged in discussions of potential international collaboration. Thus far these discussions have been informal and have preceded the release of detailed plans or architectures.

Moving forward, the United States will engage in international collaboration on space exploration if the collaboration mechanism meets the ten criteria below. The criteria are not listed in order of importance; they are simply grouped for flow of ideas. All ten criteria should be met, though of course there will likely be room to negotiate if necessary.

These criteria were developed by synthesizing information from interviews with space experts at NASA and the White House, statements from U.S. policies, such as the Vision for Space Exploration and the 2006 U.S. National Space Policy, and speeches by high-ranking officials, including President Bush, White House Science Advisor John Marburger, and NASA Administrator Mike Griffin.<sup>1</sup> Because most of these criteria are driven by policies at the Administration, as opposed to agency, level, their applicability may need to be revisited when a new U.S. President is elected in 2008.

*1. The mechanism must protect and advance U.S. interests.*

First and foremost, any international collaboration must protect and advance U.S. interests. Likewise, the venue should protect and advance the interests of U.S. allies, wherever possible. The United States will seek international collaboration, but not at all costs.

This criterion requires that the objectives and principles of the mechanism be in line with U.S. policy and plans. For example, any mechanism must include exploration to the Moon as part of its mandate, as this is one centerpiece of current U.S. space policy. The mechanism must also enable NASA to meet its program objectives, while advancing general U.S. scientific, security, and economic interests.

In other words, the United States will not participate in something simply to promote good will among nations (though, of course, this is part of U.S. security interests). The mechanism must actively enable the United States to achieve its national objectives. Enablers could be specific international cooperation agreements to jointly carry out a particular mission, legal mechanisms that ensure resource utilization rights, or exploration participation and investment by a larger group of nations than the traditional space powers, among other things.

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<sup>1</sup> A full list of sources is included in the reference list. All interviews were conducted on a non-attribution basis.

2. *The mechanism must have a clear scope.*

The collaboration mechanism must define and maintain a clear scope or set of objectives toward which the participants are working. Looking at current exploration policies from the world's space-faring nations, there are a wide variety of options for the mechanism's scope. The options range from pure robotic missions to other planets or near-earth objects to manned missions to the Moon or Mars. Any or all of these missions could be encompassed by a sufficiently well defined scope. What the scope encompasses is not as important, so long as it is clearly defined and maintained over time.

3. *The mechanism must allow the United States to retain its independence in key areas.*

While the United States is certainly interested in collaborations with other countries, it will not engage at the expense of its independence in certain key areas. In this context, independence means two things.

First, the United States must retain its independence of decision. At this stage, and probably for the foreseeable future, the United States will not join any collaboration forum that makes programmatic or budgetary decisions by committee. This means that the collaboration mechanism must either not make any programmatic or budgetary decisions, or that any decisions that are made must be treated as non-binding recommendations. This aspect of the criteria is in line with criteria #1. By maintaining its ability to make independent decisions, the United States will inherently have the control to follow its strategic interests, even if they change over time.

Second, the United States must retain its freedom of action. The United States is not interested in becoming bound by an international agreement that will commit it to a specific course of action for many years in the future. The United States must be able to pursue its own programs, and change its plans and policies as conditions warrant, irrespective of what other

nations want to do. Similarly, other nations must be able to change their plans and policies without totally disrupting those of the United States. In other words, the United States is not ready to agree to another International Space Station-type agreement that ties its hands (and budget) for 25 years or more.

4. *The mechanism must operate such that the United States can exercise control over its membership.*

The United States will not engage in international collaboration with any and all nations that are interested in space exploration. The United States must be able to control which nations (or representative space agencies) can become members of the collaboration mechanism. There are two components to this control.

First, there must be a set of criteria that interested nations or agencies must meet in order for them to be considered for membership. This would have to include a criterion that potential members have at least modest budgets allocated for exploration activities. Every participant must have “skin in the game.” An additional criterion could be a certain level of technological capability. Every participant must be able to contribute something that furthers the overarching goals. These types of objective criteria ensure that all participants are, in a broad sense, equivalent.

Second, existing participants must be able to approve or deny new membership requests. United States action in space does contribute to and must conform to U.S. foreign policy. Even if the mechanism is non-binding (as described in #3), simply the fact that the United States is a member of the mechanism implies a foreign policy alignment with other members. Therefore, all members of the mechanism must be acceptable partners from a foreign policy perspective, in addition to meeting the criteria outlined above. One option for meeting this criterion would be

that all membership requests must be approved by a consensus of existing members. This allows the United States to exercise a veto option on states it does not want to participate in the mechanism.

*5. The mechanism must operate on a no exchange of funds basis.*

The United States will not provide any other nation with funds in exchange for systems or services. Participants will be expected to fund their own capabilities and, if they so choose, share them via a non-monetary exchange.

This criterion ties closely to the previous one by implying that a nation must invest at a certain level in order to be involved in the collaboration mechanism. In addition to ensuring that all nations provide contributing capability, it means that only those with a vested interest in program success will play a role in discussions. Any participant given a seat at the table and a voice in the forum will represent an actual exploration program with a non-zero budget.

*6. The mechanism must protect U.S. strategic technologies.*

In areas where the United States maintains a strategic technology advantage, it will not share detailed technical information with all of its potential partners. This criterion has ramifications for the types of discussions that participants in the collaboration mechanism can have as a whole group. While the United States may be willing to engage in more detailed technical discussions with its traditional NATO or ISS partners, it is unlikely to share with other partners information at any significant level of technical detail.

Unless the United States asks its non-traditional partners to “leave the room” during technical discussions or exercises firm control over group membership (as described in #4), the mechanism cannot serve as a cooperation framework for specific projects. Any direct

cooperation where two or more agencies are contributing to the same system must be handled by additional bilateral or multilateral cooperation agreements.

*7. The mechanism must be able to engage actors beyond other national space agencies.*

The actors participating in space exploration extend beyond national space agencies. Two groups in particular, the private sector and other coordination bodies, should be able to participate in the collaboration mechanism, though not necessarily as “members” meeting the criteria outlined in #3.

Traditional aerospace contractors and emerging entrepreneurs will have an interest in the discussions of the national space agencies so that they can understand what capabilities they may be called on to provide in both the short and long term. A key charge of the Vision for Space Exploration is to enable these and other commercial firms. Allowing the private sector to listen to discussions and contribute, when appropriate, can facilitate their future success.

Other coordination bodies, such as existing space exploration working groups like the Mars Exploration Program Analysis Group or existing international space coordination and regulatory bodies such as the International Telecommunications Union, have both the expertise and international networks that can provide valuable insight, recommendations, and credibility for exploration. These groups could be utilized as working groups for the mechanism, instead of convening fresh groups of experts each time recommendations are needed.

The collaboration mechanism therefore must be flexible enough to interface with other groups and, in the case of the international coordination and analysis groups, do so in a way that does not encroach on their established areas of expertise. While the way the mechanism interfaces with different groups may vary, the key criterion is the flexibility to engage outside groups however is most useful.

8. *The mechanism must not require formal agreement above the agency-to-agency level.*

At this point in time, the United States does not want to sign an agreement that is at the level of a treaty or other government-to-government agreement. An agreement at these high levels would take years to negotiate and sign and not allow for sufficient flexibility in the early stages. Instead, an agreement at the agency or program level agreement would be easiest to implement and most appropriate during these early stages.

This criterion, of course, does not mean that actors above the agency level will not need to be involved in agreeing to a mechanism. If NASA wants to become part of an international collaboration mechanism, White House and Department of State staff must concur because of the foreign policy implications inherent in collaboration on space exploration. If NASA as an agency and representative of the U.S. government is a member of a mechanism, other parts of the government must approve.

9. *The mechanism must be flexible.*

A key part of the Vision is that space exploration be sustainable over time. Having a more flexible mechanism will allow it to be modified over time as the types of exploration activities change. If nations, including the United States, change their plans, a flexible mechanism could be reworked to take major changes into account.

Flexibility also means that the mechanism will not be too organizationally heavy. The United States does not want international collaboration to be burdened by unnecessary rules and bureaucracy. At the same time, the mechanism must have enough structure so that it is real enough and useful enough to ensure members participate in mechanism activities and sustain them over time. At minimum, this criterion implies a regular schedule of meetings and some type of terms of reference, and could imply a standing secretariat is maintained.

*10. The mechanism may evolve over time, possibly toward a more binding agreement.*

Finally, all of the criteria discussed above will change over time, as exploration plans solidify and nations begin developing hardware. If the United States becomes involved in a global exploration architecture where it relies on other nations to provide capabilities (even augmented capabilities such as science labs), it will want to bind participants to better ensure they deliver on their commitments. Any multilateral binding via the mechanism will not occur for at least five to ten years, beginning once national priorities and national programs are identified, and becoming critical once money is being spent and metal is being cut.

Therefore, the other nine criteria will serve as the foundation for designing an international collaboration mechanism that the United States would agree to in the near future. This mechanism will be designed under the assumption that it is an initial structure that will be most useful for the early stages of exploration, particularly the planning and architecture baselining stages. The mechanism will also be designed such that it may evolve over time toward a different type of mechanism suggested by this final criterion.

***From the Perspective of Other Nations***

The space agencies of the rest of the world do not yet enjoy the same political support for space exploration, particularly human exploration, as does NASA. Planning for exploration is, in many space agencies, still in its infancy, if it has begun at all. Therefore, the criteria described below are generally not official positions of the different potential participants in space exploration, but rather represent the personal views of the individual interviewed. Like the U.S. criteria, the ten criteria below would have to be reviewed with changes in national leadership and space policy. Again, the criteria are grouped by flow and do not reflect any prioritization.

To generate this set of criteria, interview data from official and unofficial representatives of other space faring nations and agencies were synergized to create a coherent set of ideas. In many cases, representatives from many different nations offered the same ideas, and so it was relatively easy to combine the data from different sources into one set of criteria. Each nation, however, will likely have its individual priorities when negotiations begin.

The individuals interviewed in this section were the official Washington, D.C. representatives for the Canadian Space Agency (CSA), European Space Agency (ESA), French National Space Agency (CNES), German Aerospace Agency (DLR), Indian Space Research Organization (ISRO), and Japanese Aerospace Exploration Agency (JAXA). In addition, general science and technology counselors representing Italy and Russia were interviewed. Finally, a visiting scholar from the Chinese National Space Agency (CNSA), currently at the George Washington University Space Policy Institute, was interviewed for an unofficial perspective on China. Additional research for this section includes papers from the 2005 and 2006 International Astronautical Congresses, presentations from the series of “Spineto” workshops (I and II), findings from the series of AIAA workshops on international cooperation for space exploration, and other relevant speeches and presentations.<sup>2</sup>

### **Preconditions**

Before laying out the ten criteria for participation, first there are two preconditions that many space agencies must address before they can consider participation in an international collaboration mechanism.

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<sup>2</sup> A full list of sources is included in the reference list.

1. *Space agencies need political backing for exploration and/or human spaceflight programs.*

As mentioned, other space agencies do not enjoy the same national political backing for exploration that NASA does. Before being able to fully engage in collaboration on exploration, other space agencies must receive signals from their political and policy leaders to proceed. Some individuals suggested that an invitation by the U.S. President could increase the likelihood of a commitment by their political leaders, but recognized that may not happen.

Europe in particular must decide on its human space flight policy. While Europe does enjoy political support for unmanned planetary exploration, its ability to engage in lunar exploration depends on what its human space flight capabilities are. Europe must decide whether to partner with Russia and/or Japan to develop a parallel capability to the U.S. Crew Exploration Vehicle and associated launch systems. Included in this decision is whether Europe wants to assured access to fly European astronauts.

2. *Space agencies need confidence that U.S. space policy will not change dramatically following the U.S. presidential election in 2008.*

Many space agencies are considering altering their space programs and plans in order to participate in the lunar exploration plan initiated by the United States. Many space agencies did not previously have plans to explore the Moon, but instead were focused on Mars and other destinations in the solar system. Refocusing their efforts to the Moon will require a shift in policy.

In order for space agencies to fully commit to this change in focus, they must be assured that the United States is not going to change its plans following the presidential election of 2008.

Space agencies do not want to invest resources in lunar exploration only to find that the major partner, the United States, is no longer interested.

In additions, space agencies are waiting to see what the United States' post-2010 International Space Station policy will be. While they currently feel assured that the United States will meet its obligations to complete assembly of the station, they are not sure whether the United States plans to commit resources to ISS utilization. If other space agencies had to assume responsibility for the whole ISS utilization budget, they likely would not have enough funds to also pursue new lunar exploration programs.

### **Mechanism Criteria**

1. *The mechanism must allow space agencies to retain their independence in key areas.*

This criterion is virtually identical to that described in the U.S. section. Again, key areas of independence for other space agencies are independence of decision and independence of action.

Other space agencies described independence slightly different than the U.S., but to the same effect. Independence is the ability to make independent decisions to pursue independent national programs. Space agencies do not want all of their funds tied up with exploration, should they choose to pursue other national programs because of national priorities. Each nation has its own strategy, and each wants the ability to follow its own path. Where national priorities yield missions that tie to exploration, space agencies are willing to coordinate with a “system of systems” approach.

This attitude does not appear to rule out bilateral cooperation for specific projects or capabilities. However, like the U.S. attitude about independence, other space agencies want the self-determination to make decisions and carry out programs in a manner best suited to them.

2. *The mechanism must include collaboration on scientific investigations.*

Because many space agencies do not yet have a political mandate to pursue human exploration, scientific investigations must be included in the mechanism's purview, in order for some space agencies to participate. This criterion is similar to the first criterion in the U.S. section – that the mechanism must protect the interests of the United States. Similarly, the space agencies insisting on this criterion (mostly European space agencies) will not allow their national priorities to be subsumed by the collaboration activities. This criterion also means that scientific investigations of Mars must be included in the mechanism's purview, as many space agencies are more focused on Mars than the Moon.

An additional note is that by including robotic scientific investigations in the mechanism's purview, space agencies can gain political backing for participating in the mechanism, which could lead to greater support for exploration in general. The exploration programs of many space agencies are supported primarily by the scientific community. Satisfying the interests of the scientific community will be critical for enabling space agencies to collaborate on exploration.

3. *The mechanism must enable the creation of a global exploration reference architecture.*

Almost every interviewee said that a global exploration reference architecture was necessary to define common objectives, develop an overall plan, and provide continuity over time.

A global architecture begins by defining common objectives. All space agencies must decide together what the areas of common interest are for space exploration, broadly defined. Then, based on national capabilities and interests, the mechanism participants can develop a plan together to outline roughly how each nation can contribute to the larger plan. Finally, national space agencies can show this information to their politicians and policymakers to demonstrate

how their proposed programs will fit into the larger global picture. This could yield sustained funding and support for exploration.

4. *The mechanism must influence space agencies to undertake particular missions and projects.*

One of the key functions of the collaboration mechanism is that it should identify where particularly capabilities are lacking and serve to influence space agencies or cooperating groups of space agencies to fill those gaps. Without this function, the value of international collaboration is greatly diminished.

If participants develop a global reference architecture, as outlined in criteria #3, identifying gaps should be relatively easy. The more difficult part will be to influence space agencies to fill those gaps or provide redundant systems for capabilities on the critical path. This criterion could be satisfied in a number of ways, including treaty-like legal obligations upon joining the mechanism or simply greater political pressure associated with membership. How this criterion will be satisfied will depend on other criteria for the mechanism.

An additional point here is that by identifying areas for national contribution, the mechanism can also provide a forum in which to encourage and facilitate bilateral or multilateral cooperation on specific projects. If multiple space agencies are interested in filling the same gap, they could identify that mutual interest through mechanism discussions and then begin negotiations. The mechanism itself does not have to be the forum of negotiation, but it can provide a starting point to initiate them.

5. *The mechanism must allow all space agencies to make a visible contribution to exploration.*

Other space agencies recognize that they are not likely to make as large a contribution to exploration as the United States. They still, however, want their contribution to be visible to their citizens because space exploration is still a source of national pride. If space agencies are going to invest resources in space exploration, their activities must be seen, in part, as national programs.

This means that “international collaboration mechanism” cannot be synonymous with a single U.S.-centric project for which other space agencies provide only augmented capabilities. Instead, the mechanism must either facilitate the coordination of independent programs or provide opportunities for mutually beneficial bilateral and multilateral cooperation projects.

6. *The mechanism must define a set of interaction principles for mission collaboration.*

Space agencies want the mechanism to define the principles of their interactions on exploration missions. In this context, interactions covers a variety of topics, ranging from legal interactions such as export control frameworks, to programmatic interactions such as infrastructure sharing, to technical interactions such as interoperability standards.

While these types of issues are very different, they all can be defined and agreed upon by the mechanism participants early on in collaboration. No matter what solutions participants agree to, having an established set of “rules of the game” will provide transparency to existing members and potential members. The principles should apply equally to all potential partners, to foster good will and a positive spirit of cooperation. If possible, agreeing to the principles should be mandatory for any nation interested in participating in the mechanism.

7. *The mechanism must be open to all space agencies that want to participate in exploration.*

Every interviewee who commented on the subject of membership said that any nation should be welcome to participate in the international collaboration mechanism, given that the nation has at least some small budget invested in exploration programs. Many interviewees described space exploration as a way to foster international stability and bring developing space agencies into a common international system. Space agencies do not want to treat space exploration as an area for competition.

This criterion runs contrary to one of the criteria of the United States. The United States wants the ability to control which space agencies join the mechanism, whether or not they meet the objective membership criteria (such as investment levels and technical capability, as described in #4 of the U.S. criteria). The United States is not comfortable collaborating with every nation and is not likely to agree to the “everyone is welcome” principle. Resolving this issue will be critical in developing the initial terms of reference of the mechanism and will require NASA (the likely representative for the United States) to consult heavily with the White House and Department of State.

8. *The mechanism must allow members to join and leave as national conditions warrant.*

The mechanism must be flexible enough that it allows new space agencies to join, as they become technically capable of contributing, and existing members to leave, as their national priorities change.

The first half of this criterion – the ability to accept new members as they become technically capable – recognizes that space capabilities are rapidly proliferating to many more space agencies around the world. Space is no longer the purview of only an elite group of space

agencies. If space exploration becomes a long-term endeavor, the mechanism must be able to incorporate the efforts of more space agencies as they become able to contribute. Allowing additional space agencies to participate over time will improve sustainability by increasing the total capabilities devoted to exploration and can foster the international stability described in criterion #7.

The second half of this criterion – the ability of a nation to leave the mechanism as their national priorities warrant doing so – was also touched upon in the U.S. criteria. If national priorities change and nations want to discontinue their exploration participation, the mechanism must allow them to leave. Satisfying this criterion may mean that joining the mechanism does not require a nation to contribute capabilities to a larger multilateral exploration architecture. Instead, specific projects may be agreed upon in bilateral or multilateral agreements like the International Space Station. Therefore, if space agencies want to change their contributions, they only disrupt the specific agreements they have made on project cooperation, as opposed to hindering the operation of the mechanism as a whole.

*9. The mechanism must require some participation at the heads of agency level or higher.*

The mechanism must require some participation by higher-level figures, such as the heads of agencies. Recognizing that the majority of the substantive collaboration work will, of course, be performed at the level of working personnel, having political figures involved at some stage in the mechanism's development and implementation will give it some political legitimacy.

Those who suggested this criterion did not all agree on what the appropriate level of political engagement should be. Some expressed that heads of agency meeting would be appropriate, while others expressed that the mechanism should be kicked off at the ministerial or heads of state level, via a forum such as the G8 meetings.

This criterion does not imply that heads of agency or heads of state must sign on to the mechanism as if it were a treaty, though some interviewees did suggest that. The consensus was only that by involving political figures either to kick-off the mechanism or review its progress on an annual or bi-annual basis, collaboration could be much more fruitful. Having political figures involved increases the political pressure on the mechanism to achieve meaningful results.

*10. The mechanism must be able to evolve over its lifetime.*

This criterion is similar to the final criterion in the U.S. section, without the strong call for evolution toward binding agreements. While one interviewee did suggest something very similar as described in U.S. criterion #10, most interviewees simply wanted to ensure that the mechanism could evolve as political and programmatic conditions changed.

This criterion recognizes that there will not be one mechanism that is appropriate for all situations. Instead, the mechanism should be built over time and able to grow or possibly scale back as conditions warrant. The mechanism should allow all windows of opportunity for international collaboration to remain open, without tying participants to any one way of working together.

As long as there is recognition by the international community that this mechanism is the place for discussions on space exploration, the structure of the mechanism is not of paramount concern. Space agencies will find ways to work together as they have always done, and the particular forum will evolve as need be.

**Other Discussion**

An additional point that does not fit with the mechanism criteria nor the preconditions is worth discussion nonetheless. Many interviewees raised the question of leadership. Who will be

the leader of the mechanism? Will there be formal leader? How will a leader or leaders affect the functioning of the mechanism?

First, many space agencies expressed interest, or at least acceptance, of U.S. leadership of exploration. Given that the United States currently has the most resources invested in exploration, it seems natural that other space agencies would plan their activities around those of the United States. This situation, however, may change over time. If other space agencies begin investing more resources, especially to develop parallel space transportation capabilities, other leaders may emerge. In order to deal with the rise and fall of dominant players, multilateral structures are necessary because they engage all players.

Second, leadership question also arose with respect to intra-European relationships. While the interviewees from the ESA member states were generally supportive of ESA representing their interests in the international collaboration forum, they still expressed interest in signing bilateral agreements between their national space agency and others. Whether these two positions are in conflict may not become apparent until multilateral collaboration begins in earnest.

### ***A Synergized Perspective***

As has been alluded to, many of the same criteria are found in both the U.S. and other nations' sets. While the motivations for specific criterion may differ depending on the nation or agency that proposed it, the end result is a set of mechanism requirements that are very similar. Though some negotiation will be necessary in areas of less synergy, we can imagine a mechanism that will meet most of the needs of the current major space actors.

The most overlap between the two criteria sets is in the requirements for independence, flexibility, and a clear scope. Almost every agency wants the ability to make independent

decisions to join and leave the mechanism as meets their national priorities, contribute program capabilities as they are able to, and shape the mechanism over time as their needs change. Some agencies want this flexibility because they perceive that their national priorities may change in the future; other agencies want this flexibility because they are not yet sure how they might contribute to exploration; and finally some agencies are still grappling with experiences from past collaborative programs such as the International Space Station. And though flexibility can extend to the scope of the mechanism, as it will likely evolve over time as well, all agree that a commonly understood starting point for discussion and collaboration is essential.

The only area of disagreement between the U.S. and other national perspectives is which nations will be invited or allowed to participate in the mechanism and what will this participation mean. While most nations want to welcome all interested nations, the United States is more concerned with the foreign policy implications of collaborating with those who may not be preferred partners. Resolving this disconnect will be important in establishing the mechanism's operations and initial membership group.

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