

YOOL KIM, GEORGE NACOUZI

# A Framework for Building a Civil Reserve Space Program

## Applicability of U.S. Transportation Command's Commercial Partnership Models

The U.S. Department of Defense (DoD) has been leveraging commercial space services for military operations for decades, primarily in the area of satellite communications (SATCOM) and remote sensing. In more recent years, the opportunities for DoD to leverage a variety of commercial space capabilities have expanded as the commercial space industry has evolved and grown substantially. Additionally, DoD recognizes that the U.S. commercial space industry is an element of national power, and its interests and efforts in developing a tighter partnership with the commercial space industry have been increasing. A conceptual partnership arrangement that is akin to the Civil Reserve Air Fleet (CRAF) program has recently gained attention as one avenue for building a close partnership between DoD and the commercial space industry.

The CRAF program is a partnership between the U.S. government and the U.S. commercial airline industry to provide DoD with assured access to additional airlift capabilities in times of national emergency or wartime operations. In exchange for

providing supplemental airlift capabilities, participants of the program receive preference for DoD and U.S. government business during peacetime. One thought is that DoD could develop a CRAF-like program for space to further strengthen its partnership with the commercial space industry to meet surge needs for space capabilities in crisis or wartime. This Perspective discusses how a program modeled after CRAF and the analogous maritime program, Voluntary Intermodal Sealift Agreement (VISA),<sup>1</sup> might apply to the space domain.

## Insights from the CRAF and VISA Programs

We examined key elements of CRAF and VISA to gain insights into key factors that DoD should consider if it were to develop a civil reserve space program. These key factors are summarized in Table 1, and we discuss each element and its implications for a civil reserve space program in the remainder of this section.

### Abbreviations

CRAF	Civil Reserve Air Fleet
DoD	U.S. Department of Defense
NSD	National Security Directive
OPLAN	operational plan
SATCOM	satellite communications
USTRANSCOM	U.S. Transportation Command
VISA	Voluntary Intermodal Sealift Agreement

## Guiding Statutes and Policies

The CRAF and VISA programs are both emergency preparedness programs founded on the Defense Production Act and supported by various laws and policies as listed in Table 1. These statutes and policies (see text boxes on page 4) are foundational to these programs because they support strategic goals of bolstering the U.S. commercial airline and maritime industries and creating enabling environments for such partnerships between the U.S. government and these two commercial industries.

Similarly, a CRAF-like program for space may need to be founded upon the Defense Production Act to provide DoD with the necessary authority to access the U.S. commercial space industry in times of national emergency or war. Furthermore, additional policies or laws that incentivize U.S. commercial space providers to sign up for the civil reserve space program may be necessary. A similar set of policies and laws for space would require DoD to rely on commercial space capabilities to meet its space needs in peacetime and contingency to the extent that commercial space industry can provide such capabilities.

## Mix of DoD and Commercial Capacity to Support Operational Plans

Developing a program like CRAF or VISA requires that DoD carefully balances how much and for which capability it will rely on commercial space industry versus its own organic assets. As shown in Table 1, the CRAF and VISA programs reflect a different level of reliance on commercial capabilities to meet airlift and sealift requirements in support of operational plans (OPLANs). Many factors

TABLE 1

## An Overview of Key Elements of USTRANSCOM's Commercial Programs

Factor	CRAF	VISA
Guiding statutes and policies	<ul style="list-style-type: none"> <li>• Defense Production Act of 1950</li> <li>• National Airlift Policy</li> <li>• Fly America Act</li> <li>• Fly CRAF Act</li> </ul>	<ul style="list-style-type: none"> <li>• Defense Production Act of 1950</li> <li>• Cargo Preference Act</li> <li>• National Security Directive on Sealift (National Security Directive [NSD] 28)</li> <li>• Jones Act</li> </ul>
Mix of DoD and commercial capacity to support OPLANs	<ul style="list-style-type: none"> <li>• Reliance on commercial industry to meet 40% of DoD cargo requirements and 90% of passenger requirements</li> </ul>	<ul style="list-style-type: none"> <li>• Reliance on commercial industry to meet 19% of force projection capacity and 95% of sustainment capacity</li> </ul>
Industry participation	<ul style="list-style-type: none"> <li>• 25 U.S. airlines, 400+ aircraft</li> <li>• Includes major U.S. cargo and passenger air carriers (American, Delta, Southwest, United, FedEx, UPS), as well as smaller charter airlines</li> </ul>	<ul style="list-style-type: none"> <li>• 53 commercial participants, 95 ships</li> <li>• 90% of militarily useful U.S. flag ships</li> </ul>
Industry status	<ul style="list-style-type: none"> <li>• Mature, financially healthy industry (most of the time)</li> <li>• DoD business accounts for less than 2% of total revenues</li> <li>• CRAF participants have a varying degree of DoD business</li> </ul>	<ul style="list-style-type: none"> <li>• Declining industry, not competitive internationally because of higher personnel costs of operating under U.S. flag</li> <li>• VISA participants rely on DoD for a large share of their revenues</li> </ul>
Activation terms	<ul style="list-style-type: none"> <li>• Three stages of CRAF activation <ul style="list-style-type: none"> <li>– Stage I: Minor regional crisis (32 aircraft, 24 hours' notice)</li> <li>– Stage II: National theater war (177 aircraft, 48 hours' notice)</li> <li>– Stage III: National mobilization (266 aircraft, 72 hours' notice)</li> </ul> </li> <li>• CRAF has been activated three times: (1) August 1990–May 1991 for Operation Desert Shield/Desert Storm; (2) February–June 2003 for Operation Iraqi Freedom; and (3) August 2021 for Operation Allies Refuge</li> </ul>	<ul style="list-style-type: none"> <li>• Three stages of VISA activation <ul style="list-style-type: none"> <li>– Stage I: 15% of capacity</li> <li>– Stage II: 40% of capacity</li> <li>– Stage III: 50% of capacity</li> </ul> </li> <li>• VISA has never been activated</li> </ul>
Operations in threat environment	<ul style="list-style-type: none"> <li>• Commercial aircraft are operated only in low threat environments</li> <li>• Airline has the last right of refusal</li> <li>• If adequate commercial insurance coverage is not available, DoD will pay for war risk insurance</li> </ul>	<ul style="list-style-type: none"> <li>• Commercial ships operate in the same threat environment as DoD organic cargo ships</li> <li>• U.S. Maritime Administration provides war risk insurance; U.S. Navy may provide protection</li> </ul>

SOURCES: Features information from Hill, 2020; Boemecke and Grout, 2020; U.S. Department of Defense. 2021.

## Guiding Statutes and Policies for CRAF

### Defense Production Act of 1950

- Requires businesses to sign contracts or fulfill orders deemed necessary for national defense
- Authorizes the President to establish mechanisms to allocate materials, services, and facilities to promote national defense

### National Security Defense Directive 280—National Airlift Policy

- Ensures military and civil airlift resources can meet defense mobilization and deployment requirements
- Promotes CRAF effectiveness through appropriate levels of peacetime airlift augmentation

### 49 U.S.C. § 40118—Fly America Act

- Requires use of U.S. carriers to transport personnel and goods if the government pays for such transportation and the service is available in the United States (and reasonably available for points outside the United States)

### 10 U.S.C. § 9516 and 49 U.S.C. § 41106—Airlift Service and Fly CRAF Act

- Requires all DoD agencies to use CRAF carriers if the service is available in the United States (and reasonably available for points outside the United States)

SOURCE: Adapted from Hill, 2020; based on USTRANSCOM staff, discussion with the RAND team on CRAF, January 8, 2020.

go into determining how much commercial capabilities will support DoD's airlift and sealift needs. First, DoD determines the overall airlift and sealift requirements

## Guiding Statutes and Policies for VISA

### 46 U.S.C. § 55102—Jones Act

- Requires that ships transiting to a U.S. port must be U.S.-built, U.S. citizen-owned, with a U.S. crew

### Defense Production Act of 1950

- Requires businesses to sign contracts or fulfill orders deemed necessary for national defense
- Authorizes the President to establish mechanisms to allocate materials, services, and facilities to promote national defense

### National Security Directive of Sealift (NSD 28)

- Provides guidance on the mix of commercial and U.S.-owned (Effective U.S. Controlled) sealift resources to meet peacetime, crisis, and wartime requirements
- The U.S.-owned commercial carrier industry, to the extent it is capable, will be relied upon to provide sealift in peacetime, crisis, and wartime

### Cargo Preference Laws

- Military Cargo Preference Act of 1904 (10 U.S.C. § 2631): Requires 100 percent of military cargo to be carried on U.S. flag ships
- Cargo Preference Act of 1954 (46 U.S.C. § 55305): Requires 50 percent of all government-upheld cargo (with the exception of DoD) to be carried on U.S. flag ships

SOURCE: Adapted from Hill, 2020; based on USTRANSCOM staff, discussion with the RAND team on commercial sealift programs, January 23, 2020.

(capability and capacity) based on mobility analyses associated with supporting OPLANs. These analyses

determine the demand side of the equation, and the industry's available capability and capacity will drive the supply side to inform for which military needs DoD can rely on commercial lift capabilities. For instance, there is no commercial market for outsize cargo capability, and thus, CRAF participants cannot carry cargo such as helicopters, Patriot missile batteries, or tracked vehicles (Air Mobility Command Headquarters, DoD Commercial Airlift Division, 2018). Other military-unique requirements or practical constraints could limit how much DoD could leverage commercial capabilities. As an example, CRAF ceased support for aeromedical evacuation since 2014 because of the long timeline required to prepare CRAF aircraft for this specialty mission.<sup>2</sup> A similar example on the sealift side is that VISA participants do not support missions that require high readiness. Organic (and reserve) fleets are required to deploy and accept missions within five days.<sup>3</sup>

To structure an emergency preparedness program for space, the space community would most likely need to derive space capability and capacity requirements to support OPLANs as a starting point and understand the industry's capacity and capability. Some capability areas may not be available in the commercial market (e.g., missile warning), or there may be military-unique requirements that commercial providers may not be able to or choose not to meet (e.g., low probability of detect or low probability of intercept for SATCOM or supporting space control missions).

Cost is another key factor in determining the mix of commercial and DoD organic capabilities. The CRAF and VISA programs are based on the fact that it is more cost-effective for DoD to leverage commercial airlift and sealift capabilities for meeting surge needs rather than owning

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One of the key incentives for CRAF and VISA participants is to capture DoD business during peacetime.

and operating organic assets.<sup>4</sup> Similarly, DoD needs to determine whether it is more cost-effective to provide the surge capacity through commercial space services than to own and operate organic space capabilities.

## Industry Participation and Industry Status

As Table 1 shows, both CRAF and VISA have a healthy participation from the U.S. commercial airline and ocean carrier industries. CRAF participants are required to commit a minimum of 40 percent of their CRAF-eligible fleets. VISA participants commit a minimum of 50 percent of their ship capacity. The incentives and risks associated with these programs will influence the level of participation from the industry. One of the key incentives for the participants is to capture DoD business during peacetime. That said, the financial benefits for each CRAF and VISA participant may vary.

The U.S. commercial airline industry is relatively healthy, and thus, DoD business accounts for less than

2 percent of its total revenues. Not all CRAF participants have DoD business, and some CRAF participants may be more reliant on DoD business than others. About a dozen companies support day-to-day DoD airlift needs, and about one-quarter of those companies support 75 percent of DoD business. Thus, for many of the U.S. airlines, the financial incentives may be eclipsed by the political value of participating in CRAF.

In contrast, VISA participants are heavily reliant on DoD business. The ocean carrier industry is declining because of the lack of competitiveness in the international market. As a result, DoD closely monitors commercial capacity and actively manages risks where possible. In cases when U.S. flag ships cannot meet the requirement, DoD will contract with a foreign company.

Based on these insights, determining the right type of incentives and acceptable risks for the participants of a civil reserve space program would be critically important

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If there is an insufficient number of commercial participants or capacity, would DoD be willing to consider foreign participants?

so that DoD is able to attract a sufficient number of participants and associated capacity to meet its space needs. The incentives and risks will highly depend on industry status and characteristics. One of the complexities that DoD might face in developing a program similar to CRAF or VISA is that the status of the U.S. commercial space industry varies by sector.

Some sectors are more mature and stable than others. For example, the commercial SATCOM, remote sensing, and space launch sectors are mature, whereas other sectors, such as commercial weather and commercial space domain awareness, are relatively new. Even the mature sectors exhibit very different characteristics. Although government customers represent a small percentage of the U.S. SATCOM industry revenues, remote sensing and space launch sectors have depended heavily on government revenue for financial viability in the past. Additionally, many SATCOM providers that serve DoD have foreign parent companies. If there is an insufficient number of commercial participants or capacity, would DoD be willing to consider foreign participants?

### Activation Terms

One of the key characteristics of CRAF and VISA is enabling DoD to take control of commercial operations when CRAF or VISA is activated—that is, DoD has tactical control over commercial assets (specific aircraft and ships that are signed up in the programs) and their crews or mariners (see Table 1). The activation may be instantiated differently for the space domain. Rather than DoD taking control over commercial satellites and commercial crews, it may simply require the commercial space companies to

provide their committed capability and capacity. Additionally, DoD may wish to exercise other types of control upon activation. For instance, the government may wish to impose *shutter control* or restrict U.S. commercial remote sensing companies from collecting imagery over certain areas or restrict resale or release of imagery over such areas to the public domain (Hitchens, 2021).

One of the biggest concerns that CRAF and VISA participants have is losing control of their assets when the respective program is activated because it causes a significant disruption to their commercial operations. Such an arrangement could discourage commercial airliners and ocean carriers from participating in the programs. However, these programs are designed so that the likelihood of their activation is very low (see Table 1).<sup>5</sup> Furthermore, participants have the option to volunteer their assets, which allows them more flexibility to meet their commercial customer needs while meeting their commitments to CRAF or VISA. Lastly, participants are financially compensated when their assets are called upon, which may alleviate their exposure to financial risks.

Recognizing that the activation feature will likely be viewed as a high risk for the commercial space industry, DoD should consider the likelihood of activation for a civil reserve space program and the terms of activation that the commercial space industry could meet. For instance, how much surge capacity does DoD need or how fast do commercial space companies need to respond to provide the “activated” capability? What level of control over the commercial operations does DoD need to meet its objectives?

The business models of different commercial space sectors or different companies may make it prohibitively

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One of the biggest concerns that CRAF and VISA participants have is losing control of their assets when the respective program is activated.

difficult for the companies to commit a certain amount of capacity or to allow control of their operations (e.g., shutter control) without jeopardizing loss of commercial customers and financial viability. For sectors or companies with limited excess capacity, they may not be willing to drop their commercial customers to support DoD’s need in times of crises or conflicts, especially if DoD is a small portion of their business. In contrast, the risk may be acceptable for emerging companies that need DoD revenues in peacetime to grow and sustain their business. Another key question to consider is how much financial compensation is needed to incentivize the U.S. commercial space companies to sign the contract for guaranteed surge capacity.

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A CRAF-like program may be more suitable for one commercial space sector than another.

### Operations in Threat Environment

With the recognition that space is a warfighting domain, the commercial space industry may have concerns about the implications of supporting DoD in a wartime scenario. Given this context, DoD needs to consider (in conjunction with the commercial space industry) the level of threat environment that is acceptable for commercial operators. Additionally, how would DoD cover indemnifications should the commercial space asset be damaged or lost?

For CRAF, policies are in place for commercial airliners to operate only in low-threat or low-risk environments (as determined by the U.S. Air Force Air Mobility Command).<sup>6</sup> Furthermore, the airlines have the last right of refusal. For VISA, however, although commercial ships lack defensive capabilities, they traverse as far forward as possible. That said, U.S. Navy ships do provide security to commercial carriers to traverse high-risk waters to the extent the Navy has resources available to do so.

Both CRAF and VISA provide indemnification if commercial assets get damaged during operation. If a CRAF participant is unable to get commercial insurance for DoD

support, it can obtain insurance via the U.S. Department of Transportation and the Federal Aviation Administration. For VISA, the Maritime Administration manages the war risk insurance to cover indemnification in the event of a catastrophe. Carriers might not be able to pay the high premium to operate in a high-risk environment or underwriters might not cover them. In those situations, the Maritime Administration will provide the coverage (or pay for the difference in the higher insurance cost).<sup>7</sup>

### Summary

Drawing on our analysis of the CRAF and VISA programs, we observed that there are many key elements that contribute to their success to meet DoD's strategic and warfighting objectives. Developing a program analogous to CRAF or VISA for the space domain requires that DoD carefully think through various key questions and considerations discussed, as summarized in Table 2.

This initial set of questions can help DoD explore how a civil reserve space program could be structured to balance benefits, risks, and costs. As we noted with the CRAF and VISA programs, the incentives associated with those two programs differ to better align with industry status and characteristics. Similarly, answers to the questions in Table 2 will vary depending on the particular space capability area that DoD is trying to augment with commercial capability and the characteristics of the corresponding commercial space market.

Moreover, some of these questions may be more important than others. For instance, the activation terms may be more critical in determining the structure of the program than accurately determining the cost differentials

TABLE 2  
Initial Set of Key Questions to Inform Development of a Civil Reserve Space Program

Topic	Key Questions for Consideration
Guiding statutes and policies	<ul style="list-style-type: none"> <li>• Are there adequate guiding statutes and policies in place to support a civil reserve space program?</li> </ul>
Mix of DoD and commercial capabilities to support OPLANS	<ul style="list-style-type: none"> <li>• What is the required capacity of space services to support OPLANS?</li> <li>• Which military needs can commercial industry support?</li> <li>• What is the cost-effectiveness of owning and operating organic space assets to meet surge needs?</li> </ul>
Capacity of U.S. commercial space industry	<ul style="list-style-type: none"> <li>• Is there sufficient capacity in the industry to meet DoD's surge needs?</li> <li>• Is DoD willing to accept foreign participants?</li> </ul>
Health of the commercial space industry	<ul style="list-style-type: none"> <li>• How robust is the industry?</li> <li>• What is the industry's dependence on DoD or other U.S. government revenue?</li> </ul>
Commercial space business model	<ul style="list-style-type: none"> <li>• Does the business model enable the providers to commit to a certain amount of capacity without undue risk?</li> <li>• Is DoD willing to pay for the excess capacity that the commercial providers will reserve for DoD?</li> </ul>
Activation terms	<ul style="list-style-type: none"> <li>• What is the likelihood that DoD would activate the civil reserve space program?</li> <li>• What type and level of control over commercial operations does DoD need in times of crises or conflicts to meet its warfighting objectives?</li> <li>• How much is DoD willing to pay to access additional space capability and capacity in times of crises or conflicts?</li> </ul>
Expected threat environment for the commercial operators	<ul style="list-style-type: none"> <li>• What is the acceptable threat environment for the commercial operators?</li> <li>• Will DoD protect commercial assets or indemnify them?</li> </ul>

between using organic assets and relying on commercial assets. As a result, a CRAF-like program may be more suitable for one commercial space sector than another. Or multiple CRAF-like programs may be necessary to tailor the program to DoD's needs in a particular space capability area and the characteristics of the associated commercial space sector.

Because these programs are aimed at developing a strong partnership between the commercial industry and

DoD, the incentives and risks have to align for both parties to agree to such an arrangement. It may not be practical to replicate the exact features that CRAF and VISA offer for a civil reserve space program. Potential program features will likely depend on what DoD space needs are in times of crisis and conflict and on what the commercial space industry can support.

## Notes

<sup>1</sup> VISA participants may participate in the Maritime Security Program, which requires a higher level of sealift commitment during VISA activation in exchange for a financial stipend (Boemecke and Grout, 2020). This Perspective does not discuss the Maritime Security Program.

<sup>2</sup> U.S. Transportation Command (USTRANSCOM) staff, discussion with the RAND team on CRAF, January 8, 2020.

<sup>3</sup> USTRANSCOM staff, discussion with the RAND team on commercial sealift programs, January 23, 2020.

<sup>4</sup> USTRANSCOM staff, discussion with the RAND team on CRAF, January 8, 2020; USTRANSCOM staff, discussion with the RAND team on commercial sealift programs, January 23, 2020.

<sup>5</sup> Air Mobility Command exhausts all options to maximize airlift availability prior to activating CRAF (e.g., use all modes of transportation, leverage aircraft assigned for training and mobilization of the air reserve component) (Air Mobility Command Headquarters, DoD Commercial Airlift Division, 2018). On the sealift side, DoD uses globally prepositioned capacity first, then it relies on other organic fleet to project a preponderance of force. If additional sealift capacity is needed, DoD seeks volunteers from the VISA participant pool. If there are still sealift shortfalls, then DoD will activate VISA to get the capacity it needs. Finally, if there is still a capacity shortage, DoD could invoke the statute in the Defense Production Act of 1950. This gives the President authority to requisition U.S.-owned ships, including U.S.-owned foreign ships (USTRANSCOM staff, discussion with the RAND team on CRAF, January 8, 2020; USTRANSCOM staff, discussion with the RAND team on commercial sealift programs, January 23, 2020).

<sup>6</sup> USTRANSCOM staff, discussion with the RAND team on CRAF, January 8, 2020.

<sup>7</sup> USTRANSCOM staff, discussion with the RAND team on commercial sealift programs, January 23, 2020.

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## About the Authors

**Yool Kim** is a senior engineer and the director of the Washington office at the RAND Corporation. Her research has focused on commercial space capabilities, space acquisition, international space cooperation, space command and control, and space operations. She holds a Ph.D. in aeronautics and astronautics.

**George Nacouzi** is a senior engineer at the RAND Corporation who specializes in space-related analysis. He uses various approaches, including mission and systems engineering, to develop and assess space missions and architectures. He has conducted a variety of analyses related to space-based intelligence, surveillance, and reconnaissance; space domain awareness; space command and control; and other space operations. He holds a Ph.D. in aerospace engineering.

## About This Perspective

With the recent growth in the commercial space industry and recognition that the U.S. commercial space industry is an element of national power, the U.S. Space Force (USSF) is exploring new ways of leveraging commercial space capabilities and securing partnerships to meet strategic and warfighting objectives. The concept of a civil reserve space program, a partnership arrangement that would be akin to the CRAF program, has recently gained attention as one avenue to build a closer partnership between DoD and the commercial space industry and gain assured access to commercial space services to augment DoD's space capabilities in times of national emergency or wartime operations.

Developing a civil reserve space program would likely be complex and would need to be carefully structured to ensure that the right incentives, policies, and activation terms were in place to align with the status of the commercial space industry, commercial business models, and acceptable risks for commercial entities. This Perspective examines key elements of the CRAF program and the analogous maritime program, VISA, to inform key factors that DoD should consider for a civil reserve space program to balance benefits and risks to both the USSF and the commercial sector. These findings may be of interest to USSF leadership, space acquisition authorities, and commercial space industry partners.

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