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The Potentiality of Space Enterprise Force Reconstitution: Nationalizing Civilian Satellites during Kinetic Conflicts

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VIEW

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"We must expect that war of any kind will extend into space in any future conflict, and we have to change the way we think and prepare for that eventuality," Air Force Chief of Staff Gen David L. Goldfein told the Air Force Association in February 2018.[1] Considering President Trump's recent promotion of a military department specializing in space operations, conflict in outer space is becoming an increasingly concerning possibility for US officials.[2] This conflict could be the result of a number of different scenarios: space war could occur as an isolated incident, a preliminary strike in preparation for a terrestrial conflict, or an escalation of an existing terrestrial conflict. Regardless of the means by which the US arrives at the brink of a space war, the US government (USG) and military must possess the tools necessary to create a successful deterrent against potential adversaries. Should deterrence fail, the US must retain the ability to support ground forces via the exploitation of space—the "ultimate high ground."[3]

With these requirements in place, General Goldfein's statement gains new urgency. Yet, it is possible that changing the way we think about the eventuality of space conflict could mean looking back to heritage processes to ensure military readiness. For instance, if an adversary is prepared to inhibit the functionality of "x" number of US on-orbit systems, could the US deter the adversary from attacking by rapidly doubling or even tripling its available space assets? The difficulty of producing and launching space assets precludes the possibility of rapid acquisition; however, the temporary nationalization of existing civilian-owned assets in space for governmental and military purposes could abridge an otherwise lengthy space acquisitions process. Although the duration of nationalization may span weeks to months—even years—an accurate assessment of the "temporary" nature of such a program is dependent on several factors. These factors include the continued presence of an adversary counterspace threat during a space war must be considered, preconflict contractual agreements, and the schedule for formal reconstitution of key on-orbit systems at the completion of a space war. The formal

reconstitution may be on the order of years based on the current space acquisitions process that typically takes 5–10 years to replace a given space system.[4] This timeline may be shortened, though, with rapid-acquisitions solutions focused on commercial-off-the-shelf components and systems within a wider "responsive space" acquisitions architecture seeking to deliver stop-gap systems to mitigate short-term capability gaps. The use of the descriptor *temporary* hereafter is meant to capture the finite nature of the program but is intentionally vague due to the scope of the present analysis.

This article will discuss the possibility of employing a policy of civilian satellite nationalization during a space war as a means of US Space Enterprise force reconstitution to ensure continued access to space capabilities necessary for the execution of the national strategy, as well as deterring potential adversaries from initiating counterspace hostilities. In terms of structure, the authors will examine the thesis by answering these questions. First, what historical precedent exists for the rapid military acquisition of civilian assets via nationalization? Second (given the unique nature of space as an operational environment), can that historical precedent be applied to space acquisitions? And, finally, could the nationalization of civilian space assets be used as a deterrent against potential adversaries? This article will answer these questions by utilizing a combination of historical investigation, space environment analysis, and scenario-driven deterrence theory.

Nationalization Historical and Legal Precedent

To discuss whether the nationalization of civilian space assets is a practical option for the USG, one should first ascertain whether a precedent exists for such an endeavor. Adapting earlier contracts or systems within the USG is considerably easier than building a new program with no existing foundation. To discuss this precedent fully, the authors will analyze two existing programs through which the USG has acquired civilian assets in the past. The first of these is the Civil Reserve Air Fleet (CRAF), managed by the USAF (specifically, Air Mobility Command [AMC]), and the second is the Voluntary Intermodal Sealift Agreement (VISA), managed by the US Navy (specifically, Military Sealift Command). These agreements date back to 1952 and have continued to be beneficial to the US military as recently as Operation Iraqi Freedom (OIF). By discussing the frameworks of these agreements, this article will seek to establish a precedent for nationalizing civilian space assets.

The Civil Reserve Air Fleet. The first of these military-civilian contractual systems—the CRAF—began as a result of a shortfall in military strategic transports during World War II. Due to the military's shortage in aircraft, the USG sought to use commercial airlines to transport troops and materiel to Europe. The

problem occurred once more in the Korean War when the USAF lacked the transport capabilities to relocate sufficient troops to the front lines. After the military experienced the same problem in two different wars, President Harry S. Truman issued an executive order in 1951 that led to the creation of the CRAF under the departments of Commerce and Defense. In 1952, the Secretary of the Air Force released a memorandum to top airline executives outlining the new program.[5]

Today, the program exists under the Department of Transportation (DOT) and the DOD. To ensure that the US military retains the ability to rapidly move troops and their equipment, the CRAF is renewed every year. Initially, a carrier signs a one-year contract with the CRAF program stating that the government is entitled to use a certain number of its aircraft if the CRAF program is activated. Then, the AMC assigns the enlisted aircraft to a stage within the CRAF. Stage One implies partial mobilization and entitles the airline to a share of the DOD's peacetime airlift business. Stage two involves more aircraft than stage one and places an emphasis on long-range airframes. Stage three involves full aircraft mobilization in case of a national emergency, including ground support at selected commercial airports. After each aircraft is assigned a stage, the airline is eligible to be activated should the CRAF be put into action. The activation of the CRAF allows the DOD (via the AMC) to assume mission control, including the ability to plan the mission, determine the type of aircraft required, and set times, locations, and cargoes as needed. Within the CRAF arrangement, the airline retains operational control of the craft and crew.

The CRAF has only been activated twice since its conception in 1952—once during Operations Desert Shield and Desert Storm and once more in OIF. During Desert Shield, commercial airlines flew more than 5,000 military missions and transported more than 60 percent of the troops and 25 percent of the cargo used in the context of the subsequent Desert Storm.[6] In the days following the Iraqi invasion of Kuwait, the former Military Airlift Command sent a message to CRAF carriers indicating the possibility of impending CRAF stage-one or -two activation. Just a few days later, the contracts were put into action, marking the first time the CRAF was activated.

This case study carries particular relevance to the possibility of space asset acquisitions due to the current system in which the USAF supports the majority of space operations. As a result of the existing CRAF program, the Air Force is well-equipped to operate within the framework of a similar arrangement designed for space systems. Should a US Space Force, or a variation thereof, become a reality in the near future, the existing expertise on the acquisition of civilian assets by the USG will be easily transferrable.[7] Thus, the case study of the CRAF holds

special significance for the potential military acquisition of commercial space-based assets in the event of a conflict. In fact, a similar strategy—devised by David Arnold and Peter Hayes in 2012—focused primarily on the budgetary implications of adopting a CRAF-like agreement for space strategies, which the authors found to be an excellent option for rapid asset acquisition.[8]

VISA. VISA is a cooperative program between the DOD and the DOT—Maritime Administration. Founded in February 1997 via the approval of the Maritime Security Program, VISA acts as a mechanism for the rapid deployment of US cargo in the event that cargo shipment requirements outpace the capabilities of the US Merchant Marine. Due to its relatively young status when compared with the CRAF, VISA has yet to be activated in a real-world scenario, although biannual exercises test the program's readiness for activation via simulation.[9]

The DOD-DOT program is based largely on the CRAF agreement discussed above. Participating companies sign annual contracts that entitle them to a certain percentage of all peacetime USG cargo transports while guaranteeing the government rapid access to cargo space on transport craft. Unlike the CRAF, VISA does not seek to acquire full ships. Instead, VISA capitalizes on a recent trend in oceanic transport: the increasing vertical integration of shipping companies via expansion into road transport, as well as short-length air transport. Some companies guarantee the rapid delivery of products and seek to ensure customer demands are met by occasionally utilizing cargo space on competitors' vessels. Formulated to be capacity-oriented instead of asset-oriented, VISA avoids complications in mission planning and staffing often associated with CRAF programs while still fulfilling mission goals. By operating in this way, the normal operation of participating organizations is not severely altered in the event of program activation.

Due to the international nature of long-distance shipping, the comprehensive delivery structure that is an essential component of VISA often involves collaboration with non-US flagships. When such collaboration is necessary, US flagship carriers require government approval and must maintain adequate control of all government cargo while it is in transit.[10] This structure indicates that international cooperation is possible within the government-commercial collaborative structure provided that sufficient observatory mechanisms are in place. Additionally, looking at maritime collaboration is particularly useful when considering potential space-based programs due to the commonalities between outer space and international waters as internationally shared spaces.

Application to Space Systems

With the historical precedent for government acquisition of civilian assets established, one must consider the possibility of creating a new framework for the

necessary procedures by which to acquire space-based assets. Given the existence of broad and generally successful programs such as the CRAF and VISA, the creation of a new framework could be augmented largely through the adaptation of existing programmatic structures. In this manner, problems left unsolved in the CRAF and VISA operating structures could be avoided from the beginning of the space acquisitions process—a helpful precaution given the increased level of difficulty inherent in operating in the space environment. Thus, this article will discuss several key issues from earlier frameworks, as well as some critical differences between the space domain as compared to those of air and sea to ascertain if these existing frameworks contain applicable components.

Following its inception, the CRAF program experienced several key difficulties as listed by researcher Mary Chenoweth. Of these identified difficulties, the two most critical were gaps in government-sponsored liability insurance covering military missions carried out via the CRAF and the difficulties involved in CRAF assets transporting hazardous materials as occasionally necessitated by mission requirements.

The first of these issues was likely one of poor foresight in the CRAF's inception that can be easily rectified in the language of future programs. Insurance is an inherently vital aspect of satellite systems given the high costs associated with development and utilization; therefore, adapting existing insurance programs and supplementing them with additional government insurance is well within the realm of possibility. Due to the limited number and high initial investment cost of civilian space systems, an expansion of insurance programs must be combined with recompense provisions to account for loss of satellite lifespan due to on-orbit maneuvering, damage incurred during government operation, replacement of satellite(s) resulting from adversary counterspace operations, the preclusion of the satellite from conducting its civilian/commercial mission, and any potential loss of revenue due to temporary nationalization.

The second issue experienced by the CRAF, the transportation of hazardous materials, will not have a direct correlation with any program for nationalizing civilian satellites. Although these nationalized satellites will not be transporting hazardous materials, the systems will participate in a contested environment—one that will be hazardous to the longevity of the system to perform, not only its nationalized mission but also its original civilian mission following the conclusion of the conflict. One option to reduce the risks of operating in a contested environment is to perform maneuvers. However, there are limited options to reposition civilian satellites and/or constellations due to propellant costs: the expenditure of propellant for orbital maneuvers will decrease the overall lifespan of the systems. While satellites recently injected into orbit have the most propellant potential for

orbit changes, this potentiality decreases with satellite age due to a greater depletion of propellant prior to nationalization. Also, repositioning may not be an option due to payload and ground station constraints. For example, the design of an imagery payload will limit the orbital altitude while satellites must have communication access to and be visible by program-specific ground stations to maintain mission control.

Another marked difference between the CRAF program and a potential program for space-based assets concerns the political atmosphere of its inception. The CRAF was instituted during a time when declining military budgets made maintaining an expansive transportation fleet difficult. Although current trends show increasing budgets for—and a governmental emphasis on—space system acquisition, these do not preclude the institution of a program similar to the CRAF—or VISA—for civilian satellites.[11] The existing space acquisitions framework is an iterative process involving system and subsystem design, component fabrication, and system testing, including both functional and environmental aspects. The overall design must satisfy stakeholder requirements while meeting safety and functionality guidelines imposed by several governmental agencies, as well as the launch vehicle provider. Even with the completion of the satellite acquisitions process, a space launch may be delayed due to the availability of launch vehicles capable of reaching specified mission orbits. Over the past few decades, the cost and schedule for space acquisition programs within the DOD have experienced substantial increases, thus delaying both the reconstitution of aging systems and the delivery of new capabilities.[12] A framework for the temporary nationalization of civilian satellites during a space war will represent a temporary measure for satellite reconstitution until the formal space acquisitions process can replace lost assets. The current space acquisitions timeline, even accelerated, will create a gap in space-based capabilities likely measured in months and years, not days. Such a gap will inhibit the national security posture of a nation that is becoming increasingly reliant on space. Although the longest activation period among previous frameworks is just a few months, any revised agreements pertaining to space systems may require a longer retention rate in which commercial assets are repurposed by the government. These thresholds for mission diversion would be a part of each contract on a case-by-case basis.

From a technical perspective, the use of civilian satellites to augment and/or replace governmental or military space systems will introduce a series of challenges ranging from technological compatibility between civilian/commercial systems and the government/military end-users to the ability to pass classified data over civilian/commercial networks and of sharing classified information for mission planning purposes. To mitigate such challenges, preconflict programs

would be necessary to ensure compatibility of both the hardware and software components of government/military end-users who are intended to operate the nationalized space systems. As for matters of data classification, specific provisions in the nationalization agreement will be required mapping out "need-to-know" requirements of associated personnel, as well as the execution and maintenance of network system upgrades at civilian/commercial facilities for the transmission and storage of classified data.

The potentiality of nationalizing civilian assets is contrary to many core values of the US. However, a voluntary program built on the precedence of the CRAF and VISA represents a viable measure to promote force reconstitution and rapid reconstitution—albeit temporarily—during a space war. Framing an agreement for satellite nationalization will require command, control, and personnel planning, in addition to the obvious legal agreements between the involved government and civilian entities. Due to the specialized design of space systems, the effective use of nationalized civilian satellites in the event of a space war may occur with one of three options. First, government and/or military personnel could be permanently embedded at satellite ground stations of participating civilian entities to assume control of satellites in the event of conflict. Although permitting a seamless transition from civilian to nationalized use, this option will not only require a continuous governmental/military personnel presence and attendant system training but also remove such personnel from duties elsewhere within the US Space Enterprise. Second, existing civilian personnel would maintain operational control of satellite assets with limited governmental oversight. In the event of a conflict, the civilian personnel would then follow new mission directives as dictated by the preconflict nationalization agreement. Finally, government and/or military personnel could be deployed to designated satellite ground stations to augment and/or supervise the operation of nationalized systems upon activation.

Nationalization as a Counter-Counterspace Strategy

As demonstrated during World War II and conflicts in the Persian Gulf and wider Middle East, examples of commercial asset nationalization, such as cargo ships or passenger aircraft, served to facilitate the timely and continuous transportation of personnel and materiel to theaters of conflict. By comparison, satellite nationalization has possible farther-reaching ramifications beyond the factors of force reconstitution and sustainment. Extending into the arena of strategy, a policy of satellite nationalization will likely alter a potential adversary's planning for and execution of a space war. Consequently, the postulated effects on an adversary's counterspace strategic outlook must be examined from the two available

methods for promulgating the enactment of a policy of satellite nationalization: full disclosure and nondisclosure.

Full disclosure to the public (and potential adversaries) of governmental intentions for satellite nationalization, specifically the temporary and exclusive operation of civilian on-orbit assets by the government and military during a space war, will reinforce deterrence as part of the US's space control posture and emerging counter-counterspace strategy. For an adversary, the prospect of conducting armed hostilities in space to further terrestrial strategic objectives demands three fundamental questions: (1) Will counterspace operations deliver the requisite effects to decisively prevent the opposing force from leveraging space and effectively counter terrestrial military operations?, (2) what satellites and/or constellations must be targeted to either deny, disrupt, degrade, or destroy the opposing force's ability to leverage space?, and (3) what is the projected success rate of the current counterspace arsenal?

Once potential adversaries are aware, via full public disclosure that the opposing force will nationalize civilian satellites during a space war, they will be forced to re-evaluate the value of existing counterspace strategies and arsenals. If a counterspace strategy was deemed advantageous and critical to the successful conclusion of terrestrial military operations, then an adversary would produce weapons to eliminate identified on-orbit targets based on a perceived level of weapon effectiveness. With satellite nationalization multiplying the list of possible on-orbit targets, an adversary is now operating with a counterspace arsenal that will be unable to deliver decisive effects, thus jeopardizing terrestrial military success. The adversary must then evaluate whether existing financial and technical resources are capable of revitalizing existing counterspace strategies to overcome imbalances between targets and arsenal type and size. While an adversary may deem the continued pursuit of a decisive counterspace strategy as untenable, the opposite may also be possible with the acceleration of counterspace system procurement, thereby escalating the future space war via a "counterspace arms race." Alternatively, an adversary may pursue a decisive counterspace strategy where arsenal numerical parity is not required. In this instance, an adversary may embrace the use of a high-altitude nuclear detonation (HAND) to deliver the same intended negation of an opposing force's space enterprise. Despite being a force multiplier in itself, the use of HAND requires extensive analysis of the postconflict costs in terms of debris and geopolitical tensions from the degradation and destruction of not only the target but also indigenous and third-party, nonaligned satellites in the targeted orbital regime.

The second method of promulgation—nondisclosure—intends to keep the policy of satellite nationalization secret from the public and, by extension, from

potential adversaries. In the event of a preemptive counterspace strike by an adversary as a prelude to terrestrial military operations, satellite nationalization would enable the prompt reconstitution of degraded or destroyed on-orbit capabilities such as communication or imagery satellites. This replacement of governmental and military satellites with civilian systems will promote operational surprise and a likely decline in adversary offensive tempo during the initial phases of a space war. In terms of the former, the continued action of space-dependent air, ground, and naval assets by an opposing force—despite counterspace operations to prevent such action—will introduce operational fog into an adversary's campaign execution. Force reconstitution will hinder the adversary's observe, orient, decide, and act loop at the "decision" phase due to incomplete space situational awareness. This will then force the adversary's space object surveillance and identification network to obtain new targetable orbit position data for now-nationalized assets during the "orient" phase.[13] This requirement to obtain new target data is contingent on the visibility of satellites by ground-based sensors. Without a globally distributed sensor network, updates to target data must be initiated during satellite overflight of the adversary's territory, which will add at minimum hours—if not weeks—onto the adversary's ability to engage the new target list due to requirements for data processing and orbit determination.

An added complication to the task of acquiring a new satellite target list is the availability of intelligence regarding which civilian satellites and/or constellations are being leveraged by the opposing force.[14] Without robust networks to provide timely and accurate communications and signals intelligence, adversary targeting decisions must be made based on assumptions of likely civilian satellite/constellation use. Incorrect assumptions, however, will lead to either the disruption, degradation, or destruction of noncombatant satellites and the potential legal challenges of such engagements at the conclusion of the conflict. If an adversary is capable of correctly identifying which civilian satellites/constellations have been nationalized, then the newly expanded satellite target list will dilute the target space, thus degrading an adversary's a priori notions of counterspace economy of force. In a similar vein, the international nature of the commercial space market presents a unique challenge; previous research posits that a single commercial entity entering into similar contracts with multiple states may serve as a further deterrent by increasing the likelihood that an aggressor strikes the contracted satellite of a state not yet involved in the conflict. Despite this possibility, this research finds that the use of civilian satellites that serve multiple states—or contracts with entities serving multiple states—may introduce a conflict of interest. If the non-US entities do not wish to participate in the emerging conflict, they may financially pressure the corporation not to participate as outlined in the contrac-

tual agreement. Additionally, inclusion and reliance on satellites serving multiple states may jeopardize any nondisclosure agreements due to legal requirements that the corporation discloses such activities with its customers. Thus, this research finds that any government-civilian contracts must be carried out with companies foregoing such involvement with other states.

In the spectrum of counterspace capabilities, kinetic weapon systems—such as ground-based direct-ascent antisatellite missiles—are finite in number. Assuming the number of kinetic systems procured and fielded reflects the anticipated target space before the initiation of hostilities, then any substantial increase in the number of target satellites will change the engagement decision calculus. Unable to either rapidly reconstitute expended kinetic weapon systems or expand magazines via system acquisition, an adversary is faced with the continuation of a space war without the ability to secure decisive on-orbit victory as a result of target space dilution. While remaining kinetic systems could reduce a fraction of nationalized satellites, such engagements would create a counterspace strategy of attrition. Despite the possible benefits of hampering an opposing force's continued use of space, attrition would ultimately ensure only the creation of more debris rather than the realization of specific strategic objectives in support of terrestrial operations. The application of electronic warfare counterspace systems, such as signal jammers, could provide an adversary the ability to disrupt and deny the use of a segment of nationalized satellites; however, such capabilities are temporary in effect and local to the immediate battle space if ground-based in design.

A potential middle ground may exist between full and nondisclosure options that may retain the benefits of both extremes while mitigating many of the risks. Partial disclosure could make public the agreements that exist between the USG and commercial satellite operators, thereby affording the US the benefit of deterrence by informing potential aggressors that the true number of mission-ready space assets could change rapidly in the face of a threat. These public agreements could also serve as incentives for corporate participants while promoting the program's continuation by exhibiting the number of industry-leaders participating. The key benefit to nondisclosure—a mitigated risk of an adversary simply acquiring enough ASAT weapons systems to overcome any rapidly-acquired space assets—could be maintained in a partially disclosed agreement by withholding critical components of each contract. Such components could include the number and capabilities of assets promised by each participant, the nature of ground-control arrangements, and any other details deemed sensitive or critical to mission success.

Conclusion

The acquisition of new space systems requires the execution of an iterative system design, test, and subsystem integration process. The result of this process—an operational satellite—must satisfy user needs while meeting requirements imposed by the prospective launch vehicle provider. With individual satellites' largely unique systems, or as part of a limited variant block within an overall program, the reinitiating of the space acquisitions process to reconstitute disabled or destroyed assets will likely create a multiple-year delay in achieving a fraction of preconflict space capabilities. The difficulties in rapid reconstitution require an alternative, yet temporary, approach to enable continued operation of at least key facets of the US Space Enterprise. The pursuance of civilian agreements for the nationalization of satellites in the event of a space war permits such an immediate adjunct to reconstitution and is recommended for preventing a protracted loss of the "ultimate high ground" of space. Given the difficulties of crafting an entirely new nationalization process framework, this effort could find a foundation in the existing structures of the CRAF and VISA, two programs instituted for the air and sea domains, respectively.

Satellite nationalization represents a stop-gap capability that satisfies immediate space system requirements in the short-term until the formal space acquisitions process can replace space systems in the long-term. From a planning perspective, a cost-benefit evaluation of the level of public disclosure for instituting a policy of civilian satellite nationalization is required. While full disclosure of the policy could garner a position of strategic deterrence to space warfare by reducing the effect of limited counterspace arsenals and capabilities, the opposite may be true with full disclosure precipitating an expansion of counterspace system procurement by potential adversaries. Independent of its potential geopolitical and strategic ramifications, satellite nationalization will require robust preconflict planning to enable the exploitation of civilian satellites for achieving US Space Enterprise requirements, as well as the integration of civilian space capabilities into existing US governmental space system architectures. ✪

Notes

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