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The Joint Force is reliant on activating the Civil Reserve Air Fleet (CRAF) to move its passengers and cargo, even as there are stark and compelling indications that Industry will be unable or inadequate to operate in the contested environment engendered by Great Power Competition. While the CRAF remains valuable for many environments, the DoD must preserve its dominance by creating a "hybrid-CRAF," that can mobilize within hours and operate into contested areas with the right balance of activated aircrew, aircraft, and military operational control (OPCON). The underlying hypothesis for this thesis is that the CRAF can sustain the Joint Force in a permissive environment but would be inadequate in a contested environment. This is borne out by examining the role and performance of CRAF from its past through today, the nature of the all-domain contested environment, and the DoD's hesitancy to risk mobility assets. The conclusion recommends the DoD develop an expeditionary-CRAF, incorporating both crews and aircraft, and integrated into the military's planning and execution system.

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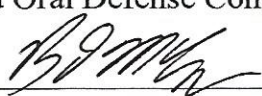
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Executive Summary

Title: An Expeditionary Civil Reserve Air Fleet for the Contested Environment

Author: Major Phillip A. Surrey, USAF, Illinois Air National Guard (ILANG)

Thesis: The Civil Reserve Air Fleet (CRAF) can sustain the Joint Force in a permissive environment but would be inadequate in a contested environment. This is borne out by examining the role and performance of CRAF from its past through today, the nature of the all-domain contested environment, and the DoD's hesitancy to risk mobility assets.

Discussion: The Joint Force is reliant on activating the CRAF to move its passengers and cargo, even as there are stark and compelling indications that Industry will be unable or inadequate to operate in the contested environment engendered by Great Power Competition. While the CRAF remains valuable for many environments, the DoD must preserve its dominance by creating a "hybrid-CRAF," that can mobilize within hours and operate into contested areas with the right balance of activated aircrew, aircraft, and military operational control (OPCON).

Conclusion: The conclusion recommends the DoD develop an expeditionary-CRAF, incorporating both crews and aircraft, and integrated into the military's planning and execution system.

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Preface

About 20 years ago I began my odyssey in the air mobility world as a young Airman guarding a row of parked aircraft, the lone armed sentry on a 12+ hour shift where the only signs of life were a family of foxes crossing the runway. Since that time, through a series of fortuitous events, I have grown as an airlift contracting officer at USTRANSCOM, a current ops branch chief for 18th Air Force, and a risk analysis coordinator for Air Mobility Command's fleet.

This journey has fostered, I think, a unique perspective on the elements of air mobility at the crossroads of commercial aviation, operational requirements, and intelligence. Air mobility affects nearly everyone, and yet it is often misunderstood in all its complexities (frequently exacerbated by those who fail to identify the secondary and tertiary effects of their mobility assumptions in planning). As I completed this thesis paper, the Government Accountability Office revealed in February 2021 that there is much work to be done to leverage contested mobility studies into real outcomes (GAO-21-125). With those concerns in mind, I offer my research in hopes that it can contribute to tangible results.

My family—Sarah and my two boys—provided unending support during my research and reminded me of what's important in life. My classmates, mentors, and the staff at the Marine Corps Command & Staff College were instrumental in helping me improve my way of thinking, writing, and communicating. A special thanks to all the people throughout my career, including my former squadron commander Colonel Karen Hendrickson, who have influenced my perspective and were a constant source of encouragement through their professionalism and dedication to their tradecraft.

INTRODUCTION

“Amateurs study tactics, professionals study logistics”

- unknown

Despite acknowledging the new normal of contested logistics, the Joint Force is reliant on activating the Civil Reserve Air Fleet (CRAF) to move its passengers and cargo, even as there are stark and compelling indications that Industry will be unable or inadequate to operate in the risk environment engendered by Great Power Competition. This is a culmination of the complexities brought about by a globalized economy, the ability of peer adversaries to place Industry at risk, and a military supply chain model structured for efficiency and not survivability. While the CRAF remains valuable for many environments, the DoD must preserve its dominance by creating a “hybrid-CRAF,” that can mobilize within hours and operate into contested areas with the right balance of activated aircrew, aircraft, and military operational control (OPCON).

The underlying hypothesis for this thesis is that the CRAF can sustain the Joint Force in a permissive environment but would be inadequate in a contested environment. This is borne out by examining the role and performance of CRAF from its past through today, the nature of the all-domain contested environment, and the DoD’s hesitancy to risk mobility assets. The conclusion recommends the DoD develop an expeditionary-CRAF, incorporating both crews and aircraft, and integrated into the military’s planning and execution system.

THE ESSENTIAL CIVIL RESERVE AIR FLEET

"Bitter experience in war has taught the maxim that the art of war is the art of the logistically feasible."

- ADM Hyman Rickover, USN (unknown date)

For the past eight decades, America has been able to mobilize enough aircraft to meet wartime demand. At the start of World War II, the U.S. had 359 aircraft in its domestic commercial fleet.¹ With carriers such as Northwest and TWA, the commercial airlines would move 88% of the military's ferrying and airlift requirements in 1942, although the percentages dropped significantly after that year.² Eventually the 3,000 military aircraft acquired by the Army Air Forces Air Transport Command (ATC) would dwarf the commercial carriers, although commercial partners would continue to contribute in some capacity throughout the war.³

After World War II and spurred on by the Berlin Airlift and Korean War, the DoD established the Civil Reserve Air Fleet (CRAF) in 1951 to provide rapid access to American passenger and cargo commercial aircraft.⁴ It formed a program along an escalating system of stages (I, II, III). While it provided transportation in the Korean War, Vietnam, the Persian Gulf War, and the wars of the 21st century, the DoD has activated it only twice, the first time for Operation Desert Storm and the second for Operation Iraqi Freedom.

Today, the Department of Defense (DoD) designates United States Transportation Command (USTRANSCOM) to provide globally integrated mobility operations, and as such

¹ Robert Serling, *When the Airlines Went to War* (New York: Kensington Publishing Corp, 1997), 22

² Roger Bilstein, *Airlift and Airborne Operations in World War II*, Air Force History and Museum Program, 1998, <https://media.defense.gov/2010/Sep/22/2001330050/-1/-1/0/AFD-100922-024.pdf> (accessed November 13, 2020), 9

³ Robert Serling, *When the Airlines Went to War*, 243

⁴ Theodore Crackel, "A History of the Civil Reserve Air Fleet," Air Force History & Museum Program, Washington D.C., 1998, <https://media.defense.gov/2013/Sep/16/2001329866/-1/-1/0/AFD-130916-006.pdf> (accessed October 24, 2020), 60

USTRANSCOM, and its air component, Air Mobility Command (AMC), manage the CRAF.

Adjusted for the needs of the military, CRAF at times would offer over one thousand aircraft for activation,⁵ and it is not uncommon for the DoD to maintain a bench CRAF capability four to five times its average daily use, preserving capacity for surge operations.⁶ These numbers illustrate the relevance of CRAF underwriting America's global commitments.

The advantage of the CRAF for the DoD is that not only does it get assured access to an operating civilian fleet with built in efficiencies and economies of scale, but also avoids the cost of maintaining unused capacity in its own organic fleet. For example, the cost of the CRAF during Operation Desert Storm was \$1.5B, while an equivalent service provided by the United States Air Force (USAF) alone would have cost between \$15-\$50B.⁷ Additionally, the capacity of the CRAF to move passengers, sustainment bulk, and palletized cargo frees up military aircraft for oversized/outsized cargo and tactical missions.

CRAF carriers come from a mixture of Federal Aviation Regulation Part 121 (Regularly Scheduled Air Carriers) and Part 135 (Charter) services. When operating under the CRAF contract, they are entitled to some protections but are not considered deployed support contractors in the same way as companies providing construction, security, or other operational support.⁸ Similarly, they are not contractors who operate systems, such as Raytheon Company

⁵ Christopher Bolkcom, "Civil Reserve Air Fleet (CRAF)" Congressional Research Service Report to Congress, October 18, 2006, <https://fas.org/sgp/crs/weapons/RL33692.pdf> (accessed October 24, 2020), CRS-3

⁶ Ibid, CRS-4

⁷ Ibid

⁸ There are multiple aviation companies that provide dedicated, less than planeload, and/or small/fixed wing services, which are outside the scope of the CRAF. For those that deploy under DoD contracts, the DoD may designate them as "Contractors Authorized to Accompany the Force" with associated privileges and protections. See DoDI 3020.41 Contractor Personnel Authorized to Accompany the U.S. Armed Forces (https://fas.org/irp/doddir/dod/i3020_41.pdf) and the Defense Federal Acquisition Regulations

defense contractors supporting the employment of their proprietary Patriot missile systems. Rather, they provide a commercially available service to transport passengers and cargo for the Government.

Despite their value to the DoD, CRAF carriers face business risk in the aviation and contractor ecosystem that jeopardizes their participation in the program. The COVID-19 pandemic notwithstanding, DoD business is a small percentage of overall business, even during wartime. To illustrate, 5,300 flights supported Operation Desert Storm,⁹ and on a single routine month in 1991 the major air carriers American, Delta, and United each had at least 50,000 departures.¹⁰ To compensate for the business hardships, USTRANSCOM proactively uses a mixture of ongoing peacetime business, contract incentives, and rate adjustments to actively preserve the U.S. carrier participation.¹¹

Since its inception, the DoD has monitored carrier participation to meet military needs despite political and economic fluctuations. The Vietnam conflict saw many air carriers volunteer to support military operations, and 21 air carriers maintained membership in the CRAF in the post-Vietnam environment, including such legacy carriers as American Airlines and United Airlines.¹² After the 1978 deregulation, CRAF grappled with some issues such as the bankruptcies of U.S. air carriers and the negative financial consequences of the Desert Storm

(DFARS) 252.225-7040 (<https://www.acquisition.gov/dfars/part-252-solicitation-provisions-and-contract-clauses>)

⁹ Robert Serling, *When the Airlines Went to War*, 300

¹⁰ “FAA Statistical Handbook of Aviation, Calendar Year 1991,” U.S. Department of Transportation, <https://apps.dtic.mil/dtic/tr/fulltext/u2/a266030.pdf> (accessed February 28, 2021), 4-6

¹¹ Since the United States is not at war and the DoD has not activated the CRAF, “peacetime business” includes ongoing operations to the Middle East supporting contingency operations. Incentives and rate adjustments are the DoD’s efforts to structure the CRAF’s value proposition to maintain U.S. carrier participation.

¹² “Civil Reserve Air Fleet,” Headquarters Military Airlift Command, 1977, <https://www.youtube.com/watch?v=DWwBgWHsRz4> (accessed March 24, 2021)

CRAF activation. Such fluctuations caused CRAF capacity to register below DoD needs for both passenger and cargo needs in the 1990s.¹³ To mitigate this trend, the DoD incentivized carriers back into CRAF by requiring membership as a prerequisite for other business, such as bulk flight contracts for individual federal employee travel (also known as Government City Pairs). From 1995 to the present time the CRAF has met or exceeded its requirements based on the Government's requirements, resulting in no significant challenges meeting activation participants by the time of the Global War on Terrorism,¹⁴ with 25 carriers and 433 aircraft enrolled in CRAF as of 2019.¹⁵

In a broader sense, the U.S. Government has a vested political, economic, and national security interest in the viability of the airline industry. Since the early 1920s the U.S. Government has fretted about foreign control and ownership of U.S. airlines, fearing that non-U.S. stakeholders could leverage the airlines as political capital, steer economic benefits away from U.S. citizens, and restrict access to airlines during a period of national crisis.¹⁶ Through the subsequent decades the U.S. implemented protectionist legislation to block foreign influence and by 1974 enacted the *Fly America Act* to provide preference for U.S. air carriers when moving

¹³ See James Sheridan, "Civil Reserve Air Fleet Participation Analysis 1986-2005," (Master's Thesis, Air Force Institute of Technology, 2006), <https://apps.dtic.mil/dtic/tr/fulltext/u2/a455911.pdf> (accessed March 24, 2021), 22; Sheridan provides a complete discussion of CRAF participation based on data provided from Air Mobility Command, including tailored discussion of elements of the CRAF's history, including cargo requirements, passenger requirements, international/domestic segments, and aircraft sizes (wide body equivalent and narrow body equivalent)

¹⁴ Ibid, 30-32

¹⁵ "Civil Reserve Air Fleet" Air Mobility Command, February 13, 2019, <https://www.amc.af.mil/About-Us/Fact-Sheets/Display/Article/144025/civil-reserve-air-fleet/> (accessed March 24, 2021)

¹⁶ Christopher McBay, "Airline Deregulation Deserves Another Shot: How Foreign Investment Restrictions and Subsidies Actually Hurt the Airline Industry," *Journal of Air Law and Commerce*, 2007, Vol. 72 Iss. 1, <https://scholar.smu.edu/cgi/viewcontent.cgi?article=1128&context=jalc> (accessed October 26, 2020), 175-176

Government passengers and cargo.¹⁷ In essence, “every major piece of national legislation pertaining to aviation, from the Civil Aeronautics Act of 1938, to the Federal Aviation Act of 1958 and the Airline Deregulation Act of 1978, include policy statements specifically linking the needs of national defense to the maintenance of a strong civilian air transport system.”¹⁸

Although the instability and financial impact of airline deregulation arguably worked against the idea of a stable, robust airline industry,¹⁹ the overarching intent of American policy and legislation is to preserve an industry free from foreign influence and available when the nation requires its services.

An additional burden on the DoD is the political spotlight on the contracting world. Focused on cost, schedule and performance, investigative bodies are often quick to conjecture on potential cost savings, such as when the Inspector General estimated overpayment of \$124 million in airlift costs on a \$3 billion Defense Logistics Agency Contract.²⁰ Such “in the rear” assessments assume that the alternatives were sufficiently available and resourced to provide such cost savings, and do not fully explore the fog of war that so often constrains the best intentions. In fairness, the same report goes on to observe that “federal agencies lack the organic capacity to perform some mission-critical functions.”²¹ As these types of reports inform

¹⁷ Similar laws exist for the Sealift Industry, see “Cargo Preference Laws and Regulations” U.S. Maritime Administration, <https://www.maritime.dot.gov/cargo-preference/military-cargoes/cargo-preference-laws-and-regulations>

¹⁸ Kent Gourdin, “Sustaining the Civil Reserve Air Fleet,” National Defense Transportation Association, February 18, 2020, <https://www.ndtahq.com/sustaining-the-civil-reserve-air-fleet/> (accessed February 28, 2021)

¹⁹ Robert Patterson, “Impacts of Airline Deregulation,” TR News, May-June 2018, <http://onlinepubs.trb.org/onlinepubs/trnews/trnews315airlinedereg.pdf> (accessed March 24, 2021), 10-17

²⁰ U.S. Congress, “Transforming Wartime Contracting,” Commission on Wartime Contracting in Iraq and Afghanistan, August 2011, https://cybercemetery.unt.edu/archive/cwc/20110929213820/http://www.wartimecontracting.gov/docs/CWC_FinalReport-lowres.pdf (accessed October 19, 2020), 82

²¹ *Ibid*, 2

Congressional oversight and leads to legislation and policy decisions, the DoD must labor to adhere to fiscal and oversight standards while making the case for enough capacity (with enough resilience) to win at the speed of relevance.

CRAF has demonstrated time and again its value when operating into permissive environments, and the DoD carefully ensures the safety of CRAF through USTRANSCOM's Mission Assurance Working Group (MAWG) and AMC's Threat Working Group (TWG). For slowly developing crises, strategic posturing, and operations to safe airfields, the CRAF remains a critical enabler. However, as will be discussed below, the nature of contested logistics now creates a chasm between what the organic (USAF) fleet can provide, and what the CRAF can augment. The DoD must fill this critical gap or accept strategic risk that it cannot deploy and sustain its forces at the time and place of its choosing or in sufficient quantities to reach mission accomplishment.

UNDERSTANDING THE NEW ERA OF CONTESTED LOGISTICS

“Logistics controls all campaigns and limits many.”

- GEN Dwight Eisenhower (unknown date)

The growing access, range, and lethality of weapons technology has ushered in an era of “contested logistics.” An adversary, who may be unwilling or unable to win a force on force confrontation, may choose to interrupt an opponent's logistics throughput. This creates a competitive advantage, especially in limited operations where the fastest participant gains political or military leverage. Thus, while U.S. planners must deal with traditional logistical challenges, they must estimate the effect that new enemy tactics, techniques, and procedures will have in the global environment.

The underlying challenges of logistics for world powers are not new. Long before the great powers of the 17th century had to protect sea routes to trade with the West and East Indies, the tyranny of distance plagued logisticians. For a nation with international commitments, the U.S. must mobilize forces at their forts and installations, aggregate them at aerial or seaport ports of embarkation (APOE and SPOE respectively), move them into theater where they will undergo some form of Joint Reception Staging and Onward Integration (JRSOI), then transport them to their destination. In addition to this “fort to foxhole” demand signal, the nation must provide an uninterrupted supply of perishables (such as blood) and grapple with bulky and hazardous cargo (such as munitions), often across geographic chokepoints or with permission from other countries.

Now more than ever, a complex tapestry of emerging threats such as unmanned aerial systems (UAS), hypersonic weapons, and cyber-attacks are extending the threats against logistics and intensifying the traditional threats to air mobility while airborne or within the airfield footprint. A DoD Office of Net Assessment (ONA) 2001 wargame called Future Warfare 20XX identified that in addition to an adversary targeting the continental United States (CONUS) and space, “logistics networks would also come under withering attack, which would deny America the ability to fight in the same way it had in Iraq.”²²

Without knowing the realities of a future great power war, the DoD must craft practical responses to how these new developments will change warfare. This is not without precedent. The Russo-Japanese war of 1904 provided insights into the increased lethality and complexity that would exemplify World War I,²³ and the conflicts in Ukraine, Syria, and Nagorno-Karabakh

²² Christian Brose, *The Kill Chain* (New York: Hachette Books, 2020), 33

²³ John Steinberg, “Was the Russo-Japanese War World War Zero?” *The Russian Review*, Vol. 67, No. 1, January 2008, <https://www.jstor.org/stable/20620667> (accessed January 1, 2021)

should provide mobility-relevant insight for today’s practitioners. While the proving grounds of war are the ultimate reality check, the U.S. cannot afford to presume that civilian aircraft, the backbone of America’s ability to project power, are ready to underwrite Dynamic Force Employment as imagined by the 2018 National Defense Strategy.

Mitigations to some of these new threats hold promise, but even where mitigations are available, the DoD must recognize that commercial operations may balk at operating in any risk environment. As an example, belligerents have integrated UAS in conflicts across the Middle East, such as the attack against a Russian airbase in January 2018.²⁴ In response to this threat system, the U.S. has responded by developing a Counter-UAS (c-UAS) system of sensors and shooters. Based on Army Air and Missile Defense Doctrine, it may be only a matter of time before c-UAS matures to be reliable, incorporating such technology as directed energy.²⁵ While this may be promising for military aircraft protection, commercial airlines typically have a “low” or “no” risk protocol and venturing into an unpredictable area could effectively halt risk-averse commercial operations.

Adding to this risk, the U.S. drive for efficiency, ongoing contingency operations, and shrinking budgets has caused the elements of mobilization to become leaner. Touting the supply chain miracles of companies such as FedEx and UPS, USTRANSCOM has sought cost-effectiveness which by default would rely on industry deploying and sustaining forces for any scenario. The implications of this are that reliance on contractors is now a critical vulnerability

²⁴ David Reid, “A swarm of armed drones attacked a Russian military base in Syria,” CNBC, January 11, 2018, <https://www.cnbc.com/2018/01/11/swarm-of-armed-diy-drones-attacks-russian-military-base-in-syria.html> (accessed January 1, 2021)

²⁵ “Army Air & Missile Defense 2028” U.S. Army, https://www.smdc.army.mil/Portals/38/Documents/Publications/Publications/SMDC_0120_AMD-BOOK_Finalv2.pdf (accessed January 3, 2021)

for the mobility center of gravity, presenting additional opportunities for U.S. adversaries to target the mobilization network.

This new environment demands the DoD rethink its existing mobility model; the next evolution must maintain tempo and it must be integrated into the larger Joint All Domain Command and Control (JADC2) while syncing with real-time sensor to shooter intelligence, surveillance, and reconnaissance.²⁶ This is diametrically opposed to the DoD's current logistics enterprise reliance on Industry's willingness and capability to support. As one article summarizes it effectively:

In future combat scenarios, DoD's logistics concepts envision critical time dependent reliance on air transportation for both deployment and sustainment. The traditional approach in which aircraft and crews are activated and plugged into the DoD logistics system may have been workable for traditional logistics concepts, but modern logistics concepts will require a more integrated operation than can be achieved under such an approach.²⁷

Recognizing this overarching sea change, the DoD maintains its situational awareness through such inquiries as its Mobility Capabilities Requirements Study (MCRS), the 2020 version of which focuses on Great Power Competition. This comprehensive review analyzes the entire logistics infrastructure such as airports and seaports, assessing the overall DoD capacity for power projection.

What is becoming clear is that the DoD should not discard CRAF, only that planners must adjust to the new reality. First, there may be many traditional scenarios where the DoD will need CRAF to deploy a large force over the course of many months, as it did during Desert

²⁶ John Hoehn and Nishawn Smagh, "Intelligence, Surveillance, and Reconnaissance Design for Great Power Competition," Congressional Research Service, June 4, 2020, <https://crsreports.congress.gov/product/pdf/R/R46389> (accessed February 9, 2021)

²⁷ David Graham, "Sustaining the Civil Reserve Air Fleet (CRAF) Program," Institute for Defense Analysis, May 2003, <https://apps.dtic.mil/dtic/tr/fulltext/u2/a431033.pdf> (accessed October 24, 2020), 25

Storm. Second, as a byproduct of Great Power Competition, there may be many military operations short of war or limited in scope that allow for safe passage of commercial aircraft, especially to commercially operated airfields in countries non-affiliated or neutral to the conflict. To pick an example at random, one may consider the ongoing proxy wars in North Africa and the Middle East as examples where the regional participants, such as Russia and Turkey, have freedom-of-movement to fly in and around the conflict areas.

In these instances, especially when the volume of moves is high and consistent, there is value-added in letting industry, driven by its internal aircraft, crew, maintenance, and insurance (ACMI) efficiencies, to run elements of the air mobility system. Injecting military operators and planners into the system may create bottlenecks. This was discussed during World War II, and the U.S. wisely decided to allow industry experts to keep operations in house while performing military missions²⁸ (Executive Order 8974 gave the Secretary of War Control of Civil Aviation²⁹). As evidenced by ongoing military operations in the Middle East, repetitive sustainment moves (e.g., “milk runs”), remain a key enabler for the DoD.

It should be noted that the DoD is also exploring options that could reduce the need for manned airlift. The first are the potential for drones and UAS to provide resupply and transportation.³⁰ This force multiplier may have vast application, such as an ability to deliver supplies to dispersed forces such as those envisioned by the U.S. Marine Corps’ Expeditionary Advanced Base Operations (EABO). The second is reducing the demand signal from forces by

²⁸ Robert Serling, *When the Airlines Went to War*, 19-21

²⁹ John Plating, *The Hump: American Strategy for Keeping China in World War II* (College Station: Texas A&M, 2011), 40

³⁰ The research and development firm Gartner predicts that by 2026 there will be one million drones in commercial use, see Bridget McCrea, “Mobility: The Strongest Link in Connected Supply Chain,” *Logistics Management Magazine*, September 15, 2020, https://www.logisticsmgmt.com/article/mobility_the_strongest_link_in_connected_supply_chain (accessed September 22, 2020)

either curtailing the amount of personnel and cargo to accomplish the mission, prepositioning supplies, or sourcing forward. The third are futuristic, such as using SpaceX to launch a C-17 equivalent load anywhere in the world in 60 minutes.³¹ Regardless of the potential, until the time that manned aircraft are no longer needed in contested environments, the DoD will need to grapple with mission benefits of sending an aircrew into harm's way or accept that it cannot perform its mission.

To summarize, changes to logistical survivability creates an “accelerate change or lose” for the Air Force and its mobility capabilities.³² Mobility assets will need to operate in less than permissive environments, supporting distributed operations where “operators will spend more time thinking about logistical constraints [and] sustainment professionals will spend more time thinking about warfighting.”³³ Fundamental to any future decision, the DoD must examine whether it has the right institutional understanding of its risk tolerance and management when it comes to civilian and military air mobility operations.

MODERNIZING DOD’S RISK TOLERANCE AND MANAGEMENT

“My logisticians are a humorless lot ... they know if my campaign fails, they are the first ones I will slay.”

- Alexander the Great (unknown date)

³¹ “USTRANSCOM Announces the Next Frontier for Logistics – Space,” USTRANSCOM Public Affairs, October 7, 2020, <https://www.ustranscom.mil/cmd/panewsreader.cfm?ID=29ADE173-D927-8E46-7C6CBC100BAD9F71&yr=2020> (accessed November 6, 2020)

³² General Charles Brown, “Accelerate Change or Lose,” Chief of Staff United States Air Force, August 2020, https://www.af.mil/Portals/1/documents/2020SAF/ACOL_booklet_FINAL_13_Nov_1006_WEB.pdf (accessed February 28, 2021)

³³ Miranda Priebe, Alan Vick, Jacob Heim, and Meagan Smith, “Distributed Operations in a Contested Environment,” RAND 2019, https://www.rand.org/pubs/research_reports/RR2959.html (accessed February 9, 2021), ix

The DoD must understand Industry's resilience and willingness to engage the wheels of mobilization when it experiences cyber, political, or kinetic attacks. As is often the case, the political will of the nation will play a part in the military options, with acceptable risks and casualties becoming key discussion points. It is crucial the DoD rigorously examines its methods for determining risk, standardizing the logic with how it evaluates the acceptable risk-to-force and risk-to-mission to reach its military end state.

Inherently there is a disconnect between commercial and military supply chains. Commercial supply chains maximize efficiency, while the military supply chain must contend with survivability. Commercial carriers do not operate where costs are prohibitive and unprofitable, while the military may need to apply coercive force to establish and maintain a logistics infrastructure. Commercial operations, if they fail, can learn their lessons and come back another day, while it is inconceivable that the military would abandon its supply to forces in combat.

In a full-scale conflict involving the use of hypersonic cruise missiles, long range fires, and air attacks, military planners will see a risk to all forces, not just aircraft. Planners will need to prioritize mitigation, such as Patriot Missile Defense systems, Terminal High Altitude Area Defense, and combat air patrols, to preserve point defense and manufacture windows of overmatch to permit not only aircraft, but also all military forces, to operate in the environment.

Putting manned assets in harm's way places both lives and airframes in jeopardy. Particularly with logistics, decision makers must understand the second and third order effects of losing a capability and its cost in terms of reconstitution and transportation backlog. The compounding trauma of losing a low-density military asset during a specific operation along

with losing any future contributions tends to skew decisions towards the risk adverse end of the spectrum.

Before discussing the risk to CRAF, one must note there is not a uniform acceptance of risk across the DoD for its own aircraft. To illustrate, when Task Force 58 inserted into Afghanistan at Camp Rhino in 2001, it needed C-17 support which USTRANSCOM hesitated to provide due to the perceived threat even though U.S. special operations forces and Marines had secured the remote airfield as a logistics hub.³⁴ According to the USMC History Division, only when then-Brigadier General James Mattis suggested he explain to the press that the new C-17 could not accomplish its designed mission did the Joint Forces Air Command relent.³⁵ While one can only speculate at the unclassified level what drove planners to assess such a high risk or at least a reaction to such a risk, it is clear that the air threat in Afghanistan pales in comparison to what will be expected in a Great Power contested environment.

One important conclusion to be drawn from this example is that the probability of an attack is not the limiting factor for mobility, it is the extreme consequences should anything happen. Thus, using a standard risk management model that matrices probability and consequence, the DoD has boxed itself into a corner where changes to probability barely budge the evaluation. The impact of losing one C-17 mobility aircraft is an event of such scale that it could have strategic or political implications due to the loss of life—a lesson the Russians learned in Chechnya when they lost 127 personnel in one Mi-26 shootdown.³⁶ For President

³⁴ Nathan Lowrey, *U.S. Marines in Afghanistan, 2001-2002: From the Sea*, United States Marine Corps History Division, 2011, <https://www.usmcu.edu/Portals/218/FROM%20THE%20SEA.pdf> (accessed November 13, 2020), 101

³⁵ *Ibid.*

³⁶ Shannon Caudilly, *Defending Air Bases in an Age of Insurgency* (Maxwell: Air University Press, 2014), 339. Also see a discussion of the political and military ramifications for Vladimir Putin after the

Vladimir Putin, this single incident soured his message that military operations in Chechnya were culminating, and analysts observed that it probably emboldened Russian adversaries against seeking conflict resolution.³⁷ Risk-aversion is a cultural norm within U.S. mobility circles, leading one seasoned aviator remarking that USAF aircraft might as well be “painted pink.”³⁸ Indeed, the shrinking inventory of risk-worthy mobility aircraft, coupled with the increasing means to shoot them down, creates a challenge for preserving Rapid Global Mobility, the hallmark of Air Mobility Command and a key enabler of the Joint Force.

This concern extends exponentially to the CRAF and its regulatory agency, the Federal Aviation Administration (FAA). While the FAA is amenable to the needs of the DoD, it champions the need to ensure safe operations of U.S. civilian aircraft. While the CRAF in Desert Storm delivered a significant if not majority of passengers and cargo while under the threat of Iraqi missile attack,³⁹ the threat was uniquely transregional, indiscriminate, and often mitigated. Such threats are the upper limit to acceptable CRAF operations.⁴⁰ Thus any additional credible threats, such as ongoing fighting in the airfield footprint or precision guided missiles, would cause the FAA to shut down the airspace for U.S. carriers, and carefully weigh any exceptions it grants to DoD contract missions. Because the DoD cannot compel the air

Chechens shot down a Russian Mi-26 resulting in 127 deaths during an unpopular war in Steven Myers, *The New Tsar* (New York: Simon & Schuster, 2015), 215-216

³⁷ “Europe: A calamity, yet no end of war in sight; Russia and Chechnya,” *The Economist*, Vol. 364 Iss. 8287, August 24, 2002, 42.

³⁸ Personal conversation with the author while assigned to 18th Air Force, Air Mobility Command, 2016

³⁹ David Graham, “Sustaining the Civil Reserve Air Fleet (CRAF) Program,” 3

⁴⁰ Sadaam Hussein’s ability to strike with chemical weapons did not stop CRAF, and the DoD still maintains this ability for CRAF carriers to operate into locations “where CRAF aircrews may be subjected to chemical, biological, radiological or nuclear threats.” See “Dover Enables CRAF Readiness Exercise,” Air Mobility Command, November 28, 2017, <https://www.amc.af.mil/News/Article-Display/Article/1385356/dover-enables-craf-readiness-exercise/> (accessed December 21, 2020)

carriers and the pilot unions to consent to higher risk missions, every CRAF mission is at the mercy of several processes and stakeholders, not the least of which is the pilot-in-command.

To address this concern, the DoD has sought to mitigate the risk to commercial aviation in these more extreme situations by using an Intermediate Staging Bases (ISB). While the military often uses hubs to receive commercial aviation and then go the “last tactical mile” via military airlift (a “hub and spoke” model), the use of an ISB adds another break in the mobility system by receiving civilian aircraft at an airfield outside a threat, transloading to a military aircraft, then entering the threat environment with its own aircraft. While requiring immense resources at the aerial port, it denies adversaries the ability to target civilian aircraft. This was the model the U.S. pursued in the Korean War, although it did allow charters to fly direct into Vietnam.⁴¹

The ISB model is an increasingly ineffective assumption, as the geographic proximity of potential adversaries with long-range munitions places virtually the entire globe at risk. Military planners must assume the entire environment is contested. Even if planners could apply the ISB concept to a deployment, the actual threats may drive the use of bases not foreseen in the calculus of the original plan, or drive adjustments that become ineffective for the needs of the Joint Force Commander (JFC).⁴² Additional complications emerge if USTRANSCOM or the Theater Sustainment Command (TSC) must account for multi-modal integration, such as transloading at seaports and providing linehaul via surface movement.

Another challenge to the ISB is the duplication of effort required of the Joint Force to operate additional aerial ports. In a dynamic major combat it is unlikely that if threat conditions

⁴¹ Robert Serling, *When the Airlines Went to War*, 285

⁴² David Banholzer, “The Civil Reserve Air Fleet: A Vulnerable National Asset,” Naval War College, Newport Rhode Island, February 13, 2006, <https://apps.dtic.mil/dtic/tr/fulltext/u2/a463332.pdf> (accessed October 24, 2020), Abstract

warranted an ISB to protect civilian aircraft, that the introduction of additional personnel and resources exposed near the threat window would be prudent. That is not to say that ISB is irrelevant, only that it may be feasible only under very specific circumstances such as the “limited” conflicts in Afghanistan, Iraq, and Syria.

In conclusion, although the CRAF offers a distinct capability that the DoD must continue to leverage, there exists a capability gap that jeopardizes the DoD’s ability to provide *Resilient and Agile Logistics*, a critical capability in the 2018 National Defense Strategy. Thus, the DoD must provide a comprehensive assessment of the current state of the CRAF, and recommend a holistic solution that meets the intent of the DoD to provide Rapid Global Mobility.

THE NEED FOR AN EXPEDITIONARY CRAF

“Set a course to the battle, speed is our weapon of war.”

– Alestorm “No Grave but the Sea” (2017)

To remain credible, the DoD must demonstrate the ability to provide Rapid Global Mobility (RGM) in all environments up through the contested environment. Where the traditional CRAF program cannot do this, the DoD should create a hybrid, expeditionary-CRAF. Prior to embarking on this process, the DoD must establish its end state, clarify its investment strategies, and safeguard the viability of the existing CRAF program. This model will allow the DoD to maximize mobility flexibility while sustaining the global logistics network.

Before delving into structure of an expeditionary-CRAF, three relationships are important to understand in any mobility scenario. These are the following: (1) the threat environment, (2) the sufficiency of military airlift, and (3) the optics of military airlift. The below figure

illustrates the different combination with associated airlift options, with each category defined as follows:

- **Threat Environment:** The intent and capability of an adversary to target mobility assets.
- **Sufficiency of Military Aircraft:** Whether USTRANSCOM and theater airlift can move required passengers and cargo with its organic fleet.
- **Optics on Military Aircraft:** A general category that factors in whether using military aircraft is expedient given the political environment, the risk of escalating a crisis/conflict, and foreign cooperation for access and basing of military aircraft.⁴³

Figure 1: Rapid Global Mobility Scenarios				
	Sufficient Military Airlift & Favorable Optics on Military Use	Sufficient Military Airlift & Unfavorable Optics on Military Use	Insufficient Military Airlift & Favorable Optics on Military Use	Insufficient Military Airlift & Unfavorable Optics on Military Use
Anti-Access / Area Denial	Military Aircraft	Military Aircraft*	Military Aircraft Expeditionary-CRAF	Military Aircraft* Expeditionary-CRAF
Active Hostilities with (Near) Peer Competitor	Military Aircraft	Military Aircraft*	Military Aircraft Expeditionary-CRAF	Military Aircraft* Expeditionary-CRAF
Escalating Crisis (within enemy engagement zone)	Military Aircraft	Expeditionary-CRAF	Military Aircraft Expeditionary-CRAF	Expeditionary-CRAF
Mitigatable Threats (Non-Kinetic Interference, Low Intensity Adversaries (Taliban, ISIS))	Military & CRAF	CRAF	Military & CRAF	CRAF
Permissive	Maximize CRAF volunteerism (peacetime business)	CRAF	Military & CRAF	CRAF

* At this level of conflict, military necessity most likely outweighs any concerns on the "optics" of using military aircraft.

Roughly charted out, one can see quickly where a risk-worthy, expeditionary-CRAF would be a critical capability (shaded in gray). Lacking an expeditionary-CRAF, in 7 of the 20 scenarios the U.S. would sacrifice either political nimbleness by appearing to engage in overt “gunboat diplomacy” or shortfall its movement requirements. In fairness, each real-life scenario would involve a trade-off between these factors. For example, the JFC may question the value of using civilian aircraft even if the “optics” and environment are favorable, and instead accept risk-

⁴³ This category warrants a healthy debate. If civilian aircraft are clearly supporting the DoD, or if civilian aircraft are piloted by military crews, the “optics” advantage of not using military aircraft may be negated, or even be a disadvantage depending on the scenario and information operations environment.

to-mission by moving forward with only military aircraft. Regardless, this figure suggests the DoD needs to fill a gap between military aircraft and the traditional CRAF.

To put the discussion in perspective, the right size for a hybrid, expeditionary-CRAF could be as few as a dozen, and the DoD must be clear in its assumptions and assessment in determining which fleet provides a decisive mobility capability and how they fit into contingency plans. Because the DoD values the existing CRAF program, this hybrid should not pull away the peacetime business operations of CRAF. The advantage of maintaining normal CRAF business is that the industry can continue to maintain routine interoperability with AMC's en route system of aerial ports and support activities known as the Global Air Mobility Support System (GAMSS). The DoD should clarify its end state is to create a readily available capability when CRAF is unable to contribute, and organic resources have reached maximum capacity or are suboptimal.

To build this expeditionary-CRAF, the DoD should engage along three broad lines of effort: (1) Aircrew, (2) Aircraft, and (3) Operational Control (OPCON). These are discussed in detail below.

Aircrew

Commercial aircrews limit the location to which the DoD can fly. In World War II, when German aircraft threatened the safety of aerial lines of communication, civilian pilots were hesitant to continue operations.⁴⁴ In the Pacific, Pan Am pilots refused to fly in China as the threat window from Japanese fighters increased.⁴⁵ In Desert Storm, the DoD experienced a

⁴⁴ Bilstein, Roger, *Airlift and Airborne Operations in World War II*, 9

⁴⁵ John Plating, *The Hump: American Strategy for Keeping China in World War II*, 80

modest disruption when the Iraqi Scud missile threat drove some CRAF carriers to refuse to fly into targeted areas at night.⁴⁶

Presumably, with the average of airline pilots at over 40 years old, it is likely they may hold reservations about risking their life in the same manner a younger military pilot, with a commitment and obligation to the military effort, would be willing to do.⁴⁷ Another factor to consider is that the percentage of pilots with a military background are decreasing,⁴⁸ meaning that a military-type operation is an uncharted experience and lacks the nostalgia or patriotism that an ex-military pilot might have (something that is hard to measure by quantitative standards). Maintaining the current model of using standard civilian aircrews not only means that aircrews would not be trained for contested environments, but also that they may not be willing to place their lives in jeopardy and, therefore, would be quicker to decline CRAF missions.

The DoD should pivot to build a standby cadre of USAF Reserve Component pilots who can be activated and placed under the OPCON of a military commander.⁴⁹ This could mimic a similar program the Military Sealift Command has designed under the Strategic Sealift Officer

⁴⁶ James Winnefield, Preston Niblack and Dana Johnson, “A League of Airmen: U.S. Air Power in the Gulf War,” 1994, https://www.rand.org/content/dam/rand/pubs/monograph_reports/2006/MR343.pdf (accessed October 24, 2020), 33

⁴⁷ “Average age of pilots in the United States from 1993 to 2019,” Statista, <https://www.statista.com/statistics/910024/average-age-pilots-in-the-united-states/> (accessed November 10, 2020)

⁴⁸ Andrew van Dam, “What are the odds of a former fighter pilot being at the controls of your plane?” The Washington Post, April 20, 2018, <https://www.washingtonpost.com/news/wonk/wp/2018/04/20/the-odds-youll-be-flown-by-a-former-fighter-pilot-like-southwests-shults-have-plummeted/> (accessed January 2, 2021)

⁴⁹ Presumably, the Air Force could extend this program to align loadmasters and maintainers to this program, with the most critical elements being (1) maintainers that can service civilian aircraft, and (2) loadmasters that could plan and execute loads while integrating with the aerial port equipment.

Program (SSOP).⁵⁰ A USAF version of this could see AMC centrally managing crews aligned against the CRAF and distinct from Reserve and Air National Guard aircrew who are commercial pilots and gained by various flying units. At the risk of oversimplifying a complex program, Air Mobility Command routinely seeks a healthy balance between maintaining its aircrews from being hired by the airlines, and perhaps such a personnel program that pipelines military crews into civil aviation with a 4-to-6-year obligation to maintain CRAF Reserve currency could solve some of those issues.⁵¹

A variation of this system would be for the DoD to have a mechanism to “sheep dip” a select group of civilian aviators into a military status. During World War II, the Air Transport Command did just this as it hired civilian pilots directly into the military.⁵² To mimic the competencies of traditional military pilots, the DoD would have to afford these civilians the training for relevant military environments, including mission planning, scheduling, and execution. To recruit them, the DoD could develop an incentive program that could subsidize career growth or opportunities. The risk with this course of action is to end up with “airline pilot mentality wrapped in a military uniform,” with pilots expecting routine flight duty days and civilian accommodations—grossly unprepared for the hardships and additional responsibilities of a military operation.⁵³

⁵⁰ “Strategic Sealift Officer, United States Merchant Marine Academy,” U.S. Merchant Marine Academy, <https://www.usmma.edu/academics/departments/strategic-sealift-officer> (accessed May 6, 2021)

⁵¹ When the economy is good and airlines are hiring, many pilots are ready to settle down and get started on their civilian careers, especially when the rate of deployments is so high in the military. See Stephen Losey, “To keep pilots from leaving, Air Mobility Command aims to get them back in the air,” Air Force Times December 21, 2018, <https://www.airforcetimes.com/news/your-air-force/2018/12/21/to-keep-pilots-from-leaving-air-mobility-command-aims-to-get-them-back-in-the-air/> (accessed January 2, 2021)

⁵² John Plating, *The Hump: American Strategy for Keeping China in World War II*, 61

⁵³ *Ibid*, 122

The benefit of activated military crews is not only their availability, but their fluency with tactical military planning and execution. They would be familiar with military procedures, enabling more efficient communication and integration into air battle management. Their status as military aviators mean they can be housed and worked just like any other aircrew within the Air Force's Operational Risk Management guidelines. This cannot be replicated with a civilian crew unfamiliar with military operations and owed civilian accommodations.

A final key benefit of having pilots "dual hatted" flying day-to-day commercial operations and ready to be transformed into military aviators is the mobilization realities within DoD. While the USTRANSCOM commander has authority (with concurrence of the Secretary of Defense) to augment his mobility forces by activating CRAF, he does not access the Reserve Component aircraft without a Presidential mobilization.⁵⁴ Even if this would happen, it can take days to weeks to mobilize the capability in the Reserve Component and align crews to aircraft, although hopefully less than the 75 days it took for the Korean War.⁵⁵ Thus, the surge "fight tonight" airlift may be commercial crews already in the seat and flying their aircraft. By creating an authorization to activate predesignated crews concurrent with the CRAF, USTRANSCOM creates a key capability that is unmatched.

Aircraft

Normally the DoD protects CRAF aircraft through U.S. supplied war risk insurance, providing protection for "operations that are deemed essential to the foreign policy or national

⁵⁴ See James Winnefield, Preston Niblack and Dana Johnson, "A League of Airmen: U.S. Air Power in the Gulf War," 29

⁵⁵ Robert Serling, *When the Airlines Went to War*, 285

security interests of the United States.”⁵⁶ War risk insurance is a vital tool for the Government, and is a substitute for commercial war risk insurance when the premiums become cost prohibitive or when insurance companies offer no policy at all. Again, much like access to mobilized Reserve Component aircrew, USTRANSCOM must rely on an external agency, the Department of Transportation, to authorize such insurance.⁵⁷ To avoid delay, the DoD must either establish the authority to activate war risk insurance as part of a CRAF activation, or establish the contractual instrument to take temporary ownership of some CRAF aircraft with supporting enablers (primarily maintenance equipment) as part of its military fleet.

The advantage of the DoD integrating some aircraft into its fleet is that it can protect U.S. carriers from some of the complexities that go with supporting military operations during periods of crisis. While this may be a conjectural benefit, it is realistic that some U.S. carriers could be pressured by their shareholders and foreign interest to not offer its aircraft in a rapidly changing environment, even with war risk insurance. During the prelude to World War II, Neutrality Laws and an ambiguous “declared war zones” inhibited the U.S.’s ability to flow cross-Atlantic cargo.”⁵⁸ However the DoD chooses to navigate this issue, an expeditionary-CRAF should not have to wait for external processes to guarantee the availability of aircraft.

Since the expeditionary-CRAF is designed to operate into contested areas, the DoD should predesignate which specific aircraft it will need (presumably long-range aircraft with healthy maintenance records) and install the infrastructure to add protective systems. El Al

⁵⁶ “War Risk Insurance Extension act of 2019,” Report of the Committee on Commerce, Science, and Transportation, 116th Congress, February 27, 2020, <https://www.congress.gov/116/crpt/srpt219/CRPT-116srpt219.pdf> (accessed October 26, 2020)

⁵⁷ Ibid

⁵⁸ David Kennedy, *Freedom From Fear: The American People in Depression and War, 1929-1945* (New York, Oxford University Press, 1999), 490

Airlines, Arkia Israel Airlines, and Israir Airlines already have done this for their fleets.⁵⁹ Laser based, electro-optic systems are one such example to defend against Man Portable Air Defense Systems (MANPADS), which are surface-to-air missiles that need to track an aircraft's infrared signature to effectively engage an aircraft. To cite an example, the C-MUSIC system on El Al aircraft provides a protective suite that includes an externally mounted pod on the underside of the fuselage.⁶⁰ The U.S. has a similar system known as Large Aircraft Infrared Countermeasures (LAIRCM).⁶¹ The DoD should not limit its investment against MANPADs only, but should consider a board range of complimentary capabilities that would promote survivability in the contested environment, such as electronic warfare self-protection (EWSP) systems.

In terms of cost, the DoD has routinely improved CRAF aircraft when it has been in the interest of national security. After the introduction of CRAF, the DoD invested several million dollars to ensure civilian airlines had reinforced floors and cargo decks to be on call.⁶² Specifically, the U.S. spent \$600 million to modify nineteen conventional Pan Am 747s to modify them for military cargo compatible cargo planes.⁶³ Since it is not unprecedented for the DoD to offset costs for Industry to remain compatible with military operations, the question becomes one of trade-off between how much the DoD values the ability to preserve its competitive advantage of Rapid Global Mobility.

⁵⁹ Jacek Nowak, Krzysztof Ogonowski, and Marek Kustra, "Selected Threats to Civil Aviation," *Scientific Journal of Silesian University of Technology*, 2019, <https://doi.org/10.20858/sjsutst.2019.102.12> (accessed November 10, 2020)

⁶⁰ "C-MUSIC (Sky Shield)," Israeli Innovations, Israel Ministry of Economics and Industry, <http://mag.calltext.co.il/storage/2246/book%20sofi%20%281%29.pdf> (accessed December 21, 2020)

⁶¹ "Large Aircraft Infrared Countermeasures (LAIRCM)," Air Force Programs, <https://www.dote.osd.mil/Portals/97/pub/reports/FY2011/af/2011laircm.pdf?ver=2019-08-22-112334-06> (accessed December 21, 2020)

⁶² Bilstein, Roger, *Airlift and Airborne Operations in World War II*, 49

⁶³ Robert Serling, *When the Airlines Went to War*, 297. See also Roger Roberts, "A Comparison of Military and Civilian Air Cargo Systems," (Master's Thesis, Naval Postgraduate School, 1979), <https://apps.dtic.mil/dtic/tr/fulltext/u2/a078503.pdf> (accessed October 29, 2020), 52

Operational Control (OPCON)

There is always some latency and inefficiencies when forces external to the Joint Force Command (JFC) must be integrated with the larger scheme of maneuver. An expeditionary-CRAF, with aircrews and capabilities aligned under the JFC or other appropriate command relationship with USTRANSCOM, can more easily be integrated into the military's scheduling and Command and Control (C2). This reduces the need for integration with civilian carrier operations and allows the DoD to control such measures as diplomatic overflight, scheduling, and crew management.

With contractor owned and operated fleets, there are always practical challenges and limits to what the Government can expect of them. During Desert Storm, DoD planners struggled to rapidly integrate CRAF. Commercial aircraft lacked military communications interoperability and aircraft countermeasures. Unfortunately, mobility takes a back seat to the warfighting function, and thus is often the last invited to the table—as happened in Desert Storm when the DoD did not involve experienced transport planners in the planning until the deployment order was issued.⁶⁴ While there is always room for improving synergy, aligning the expeditionary-CRAF into the Air Operations Center (AOC) allows the DoD to eliminate known frictions with a pure civilian model.

The challenge for the DoD will be ensuring its air mobility planners are diligent in identifying where to use the traditional CRAF—with its in-house operations centers and scheduling—and where the contested environment requires detailed military planning and execution with the expeditionary-CRAF. This is an important point, even as it is in doubt

⁶⁴ James Winnefield, Preston Niblack and Dana Johnson, “A League of Airmen: U.S. Air Power in the Gulf War,” 29

whether the Joint Force effectively integrates mobility into contested operations in general for its own organic fleet.⁶⁵ Nevertheless, integrating the expeditionary-CRAF between AMC's global air operations center (618th Air Operations Center) and the theater AOC's Air Mobility Division would streamline its effectiveness while aligning lines of effort in sync with the AOC's strategy, planning, and execution cycle.⁶⁶

An additional value to this model is that the JFC can execute missions against emerging threats and will not necessarily have to retreat to an ISB. Rather, the JFC retains flexibility to shape forward logistics within their span of control and align with local air superiority without consulting external stakeholders. Should the adversary lack the ability to hold every location at risk all the time, it means that there are opportunities to fly aircraft into and seize superiority, at least for limited periods of time. Such a capability could multiply, rather than decrease, available airfields, limiting the amount that must be moved from an ISB by tactical military lift.

From a C2 perspective, there is more flexibility and decision space to address problems and mitigate threats versus shutting off a mission as soon as the "low risk" threshold is breached. Airspace controllers and intelligence duty officers could notify crews of threats en route (or automated onboard systems), allowing aircraft to avoid areas or if necessary, hold until countermeasures could establish overmatch in the airspace. Planners could safeguard aircraft by arranging for escorts through hotspots or by providing electronic warfare (EW) effects. By comparison, commercial aircraft operate with limited situational awareness and lack context or

⁶⁵ See the author's article, "Rapid Global Mobility in the Air Operations Center: Integration for Future Warfare," June 2020, available upon request.

⁶⁶ Since the dawn of air mobility, there is always an inherent friction between global and theater mobility needs. For example, during the China resupply mission ("Flying the Hump"), "the War Department knew that local commanders...would put the needs of their theaters above the broader national policy aims of the president and the Combined Chiefs of Staff." John Plating, *The Hump: American Strategy for Keeping China in World War II*, 43

resources to make decisions in real-time. For example, in Iraq in 2004, ground transportation contractors were forced to abandon their mission, whereas “had the supply line been run by military forces, it would have been both moral and possible to order them to fight through.”⁶⁷ This benefit exists if the DoD can plan their missions into contested environments while ensuring that sufficient external mitigations, such as counterair, missile defense, and airfield footprint security, are resourced and sequenced to ensure survivability.

In 2019, the AMC Commander directed that “the next generation commercial airlift fleet must allow AMC to compete, deter, and win in contested environments where a competitor or adversary uses kinetic or non-kinetic capabilities in an attempt to disrupt, delay, or deny U.S. operations in any domain.”⁶⁸ This thesis concludes by offering that for the foreseeable future, the way to do this through an expeditionary-CRAF piloted by military aircrew and equipped with sensor equipment, C2 suites, and counter-measures. In this manner the DoD can meet its obligations in the era of Great Power Competition.

CONCLUSION

“He Conquers Who Gets There First”

- First Troop Command, U.S. Army Air Force

For the DoD to alleviate the shortfalls of the current CRAF model and have a timely surge capacity, it should begin taking concrete steps now to realize this goal. Additional

⁶⁷ T.X. Hammes, “Private Contractors in Conflict Zone,” Joint Force Quarterly, Issue 60, 1st Quarter

⁶⁸ Air Mobility Command, “Department of Defense Commercial Airlift Vision for 2030 and Beyond,” June 2019,

https://www.amc.af.mil/Portals/12/Commercial%20Airlift_Vision%20Booklet_2019%20v2_1.pdf?ver=2019-06-20-092008-973 (accessed October 29, 2020)

research and experimentation will determine what type of “product mix” best achieves that objective, but as an initial step, the DoD⁶⁹ should start by executing the following:

1. Maintain a planning group charged with continual oversight of the requirement for contested operations based on the needs of the Combatant Command CONOPS; the report of such a planning group would drive resource allocation and standardize mobility resources available for Joint Planning.
2. Develop a personnel system and pipeline for ready access to USAF aircrews currently in commercial aircraft, with the proper authorities to access them when USTRANSCOM activates the expeditionary-CRAF; such system should complement recruiting and retention efforts.
3. Contract with industry and obtain inter-governmental buy-in and approval to accept responsibility and liability for a fleet of commercial aircraft.
4. Source, install, and maintain cockpit systems and countermeasures necessary for designated aircraft; such systems may be externally mounted, inside the cockpit, or otherwise incorporated as necessary, and either maintained on the aircraft or secured with rapid access during activation.
5. Ensure readiness by conducting exercises incorporating the expeditionary-CRAF into military maneuvers, normalizing the planning for force protection measures provided by the supported commander in theater.

With trained crews flying aircraft with defensive systems, aggressive force protection measures on the ground, and an active threat monitoring and mitigation system, the USAF will ensure the CRAF will continue to be a decisive enabler in the contested environment.

⁶⁹ Recommending a specific office of primary responsibility (OPR) is outside the scope of this thesis, and in fact some of these functions may already be performed to some degree and they would simply adjust to any new demands; key stakeholders outside the Pentagon would be USTRANSCOM J5/4, the strategic planning offices of the various combatant commands, and the Organize, Train and Equip (OT&E) offices that provide manpower, equipment, and maintenance to support the outcome.

Bibliography

- Air Mobility Command, “Department of Defense Commercial Airlift Vision for 2030 and Beyond,” June 2019, https://www.amc.af.mil/Portals/12/Commercial%20Airlift_Vision%20Booklet_2019%20v2_1.pdf?ver=2019-06-20-092008-973 (accessed October 29, 2020)
- “Army Air & Missile Defense 2028” U.S. Army, https://www.smhc.army.mil/Portals/38/Documents/Publications/Publications/SMDC_0120_AMD-BOOK_Finalv2.pdf (accessed January 3, 2021)
- “Average age of pilots in the United States from 1993 to 2019,” Statista, <https://www.statista.com/statistics/910024/average-age-pilots-in-the-united-states/#:~:text=In%202019%2C%20the%20average%20age,than%20in%20the%20previous%20year> (accessed November 10, 2020)
- Banholzer, David, “The Civil Reserve Air Fleet: A Vulnerable National Asset,” Naval War College, Newport Rhode Island, February 13, 2006, <https://apps.dtic.mil/dtic/tr/fulltext/u2/a463332.pdf> (accessed October 24, 2020)
- Bilstein, Roger, *Airlift and Airborne Operations in World War II*, Air Force History and Museum Program, 1998, <https://media.defense.gov/2010/Sep/22/2001330050/-1/-1/0/AFD-100922-024.pdf> (accessed November 13, 2020)
- Bolkcom, Christopher, “Civil Reserve Air Fleet (CRAF)” Congressional Research Service Report to Congress, October 18, 2006, <https://fas.org/sgp/crs/weapons/RL33692.pdf> (accessed October 24, 2020)
- Brose, Christian, *The Kill Chain* (New York: Hachette Books, 2020)
- “C-MUSIC (Sky Shield),” Israeli Innovations, Israel Ministry of Economics and Industry, <http://mag.calltext.co.il/storage/2246/book%20sofi%20%281%29.pdf> (accessed December 21, 2020)
- Campbell, Gordon, “Contractors on the Battlefield: The Ethics of Paying Civilians to Enter Harm’s Way and Requiring Soldiers to Depend upon Them,” Joint Services Conference on Professional Ethics 2000, <http://isme.tamu.edu/JSCOPE00/Campbell00.html> (accessed October 9, 2020)
- Chenoweth, Mary, “The Civil Reserve Air Fleet and Operation Desert Shield/Desert Storm,” RAND Corporation, 1993, https://www.rand.org/pubs/monograph_reports/MR298.html (accessed October 24, 2020)
- Caudilly, Shannon, *Defending Air Bases in an Age of Insurgency* (Maxwell: Air University Press, 2014)

- “Civil Reserve Air Fleet” Air Mobility Command, February 13, 2019, <https://www.amc.af.mil/About-Us/Fact-Sheets/Display/Article/144025/civil-reserve-air-fleet/> (accessed March 24, 2021)
- “Civil Reserve Air Fleet,” Headquarters Military Airlift Command, 1977, <https://www.youtube.com/watch?v=DWwBgWHsRz4> (accessed March 24, 2021)
- Civil Reserve Air Fleet Audit Report, Department of Defense Inspector General, April 1992, <https://apps.dtic.mil/sti/pdfs/ADA378341.pdf> (accessed November 13, 2020)
- Crackel, Theodore, “A History of the Civil Reserve Air Fleet,” Air Force History & Museum Program, Washington D.C., 1998, <https://media.defense.gov/2013/Sep/16/2001329866/1/-1/0/AFD-130916-006.pdf> (accessed October 24, 2020)
- Delta Air Lines, “Form 10-K, Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934,” Delta Air Lines, December 31, 2019, <https://d18rn0p25nwr6d.cloudfront.net/CIK-0000027904/1fe7420e-4781-437f-92c3-08991a2d6695.pdf> (accessed October 24, 2020)
- Downing, Glen, “Missile Defense Systems and the Civil Reserve Air Fleet,” (Master’s Thesis, Air War College, 2009), <https://apps.dtic.mil/sti/pdfs/ADA540001.pdf> (accessed November 13, 2020)
- “Europe: A calamity, yet no end of war in sight; Russia and Chechnya,” *The Economist*, Vol. 364 Iss. 8287, August 24, 2002, 42.
- “FAA Statistical Handbook of Aviation, Calendar Year 1991,” U.S. Department of Transportation, <https://apps.dtic.mil/dtic/tr/fulltext/u2/a266030.pdf> (accessed February 28, 2021)
- Government Accountability Office “Defense Transportation: DOD Can Better Leverage Existing Contested Mobility Studies and Improve Training,” Government Accountability Office (GAO), February 2021, <https://www.gao.gov/assets/gao-21-125.pdf> (accessed March 25, 2021)
- Government Accountability Office, “Military Airlift: DoD Should Take Steps to Strengthen Management of the Civil Reserve Air Fleet Program,” Government Accountability Office (GAO), September 2009, <https://www.gao.gov/assets/300/296326.pdf> (accessed November 20, 2020)
- Graham, David, “Sustaining the Civil Reserve Air Fleet (CRAF) Program,” Institute for Defense Analysis, May 2003, <https://apps.dtic.mil/dtic/tr/fulltext/u2/a431033.pdf> (accessed October 24, 2020)

- Gourdin, Kent , “Sustaining the Civil Reserve Air Fleet,” National Defense Transportation Association, February 18, 2020, <https://www.ndtahq.com/sustaining-the-civil-reserve-air-fleet/> (accessed February 28, 2021)
- Hammes, T.X., “Private Contractors in Conflict Zone,” Joint Force Quarterly, Issue 60, 1st Quarter 2011, <https://apps.dtic.mil/dtic/tr/fulltext/u2/a536906.pdf> (accessed October 11, 2020)
- Herrmann, David, *The Arming of Europe and the Making of the First World War* (New Jersey: Princeton University Press, 1996)
- Hoehn, John, and Nishawn Smagh, “Intelligence, Surveillance, and Reconnaissance Design for Great Power Competition,” Congressional Research Service, June 4, 2020, <https://crsreports.congress.gov/product/pdf/R/R46389> (accessed February 9, 2021)
- Hunt, Greg, and Mickey Muskopf, “United States Transportation Command Readiness Programs,” October 22, 2018, <https://www.ndtahq.com/wp-content/uploads/2018/10/Slides-Muskopf-TCAQ.pdf> (accessed November 22, 2020)
- Joint Mobilization Planning, Joint Publication 4-05, October 23, 2018, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp4_05.pdf (accessed September 22, 2020)
- Joint Planning, Joint Publication 5-0, June 16, 2017, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp5_0_20171606.pdf (accessed October 9, 2020)
- Kennedy, David, *Freedom From Fear: The American People in Depression and War, 1929-1945* (New York, Oxford University Press, 1999)
- “Large Aircraft Infrared Countermeasures (LAIRCM),” Air Force Programs, <https://www.dote.osd.mil/Portals/97/pub/reports/FY2011/af/2011laircm.pdf?ver=2019-08-22-112334-06> (accessed December 21, 2020)
- Losey, Stephen, “To keep pilots from leaving, Air Mobility Command aims to get them back in the air,” Air Force Times December 21, 2018, <https://www.airforcetimes.com/news/your-air-force/2018/12/21/to-keep-pilots-from-leaving-air-mobility-command-aims-to-get-them-back-in-the-air/> (accessed January 2, 2021)
- Lowrey, Nathan, *U.S. Marines in Afghanistan, 2001-2002: From the Sea*, United States Marine Corps History Division, 2011, <https://www.usmcu.edu/Portals/218/FROM%20THE%20SEA.pdf> (accessed November 13, 2020)
- McBay, Christopher, “Airline Deregulation Deserves Another Shot: How Foreign Investment Restrictions and Subsidies Actually Hurt the Airline Industry,” *Journal of Air Law and*

- Commerce, 2007, Vol. 72 Iss. 1,
<https://scholar.smu.edu/cgi/viewcontent.cgi?article=1128&context=jalc> (accessed October 26, 2020)
- McCrea, Bridget, “Mobility: The Strongest Link in Connected Supply Chain,” *Logistics Management Magazine*, September 15, 2020,
https://www.logisticsmgmt.com/article/mobility_the_strongest_link_in_connected_supply_chain (accessed September 22, 2020)
- Nowak, Jacek, Krzysztof Ogonowski, and Marek Kustra, “Selected Threats to Civil Aviation,” *Scientific Journal of Silesian University of Technology*, 2019,
<https://doi.org/10.20858/sjsutst.2019.102.12> (accessed November 10, 2020)
- Patterson, Robert “Impacts of Airline Deregulation,” *TR News*, May-June 2018,
<http://onlinepubs.trb.org/onlinepubs/trnews/trnews315airlinedereg.pdf> (accessed March 24, 2021)
- Plating, John, *The Hump: American Strategy for Keeping China in World War II* (College Station: Texas A&M, 2011)
- Priebe, Miranda, Alan Vick, Jacob Heim, and Meagan Smith, “Distributed Operations in a Contested Environment,” *RAND* 2019,
https://www.rand.org/pubs/research_reports/RR2959.html (accessed February 9, 2021)
- Reid, David, “A swarm of armed drones attacked a Russian military base in Syria,” *CNBC*, January 11, 2018, <https://www.cnbc.com/2018/01/11/swarm-of-armed-diy-drones-attacks-russian-military-base-in-syria.html> (accessed January 1, 2021)
- Roberts, Roger, “A Comparison of Military and Civilian Air Cargo Systems,” (Master’s Thesis, Naval Postgraduate School, 1979), <https://apps.dtic.mil/dtic/tr/fulltext/u2/a078503.pdf> (accessed October 29, 2020)
- Schwartz, Moshe and Jennifer Church, “Department of Defense’s Use of Contractors to Support Military Operations: Background, Analysis, and Issues for Congress,” *Congressional Research Service*, May 17, 2003, <https://fas.org/sgp/crs/natsec/R43074.pdf>, (accessed October 9, 2020)
- Serling, Robert, *When the Airlines Went to War* (New York: Kensington Publishing Corp, 1997)
- Sheridan, James, “Civil Reserve Air Fleet Participation Analysis 1986-2005,” (Master’s Thesis, Air Force Institute of Technology, 2006),
<https://apps.dtic.mil/dtic/tr/fulltext/u2/a455911.pdf> (accessed March 24, 2021)
- Steinberg, John, “Was the Russo-Japanese War World War Zero?” *The Russian Review*, Vol. 67, No. 1, January 2008, <https://www.jstor.org/stable/20620667> (accessed January 1, 2021)

“Strategic Sealift Officer, United States Merchant Marine Academy,” U.S. Merchant Marine Academy, <https://www.usmma.edu/academics/departments/strategic-sealift-officer> (accessed May 6, 2021)

U.S. Congress, “Transforming Wartime Contracting,” Commission on Wartime Contracting in Iraq and Afghanistan, August 2011, https://cybercemetery.unt.edu/archive/cwc/20110929213820/http://www.wartimecontracting.gov/docs/CWC_FinalReport-lowres.pdf (accessed October 19, 2020)

“USTRANSCOM Announces the Next Frontier for Logistics – Space,” USTRANSCOM Public Affairs, October 7, 2020, <https://www.ustranscom.mil/cmd/panewsreader.cfm?ID=29ADE173-D927-8E46-7C6CBC100BAD9F71&yr=2020> (accessed November 6, 2020)

Van Dam, Andrew, “What are the odds of a former fighter pilot being at the controls of your plane?” The Washington Post, April 20, 2018, <https://www.washingtonpost.com/news/wonk/wp/2018/04/20/the-odds-youll-be-flown-by-a-former-fighter-pilot-like-southwests-shults-have-plummeted/> (accessed January 2, 2021).

“War Risk Insurance Extension act of 2019,” Report of the Committee on Commerce, Science, and Transportation, 116th Congress, February 27, 2020, <https://www.congress.gov/116/crpt/srpt219/CRPT-116srpt219.pdf> (accessed October 26, 2020)

Winnfield, James, Preston Niblack and Dana Johnson, “A League of Airmen: U.S. Air Power in the Gulf War,” 1994, https://www.rand.org/content/dam/rand/pubs/monograph_reports/2006/MR343.pdf (accessed October 24, 2020)