CSAF'S NEW FORCE GENERATION MODEL (AFFORGEN): IS THE AIR FORCE RESERVE STRUCTURED FOR SEAMLESS INTEGRATION?

GRADUATE RESEARCH PAPER

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Abstract

The purpose of this research was to address manpower and budgetary deficiencies of the new Air Force Force Generation model (AFFORGEN), specifically with respect to Air Force Reserve Command's (AFRC) implementation for its mobility C-17 forces. Providing estimates for the number of man-days required for training and deployment planning allows AFRC decision makers to better forecast budgets, schedule reservist participation, and establish consistency that is vital to all Air Force reserve flying units.

Calculations were performed based on the latest iteration of the Mobility Air Force Force Generation (MAFFORGEN) model, which is derived from the AFFORGEN model and catered to Air Force mobility units. The calculations were scoped to address a Classic Associate Reservist C-17 flying squadron. Results provided the number of training man-days required to train up to two C-17 aircrew for deployment rotations, optimized rotation lengths to minimize man-day funds required, and articulated the optimal C-17 crew composition to fill taskings. Lastly, the calculations highlighted the man-day cost of mobilization to be used by senior leaders as a decision variable.

Research concluded that in order to support a 180-day deployment within the MAFFORGEN model, a Classic Associate Reserve C-17 squadron should deploy combat basic C-17 aircrew for 90-day rotations, utilizing mobilization orders to fund MPA orders. The recommended solution minimizes total man-days required, while balancing retention concerns with the use of mobilization for C-17 crew members

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CSAF'S NEW FORCE GENERATION MODEL (AFFORGEN):

IS THE AIR FORCE RESERVE STRUCTURED FOR SEAMLESS INTEGRATION?

I. Introduction

Changing the Way We Fight

In August 2021, Air Force Chief of Staff General Charles Q. Brown, announced that the United States Air Force was "transitioning to a new force generation model to balance today's combatant commander needs while building high-end readiness for the future" (SAF/PA, 2021). Since the beginning of the 21st century, the Air Force supplied combat forces for contingency operations through a crowd-sourcing process known as the Air Expeditionary Task Force (AETF). Small contingents of aircraft, aircrew, maintenance, and support functions were selected from various units across the Air Force to fulfill requested unit type codes (UTCs) (HAF/A3, 2021a). The force elements operated under the orders of deployed commanders for periods ranging from two to twelve months and were relieved by replacement forces in a rotational sustainment model. Force presentations included Active Duty Air Force personnel, augmented by both Air Force Reserve and Air National Guard personnel, comprising a Total Force approach to projecting world-wide airpower.

Joint services force presentation constructs revolve around the core combat units of each service. In 2016, these were the Marine Air-Ground Task Force (MAGTF), the U.S. Navy's Carrier Strike Group (CSG), the U.S. Army's Brigade Combat Team (BCT) and the USAF's Air Expeditionary Task Force (AETF) (Vick, 2018). Recently, senior Air Force leaders struggled to quantify the readiness of the AETFs due to a decades long demand signal for 24/7/365 airpower. Ultimately, global demand for conventional Air Forces across all combatant commanders (CCDR) exceeded force generation capabilities (AMC/A3T, 2021c). According to

General Brown, comparing Air Force force presentation to that of sister services, "we've lacked the ability to present an easily understood model that reflected all facets of airpower and the ability to clearly articulate readiness impacts" (SAF/PA, 2021). As a result, the Air Force will replace the Air Expeditionary Task Force construct with a 24-month cycle composed of four, six-month readiness phases, known as the Air Force Force Generation (AFFORGEN) model, projected to reach operational capability by fiscal year 2023 (SAF/PA, 2021).

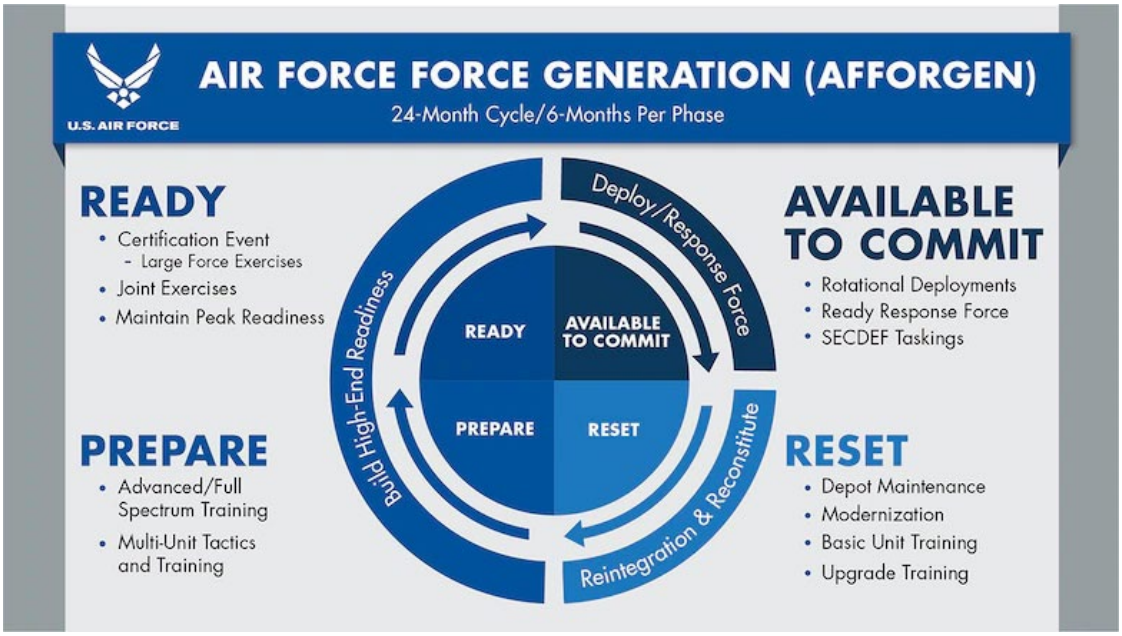

Figure 1: AFFORGEN Cycle

AFFORGEN's phase-based model, as shown in *Figure 1,* stages Air Force operational squadrons through a progressive readiness cycle, culminating with a certification event that validates capabilities prior to the squadron's employment for combatant commander (CCDR) and United States Transportation Command (TRANSCOM) requirements. Active, Reserve, and National Guard squadrons progress through "Available", "Reset", "Prepare", and "Ready" bins to provide a finite, supply constrained approach to force generation (AMC/A3T, 2021e). In order to communicate readiness states to CCDRs and Joint Forces commanders, units will be

coded with readiness postures: C1 (Fully Mission Capable) through C4 (Unqualified/unavailable), signifying their stage in the AFFORGEN process and resultant availability (AMC/A3T, 2021c).

Departing from the AEF presentation of crowd-sourced forces, AFFORGEN re-establishes the Air Force Wing and its subordinate squadrons as the quintessential fighting unit, known as a Force Element. Individual wings are ordered to fulfill a CCDR tasking, and further assign one of its operational squadrons to fulfill the tasking requirements for a period of 180 days. For example, the 305th Air Mobility Wing from New Jersey tasked to provide a C-17 FE fulfills the tasking through its 6th Airlift Squadron. The C-17 FE consists of squadron owned aircraft, aircrew, maintenance, intelligence, and mission planning personnel required to generate and deploy as a unit to conduct missions (AMC/A3T, 2021f).

To account for the unique mission sets across the Air Force, major commands including Air Combat Command, Air Force Special Operations Command, Air Mobility Command, and Air Force Global Strike Command transitioned squadrons to fit the AFFORGEN model (SAF/PA, 2021) while the Air Force Reserve Components (ARC) and Air National Guard re-postured their forces to align and augment Active Component (AC) forces operating within the AFFORGEN construct in accordance with a Secretary of the Air Force mandated 1:5 mobilization-to-dwell ratio (AFRC/A5XW, 2021).

Within the previous AETF construct, Combat Air Forces (CAF), i.e., F-22s, F-15s, and F-16s, already fulfilled UTCs similar to the force presentation within the AFFORGEN model. CAF squadrons deployed for six-month rotations, equipped with all necessary functions to generate sorties in a deployed environment (HAF/A3, 2021b). Conversely, Mobility Air Forces (MAF), i.e., C-17s, KC-135s, trained and presented world-wide airlift and air refueling forces

year-round on demand, limited only by task-to-dwell or mobilization-to-dwell quantitative tempo measurements to sustain readiness (HAF/A3, 2021a). Due to the drastic shift in posturing for MAF forces in accordance with the AFFORGEN model, this research is focused only on Air Mobility Command's implementation of AFFORGEN, commonly referenced to as MAFFORGEN. Specifically, the scope of the research is restricted to the integration of Air Force Reserve Command (AFRC) Classic Associate C-17 mobility forces within the MAFFORGEN model, in an effort to identify implementation shortfalls and provide actionable metrics for AFRC senior leaders.

Research Problem

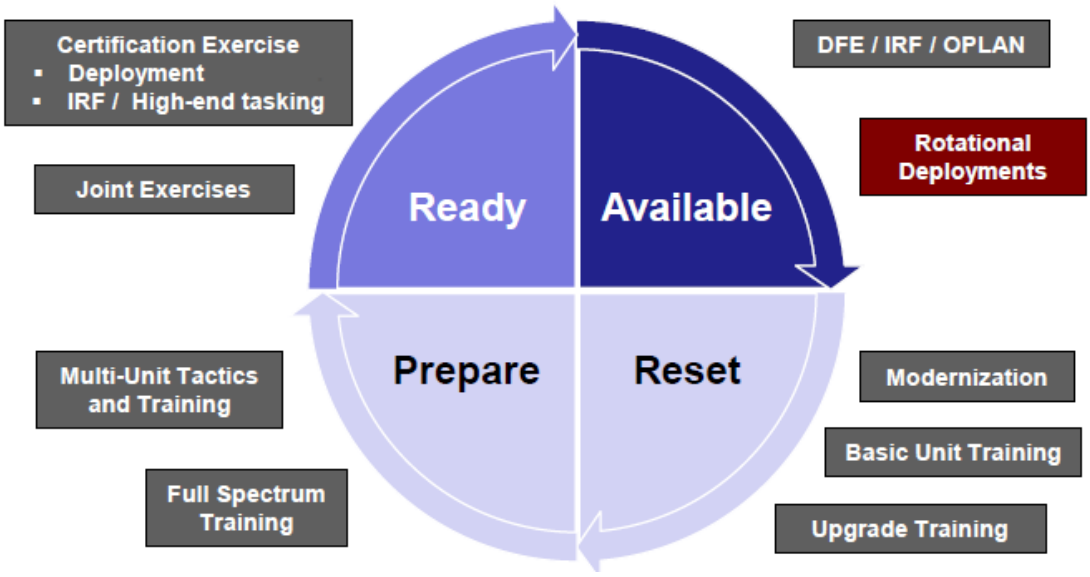

Figure 2: MAFFORGEN AFRC Model (HQ/AMC, 2021)

The MAFFORGEN model follows the AFFORGEN tiered readiness model, consisting of tiered budgets, a redistribution of flying hours, as well as a reallocation of operational taskings within each readiness phase. Once an active duty Mobility Wing and its subordinate squadron enters the "Available" phase, the active Mobility Wing is tasked to provide a force element consisting of eight aircraft and twelve fully qualified aircrew to operate worldwide

missions. Using common deployment nomenclature, a force element consists of eight "jets" and twelve "lines". If the active Mobility Wing is unable to fulfill the full force element, volunteerism from a co-located ARC Classic Associate Wing is leveraged to satisfy deployment shortfalls. To support CCDR taskings, ARC Classic Associate Wings are required to augment the deployment for the full 180-day tasking (AFRC/A5XW, 2021).

Problem Statement

In theory, while the integration of the ARC Classic Associate Wing into the MAFFORGEN model satisfies the intent of the AFFORGEN model in presenting complete force elements, it fails to standardize the required level of augmentation across all ARC Classic Associate Wings. ARC Classic Associate Wings across AFRC are expected to augment on an "as needed" basis, introducing a number of budgetary costs associated with training and certifying aircrews that are currently unknown to ARC Classic Associate Wing Commanders. This research focuses specifically on the budgetary costs for classic associate C-17 wings to augment their active duty counterparts, and highlights possible second order effects on classic associate units' retention.

MAFFORGEN Model Gaps

1) Traditionally, ARC aircrew were mobilized under U.S.C. Title 10 to support CCDR taskings. For KC-135 and C-130J units participating in the MAFFORGEN model, mobilization will be utilized to fulfill taskings. However, the MAFFORGEN model does not provide for mobilization of classic associate C-17 aircrew. C-17 aircrew participating under the MAFFORGEN model are not eligible for enhanced benefits afforded through mobilization such as expanded Tricare health coverage or mobilization-to-dwell protection (AFRC/A5XW, 2021).

2) The MAFFORGEN model does not set a standardized augmentation level expected of C-17 ARC aircrew supporting the FE. Each deployment tasking drives a dialogue between the AC Wing Commander and Reserve Wing Commander to determine the classic associate unit's assistance, and current projections range from no augmentation to up to two fully qualified aircrew. Furthermore, if the classic associate unit cannot provide sufficient C-17 aircrew to complete a wing's force element, volunteerism across AFRC for qualified C-17 aircrew is utilized, further complicating planning for ARC Wing Commanders (AMC/A3T, 2021f).
3) The MAFFORGEN model does not dictate how classic associate units can split the 180-day tasking among multiple C-17 aircrew. Traditional 180-day taskings are split into 45 or 90-day blocks, but no policy exists AFRC-wide. Each option drives a different number of man days required to support with MPA orders; therefore, Reserve units cannot accurately forecast budgets to support training and certification of its aircrew (AFRC/A5XW, 2021).
4) In conjunction with the MAFFORGEN model, AMC/A3 and AFRC/A3 are coordinating new aircrew training regulations and new Ready Aircrew Program (RAP) Tasking Memos (RTM) for the C-17. This document defines the training necessary to certify a C-17 crewmember as fully qualified, and will impact training resources available for C-17 aircrews not selected to participate in a force element (AMC/A3T, 2021d).
5) MAFFORGEN budgetary costs are not addressed by AFRC A5/A8, leaving ARC Wing Commanders unaware of future budget expenses in conjunction with the new C-17 RTM training requirements (AFRC/A5XW, 2021).

6) The MAFFORGEN model does not address taskable world-wide missions outside the 12-month "Ready" and "Available" phases for ARC Classic Associate Wings. This results in a 12-month period of unknown operational missions taskable to a unit, potentially creating a gap in training opportunities, proficiency levels, and aircrew upgrades (AMC/A3T, 2021c).
7) The MAFFORGEN model does not address aircrew seasoning, possible aircrew migration between ARC units, and impact on ARC culture. Accessions into the ARC from AC aircrew faces challenges resulting from decreased employment opportunities.

Research Objectives/Questions

The first objective of this research is to quantify, in terms of man-days, the total man-day requirement to augment a C-17 force element for a period of 180 days. The goal is to calculate the number of MPA funded man-days required based on 45 and 90 day tasking splits, considering both mobilization and non-mobilization of C-17 aircrew. The research will also inform man-day requirements based on two different C-17 crew compositions: Fully Augmented (5 total crewmembers) and Combat Basic (4 crewmembers).

The second objective is to use the new MAFFORGEN C-17 RTM to estimate in total man-days, the expected man-days needed to train a reservist C-17 aircrew through the MAFFORGEN phases from basic qualification to fully qualified status. Similar to the first objective, the research will inform man-day requirements based on two different C-17 crew compositions: Fully Augmented (5 total crewmembers) and Combat Basic (4 crewmembers).

Ultimately, the intent of both man-day calculations is to provide decision makers with a starting point to run budget estimates using the Program Budget Accounting System (PBAS). The

PBAS program breaks down the cost of a man-day for each rank. These calculations will better inform ARC wings budgetary estimates for how much it costs to train aircrew to support a force element.

II. Literature Review

A comprehensive search of scholarly research databases was conducted to examine historical deployment models utilizing Air Force Reservists. The most abundant research themes address the frequency of reservist deployments throughout American history, and correlate the resulting outcomes of mobilization on retention and health of the force. The most common themes examined during this research address: deployment models (Vick, 2018) , AEF/AETF execution (Vick, 2018), readiness articulation (HAF/A3, 2021a), retention (Kirby & Naftel, 2000), mobilization (Hansen et al., 2004), aircrew proficiency (HAF/A3, 2021a), post-traumatic stress disorder (PTSD) (Fugita & Lakhani, 1991), substance abuse (Fugita & Lakhani, 1991), suicide (Fugita & Lakhani, 1991), and deployment impacts on military families (Marion & Hoffman, 2018). The predominance of literature and studies surrounding Air Force Reservists, specifically RAND sponsored studies, focus on the personal and family impacts of frequent deployments, and fail to address the success or inadequacies of deployment models on mission accomplishment or budget costs. For decades, deployed forces were funded using unlimited Overseas Contingency Operations (OCO) funds, which may explain the lack of published research on budgetary costs and reservist deployments.

However, past literature does provide correlations between historical deployment constructs that emphasized organic Air Force wings and squadrons, and the return to organic forces projected under the MAFFORGEN model (Kirby & Naftel, 2000). Additionally, significant literature exists linking deployment mobilization and future retention (Hansen et al., 2004). This directly relates to the MAFFORGEN decision to include mobilization for C-17 reservists deploying in a force element. Ultimately, a research gap exists in addressing the manpower demands of the MAFFORGEN model, and the resulting man-day and budget costs

required to transition to the new model. This research serves to address that gap, highlighting the under-discussed manpower demands of the ever-evolving MAFFORGEN model.

Dating back to World War I, the Aeronautical Division of the U.S. Army Signal Corps and later the U.S. Air Force, presented forces primarily as squadrons, groups, wings, and task forces. Active and reserve squadrons were the enduring and permanent warfighting unit used to provide forces throughout the Cold War (Vick, 2018). In 1995, the U.S. Air Force began to develop and use new expeditionary force constructs to meet the ongoing demands of the Gulf War (Vick, 2018), a model that would ultimately become the Air Expeditionary Task Force (AETF). As the service moved away from deploying entire squadrons in favor of crowd-sourcing forces to supply deployed commanders, it also relied more on crowd-sourcing mobilized Air Force Reservists to augment active duty forces operating worldwide. In total, roughly 280,000 reservists were mobilized for Operations Noble Eagle, Enduring Freedom, and Iraqi Freedom (Marion & Hoffman, 2018). Ultimately, did the Air Force's increasing reliance on reservist participation have a negative effect on retention?

An examination of reservist retention behavior after large scale mobilizations revealed a pattern of increased retention among reservists. Fugita and Lakhani, studying reservist retention after the Cold War, concluded that reserve earnings, while controlling for other sources of family income and seniority, had a small but significantly positive effect on re-enlistment intentions (Fugita & Lakhani, 1991). Kirby and Naftel, in their analysis of reservist retention after Operations Desert Shield and Desert Storm, concluded that being mobilized for the two conflicts did not adversely affect retention. Rather, the likelihood of future mobilizations had a large and positive effect on retention (Kirby & Naftel, 2000). Additionally, reported income loss [from civilian job from $0-$1,000] and additional expenses attendant on being mobilized did not have

any effect on retention (p. 273). This pattern of increased retention after mobilization was also validated by the research of Hansen and MacLeod. In their 2004 report "Retention in the Reserves and Guard Components", an ex-post-facto examination amongst Army, Air Force, Navy, and Marine Corps reserve components experienced notable increases in retention after the increase in mobilizations (Hansen et al., 2004).

Retention decisions were also influenced by other non-financial variables like job satisfaction, recognition, training and professional development opportunities, and those non-financial variables continue to remain today. In 1979, Compton's research on Reserve retention concluded that while good pay and fringe benefits are of importance to workers, most job dissatisfaction is based primarily on a lack of interesting and personally rewarding training and a lack of duties integrated with opportunity for achievement and recognition (Compton, 2020) . Additionally, retention motivations are not solely restricted to U.S. forces. A study of Australia's Reserve component retention concluded a "key strategy for retention will be to improve training, leadership, career management, information about policies and procedures, and flexibility of service together with greater opportunities to serve on operations (Smith & Jans, 2011). This strategy is congruent with providing dynamic and applicable training opportunities, one of Ott's "Four useful and effective ways to improve retention" (Ott et al., 2018)

Historically, the Air Force Reserve used "retention rate" or "continuation rate" as a good metric for year-to-year retention. The retention or continuation rate is defined as the proportion of Selected Reserve members in a Reserve or Guard Component at the beginning of the fiscal year who are still members of that same unit at the end of the fiscal year. At the end of FY1991, the Air Force Reserve had a continuation rate of roughly 75% (Fugita & Lakhani, 1991), compared to a rate of 86.3% in FY2003 following a significant increase in contingency

operations (Hansen et al., 2004).

Ultimately, any new deployment model for the Air Force must provide mobilization opportunities as it has over the past thirty years if it plans to continue the same retention and participation, which was supported by a Defense Manpower Data Center Report in 2005. It showed that the top two (of seventeen) most widely selected factors affecting continuation decisions among all Reserve component members were "pay and allowances" and "the military retirement system." The deployment item of "predictability, frequency, and duration of deployments" was ranked fourth (Maue, 2007). For decades, the Air Force continued searching for a new deployment model to better incorporate stability for the steady-state level of conflict worldwide, from the late 1990s until today. As evidenced by the cyclical nature of retention research, the restoration of readiness across the service's people, aircrew, training, and weapons system sustainment (Wilson & Goldfien, 2018) continues to present a challenge for the Air Force Total Force.

In 2012, while researching improvements to the Air Force deployment system, Kevin Parker concluded that a new model must balance several competing interests: synchronizing deployment and assignment cycles, standardizing the presentation of forces, and deliberately developing our force to prepare for the long war and next fight (Parker, 2012). An emphasis on the next fight, considered a major conflict with a near peer adversary, was reiterated by the Secretary of the Air Force in 2018 in a report to Congress. Secretary Wilson testified that the "restoration of the readiness of the force has to be a top priority. The 2018 National Defense Strategy makes building a more ready and lethal force job one" (Wilson & Goldfien, 2018).

In summary, aforementioned literature shows that increased mobilizations and participation in contingency operations corresponds to increased retention and increased

readiness across the services, dating back to before the Cold War. Moreover, studies performed on Reservist across the Department of Defense show that these service members value predictable, reliable deployment schedules that bring stability into their lives. While the MAFFORGEN model is in its infant stages, this research will quantitatively address the manpower demands of the MAFFORGEN model, and the resulting man-day and budget costs required to transition to the new model. With these calculations, decision makers can compare the new model's participation requirements to those of previous deployment models. Furthermore, while the quantitative calculations do not directly address retention, future studies on retention can utilize the participation estimates (MPA days) to inform future surveys and determine if the MAFFORGEN model produces retention divergent from previous models.

III. Methodology

Quantitative Research

A quantitative approach was utilized to address the two research objectives. Data was obtained from the MAFFORGEN program guides and slideshows from HAF and AMC, the MAFFORGEN C-17 RTM, and the Air Force Expeditionary Readiness Training Guide for calculations. MAFFORGEN implementation data was obtained through interviews with AMC/A3, AFRC/A3, AFRC/A5, as well as sitting AFRC Wing and Group Commanders. Using Excel functions, data from the provided sources was input to calculate planning projections.

Objective 1: In order to quantify the total man-day requirement to augment a C-17 force element for a period of 180 days, a Gantt style timeline was created to simulate Reserve C-17 aircrew progressing through the 180-day "Available" phase, Timeline calculations include estimated man-days required for a certification event, pre-deployment spin-up and travel days, "in-place" deployment days, as well as post deployment travel and accrued leave days. Projections were based on an ARC Classic Associate Wing providing one or two aircrew to augment the force element, based on 45 and 90-day tasking splits. Although the model does not currently provide mobilization for C-17 aircrew, projections were calculated considering both mobilization and non-mobilization of C-17 aircrew. Lastly, a C-17 can be operated with either an augmented crew or a combat basic aircrew; therefore, projections are calculated considering both crew compositions. Calculations for all variable are provided in Appendix A. An example of this Gantt chart is shown in *Table 1*. In *Table 1*, a C-17 ARC Classic Associate Wing is augmenting a C-17 force element, fulfilling 2 out of the 12 flying lines for 180 days, with swap outs occurring every 45 days.

Table 1: Man-Day Calculation for 180 days with 45 day splits

MAF FORGEN Implementation Timeline and RFIs

180 days, 45 day splits, 2 lines = 10 crews needed

Reset	Ready	8 days for certification event/pre-deployment
Prepare	Available	60 day block includes 45 days in place, 11 travel days for out & back plus required crew overlap days, 4 days earned leave
Ready		
Available		Each 45 day in place requirement drives need for 68 days of MPA

Mobilized Augmented Crew

	3 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17 Aug	5		Prepare		Ready					5	5	5					RESET
C-17 Aug	5		Prepare		Ready					5	5	5					RESET
C-17 Aug	5		Prepare		Ready						5	5	5				RESET
C-17 Aug	5		Prepare		Ready						5	5	5				RESET
C-17 Aug	5		Prepare		Ready							5	5	5			RESET
C-17 Aug	5		Prepare		Ready							5	5	5			RESET
C-17 Aug	5		Prepare		Ready								5	5	5		RESET
C-17 Aug	5		Prepare		Ready								5	5	5		RESET
C-17 Aug	5		Prepare		Ready									5	5	5	RESET
C-17 Aug	5		Prepare		Ready									5	5	5	RESET
R&R Days												0	50	50	50	50	50
MPA Days:	3550							0	0	80	380	680	730	730	600	300	50

Using the column "Dec-22" as a snapshot in time, six C-17 crews are participating in the force element during December 2022. Crews in rows 3 and 4 are at the end of their deployment (dark blue), and are swapping out with C-17 crews in rows 5 and 6 (dark blue). Crews in rows 7 and 8 are completing their 8 days of pre-deployment training (light blue) and will be the next two crews up to replace the crews in rows 5 and 6. The number "5" in each block represents the 5 crew members in each crew. The orange block at the bottom of column "Dec-22" represents the rest days (R&R) due to the crew members by law because of the involuntary mobilization. To calculate the MPA days for column "Dec-22", the dark blue cells are (5 members x 30 days

deployed), the light blue cells are (5 members x 8 days training), and the orange cells are (5 members x 5 days R&R). The green summary cell (730) at the bottom is the sumproduct of all three calculations and represents the MPA days needed to fund those six crews currently participating in the force element for the month of December 2022. The total sum of MPA days needed (3,550) is located on the far left of the green row, which signifies the total number of MPA days required for all C-17 crews to participate in the 180 day tasking.

Objective 2: In order to estimate total man-days to train a reservist C-17 aircrew through the MAFFORGEN phases from basic qualification to fully qualified status, MAFFORGEN C-17 RTM training tables were used to breakdown the hours required per training event for all three crew positions in the C-17: Instructor/Aircraft Commander (IP/MP/FPK), Co-Pilot (FPC/FPQ), and Loadmaster (LM). Sortie requirements, simulator requirements, ground training requirements, and taskable training items were analyzed to determine the total amount of man-days and reservist training periods needed to be categorized as fully qualified by the MAFFORGEN C-17 RTM.

Each ARC C-17 squadron possess a unique composition of aircrew positions. For example, a squadron could have 40% Instructor/Aircraft Commanders, 30% Co-Pilots, and 30% Loadmasters. To account for this weighted average, a current ARC C-17 squadron's crew composition was weighted against the man-days required for each of the three crew positions to better estimate man-days per crew position. Additionally, in order for an aircrew to become fully certified it must complete Air Force Expeditionary Readiness Training items. Man-days estimates for these expeditionary training items were also factored into the total training requirement, and were found to require no more than 6 man-days to accomplish all required training items.

Assumptions

Due to the ever-changing nature of the MAFFORGEN model, slated to be operable in FY23, multiple assumptions are necessary:

- Per AFRC/A3, mobilizations under MAFFORGEN are only provided for KC-135, C-130, and KC-46 aircrew. C-17s will NOT be mobilized. However, calculations are provided including mobilization should AMC and AFRC change program requirements.
- If AFRC aircrew do become mobilized during the "Available" phase of the model, they maintain a 1:5 mobility-to-dwell ratio. For example, a 45 day deployment would require 225 days dwell time at home-station.
- C-17s will utilize Active Duty funded long term Military Personnel Appropriation (MPA) funds to place reservists on military status within MAFFORGEN.
- Reserve Personnel Appropriation (RPA) funds will not be used for C-17 aircrews utilized in MAFFORGEN augmentation of a force element.
- ARC Classic Associate Units will augment force elements for a full 180 days.
- Planning estimates assume both a C-17 augmented crew composition (3 pilots and 2 loadmasters) and a combat basic crew composition (2 pilots and 2 loadmasters).
- Training man-days are calculated using standard training requirements outlines in the MAFFORGEN C-17 RTM. Understandably, some aircrew training may take shorter or longer based on proficiency; however, aircrew

currency does not equal mission proficiency. Calculations do not account for proficiency advances or additional training needed, which will increase the total man-days necessary.

- Reservists utilize all allotted training statuses, Unit Training Assembly (UTA) periods, and Annual Training (AT) man-days to complete ancillary training as a pre-requisite. MPA funding is only provided for the MAFFORGEN certification event and actual tasking.
- The allocated number of reservist participation requirements as defined by AFI 36-2254 remain unchanged.
- At the time of this research, in-coordination MAFFORGEN C-17 RTM training tables were available for quantitative analysis.

Analysis and Results

Objective 1: *Table 2* displays the resulting man-day totals, consolidated from the Gantt charts located in Appendix A. It shows total man-days required to fill the 180 day tasking considering both mobilization and non-mobilization of C-17 aircrew. *Table 3* displays the total number of qualified ARC C-17 aircrews needed to fill the 180 day tasking as a result of rotational swap outs.

Table 2: Man-days to fill 180-day rotation

	No Mobilizations			
Deployment Days "In-Place"	ARC Crews filling 2 of 12 FE lines		ARC Crews filling 1 of 12 FE lines	
	Augmented	Combat Basic	Augmented	Combat Basic
45 Days	3,400	2,720	1,700	1,360
90 Days	2,340	1,872	1,170	936

	Mobilization			
Deployment Days "In-Place"	ARC Crews filling 2 of 12 FE lines		ARC Crews filling 1 of 12 FE lines	
	Augmented	Combat Basic	Augmented	Combat Basic
45 Days	3,550	2,840	1,775	1,420
90 Days	2,540	2,032	1,270	1,016

From *Table 2 above*, assuming no mobilization, 3,400 days of MPA orders would be required to fulfill two deployment lines for a period of 180 days. This accounts for augmented aircrew and includes overlapping days required for aircrew rotations at 45 day increments. In total, ten augmented ARC C-17 aircrews from the same ARC Classic Associate squadron would be required to fill two force element deployment lines for a period of 180 days, rotating out at 45 day increments. The total number of aircrews would be reduced to five if the ARC Classic Associate squadron filled one force element deployment line. In terms of MPA man-days for individual crew members, 45 day rotations require 68 days of MPA orders with no mobilization, and it increases to 73 days if aircrew are mobilized. For 90-day rotations, each crewmember would require 117 days of MPA orders non-mobilized, and 127 days if mobilized.

Table 3: Number of aircrews required

	Total number of trained aircrews needed to fill tasking			
Deployment Days "In-Place"	ARC Crews filling 2 of 12 FE lines		ARC Crews filling 1 of 12 FE lines	
	Augmented	Combat Basic	Augmented	Combat Basic
45 Days	10 crews	10 crews	5 crews	5 crews
90 Days	4 crews	4 crews	2 crews	2 crews

Overall, the data shows an inverse relationship between the number of "in-place" days and the total number of man-days required to fund the 180-day period. As the number of "in-place" days decreases, the total number of man-days required increases due to the increased number of overlap days involved with rotation swap outs. Additionally, shortening rotations from 90 to 45 days, which requires 8 additional crew swap outs, drastically increases the number of total crews required as seen in *Table 3*. The impact of mobilization in total man-days is less significant; however, the enrollment of enhanced benefits creates additional budgetary stresses. Overall, mobilization of aircrew increases total man-days by 4.4% and 8.5% for 45 day and 90-day rotations, respectively. Lastly, crew composition plays a significant role in the calculated man-days. Transition from fully augmented C-17 aircrew (5 members) to combat basic C-17 aircrew (4 members) inherently results in a 20% reduction in total man-days required because one crewmember is removed from each participating aircrew.

Objective 2**:** *Table 4* displays the resulting man-day calculations required for each aircrew position to train and become fully qualified. Totals in green reflect man-days in terms of eight-hour blocks, while totals in yellow convert the man-day numbers to four hour pay periods, in line with standard reservist participation nomenclature. Specifically, man-day calculations are based upon an ARC C-17 crewmember notification at six months prior to the "Available" phase, leaving 180 days to accomplish training requirements. A six-month notification is significant in terms of mobilization, should mobilization become possible for ARC C-17 crew members. A

six-month training spin-up period corresponds to the 180-day activation notice required to guarantee enhanced medical benefits afforded through mobilization.

Table 4: Man-days required by crew position

Man-days required in "Prepare phase" by crew position			
	MP/FPK/FPL+	**FPN/FPC/FPQ**	**LM**
8 hr period	**17**	**23**	**15**
4 hr pay period	**34**	**46**	**30**

Table 5 displays the man-day calculations for both an augmented and combat basic C-17 aircrew. In total, the MAFFORGEN C-17 RTM incurs a training bill of 87 man-days for an augmented crew and 70 man-days for a combat basic crew. The addition of Expeditionary Readiness Training items increases man-day totals to 93 and 76, respectively. Ultimately, using augmented crews drives a 24% increase in training resources. With respect to planning a crew members training flights and simulators, assuming multiple training events can be accomplished on the same sortie, a C-17 Instructor/Aircraft commander would require five sorties and six simulators to accomplish all training items. A C-17 loadmaster requires four sorties and five simulators to accomplish all training items. Mobilization costs do not directly impact the number of man-days required for training, regardless of the crew composition.

Table 5: Man-days required by crew composition

Man-days required - Augmented Crew in "Prepare"				
	MP/FPK/FPL+	**FPN/FPC/FPQ**	**LM**	**Totals**
8 hr period	**34**	**23**	**30**	**87**
4 hr pay period	**68**	**46**	**60**	**174**

Man-days Required - Combat Basic Crew in "Prepare"				
	MP/FPK/FPL+	**FPN/FPC/FPQ**	**LM**	**Totals**
8 hr period	**17**	**23**	**30**	**70**
4 hr pay period	**34**	**46**	**60**	**140**

IV. Conclusions and Recommendations

Inherently, this research drives two decisions critical to MAFFORGEN implementation. The first decision is whether or not to utilize mobilization of ARC Classic Associate C-17 aircrews in order to augment force elements. Mobilization, which legally activates reservists onto Active Duty status, guarantees the availability of forces to augment a force element and eliminates the reliance on volunteerism AFRC-wide. It provides ARC C-17 aircrews the same enhanced benefits like Tricare as other mobility crew members within the MAFFORGEN model (i.e., KC-135, C-130), at a cost burden of roughly 120-200 total additional man-days every two years (*Table 6*). Volunteerism alone may prove insufficient to cover two deployment lines within a force element, especially if the rotations are shortened into 45-day blocks. Considering the 732nd Airlift Squadron possesses 12 fully qualified crews on its manning documents, fulfilling two deployment lines would require 10 of the 12 crews to be utilized. Without mobilization, providing 10 aircrews would prove to be almost impossible to accomplish. A shift to 90-day rotations would only require four crews, and create a more reasonable tasking to satisfy for the classic associate unit.

Understandably, this capability is greatly impacted by the state of the commercial airline industry. As airline industry profitability continues to grow post-COVID, the Air Force Reserve must continue to provide incentives for reservist pilots to maintain sufficient participation, increasing overall retention, as evidenced by previous studies linking mobilization and retention. One disadvantage of the MAFFORGEN model is that the model is based on steady state mobility requirements. Should a global conflict develop, the desired readiness and force generation limitations resulting from the model are ignored, and all available crews would be trained and provided for an all-out war effort. If crew members are not afforded mobilization

benefits, the "bench" of crew members available for global conflict may be barren.

The second decision critical to MAFFORGEN implementation is the trade-off between crew composition and rotation length. *Table 6* shown below provides the total man-days required to fulfill a force element, combining MPA orders (Objective 1) and RTM Training Days (Objective 2), assuming an ARC Classic Associate Wing is required to fulfill two deployment lines for 6 months. In both the non-mobilization and mobilization options, the minimum number of man-days required to fulfill the tasking requires a **combat basic crew composition** with rotations of **90 days**. Of the three variables in the MAFFORGEN model, mobilization, crew composition, and rotation length, rotation length has the largest impact on total man-days required. Transitioning from 45 day to 90-day rotations decreases total man-days ranges from 1,228 for a combat basic crew to 1,582 for an augmented crew.

Table 6: Total man-days required (Objectives 1 & 2 combined)

Man-days Required - Mobilization				
		MPA Deployment Orders	RTM Training Days	Totals
Augmented	45 days	3550	870	4420
	90 days	2540	348	2888
Combat Basic	45 days	2840	700	3540
	90 days	2032	280	2312

Man-days Required - No Mobilization				
		MPA Deployment Orders	RTM Training Days	Totals
Augmented	45 days	3400	870	4270
	90 days	2340	348	2688
Combat Basic	45 days	2720	700	3420
	90 days	1872	280	2152

Considering all the metrics calculated above, the following recommendation is provided for an ARC C-17 Classic Associate Wing tasked to augment up to two deployment lines. The most cost-effective option for ARC Classic Associate units is to train and present combat basic C-17 aircrews on 90-day rotations, utilizing mobilization orders to fund the deployments. This force presentation option minimizes the use of total man-days, while balancing the retention and availability benefits of mobilization. While the 90-day rotation is longer than traditional 45 or 60-day rotations used over the past 20 years, it is a valid trade-off needed to guarantee future end strength numbers needed should a global conflict arise.

Areas for Future Research

Once the MAFFORGEN model has matured and more data is available, the following research topics should be addressed:

- If mobilization is not utilized, conduct surveys of reservists to estimate retention and volunteerism of C-17 aircrew as a result of the deployment model.
- Study the impact of retention, volunteerism, and participation levels of reservists who participate in "Available" phases that biennially fall over holiday periods, specifically the October to March "Available" phase.
- Analyze actual retention of ARC C-17 aircrew after multiple iterations of MAFFORGEN cycles to provide adjustment options for decision makers.

Appendix A

Objective 1 Calculations – 180-day splits

2 Crews Required – 45 day splits

MAF FORGEN Implementation Timeline and RFIs

180 days, 45 day splits, 2 lines = 10 crews needed

Reset	Ready	8 days for certification event/pre-deployment
Prepare	Available	60 day block includes 45 days in place, 11 travel days for out & back plus required crew overlap days, 4 days earned leave
Ready		
Available		Each 45 day in place requirement drives need for 68 days of MPA

Mobilized Augmented Crew

	3 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17 Aug	5		Prepare		Ready					5	5	5					RESET
C-17 Aug	5		Prepare		Ready					5	5	5					RESET
C-17 Aug	5		Prepare		Ready						5	5	5				RESET
C-17 Aug	5		Prepare		Ready						5	5	5				RESET
C-17 Aug	5		Prepare		Ready							5	5	5			RESET
C-17 Aug	5		Prepare		Ready							5	5	5			RESET
C-17 Aug	5		Prepare		Ready								5	5	5		RESET
C-17 Aug	5		Prepare		Ready								5	5	5		RESET
C-17 Aug	5		Prepare		Ready									5	5	5	RESET
C-17 Aug	5		Prepare		Ready									5	5	5	RESET
R&R Days												0	50	50	50	50	50
MPA Days:	3550							0	0	80	380	680	730	730	600	300	50

Non-Mobilized Augmented Crew

	3 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17 Aug	5		Prepare		Ready					5	5	5					RESET
C-17 Aug	5		Prepare		Ready					5	5	5					RESET
C-17 Aug	5		Prepare		Ready						5	5	5				RESET
C-17 Aug	5		Prepare		Ready						5	5	5				RESET
C-17 Aug	5		Prepare		Ready							5	5	5			RESET
C-17 Aug	5		Prepare		Ready							5	5	5			RESET
C-17 Aug	5		Prepare		Ready								5	5	5		RESET
C-17 Aug	5		Prepare		Ready								5	5	5		RESET
C-17 Aug	5		Prepare		Ready									5	5	5	RESET
C-17 Aug	5		Prepare		Ready									5	5	5	RESET
R&R Days												0	0	0	0	0	0
MPA Days:	3400							0	0	80	380	680	680	680	600	300	0

Mobilized Combat Basic Crew

	2 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17	4		Prepare		Ready					4	4	4					RESET
C-17	4		Prepare		Ready					4	4	4					RESET
C-17	4		Prepare		Ready						4	4	4				RESET
C-17	4		Prepare		Ready						4	4	4				RESET
C-17	4		Prepare		Ready							4	4	4			RESET
C-17	4		Prepare		Ready							4	4	4			RESET
C-17	4		Prepare		Ready								4	4	4		RESET
C-17	4		Prepare		Ready								4	4	4		RESET
C-17	4		Prepare		Ready									4	4	4	RESET
C-17	4		Prepare		Ready									4	4	4	RESET
R&R Days												0	40	40	40	40	40
MPA Days:	2840							0	0	64	304	544	584	584	480	240	40

Non-Mobilized Basic Crew

	2 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17	4		Prepare		Ready					4	4	4					RESET
C-17	4		Prepare		Ready					4	4	4					RESET
C-17	4		Prepare		Ready						4	4	4				RESET
C-17	4		Prepare		Ready						4	4	4				RESET
C-17	4		Prepare		Ready							4	4	4			RESET
C-17	4		Prepare		Ready							4	4	4			RESET
C-17	4		Prepare		Ready								4	4	4		RESET
C-17	4		Prepare		Ready								4	4	4		RESET
C-17	4		Prepare		Ready									4	4	4	RESET
C-17	4		Prepare		Ready									4	4	4	RESET
R&R Days												0	0	0	0	0	0
MPA Days:	2720							0	0	64	304	544	544	544	480	240	0

2 Crews Required – 90 day splits

MAF FORGEN Implementation Timeline and RFIs

180 days, 90 day splits, 2 lines = 4 crews needed

Reset	Ready	8 days for certification event/pre-deployment
Prepare	Available	3 x 30 day blocks includes days 90 in place
Ready	Reset	19 days includes 11 travel days for out & back plus required crew overlap days, 8 days earned leave
Available	R&R	10 days after return from mobilization orders

Each 90 day in place requirement drives need for 127 days of MPA

Mobilized Augmented Crew

	3 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23
C-17 Aug	5	Prepare			Ready					5	5	5	5	5				RESET
C-17 Aug	5	Prepare			Ready					5	5	5	5	5				RESET
C-17 Aug	5	Prepare			Prepare			Ready					5	5	5	5	5	RESET
C-17 Aug	5	Prepare			Prepare			Ready					5	5	5	5	5	RESET
R&R Days														100			100	
MPA Days:	2540							0	0	80	300	300	380	590	300	300	290	

Non-Mobilized Augmented Crew

	3 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23
C-17 Aug	5	Prepare			Ready					5	5	5	5	5				RESET
C-17 Aug	5	Prepare			Ready					5	5	5	5	5				RESET
C-17 Aug	5	Prepare			Prepare			Ready					5	5	5	5	5	RESET
C-17 Aug	5	Prepare			Prepare			Ready					5	5	5	5	5	RESET
R&R Days																		
MPA Days:	2340							0	0	80	300	300	380	490	300	300	190	

Mobilized Basic Crew																		
	2 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23
C-17 Aug	4	Prepare			Ready					4	4	4	4	4				RESET
C-17 Aug	4	Prepare			Ready					4	4	4	4	4				RESET
C-17 Aug	4	Prepare			Prepare			Ready					4	4	4	4	4	RESET
C-17 Aug	4	Prepare			Prepare			Ready					4	4	4	4	4	RESET
R&R Days														80			80	
MPA Days:	2032							0	0	64	240	240	304	472	240	240	232	

Non-Mobilized Basic Crew																		
	2 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23
C-17 Aug	4	Prepare			Ready					4	4	4	4	4				RESET
C-17 Aug	4	Prepare			Ready					4	4	4	4	4				RESET
C-17 Aug	4	Prepare			Prepare			Ready					4	4	4	4	4	RESET
C-17 Aug	4	Prepare			Prepare			Ready					4	4	4	4	4	RESET
R&R Days																		
MPA Days:	1872							0	0	64	240	240	304	392	240	240	152	

1 Crew Required – 45 day splits

MAF FORGEN Implementation Timeline and RFIs

180 days, 45 day splits, 1 lines = 5 crews needed

Reset	Ready	8 days for certification event/pre-deployment
Prepare	Available	60 day block includes 45 days in place, 11 travel days for out & back plus required crew overlap days, 4 days earned leave
Ready		
Available		Each 45 day in place requirement drives need for 68 days of MPA

Mobilized Augmented Crew

	3 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17 Aug	5		Prepare		Ready					5	5	5					RESET
C-17 Aug	5		Prepare		Ready						5	5	5				RESET
C-17 Aug	5		Prepare		Ready							5	5	5			RESET
C-17 Aug	5		Prepare		Ready								5	5	5		RESET
C-17 Aug	5		Prepare		Ready									5	5	5	RESET
R&R Days												0	25	25	25	25	25
MPA Days:	1775							0	0	40	190	340	365	365	300	150	25

Non-Mobilized Augmented Crew

	3 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17 Aug	5		Prepare		Ready					5	5	5					RESET
C-17 Aug	5		Prepare		Ready						5	5	5				RESET
C-17 Aug	5		Prepare		Ready							5	5	5			RESET
C-17 Aug	5		Prepare		Ready								5	5	5		RESET
C-17 Aug	5		Prepare		Ready									5	5	5	RESET
R&R Days												0	0	0	0	0	0
MPA Days:	1700							0	0	40	190	340	340	340	300	150	0

Mobilized Basic Crew

	2 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17	4	Prepare			Ready					4	4	4					RESET
C-17	4	Prepare			Ready						4	4	4				RESET
C-17	4	Prepare			Ready							4	4	4			RESET
C-17	4	Prepare			Ready								4	4	4		RESET
C-17	4	Prepare			Ready									4	4	4	RESET
R&R Days												0	20	20	20	20	20
MPA Days:	1420							0	0	32	152	272	292	292	240	120	20

Non-Mobilized Basic Crew

	2 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17	4	Prepare			Ready					4	4	4					RESET
C-17	4	Prepare			Ready						4	4	4				RESET
C-17	4	Prepare			Ready							4	4	4			RESET
C-17	4	Prepare			Ready								4	4	4		RESET
C-17	4	Prepare			Ready									4	4	4	RESET
R&R Days												0	0	0	0	0	0
MPA Days:	1360							0	0	32	152	272	272	272	240	120	0

1 Crew Required – 90 day splits

MAF FORGEN Implementation Timeline and RFIs

180 days, 90 day splits, 1 lines = 2 crews needed

Reset	Ready	8 days for certification event/pre-deployment
Prepare	Available	3 x 30 day blocks includes days 90 in place
Ready	Reset	19 days includes 11 travel days for out & back plus required crew overlap days, 8 days earned leave
Available	R&R	10 days after return from mobilization orders

Each 90 day in place requirement drives need for 127 days of MPA

Mobilized Augmented Crew

	3 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17 Aug	5	Prepare			Ready					5	5	5	5	5			
C-17 Aug	5	Prepare			Prepare			Ready					5	5	5	5	5
R&R Days														50			50
MPA Days:	1270							0	0	40	150	150	190	295	150	150	145

Non-Mobilized Augmented Crew

	3 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17 Aug	5	Prepare			Ready					5	5	5	5	5			
C-17 Aug	5	Prepare			Prepare			Ready					5	5	5	5	5
R&R Days																	
MPA Days:	1170							0	0	40	150	150	190	245	150	150	95

Mobilized Basic Crew

	2 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17 Aug	4	Prepare			Ready					4	4	4	4	4			
C-17 Aug	4	Prepare			Prepare			Ready					4	4	4	4	4
R&R Days														40			40
MPA Days:	1016							0	0	32	120	120	152	236	120	120	116

Non-Mobilized Basic Crew																	
	2 P & 2 LM	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
C-17 Aug	4	Prepare			Ready					4	4	4	4	4			
C-17 Aug	4	Prepare			Prepare			Ready					4	4	4	4	4
R&R Days																	
MPA Days:	936							0	0	32	120	120	152	196	120	120	76

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14. ABSTRACT
Research addressed manpower and budgetary deficiencies of the new Air Force Force Generation model (AFFORGEN), specifically for Air Force Reserve Command's (AFRC) C-17 forces. Provides estimates for the number of man-days required for training and deployment planning. Calculations were scoped for a Classic Associate Resevre C-17 flying squadron. Results provided number of man-days required to train up to two C-17 aircrew for deployment rotations, optimized rotation lengths, and optimal C-17 crew compositions. Research concluded a CA Reserve C-17 squadron deploy combat basic C-17 aircrew for 90-day rotations, utilizing mobilization to support a 180-day force element augmentation.

15. SUBJECT TERMS
AFFORGEN; CLASSIC ASSOCIATE; C-17A; MOBILIZATION; MPA; MAN-DAYS; FORCE ELEMENT

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