CALCULATING ANNUAL TRAINING TIME: A MISSING LINK IN AMC'S DATA CHAIN

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Abstract

Training pilots is a critical aspect of a competent Air Force. However, the number of skills in demand is constrained by aircrew time and the flying hour program. Training events should be prioritized based on the operational requirement. Therefore, deciding which training events to allocate resources to should be determined by the current and forecasted need of this operational requirements, weighed against the time it takes to ready the force with that operational skill set. When a particular skill set is then weighed against other skill sets (For example, instrument flying versus low-level flying), it is possible to systematize these cuts based on the given constraints. This research creates a decision framework for Air Mobility Command leadership; providing them with a framework to prioritize various training requirements with operational impact, now and in the future. This research uses C-130J heavy equipment airdrop as an anecdotal training event to build this decision framework. Structured interviews with C-130J subject matter experts were used to better understand the training requirement, associated time requirement per crew position, current and future operational needs. From these interviews, Annual Training Time (ATT) was calculated for the C-130J weapon system. Additionally, a thematic analysis provides a holistic look at the effectiveness of the current training model for the C-130J training program. The combination of both the time and the importance of the event provides a more objective approach and provides decision makers with a decision framework for other training events.

Acknowledgments

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Austin D. Rust

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CALCULATING ANNUAL TRAINING TIME: A MISSING LINK IN AMC'S DATA CHAIN

I. Introduction

On January 19, 2018, Defense Secretary James Mattis released a new U.S. National Defense Strategy (NDS). (Mattis, 2018) The document ratified his already popular guidance that the US military must better prepare itself for a near-peer adversary. Following the release of that NDS, units within the Air Mobility Command (AMC) began to review current training practices and analyze those practices for alignment with the NDS. One of the resulting changes in the training guidance given to the flying units was a new training plan focused on preparing for a future war with China, Russia, Iran, or North Korea. This training plan sanctioned a term that is now widely used across the AF as "Full Spectrum Readiness." Full Spectrum Readiness (FSR) is generally understood to mean the readiness required to operate in a contested, degraded, operationally limited (CDO) environment with the possibility of chemical and/or biological weapons present. Although most AMC tactical airlift units were already training to achieve some portion of FSR, this training plan outlined a command-wide focus on this type of training.

The execution of this training, however, fell short across the tactical airlift community. At airlift wings like the 317th Airlift Wing, Dyess AFB, TX (317AW) the AMC wide training plan was dead on arrival. (R. Winfield, personal communication, 17 Jan 2019) "We aren't resourced appropriately to conduct (the training plan) with our current tasking level. I don't have crew availability" to train to the program, said Maj Richard Winfield, C-130J weapons officer (WO) and Director of Operations for the 317th Operations Support Squadron. Because of the current operations and training tempo that airlift aircrew experience at their home station, squadrons are finding difficulty in meeting some of the added desired training objectives. Many of these failed training objectives are essential to meeting the challenges outlined in the NDS. Without more time or resources to train with, the C-130J community will face difficulty

advancing its training program to the required level in order to prepare successfully for the next major conflict.

In August of 2017, the MAF community held its first Mobility Guardian exercise. This exercise brought several MAF units, including international partners, together to train to complex scenarios designed to mimic events that might occur in a future war with our near-peer adversaries. The exercise is touted as AMC's premier exercise and is designed to push the boundaries of the training envelope for MAF forces. The execution of the training showcased the many current shortfalls in capability for MAF aircrew to operate in a contested environment. The after action report highlights that MAF aircrew members were unable to survive against a simulated near-peer surface to air threats as well as air to air threats. The main reason sighted for this lack of capability was the lack of readiness provided to the aircrews by their home station units. Maj Sean McConville, Mobility Guardian 2017, White Cell Air Planner Lead, pinpointed home station training shortfalls in the exercise's after action report (AAR). He concluded that "MAF [Ops Group Commanders] must commit to Integrated Tactics Training Sorties on [local training rides] (After Action report, 2017, slide 17).

As noted in the Mobility Guardian AAR, In the C-17 community, aircrews seem to be overtasked to the point that each unit is unable to train appropriately to perform against adversaries who have sophisticated surface to air and air to air threats. If crews are unable to conduct proper training due to their high operations tempo, it is unlikely that aircrew in the C-17 community will successfully meet the demands of the current NDS. With more time to train, however, the MAF community as a whole can better prepare to provide rapid global mobility in a contested environment.

Where does this time come from? If the MAF community does not have time to train properly due to the current operations tempo, how does it build in time to conduct the necessary training required? In order to answer this question, it is imperative that a MAF planner on AMC staff can accurately communicate how much time is dedicated to current training events. Although there is a program that estimates the number of flying hours required for several generalized flying events, there is not a distinct and comprehensive list of training hours required for each currency training event listed in the AFMAN 11-2MDS Volume 1, Flying Operations regulation.

The purpose of this research paper is to create a framework, for use in AMC staff, which provides the means to capture all of the time required to complete a flying training event. The paper will examine the heavy equipment (HE) airdrop capability in the C-130J active duty community to determine how much time is spent in AMC conducting HE training. This paper will not argue whether or not HE training should be reduced or eliminated, but will study the factors around this particular training event to determine the best approach to calculate training time dedicated to an event. Additionally, the paper will examine if training efforts in the C-130J are properly focused or if new training efforts should be made based on the opinion of subject matter experts (SMEs).

This paper includes a review of recent literature associated with AMC training and offers assumptions used and limitations found in this research. Following this review is a description of the methodology used to collect both quantitative and qualitative data. An analysis and results section then describes the meaning of the results found from the analysis of

the collected data. Finally, the discussion and conclusion section offers real-world applications of the data.

II. Literature Review

Chapter Overview

This section examines some of the literature currently available on three subjects: 1) why HE airdrop was chosen as the training event for analysis; 2) the shortfalls of the flying hour program; and 3) the lack of effectiveness and efficiency of current MAF airlift training models. The literature cited in this section provides additional background to support the research in this paper.

The Case Against HE Airdrop

Although no arguments are made in this paper discussing the validity of keeping HE airdrop as a core capability for the C-130J, it is important to discuss why HE was chosen as the airdrop event to research. Two important factors should be examined when deciding the necessity of a particular capability. The first is whether or not the requirement for that capability exists today, and second is whether or not the capability will be needed in the future. To examine the former, the data from the current airdrop totals in CENTCOM were analyzed. The document that contains the data is classified SECRET, which is outside the classification of this paper. However, this data does show that there is almost no requirement for HE airdrop for the wars currently being fought in that AOR. This is partly due to two factors. First, the requirement for ground forces to remain lean and agile reduces the applicability of rigging, dropping, and maintaining large vehicles at small forward operating bases (FOBs). Second, because C-130Js in the active duty fleet do not aerial refuel, the aircraft have limited applicability to providing support for airdrop of Global Response Force equipment. In a 2002 RAND study assessing the strategic responsiveness of the US Army's Stryker Brigade Combat

Team (BCT), the researchers concluded that "C-130s are not a good choice for long-range deployments, given their range, speed, and payload limitations." (Vick, Orletsky, Pirnie, and Jones, 2002, p. 19). The researchers thought that C-130s were so inadequate to strategic brigade employment that they only used C-5s and C-17s in their analysis of BCT readiness. Therefore, if the Army will not use C-130s to airdrop HE for intratheater airlift, and they will not use them for intertheater strategic airdrop, there seems to be a diminished requirement for C-130s to maintain readiness for HE airdrop.

In the fall of 2018, Headquarters Air Force (HAF) staff members tasked AMC/A3DT (Combat Tactics Branch) to evaluate the requirements for the C-130J airdrop capabilities. (D. Janssen, personal communication, 22 Feb 2019) The A3DT office was able to justify maintaining airdrop holistically as a capability. However, when asked how much training time is allocated to each airdrop event, a very experienced staffer admitted there is not an effective way to determine how much time would be saved if a specific airdrop type capability is reduced. Without knowing the time required to train for a particular event, any decisions made about how to allocate training time for currency and proficiency training are made with incomplete data.

The Flying Hour Program

As mentioned in the introduction, there is one method used in AMC that captures how much flying time should be dedicated to a particular event. Planners on AMC staff utilize estimates for particular flight events to calculate the flying hours needed for the AMC flying hour program. For example, the system estimates that an average airdrop requires 12 minutes of flight time, and an average low-level training event requires 20 minutes. They multiply this number by the number of aircrew in a unit and the number of required training events per the

AFMAN 11-2C-130 J Volume 1 (Vol 1), Flying Operations regulation, to determine the number of hours to allocate to each C-130J unit for its flying training program.

This flying hour program is based on the Air Force Single Hour Flying Model (AFSHFM) model described in the Air Force Instruction 11-102, Flying Hour Program. Although these estimates have served their purpose to allocate training time, these estimates do not appropriately capture the total time aircrew dedicate to each event. Each training event requires some time to study for, mission plan, brief, execute, and debrief for both pilots and loadmasters. In a resource-constrained environment, it is important to understand all of the factors associated with completing a training event. There is currently no mechanism to do so in AMC.

Improving Efficiency and Effectiveness

In any training program, there is always room for improved efficiency and/or effectiveness. Several papers in the last decade have been written about improving the effectiveness and efficiency of AMC training. Maj Joseph Beal wrote in 2015 about the lack of assigned priorities in Vol 1 currencies for C-17s (Beal, 2015). He created a model that uses SME opinion to assign a priority value to each training event. Beal claims the lack of prioritization of Vol 1 currency events allows a gap to exist between the weights of importance given to certain training events over others. He used interviews and surveys for polling opinions on the priorities of each training event. These priority values were designed to optimize the scheduling of training events as well as align training with theater-specific requirements.

Sometimes in a resource-limited environment, tough decisions need to be made about which core capabilities need to be maintained, and which could be reduced or eliminated. Maj Kyle Clinton researched the impact of reducing the aerial refueling training requirement to the evaluator and instructor pilots (Clinton, 2015). His research found that the Air Force could save $25 million in flight hour costs annually by reducing the requirement for a capability that is rarely utilized operationally. Some may argue that readiness should be not be reduced for the purpose of cost savings. However, it is important to have the data to understand the impact of making changes in a training model. Similarly, Maj Jon Bergman stressed the importance of aligning wartime requirements with current training models in the C-130H. (Bergman, 2015). Efficiency in the training program can be improved by accomplishing focused training events with requirements based desired learning objectives.

A consistent theme in this paper is that efficiency in a training program should be continuously measured especially in a resource-constrained environment. However, this efficiency should not be attained by reducing the effectiveness of the training program. Captain Katherine Suhrhoff proposed a system to ensure effectiveness is appropriately achieved (Suhrhoff, 2016). Suhrhoff claims that "current tactics training is not sufficient to maintain an acceptable level of threat proficiency for aircrew and intelligence analysts across the MAF." (Suhrhoff, 2016, 2) Her claims that MAF aircrew require more focused, scenario-based training is accompanied with the realization that there are current hurdles to the implementation of her training system. Crews require more time to mission plan for scenario-based training flights and exercises. Additionally, Suhrhoff's assessment that aircrews require more access to Secure Internet Protocol Router Network (SIPR) networks than they currently have highlighted another shortfall in the MAF training program. Without the appropriate access to the required

infrastructure to train with classified material, aircrew will not be prepared to operate in a complex, near-peer wartime environment.

Summary

The effectiveness and efficiency of MAF aircrew flying training has been researched and written about several times over the last decade. This section covered some of the literature that addresses current deficiencies in the MAF aircrew airlift aircrew training program. Most of this literature addresses the lack of supporting training data in AMC. This research paper builds upon that work and collects more data that supports the need for AMC training effectiveness and efficiency.

Research Question:

How can AMC accurately calculate the amount of training time dedicated to each training event in the MDS series Vol 1?

Investigative questions

1. What value is added to training in the C-130J active duty community by reducing or eliminating the core capability of HE airdrop?

2. Does the current C-130J training model match the current war and future war operational requirements?

Assumptions

- An aircrew member is considered to be a C-130J active duty pilot or loadmaster who is with a unit from Jan 1 of a year until 31 Dec of that year.
- All logged HE events were considered actual airdrops (i.e. not notional airdrops).

Limitations

- The hours and sorties used for the calculations in this paper did not include any times associated with the aircraft simulator
- The research conducted in this paper analyzed data from active duty C-130J units with only one exception: some C-130H model data was collected from the 374th Airlift Wing (374AW) since no C-130J data exists from that wing prior to 2017.
- Training event data exists in the Aviation Resource Management System (ARMS) and Automated Aircrew Management System (AAMS) database historically for only one year. Therefore, the conclusions made in this research paper are made using mostly only one year's worth of data (the year 2018).
- Research was not conducted on the monetary value associated with any training times mentioned in this paper.

III. Methodology

Chapter Overview

This paper utilized a mixed method approach to data collection. In order to answer the investigative questions, analysis of both quantitative data and qualitative data was necessary. Data was collected through the AAMS database in order to determine the number of HE training drops completed across the C-130J fleet. In order to determine the amount of time loadmasters and pilots spend planning, briefing, loading, rigging, and executing a HE airdrop, interviews with C-130J SMEs, all either C-130J Instructor Pilots (IPs) or C-130J Instructor Loadmasters (ILs), were accomplished. Additionally, a thematic analysis was conducted to gain insight into specific training needs for each of the crew positions.

Quantitative Data Collection

In order to address the first investigative question, data was collected via the Vol 1 to determine the number of HE training events required each semi-annual. Each pilot and loadmaster are required to complete number or continuation training events. The number of required events is based on the crew member's experience level. Heavy equipment airdrop training completion requires four crewmembers: two pilots, and two loadmasters. The number of required events was multiplied by the number of pilots in each C-130J unit to determine the number of required HE training events across the active duty fleet.

A HE event can only be tracked in AAMS when an event is logged as completed by the crew member. The number of HE events logged during the year 2018 across all active duty wings was collected. Prior to 2018, AMC/A3T did not maintain records for individual training

events for longer than one year. Therefore, data for completed HE events was only collected for 2018 (in the future, AMC/A3T will maintain records for individual training events for five years).

Actual vs. Notional Drops

C-130J aircrew members regularly perform notional airdrops (flying the procedures without dropping anything out of the aircraft) when HE platforms are either not available or not required. Often these events are flown but not logged. In order to determine whether or not there are HE training events that are flown but not logged, the 61st Airlift Squadron (61AS) and 41st Airlift Squadron (41AS) out of Little Rock AFB, AR, collected data on how many airdrops, actual and notional, were performed from 1 to 27 March, 2019. The data collectors utilized post-mission recaps during that time period to collect the data.

Notional Event Factor

A notional event factor (NEF) was derived from the data collected at Little Rock AFB. This data was used during analysis as a multiplier for the pilots' calculations. The NEF multiplier was designed to provide the means to account for notional airdrops that are not accounted for in the logged events. According to the Vol 1, "**7.4. Airdrop (AD). Events**. Log an airdrop event when a successful airdrop is accomplished. Pilots may log actual loads, training bundles or drogue chute only training drops (DOTD)" (AFMAN 11-2C-130J Volume 1, 2018). Therefore, the assumption used for this paper is that every event logged in ARMS (and subsequently collected in AAMS) is an airdrop with an actual HE load, training bundles, or DOTD. Therefore, it is necessary to capture the number of notional airdrops since the same

amount of training for pilots is required when conducting either actual or notional airdrops. The NEF is not used in the calculations for loadmasters since loadmasters generally do not load or rig, and therefore log, notional airdrops.

Qualitative Data Collection

To answer IQ2, the decision was made to interview C-130J SMEs. Fifteen interviews were conducted to determine the answers to two questions: 1) How much time is spent conducting a HE airdrop training event? and 2) What training should be accomplished with the time saved by eliminating/reducing HE airdrop requirements? Of the 14 SMEs interviewed, 10 were Instructor and/or Evaluator Pilots and 4 were Instructor Loadmasters. Of the 10 pilots interviewed, 5 were WOs and 5 were not WOs. The decision to choose a mix of WOs and non WOs provided a breadth of training experience and expertise and avoided possible myopic opinions of current training strengths and weaknesses. Both Instructor Pilots and Instructor Loadmasters from the 29th Weapons Squadron (29WPS) were interviewed. Interviews with non 29WPS personnel were conducted with crew members from both the 19AW and the 317AW. Crew members from both of these units were more likely to have recent CENTCOM AOR deployment experience that crews out of the 86AW, 374AW, or 317AW. Therefore, the answers given by these crew members would provide greater relevancy than members who had not deployed recently.

Thematic Analysis, Questions 1-5

The interview questions were designed to capture the subjects' views on beneficial and non-beneficial training events. See **Appendix A** for the interview questions. The first four

questions were broken up into two different categories. Questions 1 and 3 asked what training was beneficial, and what training was not beneficial, to prepare aircrew to operate in the current wars being fought in Iraq, Afghanistan, and Africa. Although the battles fought in the three operations each have distinct characteristics, the perspective from C-130J requirements are very similar. All three operations require aircrew to be proficient at airland operations in high elevations and hot environments and require airdrop proficiency. The airspace in the AORs for these operations are largely uncontested except for some small arms, rocket-propelled grenade (RPG), and man-portable air defense systems (MANPADs). Therefore, high caliber artillery and radar threats are unlikely to deter or degrade allied airlift operations. Questions 2 and 4 asked what training was beneficial, and what training was not beneficial, to prepare aircrew to operate in future wars. The questions were left intentionally ambiguous as to what defines a future war in order to eliminate bias and allow the subject to communicate what training would be required for a future war. The fifth questions asked what, if any, training should be conducted if more time was allotted to the unit (i.e. if other training requirements were reduced or eliminated).

Thematic Analysis was used to code and analyze the answers for questions 1-5 from the interview. Thematic analysis is a qualitative research method designed for "identifying, analyzing, and reporting patterns (themes) within data" (Braun and Clarke, 2006, p. 6). This method differs from other qualitative research methods by providing flexibility and generality for the researcher. The method is not theoretically bounded as interpretive phenomenological analysis or grounded theory tend to be. Since theory development was not an objective of this research paper, thematic analysis was used to group similar answers from the interview subjects into themes. The interview questions were intentionally left open-ended to allow the subject to

provide answers that were guarded against interview bias. The thematic analysis helped organize data into a few useful categories for analysis.

The interviews were conducted either in person or over the telephone. The answers to the questions were paraphrased by the interviewer. The paraphrased answers were typed up and reported to the subject. Any changes required were made in the recorded answers to capture the accurate paraphrasing of the answers. Once answers for all of the interviews were recorded, the answers were categorically coded by the question topics. The codes included one or two words that captured the topic of the subject's answer and were fit in one of five categories: Beneficial for Current War, Beneficial for Future War, Not Beneficial for Current War, Not Beneficial for Future War, and Increased Training Focused Required. Pilot answers and loadmaster answers were grouped separately since the two crew positions were asked to focus their answers on their crew position. After coding was complete, answers with similar themes were grouped together into four themes.

Total Event Time (TET)

Finally, the sixth question was intended to gather information about the time required to perform a HE airdrop. The information collected through question six would be necessary to quantify the amount of time each crew member devotes to each HE drop. The nomenclature used for this data was the Total Event Time (TET). To gather data for the TET calculations, subjects were asked to provide the average time, in hours, dedicated to a HE airdrop event in the following categories:

Pilots

Mission planning = average time dedicated to mission plan for an HE drop, in hours

Brief = average time dedicated to brief for the HE drop the day of the flight

Box build = average time dedicated to program HE airdrop in the flight computer

Execution = average time required to perform an HE airdrop in flight. This time includes the route and airdrop portion of the event.

Debrief = average time spent debriefing for HE airdrop after the completion of the flight

Loadmasters

Mission planning = average time dedicated to mission plan for an HE drop, in hours

Brief = average time dedicated to brief for the HE drop the day of the flight

Load = average time dedicated to loading a training HE platform onto the aircraft

Rig = average time dedicated to rigging a training HE platform onto the aircraft

Execution = average time required to perform an HE airdrop in flight. This time includes the route and airdrop portion of the event.

Debrief = average time spent debriefing for HE airdrop after the completion of the flight

Subjects were asked to provide the average time required to complete an HE airdrop for an average crewmember. The decision was made not to calculate times based on the experience member or crew qualification of an individual member. The assumption was made that each training event accomplished requires the same amount of time regardless of the experience or crew qualification of the member. For example, the assumption was that an IL accompanies their student during each phase of the event and therefore dedicates the same amount of time as the student does. This decision also reduced the needless complication of accurately accounting for the difference in an individual's experience or ability.

Calculating Annual Training Time

The total time spent to train by pilots and loadmasters in 2018 for HE airdrop was calculated using the factors above. The calculations for pilots and loadmasters was separated since the NEF was to be applied only to pilots. The calculations are as follows:

Pilots

*Annual Training Time (ATT) = (TEA * NEF)*(TET)*

TEA = Total Events Accomplished (the number of events logged as recorded in AAMS)

NEF = Notional Event Factor

TET = Total event time (mission planning + brief + box build + execution + debrief)

Loadmasters

*Annual Training Time (ATT) = (TEA) * (TET)*

Summary

This chapter focused on the methods used to collect data and determine the factors required to calculate the ATT. The collection of quantitative data was divided between data collected from existing databases, data collected through observations (notional event factor (NEF)) as well as data collected from interview question 6. This data will be used in the next section to calculate Total Event Time (TET) and Annual Training Time (ATT). Additionally, the chapter describes the interview questions 1-5 that were used to collect the qualitative data

necessary to answer investigative question 3. The following chapter will discuss the results of the analysis of the data collected.

IV. Analysis and Results

Chapter Overview

This chapter presents the analysis and results for both the quantitative and qualitative data collection. The variation and standard deviation of the timing data collected from the interviews were analyzed. Additionally, the Annual Training Time was calculated for both pilots and loadmasters. Finally, the qualitative data collected from the interviews were categorized into themes and the results are reported.

Total Events Accomplished

The first part of the calculation for ATT is to determine the TEA. This data was pulled from AAMS and sorted for C-130J HE airdrop accomplishment. The results are in Figure 1. Figure 1 shows the number of HE airdrops logged in 2018 as well as the number of events required in the Vol 1. This data is representative for both pilots and loadmasters. The number of total logged HE airdrops in 2018 was 5,047. This number was used as one part of the ATT calculation. The total number of Vol 1 required events was 2,689. The importance of the distinction between logged and required events is addressed in section V of this paper.

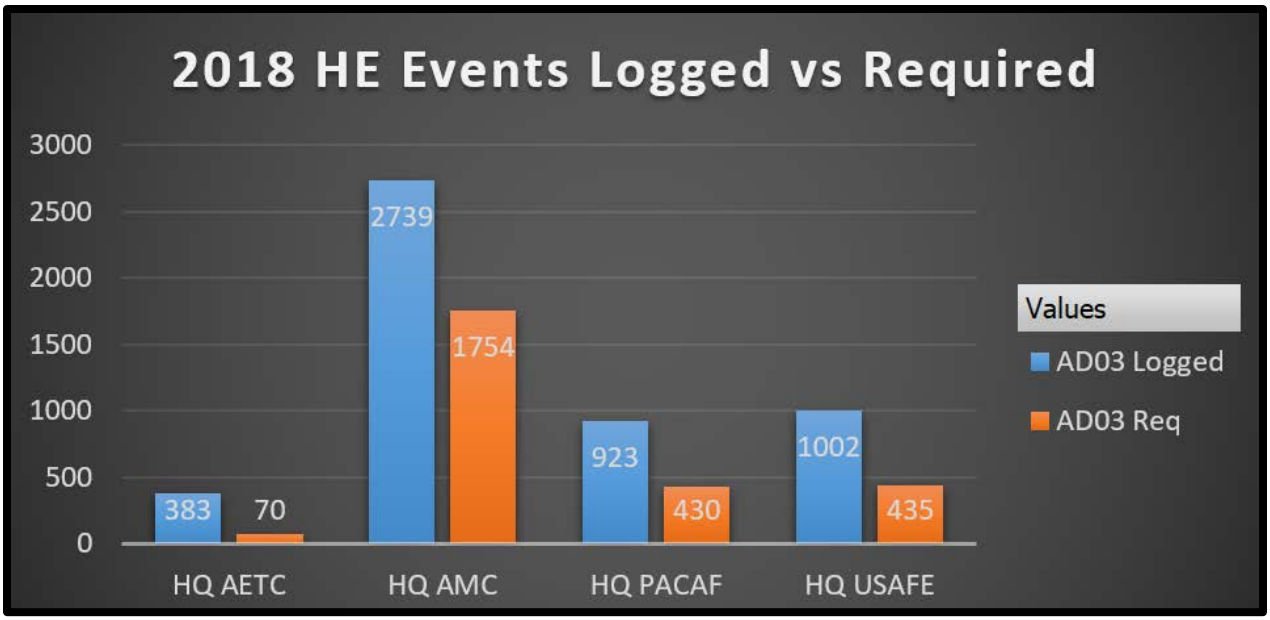


Figure 1. All Active Duty C-130J AD03 events 1 Jan-31 Dec 2018

Notional Event Factor

The second factor required to complete the ATT calculation was the NEF. As mentioned previously, the NEF was used to account for training events that may have been flown but not logged due to regulatory constraints (or any other reason). The results of the NEF data collection are shown in Table 1. The data represents all airdrops flown during the time period separated out by actual vs notional airdrops accomplished. The table shows that 28 percent of all airdrops conducted during the time period were notional drops, meaning nothing left the aircraft. The other 72 percent were a combination of actual HE and container delivery system (CDS) drops.

Table 1. 19 AW Actual vs Notional Airdrops 1 Mar – 27 Mar 2019

Actual Airdrops Accomplished	73
Notional Airdrops Accomplished	28
Total Actual and Notional	**101**
% Aidrops Notional	28%
**Notional Event Factor	**1.39**

Time Required to Complete HE Airdrop

Through data collected in question 6 of the interview, the time required to complete a HE airdrop was recorded and analyzed. This data was used as the third and final factor in the ATT calculation. Data from the 10 pilots and 4 loadmasters are shown in Tables 2 (pilots) and 3 (loadmasters). Utilizing this data, the TET was calculated and is displayed in the bottom right corner of each table.

Table 2. Total Event Time – Pilots

PILOTS	Time (in minutes)					
	Msn pln	Brief	Box Build	Execution	Debrief	Total
Subject						
1	20	20	10	45	5	100
2	60	20	20	30	20	150
3	60	20	10	45	30	165
4	60	30	10	50	5	155
5	20	10	5	45	20	100
6	30	10	10	30	10	90
7	30	10	5	60	5	110
8	75	15	5	45	30	170
9	65	15	5	45	30	160
Avg Totals	46.67	16.67	8.89	43.89	17.22	133.33
					TET	2.22 hrs

Table 3. Total Event Time – Loadmasters

LOADMASTER	Time (in minutes)						
	Msn pln	Brief	Load	Rig	Execution	Debrief	Total
Subject							
1	20	10	10	40	45	10	135
2	30	10	15	20	45	15	135
3	30	20	10	30	40	10	140
4	30	20	10	30	30	15	135
Avg Totals	28	15	11	30	40	13	136
						TET	2.27 hrs

According to the data collected, the average time dedicated for one average training HE airdrop event (TET) for a pilot is 2.22 hours and 2.32 hours for loadmasters. This means that for an average training HE airdrop, the sample data estimated that a pilot would dedicate 2.22 hours of their mission planning, briefing, programming, executing, and debriefing to a HE airdrop each time they accomplish that event. For loadmasters, the sample data estimated that they would dedicate 2.27 hours of their mission planning, briefing, loading, rigging, executing, and debriefing each time they accomplish a HE drop. One of the pilot subject's responses were not used as this subject was considered an outlier. The standard deviation for the sample set (minus the one outlier) was calculated as $\sigma = .54$ for pilots and $\sigma = .10$ for loadmasters. Therefore, the 95% confidence interval for pilots is 1.14 – 3.30 hours and for loadmasters is 2.21 – 2.33 hours.

Annual Training Time

The annual training time (ATT) for HE airdrop training results are below:

Pilots

*Annual Training Time (ATT) = (TEA * NEF)*(TET)*

For the sample data: ATT = (3629*1.39)*(2.22)

ATT = 11,198 hours

Loadmasters

*Annual Training Time (ATT) = (TEA) * (TET)*

*For the sample data: ATT = (1418) * (2.27)*

ATT = 3219 hours

Total for pilots and loadmasters across the C-130J active duty fleet:

Total ATT = 14,417 hours

Total ATT is the estimated time spent by all aircrew across the C-130J active duty fleet. See **Appendix B** for the data broken down by MAJCOM. Figure 2 provides total ATT broken down by crew position. The first column shows the total ATT for all aircrew. The second column shows the ATT for IPs, MPs, and ILs. The third column shows the ATT for IPs and ILs only.

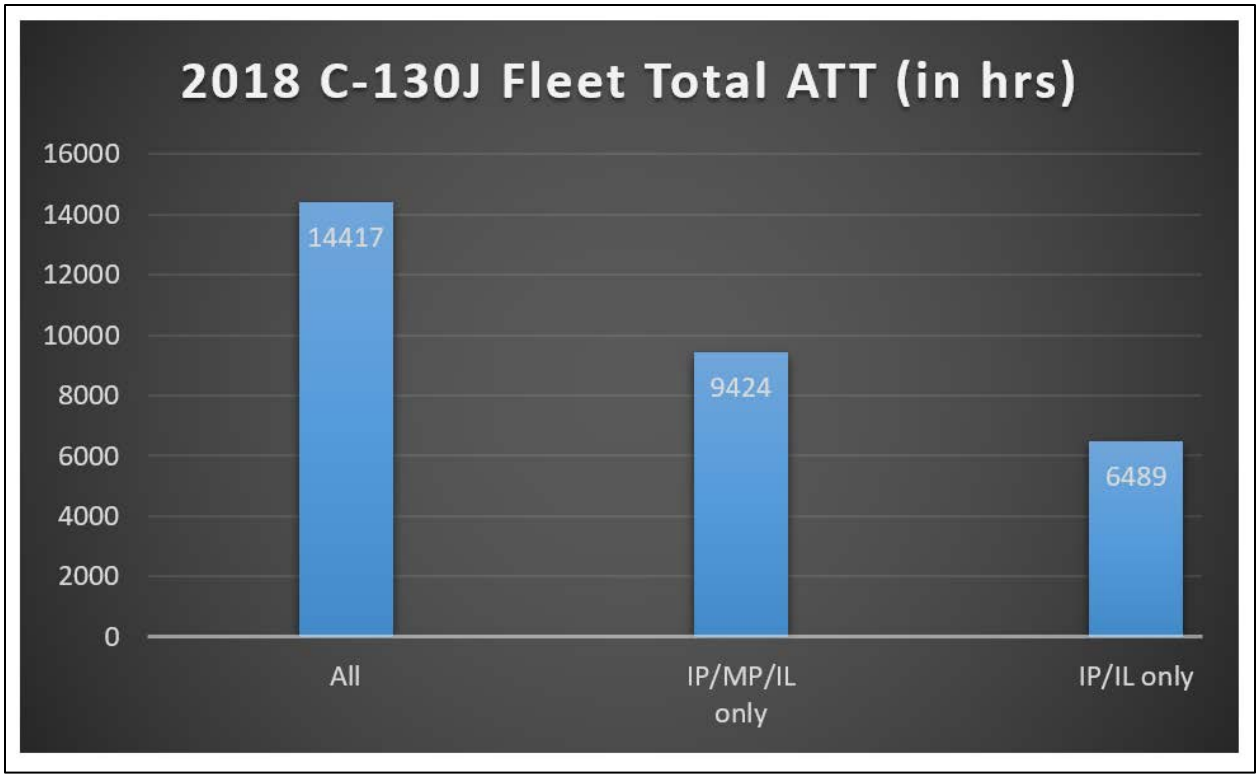


Figure 2. 2018 C-130J Fleet Total ATT

Thematic Analysis

The subjects' answers for questions 1-5 of the interview were grouped into themes. A theme was classified as such if 50% or greater of the subjects responded within that theme. The main themes were grouped into three categories: Beneficial Training, Non-Beneficial Training, and Training that needs more emphasis. Some main themes also included sub-themes. Figure 3 shows the results. Included in each theme is the percentage of subjects who had a response that was grouped into that theme. Since there was only one theme that was captured in the interview with loadmasters, an illustration of the results of the thematic analysis for the loadmasters' answers is not included in this paper.

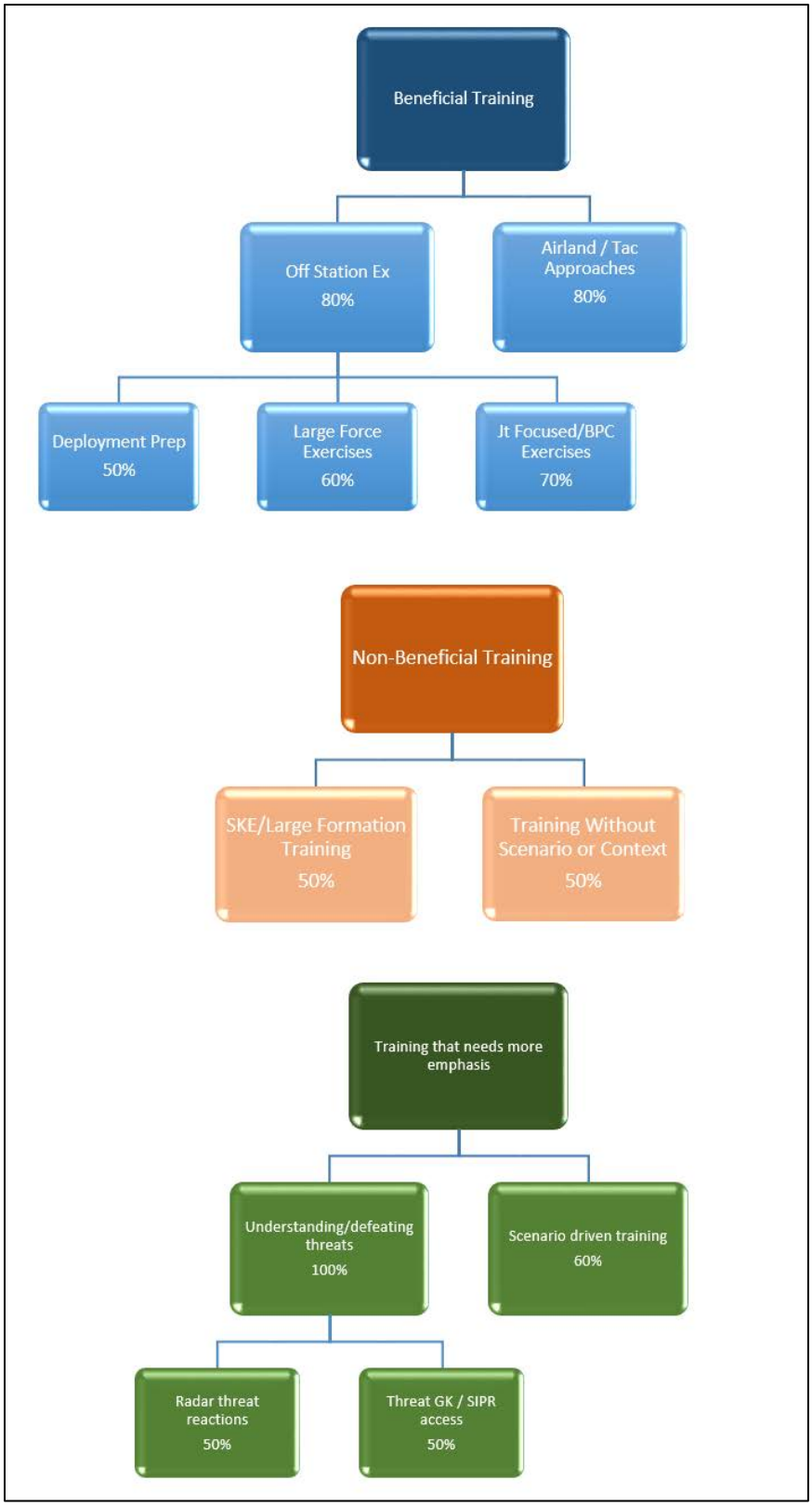


Figure 3. Results of Thematic Analysis – Pilots

Summary

This chapter described the results of both the quantitative analysis and the thematic analysis. Through the quantitative analysis, the research concluded that is it possible to calculate an ATT through the methods in this research. The time for HE airdrops was calculated at 14,417 hours. Through this calculation, an estimate of the amount of time that would have been used if only instructor pilots and instructor loadmasters completed HE airdrop training; this was less than half of the time required to maintain training currency for all C-130J active duty aircrew.

This section also provided the results of the thematic analysis. The next chapter will discuss the real world applications of the results of the data and the implications of the thematic analysis.

V. Discussion/Conclusion

Chapter Overview

This chapter discusses the findings of the research. It starts by describing the step by step framework used to calculate the ATT. It describes the importance of collecting and analyzing this data and how the data should be used. Finally, it discusses the results of the thematic analysis and implications for future research.

Framework

The main objective of this research was to create a framework for use by AMC to analyze ATT per training event. Heavy Equipment airdrop in the C-130 was used as a prototype for this framework. Figure 4 shows the step by step framework used to calculate the ATT.

Steps	Description
1	Gather logged data from previous years to determine Total Events Accomplished (TEA)
2	Determine the Notional Event Factor (NEF)
3	Determine the Total Event Time (TET)
4	Calculate Annual Training Time (ATT)
5	Use the ATT to make decisions on training events

Figure 4. Framework for determining ATT

Step 1: Gather logged data from previous years to determine Total Events Accomplished (TEA)

The first step required to calculate training time is to determine how many events on average are accomplished in the desired population in a year. To do this, AMC/A3T was asked

to provide this data for the research. The database used to collect this data was the Automated AAMS. The database provided the number of HE airdrop (ARMS task ID AD03) events logged by C-130J pilots and loadmasters across AMC, USAFE, PACAF, and AETC. The original intent was to collect five years of data and create a forecasting model to use to predict the next year's logged events. However, only one year's worth of data was available. Therefore, the only data used for analysis was for 2018. The AAMS database managers have decided that from now on, the data will be archived for five years. Once five years of data is collected, a predictive model should be created to predict future training.

Step 2: Determine the NEF

The next step in the process is a step that may or not may be required based on which training event is being analyzed. The NEF should be calculated if the event to be analyzed is ever simulated in the aircraft but not logged. The NEF for HE airdrop was calculated based on observations from 4 weeks' worth of airdrop data. A ratio of total airdrops flown vs. total notional airdrops was used to derive the NEF of 1.39. This factor was then multiplied to the Total Events Accomplished to more accurately reflect how much time was dedicated to HE airdrop training in 2018. More notional events should be observed to collect more data for NEF calculations.

Step 3: Determine the Total Event Time

Determining the total time that should be allotted per training event is the third step in this process. Fifteen interviews between pilots and loadmasters provided the data for this step. As mentioned in Chapter 4, subjects were asked to provide their estimate of time allotted to a

variety of categories for the training event. Their answers for each category were summed together and averaged. The end result was the TET. This method of data collecting would more effectively be accomplished through a large scale survey given to many more SMEs than were interviewed for this research. With more data points, the standard deviation of .54 hours for pilots can be reduced, thereby providing a more significant estimate of the time required to complete HE airdrop. The data for loadmasters did not vary as greatly as it did for pilots, but with such a small number of subject (n=5) this may be attributable to coincidence. Additionally, for future research, researchers may be better off taking time to conduct sample observations of all of the flying training events in the Vol 1. Although this would be time-consuming, this would provide the researcher with truth data rather than SME estimates and could provide more significant results.

Step 4: Calculate the Annual Training Time (ATT)

This is the desired end product. The ATT is a number that should be calculated for every flying training event in the Vol 1. The ATT provides an AMC staffer with an estimate of the average annual training time spent conducting each training event across the C-130J fleet.

Step 5: Use the ATT to make decisions on training events

How the ATT is used depends upon the desired outcome of the staff member. The following describes some applications of the data.

Why the data?

There are many applications for using the ATT. For example, the ATT can be used to compare the time requirement of specific training events. If a decision maker needs to decide to reduce and or eliminate a capability, the ATT will provide the data to determine how much time could be saved by reducing specific capability. For the example of HE airdrop used in this research, a decision maker could easily determine how much training time is saved by reducing HE capability. By maintaining HE airdrop currency only for IPs and ILs, AMC would save nearly eight thousand training hours annually (see Figure 2). This is the time that can be used to train for events that may have a higher priority requirement. This time includes a more comprehensive estimate for currency training than the current flying hour program calculates.

Calculating the ATT can also help AMC analyze the efficiency of its training. It can be used to analyze the number of hours that crew members are training for proficiency vs. currency. The data collected for HE airdrop for step one showed that in some cases, crew members are logging more than double the currency events required by the Vol 1 (see Figure 1). This may be desired for crew members to gain more proficiency than the currency requirements in the Vol 1. This also may be due to inefficient scheduling that requires pilots who have already met the currency requirements to fly additional HE sorties with other crew who have not met the requirements. Regardless of the reason behind logging more than the required currency amounts, the ATT gives a magnitude of the logged overages. From the data collected in 2018, AMC can use the ATT to calculate that across the C-130J active duty fleet, aircrew spent an estimated 7016 hours conducting HE airdrops over the amount required to maintain currency.

Whether or not this is significant is up to the decision maker, but using the steps in this paper to calculate an ATT provides the data to make those decisions with more confidence.

Thematic Analysis

Using thematic analysis data was grouped into categories, themes, and sub-themes as shown in Figure 3. This figure represents the answers from the pilot subjects only. The loadmasters had only one category of answers that met the 50% or higher criteria established for a theme. Every loadmaster interviewed answered that the most beneficial training accomplished in AMC to prepare loadmasters for the current war is oversized or nonstandard cargo loading. All four loadmasters communicated the desire to have more of this type of training. The fact that there were no other themes found may or may not indicate that current loadmaster currency training is adequate to train loadmasters for current and future wars. Future studies should include a more comprehensive questionnaire and include more than four instructor loadmasters to determine whether an adjustment should be made to current loadmaster currency training events.

Several themes were found in the answers from the ten pilots interviewed. The themes were divided into three categories. The categories were as follows: Beneficial Training (aligned with answers to questions 1 and 2), Non-Beneficial Training (aligned with answers to questions 3 and 4), and Training that Needs More Emphasis (aligned with answers to question 5).

Beneficial Training

The answers in the beneficial training categories were gathered from questions 1 and 2. These answers were grouped into two main themes: Airland/Tactical Approaches and Off

Station Exercises. Eighty percent of the subjects indicated that current airland training, to include specific tactical approach types, is beneficial. Most of the responses highlighted the fact that training that is focused on the airland mission, including approaches into airfields and complex ground operations, is necessary to prepare C-130J aircrew for current and future wars. Additionally, 80% of the subjects indicated that off-station training is beneficial. Off-station training includes training that is conducted outside of a unit's local aerodrome.

This main theme was also broken down into three sub-themes: Joint/Building Partnership Capacity Exercises, Large Forces Exercises, and Deployment Preparation Exercises. Seventy percent of the subjects discussed the benefits of training with our joint and international partners. Most of these responses (75%) were cited as beneficial for training for future wars. This indicates that many instructor pilots believe that success for the C-130J community in future wars will rely heavily on the ability to operate with our Jt and international partners. The second sub-theme, Large Forces Exercises, included answers from 60% of our subjects. Answers were grouped into this sub-theme if the subjects discussed the benefits of training in large scale exercises such as Joint Forcible Entry Exercise or any of the Red Flag exercises. These instructors expressed the benefit of training in complex scenarios with several aircraft flying in formation and/or in support of other aircraft. Finally, the third sub-theme under the main theme of Off-station Exercises was Deployment Preparation. Sixty percent of the subjects highlighted the benefit of specific deployment readiness training for the current war's deployments. This included off-station training missions designed to mimic real word deployment environments and operations tempo. This also included Green Flag Little Rock exercises, which tend to focus on airland training and working with users to move cargo around an AOR in an expedient manner.

Non-Beneficial Training

Answers in this category, aligned with answers from questions 3 and 4, were grouped together into two main themes: Station Keeping Equipment/Large Formation training and Training Without Scenario or Context. Both of these main themes were discussed by 50% of the subjects. The former was discussed as non-beneficial training mostly due to the subjects' opinions that the requirements in the Vol 1 for large formation events are not proportioned correctly to the likelihood of those events occurring in a current or future war. The latter highlighted that many instructors feel there is a lack of scenario-based training, and there is an excessive focus on accomplishing Vol 1 currencies.

Training That Needs More Emphasis

Themes in this category, derived mostly from answers to question 5, provide insight into which training areas should be given more dedicated time and/or resources. The two main themes in this category are Understanding/Defeating Enemy Threats and Scenario Driven Training. Understanding or defeating threats was a theme found in the answers of all of the pilot subjects. An answer was categorized into this theme if it included the following sub-themes: Radar Threat Reactions or Threat General Knowledge/Access to SIPR facilities. Both of these subthemes included answers from 50% of the subjects. Answers included in the Radar Threat Reaction theme were grouped as such if the subject mentioned the need for more time dedicated to that event. The second sub-theme in this category included any answer that reflected the need for more understanding of the enemy threat. This included, but was not limited to, time devoted to study classified intelligence on enemy threat systems. Subjects who discussed the need for more access to classified documents had answers grouped into this sub-theme. Answers in both

of these sub themes highlight the perceived need for increased efforts in preparing aircrew for flying against sophisticated enemy systems.

The second main theme in this category, Scenario Driven Training, includes answers that discussed the need for training based on a scenario rather than training focused solely on currency training events. Sixty percent of the subjects communicated the need to increase training that includes realistic wartime scenarios. These subjects described a lack of focus that accompanies most local training sorties. They described the need for more complex, well-developed scenario-based training that could better prepare aircrew for current and future wars.

Thematic Analysis Summary

The thematic analysis used in this paper was helpful to understand the effectiveness of the current C-130J training model. Most notably, the results of the thematic analysis highlighted specific areas where the SMEs collectively agree that more focused training should be designed. Decision makers on AMC staffs and in the flying wings should use the information in the analysis to design the most efficient and effective training possible.

Answers from the pilot subjects highlighted several areas that need more focus. Analysis of the pilots' answers showed the opinion that training should be focused less on completing required currencies, and more on building general knowledge of wartime requirements for our pilot crew force. Every pilot interviewed commented on the need for a better understanding of enemy threat systems and the tools and techniques we have to operate in a contested environment. Using the analysis one can conclude that this is the lack of this general knowledge is one of the training areas that needs the most improvement.

Similarly, since all of the loadmasters interviewed communicated that oversized cargo loading should be emphasized, training should be focused as much as possible on this type of cargo loading. Units should find any available opportunities to train with joint and international partners and work with unique cargo. Any and all attempts should be made to train loadmasters to understand the challenges that accompany these unique cargo loads. This will better prepare our loadmaster workforce to successfully meet wartime demand for current or future wars.

The main themes gathered through the thematic analysis provide the requirements for training reform through the perspective of C-130J SMEs. This information should be used at several levels throughout AMC to guide training programs. Staffers can use this information, as well as their knowledge on C-130J requirements, to guide their organize, train, and equip decisions. Wing and group commanders can make better decisions about how to allocate their training resources. Squadron commanders and directors of operations can make more informed decisions about how to utilize their training resources. Conducting a thematic analysis using information from instructor pilots and loadmasters is an effective way to capture the training reform needs from the ground up. It is not in itself a comprehensive way to determine current training effectiveness, but instead is another tool to use for more informed decision making.

Investigative Questions Answered

1. What value is added to training in the C-130J active duty community by reducing or eliminating the core capability of HE airdrop?

Through the calculation of ATT for the year 2018 an observation was made that an estimated 14, 417 hours was required to complete HE airdrop training fleet wide. If a decision was made to eliminate HE training, the C-130J active duty community would gain 14, 417 hours

to allocate to a different training event. If the HE airdrop training was reduced to IP and IL training only, the amount of time required to complete the training in 2018 would have been 6,489 hours. That would have produced a net gain of 7,928 hours for aircrew to allocate to a different training event.

2. Does the current C-130J training model match the current war and future war operational requirements?

The results of the thematic analysis show that most SMEs interviewed agree that although the current training model adequately prepares C-130J aircrew for the current war (80% agree that off station exercises and airland training are beneficial to training for the current war), more emphasis needs to be placed on preparing us for future war with a near peer adversary. One hundred percent of the pilots interviewed agreed that understanding and preparing to defeat sophisticated enemy threat systems need more training focus.

Recommendations for Future Research

Because the purpose of this research was to create a framework for further research, the most obvious suggestion for future research is to use the framework to calculate the ATT for each currency training event in the Vol 1. The most effective way to utilize the framework is to compare the ATT of each training event to the overall time required by all training events to assign a percent value to each event. For example, the research in this paper showed that HE airdrops required 14,417 hours to accomplish in 2018. If the total calculated ATT of all events in the Vol 1 were 100,000,000 hours, then HE airdrops would account for 1.4% of training time in 2018. This data point could then be used as a comparative decision-making tool. Either a

survey or observations should be conducted across the C-130J active-duty force to collect an estimate of total event time (TET) per event as described in this paper.

Additionally, future research should be focused on the following areas:

1) Utilize the model created by Major Joseph Beal (Beal, 2015) to prioritize currency training events. This information, along with the ATT framework created in this paper, should be compared to current Vol 1 requirements and training model to assess the effectiveness of the current model.
2) Continue to study to assess the impact of reducing and/or eliminating HE airdrop. This research should include the monetary impact as well as the training time impact to all organizations involved with the training (operations, maintenance, intelligence, aerial delivery, etc.). An emphasis should be placed on assessing the current requirement for HE airdrop.
3) Evaluate the benefits of the Ready Aircrew Program (RAP) model used in ACC and address the implications of utilizing this training model in AMC.

Conclusion

As the United States Air Force continues to face retention and resource challenges, its members must accomplish its tasks in a more efficient manner. Highlighted in the 2018 National Defense Strategy is the requirement for the Department of Defense to "prioritize preparedness for war." (Mattis, 2018, p. 6) The document specifies the desire to shift war preparations focus towards preparing for combat with near-peer adversaries. Without additional resources or time, our Air Force has to find ways to accomplish this.

The framework designed in this paper provides one tool for decision makers to make more informed decisions about how to refocus training efforts. The qualitative data analysis provides the function by which AMC staff members can calculate the time dedicated for each training event. Using this data, planners will have a greater understanding of how much time is required to complete each event. This time is a more comprehensive calculation than what is found in the AMC flying hour program. Once planners understand how much time is required to complete each event, decisions about which events to focus training on will be more informed. The thematic analysis in this research provides subject matter expert insight into which areas training should be focused.

Collectively, the quantitative data and qualitative data collected in this research provide an example of what data should be collected to support more effective decision making. This framework should be further refined to include cost-effective ways to collect the data. The framework fills a gap in the capability of AMC to understand its true training time cost for conducting currency training.

Appendix A – Interview Questions

Current State of C-130J Training Interview

All of the questions below refer to C-130J active duty unit flying training. Answers should include specific events (i.e. tactical approaches, airdrop types, threat reactions, etc).

1. What is the most beneficial training we currently accomplish to prepare us for the current war? Why?

2. What is the most beneficial training we currently accomplish to prepare us for conflict in 5-10 years? Why?

3. What is the least beneficial training we currently accomplish to prepare us for the current war? Why?

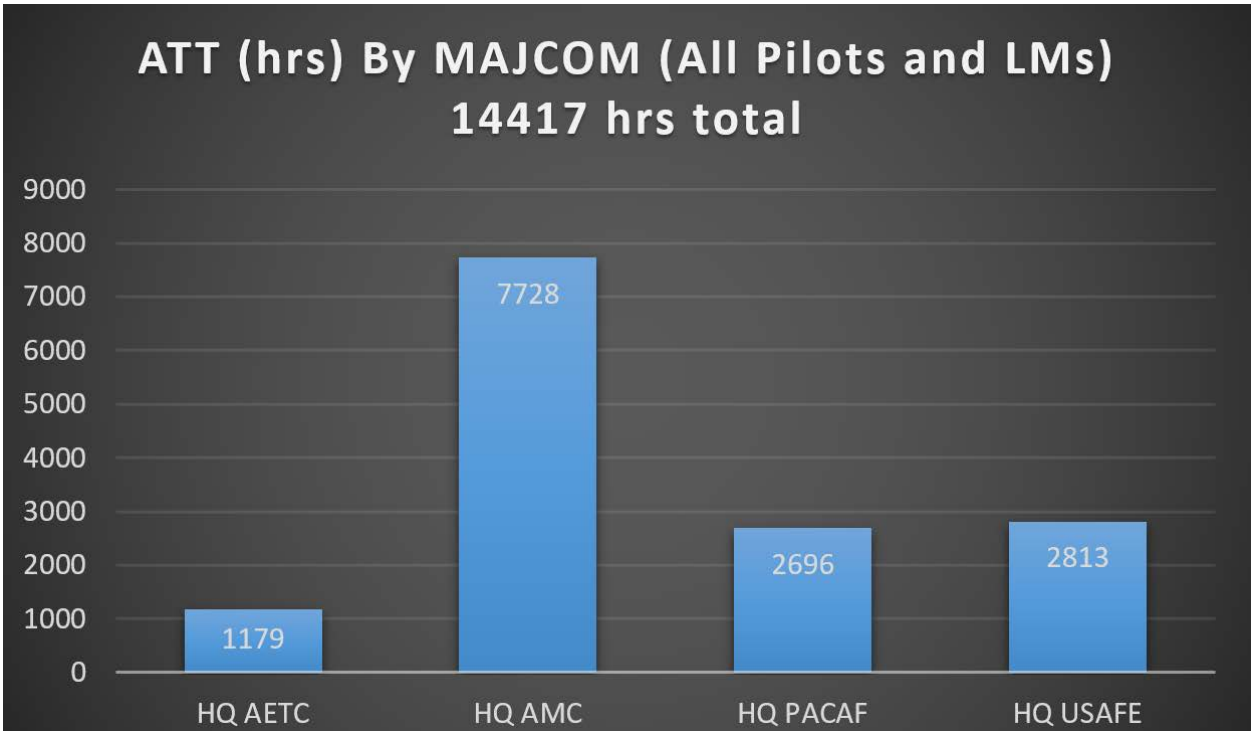
4. What is the least beneficial training we currently accomplish to prepare us for conflict in 5-10 years? Why?

5. Assume that time constraints are not a problem. What are the top three flying training events and/or ground training you would add to our current training to prepare us for conflict in the next 5-10 years (if you don't think we need to add anything, where would you focus increased training efforts)? Why?

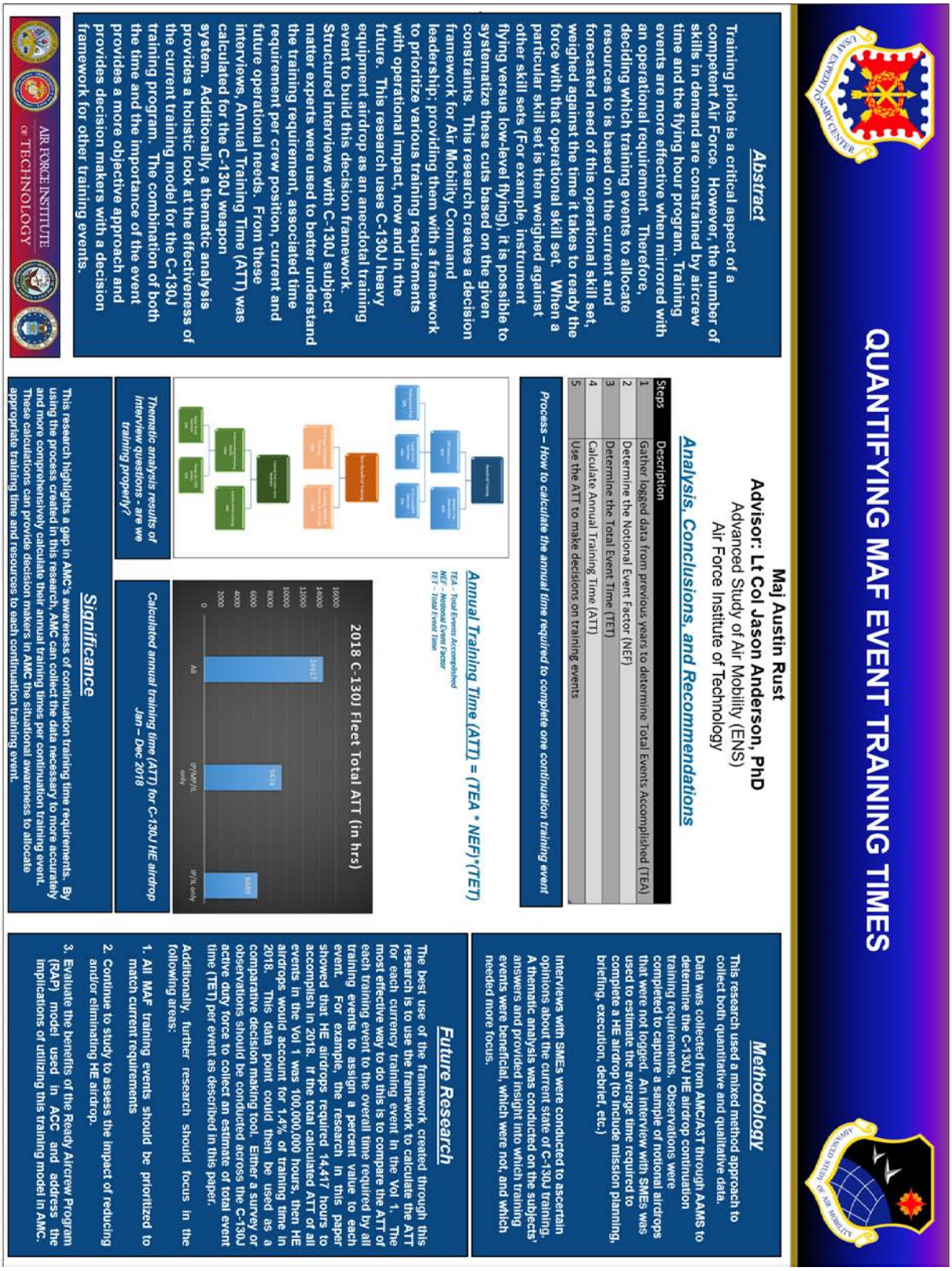
6. How much time in each category do you think Pilots spend for a HE event
    a. x hr mission pln
    b. xx mins brief
    c. xx mins box build (rigging and loading for loadmasters)
    d. xx mins
    e. xx mins

Any other time you would account for?

Appendix B – 2018 MAJCOM ATT – C-130J HE Airdrop



Appendix C – Quad Chart



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14. ABSTRACT

Training pilots is a critical aspect of a competent Air Force. However, the number of skills in demand are constrained by aircrew time and the flying hour program. Deciding which training events to allocate resources to is based on the current and forecasted need of this operational skill set, weighed against the time it takes to ready the force with that operational skill set. When a particular skill set is then weighed against other skill sets it is possible to systematize these cuts based on the given constraints. This research creates a decision framework for Air Mobility Command leadership; providing them with a framework to prioritize various training requirements with operational impact, now and in the future. This research uses C-130J heavy equipment airdrop as an anecdotal training event to build this decision framework. Structured interviews with C-130J subject matter experts were used to better understand the training requirement, associated time requirement per crew position, current and future operational needs. From these interviews, Annual Training Time (ATT) was calculated for the C-130J weapon system. Additionally, a thematic analysis provides a holistic look at the effectiveness of the current training model for the C-130J training program.

15. SUBJECT TERMS

Airdrop, Training, MAF Training, Training Time, C-130J, Heavy Equipment

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