AUSTERE AIRFIELD LOGISTICS: LESSONS LEARNED FROM OPERATION INHERENT RESOLVE

Graduate Research Paper

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Abstract

This paper examines the joint logistics practices conducted at two recent airfield openings in support of Operation INHERENT RESOLVE (OIR). The researcher assesses real-world semi-permissive airfield openings against recently updated joint doctrine in order to determine whether the doctrine is adequate for current contingency environments. In addition, the researcher looks to identify best practices that emerged from the airfield openings in order to capture and replicate the practices for future operations. The purpose of this research is to analyze logistics practices during the first thirty days of the airfield opening operations, with the goal of improving joint logistics processes for future airfield openings in semi-permissive and non-permissive environments. The end state is to assess current joint doctrine, identify lessons learned and best practices, ands impart those findings to the logistics community for future joint airfield openings in support of combat operations.

For the Logisticians in the Current Fight and Those Preparing for the Next One.

Acknowledgments

I would like to thank Major Tim Breitbach, Ph.D. for the advice and guidance he provided throughout this process. A special thanks goes out to Colonel Kevin Nalette, who readily agreed to sponsor my project and has been a constant mentor and inspiration throughout my career. His insight and candor keep me grounded and focused on leaving things better than I found them. I would also like to thank Mrs. Pamela Bennett-Bardot for her research support. She is truly the best librarian I've ever met. Finally, thank you to my friends and family, who supported me through this year and provided the encouragement I needed to put my ideas and experiences on paper.

Jessica H. Stewart

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I. Introduction

"It's after dark, and you've just arrived at an austere location. You and your team exit the plane and are surrounded by pastures and barren hills barely visible in the moonlight. There are small towns scattered across the hillsides, with no barriers between your team and the buildings. You can see lights emitting from various dwellings, but have no idea who is observing your movements. You know the local population is aware that your aircraft landed, given the sound and lack of foliage to mask your arrival. You move your belongings up a hill from the dusty airfield to the cluster of tents in the distance, and deposit them in whatever open space you find.

In the following days, you notice several things. There is no physical perimeter around your camp, just four security forces trucks staged at each end of the camp, protecting the personnel and baggage pallets inside the tent area. The outer security of the airfield and surrounding area is provided by a local military force that has free access to your camp, moving in and out at their discretion. Your airfield equipment and vehicles sit near the airstrip, unguarded. It's in the 30s and 40s Fahrenheit after dark, and security forces members standing guard don't have adequate cold weather gear. The generators heating the tents cut out at night and require several manual restarts. Communications equipment, from computers to radios, struggle to operate and take days to troubleshoot. You and your team have little idea what friendly units are in your area, or how to contact them in case your camp comes under attack, which is a real threat given the proximity to the war's front lines."

- Observer at Airfield Opening

General Issue

After United States military forces withdrew from Iraq on 31 December 2011, a new terrorist group emerged and expanded across large swaths of Syria and Iraq. The group, known as Daesh, the Islamic State in Iraq and the Levant, the Islamic State of Iraq and Syria (ISIS), or simply the Islamic State, spent the next two and a half years consolidating power and extending its control in both countries (CJTF-OIR History, para 1). By mid-2014, ISIS (the paper will refer to the group under this name), controlled vast quantities of ungoverned space, threatening the Iraqi government and creating a humanitarian crisis in Syria (CJTF-OIR History, para 1). US military forces were recalled to Iraq (and later extended into Syria) in order to halt ISIS gains, reestablish Iraq's governmental control, and mitigate the humanitarian crisis underway in both countries (CJTF-OIR History, para 2).

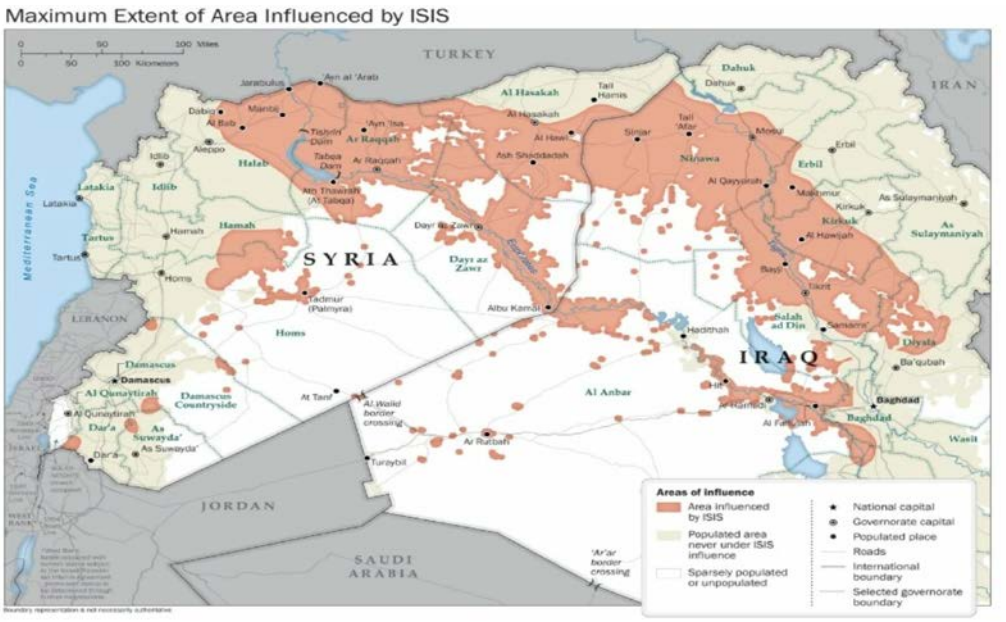

Figure 1. Maximum Extent of ISIS Area of Influence 2014/US State Department

Combined Joint Task Force Operation INHERENT RESOLVE (CJTF-OIR) was established in June 2014, with air combat operations targeting ISIS commencing soon after (CJTF-OIR History, para 2). By 2015, ground combat operations commenced in Iraq, and by 2016, US forces were advising and assisting partner forces in Syria (CJTF-OIR History para 6). In early 2016, Operation INHERENT RESOLVE (OIR) was in full swing in both countries, with partner forces making significant gains, supported by US military advisors across the entire area of responsibility (AOR). However, the success of operations created a greater need for faster, more robust logistics support. The demands for more personnel, equipment, and supplies began to outpace and exceed established logistics lines of communication, threatening to stymie operational momentum against ISIS. In an effort to maintain the pace, commanders and logisticians established two

airfields near the front lines, enabling the required flow of resources on the desired timeline to meet battlefield demands.

The subject of this paper focuses on joint logistics practices conducted at these two airfields during the initial phase of operations. This paper will focus on four of the seven core logistics functions identified in Joint Publication 4-0 (JP 4-0): deployment and distribution; supply; logistics services; and maintenance (JP 4-0, 2019: pg II-2). The goal is to assess the four core logistics functions at both airfields and identify which were executed in line with joint doctrine and which were not. In addition, this research aims to identify best practices observed during the airfield openings, and share those with future joint commanders and logisticians.

The literature review for this paper consists of previous case studies and updated joint doctrine, while the methodology reviewed after action reports (AARs) from the field, questionnaires, and interviews conducted with members involved in the OIR airfield openings in 2016. The goal is to analyze the airfield openings, previous case studies, and doctrine to identify patterns in logistics practices; assess these practices against current doctrine; and share best practices with the joint logistics community. This analysis will enable the logistics community to verify whether current practices are optimum for operational success, or identify areas for improvement.

Background

Operation ENDURING FREEDOM (OEF) and Operation IRAQI FREEDOM (OIF) saw over twenty-five airfield openings in semi-permissive and non-permissive environments in the first three years of contingency operations (Long, 2006: pg 35). For

the next decade, scholars and planners combed over AARs and documents, identifying, capturing, and codifying best practices and lessons learned in joint publications, instructions, and academic forums. Between 2006 and 2015, several humanitarian airfields were opened in response to natural disasters, but these did not operate under combat conditions. Then, in 2016, two airfields were opened in the OIR theater of operations, marking the first contingency airfields established since OEF and OIF ten years earlier. These airfields are the first opened since the new publications and doctrine were released, providing two real-world case studies from which to review and revalidate current joint doctrine.

Background of OIR Logistics Challenges

In the early stages of OIR, partner forces rapidly regained territory previously lost to ISIS, stretching the logistical lines of communication designated to resupply them. This is not a new problem, as historically, logistics lines have struggled to keep pace with fighting units advancing briskly into combat. Logistics lines of communication take all forms including air, land, and sea, requiring logisticians to be closely connected to commanders and planners during mission planning and execution. In Iraq and Syria, several issues created the necessity to devise multiple modes of sustainment that were both reliable and responsive. First, partner forces advancing toward ISIS controlled areas often outpaced ground lines of communication. Second, the occasional presence of ISIS resistance near US logistics networks caused ground lines of communication to be rerouted or at times delayed. Third, in a few instances, political uncertainties made

ground lines of communication timelines unreliable as shipments could be held up for days or weeks until disputes were resolved.

Due to these concerns, establishing airfields to support US and partner forces near the front lines of both offensives became an operational priority. Airfield openings conducted in support of combat operations are often dangerous, but critical to the success of the larger objectives, as air lines of communication allow a rapid increase in personnel, weapons, supplies, and sustainment critical to the fight. In OIR, airfields increased both the reliability and throughput of logistics support to two offensives simultaneously. What makes these two airfields excellent case study examples are the timeframe in which the airfields were opened, and the unique differences between them. Both Landing Zone 1 (LZ1) and Landing Zone 2 (LZ2) were opened within a month of each other and both were in semi-permissive environments. LZ1 was opened on an abandoned and heavily damaged airfield. LZ2 on the other hand, was created from the ground up utilizing a gravel airstrip and contingency-style infrastructure set up only days before.

The opening of a contingency location requires logistics support from the first day (and before) through mission closure at the location. This logistics support includes the movement of cargo and personnel to and from the location, and procurement of sustainment resources while at the location, at times from the local area itself. The four core logistics functions were present at both locations. Units deployed and redeployed both personnel and equipment, which at times, took different logistical modes of transportation. Once at the locations, units had to supply themselves, and were expected to request resupply as operations progressed. Each location required extensive logistics services; including fuel, food, water, and sanitary support for a growing population and

mission set. Lastly, each location required internal transportation, and with transportation came a consistent demand for vehicle maintenance support.

LZ1 and LZ2 – So Similar, but So Different

The most striking detail about the two airfields is how similar, yet different they were. As stated previously, both airfields were opened within thirty days of each other. Both areas had been secured by partner forces, and both were in close proximity to the active front line of military operations. Yet the way US forces approached the build (or rebuild), how and what they prioritized, and what materials and resources they used, are vastly different. This striking "similar yet different" feature makes these examples a perfect compare- and-contrast opportunity.

LZ1 was a previously established airbase, with a perimeter, hardened facilities, functioning runway and built up infrastructure. ISIS overran the base during their expansion and systematically destroyed the infrastructure as they were pushed back in 2016 (The Engineer, 2017: pg 20). By the time US and partner forces arrived at LZ1, it was unusable as a launching platform for aircraft, and required extensive work to make it usable. According to the Engineer Bulletin, "ISIL had leveled hundreds of buildings, toppled thousands of T-walls, removed miles of underground electrical infrastructure, and ruined more than 9,000 meters of runways by digging 2-meter-wide ditches across them (The Engineer, 2017: pg 20)." Therefore, while infrastructure existed at the site, it would take dedicated time and manpower to repair it before the airfield could be employed.

Conversely, LZ2 was built by US forces from the ground up. By 2016, partner forces had pushed ISIS back from the location and reestablished the front lines several

miles away. During 2016, the landing strip was constructed, gravel laid, and the first aircraft began landing on the improvised runway. In November 2016, a small tent city was erected after it was determined a military force would occupy the area around the runway. Supplies and personnel were quickly funneled in at an increasing rate.

Within days of establishing (or reestablishing) both airfields, delivery of war materials (munitions, equipment, vehicles) to support combat operations commenced. A consistent challenge experienced by logisticians at both the airfields and ports of embarkation entailed balancing between delivering combat operations support and airfield support equipment and unit equipment. The rate of development for each airfield slowed as combat equipment and supplies were rushed into the newly opened air lines of communication. Airfield development stymied as a consequence of this prioritization however. Competing cargo priorities for limited air assets would continue as operations at the airfields and frontlines expanded.

It should be noted that opening an airfield is not always synonymous with opening a base. A base or airfield can be a stand-alone location; therefore, these concepts are not always interchangeable. In the case of LZ1 and LZ2, the objective of opening the base was to provide an airfield that could be used to support combat operations. Therefore, the logistics of opening both an airfield and base became synonymous. Logistics for opening the airfield and supporting base development were closely intertwined, and oftentimes relied upon the same logistics networks, assets, and manpower to execute both simultaneously.

Research Motivation and Problem Statement

This research is designed to validate doctrine and identify processes that can be applied to real-world contingency operations. Using the two semi-permissive airfield openings in 2016, and recently updated joint publications, this study will identify whether both airfield openings were consistent with current joint logistics doctrine, or if best practices can be added to improve current doctrine. It is specifically tailored to the logistics professional, civilian or service member, dedicated to the task of providing military logistics in contingency environments. It is for the warfighter, the commander, and the logistician that must equip and deliver his or her units into combat to achieve effective results. This research attempts to capture logistics practices conducted at two airfields in order to improve joint logistics processes for future airfield openings in semi-permissive and non-permissive environments. It is imperative that these lessons and best practices are documented and shared with current and future warfighters, as the benefits garnered from this study will enable today's execution and tomorrow's preparation.

Research Questions

- Did the two OIR airfield openings conducted in 2016 follow joint logistics doctrine? If not, why? If they did, did the joint doctrine lead to effective outcomes?
- What were the "best practices" noted from the OIR case study examples and how can we draw from them to ensure better airfield openings in the future?

Methodology

This paper is qualitative in nature. Document studies and case studies represent the largest portion of research, with interviews and questionnaires augmenting the primary collection method. Key organizations for research include (but are not limited to) Combined Joint Task Force Operation Inherent Resolve, Air Mobility Command, Air Force Central Command, two Contingency Response Groups, the AOR Theater Sustainment Command, a Brigade Engineer Battalion and members of the Special Operations Forces involved in the operation.

Chapter Overview

This paper consists of a literature review including previous case studies and joint publications review, a methodology section including AARs, interviews, and questionnaires, a data analysis section, and conclusion and recommendations section. The study will assess recent airfield openings from 2016 against joint logistics doctrine and past case studies, and seek to identify gaps in doctrine and highlight best practices learned during the events. If gaps are identified, recommendations for updates or future research will be included in the paper.

II. Literature Review

Chapter Overview

This research topic originated from observing "logistics practices" developed and executed during one of OIR's initial airfield openings. There were concerns at the time that units didn't have the equipment or gear to perform their operations in the most effective manner, creating operational challenges for the units on the ground (SOF, observation). Reading AARs from both operations solidified this observation, and interestingly, showed similar results. The similarities between airfield openings prompted a search for previous case study research in which airfields were opened for contingency operations. Several such case studies exist, looking as far back as World War II, providing ample lessons to be learned from military operations spanning 75 years. Arguably, much of this research and many of the methods used would be outdated as technology and tactics change. Fortunately, there are several examples of airfield openings thanks to OIF and OEF. The research done post-OIF and OEF initial phases in 2006, led to changes in joint doctrine, and provided a platform for new tactics and process development.

Terminology

Before delving into the case studies and doctrine specific to airfield openings, it is valuable to define some of the important terms used throughout the paper. "Permissive environment" is defined as an "operational environment in which host nation military and law enforcement agencies have control, as well as the intent and capability to assist operations that a unit intends to conduct (DoD Dictionary, 2019; pg 170)." While "semi-

permissive" is not identified specifically in the Department of Defense Military and Associated Terms Dictionary, it is generally assumed to be an operating environment in which the host nation (or allies) have "partial" control of the area where US forces are present. Similarly, a "non-permissive" environment can be considered one that is not controlled by the host nation (or allies) making it a higher risk area in which to operate. Logistics, is another term that requires a common understanding. According to Joint Publication 3-0 (JP 3-0), logistics is "planning and executing the movement and support of forces" (JP 3-0, 2018: pg III-47). The term "logistics" is nested within the term "sustainment", which is defined as "the provision of logistics and personnel services to maintain operations through mission accomplishment and redeployment of the force" (JP 3-0, 2018: pg III-47). All three definitions from JP 3-0 are valuable, and provide insight into how operational commanders view logistics and its effects within the context of mission accomplishment.

Joint Doctrine

Joint Publication 4-0 (JP 4-0), Joint Logistics, dated 4 February 2019, contains the primary joint logistics doctrine (JP 4-0, 2019). JP 4-0 identifies seven core logistics functions: deployment and distribution, supply, maintenance, logistics services, operational contract support, engineering, and health services (JP 4-0, 2019: pg II-2). To limit the scope of research, this paper focuses on only four of the seven areas (deployment and distribution, supply, logistics services, maintenance) (JP 4-0, 2019: pg II-2). Deployment and distribution is defined as "the movement and sustainment of forces" (JP 4-0, 2019: pg II-2). Supply is considered the "management of supplies and

equipment, inventories, and global supplier networks" (JP 4-0, 2019: pg II-2). Logistics Services is categorized as "food, water, ice, base, contingency base and installation support, and hygiene services" (JP 4-0, 2019: pg II-2). Lastly, the term maintenance covers "depot or field maintenance operations" (JP 4-0, 2019: pg II-2).

Per JP 4-0, USTRANSCOM is responsible for "coordinating the capability to transport units, equipment, and initial sustainment from the point of origin to the point of need…" (JP 4-0, 2019: pg II-2). In the context of this paper, deployment and distribution would include the movement of forces into the two locations, the movement of their equipment and sustainment, and the modes chosen for transport. The timing and efficiency of deploying forces and their equipment into theater are vital to the successful execution of operations.

JP 4-0 references supply as a core function, and within it, the supply chain process (JP 4-0, 2019: pg II-2). The supply chain is described as "a global network that provides materiel, services, and equipment to the joint force" (JP 4-0, 2019: pg II-3). The publication notes that "joint logisticians must integrate all three areas of the DOD supply chain: managing supplies and equipment, managing inventory, and managing global supplier networks to provide responsive supply operations" (JP 4-0, 2019: pg II-4). At the Joint Publication level, supply is described as a strategic process, and it most certainly is. However, the principles of supply are also implemented at the operational and tactical level, as logisticians must execute the issuing, inventorying, and resupplying of supplies and equipment to units at the 'end' of the supply chain. Without properly issuing, inventorying, and resupply operations, units cannot and will not succeed in long-term operations.

Logistics Services is a robust category that covers seven functions, including food, water, contingency basing, real property life cycle management, support services, hygiene services, and mortuary affairs (JP 4-0, 2019: pg II-9). Real property life cycle management and mortuary affairs will not be included in this research, as these services were not readily available during the initial openings at both airfields. Contingency base services include "shelter, billeting, utilities, common user life support management, force protection, and facility management", which often falls under the Base Operating Support Integrator (BOS-I) duties and responsibilities (JP 4-0, 2019: pg II-9). Logistics services is the life blood of a contingency location, and is critical to every unit's survival and mission success.

Maintenance refers to both depot and field maintenance, but for the purposes of this paper, the focus will remain on field maintenance specific to vehicle operations (JP 4-0, 2019: pg II-2). The goal of field maintenance is to "return systems rapidly to users in a ready status" (JP 4-0, 2019: pg II-7). Words like "day-to-day operations", "less complex" and "serves as the link between strategic capabilities and tactical requirements" define field maintenance for a joint logistician (JP 4-0, 2019: pg II-7). Per JP 4-0, the following maintenance functions should be performed in a field environment: inspections, testing, servicing, repair, rebuilding, and calibrating (JP 4-0, 2019: pg II-7). Efficient maintenance of a vehicle fleet in a contingency environment is critical to the success of operations, both inside and outside the perimeter.

The Joint Publication 4-0 series details overarching definitions and categories of logistics support, and identifies those members responsible for logistics support to contingency forces. In this study, Joint Publications are typically used and referenced as

an “umbrella” for tactical level logistics. Each individual role, responsibility, or process identified in this research should relate to one of the core logistics functions listed in JP 4-0.

JP 4-0 specifically addresses the terms Base Operating Support (BOS) and BOS-I. BOS is defined as “directly assisting, maintaining, supplying, and distributing support of forces at the operating location, whereas the BOS-I is “the designated Service component or joint task force commander assigned to synchronize all sustainment functions for a contingency base” (JP 4-0, 2019: GL-6). The BOS-I is “responsible for planning and synchronizing the efficient application of resources and contracting to facilitate unit of effort in the coordination of sustainment functions at designated contingency locations” (JP 4-0, 2019: pg III-8).

Concerns over the lack of joint doctrine for airbase openings during the initial days of OIF and OEF led to the development of a multi-service publication by the Air Land Sea Application Center (ALSA). A “light” version of this publication was created in 2007, and was refined as a growing pool of OIF and OEF data was obtained. In 2015, ALSA produced the “Airfield Opening: Multi-Service Tactics, Techniques and Procedures for Airfield Opening” making it the first comprehensive user-friendly document to attempt a common operating picture between all four services on the subject of joint airfield opening (MSTTP, 2015). The publication included the “Initial Impressions Report (IIR) 05-31 Lessons Learned” compiled by a joint team in 2005, highlighting the lessons that drove the publication’s development (MSTTP, 2015: pgs 99-105).

The "Airfield Opening: Multi-Service Tactics, Techniques and Procedures for Airfield Opening" lessons learned section, primarily honed in on navigating challenges between BOS-Is and SAAs (MSTTP, 2015: pgs 99-105). The team identified the need to "define authorities in joint doctrine to enable the SAA and BOS-I to do their jobs" (MSTTP, 2015: pg 100). The document continues, "the IIR 05-31 lessons learned team found several instances where the SAA and BOS-I leadership had different priorities for the airfield. Because the BOS-I controls the budget for joint airfields, a disagreement on airfield priorities can cause further problems" (MSTTP, 2015: pg 5). This included recommending both members be of "commensurate rank", coordinating efforts with "higher headquarters" for long-term planning and "coordinating priorities" when limited resources were present at a location (MSTTP, 2015: pgs 100-102). In OEF, the joint team reiterated the importance of the SAA and BOS-I coordinating efforts for long-term location planning and development (MSTTP, 2015: pg 105).

As this paper was being written, an updated version of ALSA's "Airfield Opening: Multi-Service Tactics, Techniques, and Procedures for Airfield Opening" was released in October 2018. Interestingly, the new document removes the "Initial Impressions Report (IIR) 05-31 Lessons Learned" section, but expands sections on planning, assessments and surveys, the opening and transition phases, the various services airfield opening capabilities, and provides more detailed checklists (MSTTP, 2018). There is no dedicated logistics section, and much of the logistics information is scattered under various chapters (MSTTP, 2018). What is most valuable to the tactical logistician is the Airfield Assessment Checklist, specifically the Transportation and Logistics Assessment and Base Support Assessment checklists, where one can find a list

of logistics requirements and capabilities expected at an airfield (MSTTP, 2018: pgs 53-56). In addition, the Initial Handoff and Airbase Support checklists note a few logistical considerations ("coordinate bed-down", "establish passenger processing procedures", "manage fuels, petroleum, oil, and lubricants" *etc*.) embedded in a broader list of airbase transition steps (MSTTP, 2018: pgs 61-69).

The 2018 revision defines a bare-base airfield as "a site with a usable runway…and a source of potable water. It must be capable of supporting assigned aircraft and providing other mission-essential resources, such as a logistical support and services and an infrastructure composed of people, facilities, equipment and supplies" (MSTTP, 2018: pg 117). The document also highlights the rapid mobility and maneuverability of facilities, supplies, and equipment at a bare-base airfield, should the operational climate dictate a rapid departure or redeployment of the airbase elsewhere (MSTTP, 2018: pg 117). This is a departure from the "bigger is better" airfield concept in previous conflicts.

At both airfields, the SAA and BOS-I shared responsibility for logistics operations. The ALSA notes that "the most critical components of a successful airfield opening are the senior airfield authority (SAA) and the base operating support-integrator (BOS-I) and their interactions" (MSTTP, 2018: pg 3). It continues, "it is important that a command relationship is determined among SAA, BOS-I, and tenant units using the airfield to streamline funding and logistics support channels and ensure the airfield operating surfaces are deconflicted from the life-support area" (MSTTP, 2018: pg 3). In contingency operations, this command relationship can often become complex and convoluted if not properly navigated by the individuals filling these roles. In addition to

JP 4-0 and the ALSA, two more Joint Publications were released in 2018 and 2019. The first is JP 3-18, Joint Forcible Entry Operations, validated on 27 June 2018 (JP 3-18; 2018). Chapter V (3 pages) is dedicated to the logistics of joint forceable entry operations (JP 3-18, 2018: pg V1-V3). This publication provides the most tactical discussion of airfield opening logistics of the available resources. It states, "As applied to military operations and forcible entry operations specifically, logistic services comprise the support capabilities that collectively enable the US to rapidly provide sustainment for military forces…Logistic planning must account for early resupply of initial assault forces as these forces will generally be employed with limited on-hand capacities" (JP 3-18, 2018: pg V-1). The recommended list of logistics planning factors are listed in the diagram below:

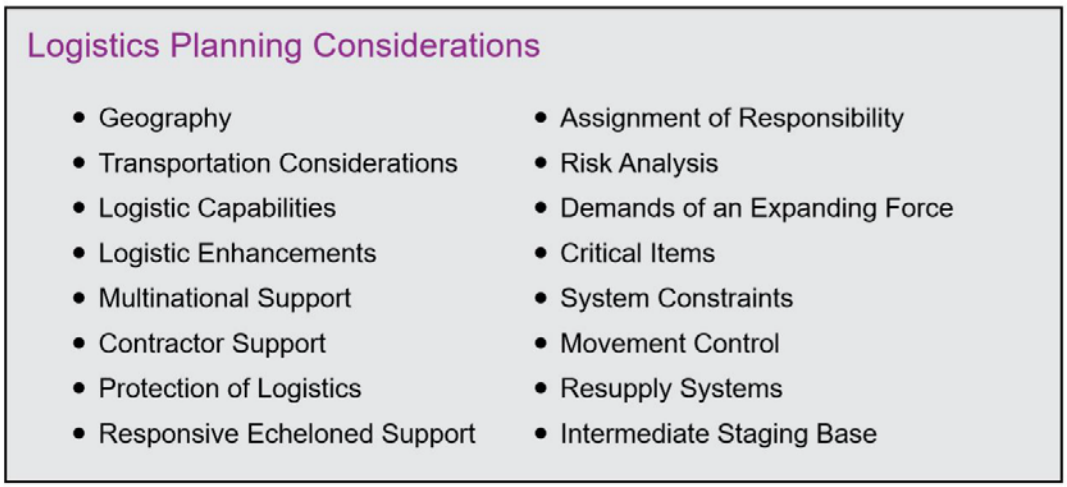

Figure 2. Logistics Planning Considerations (JP 3-18, 2018: V-1)

In JP 3-18, there are five identified phases of joint force entry. The phases relevant to the initial airfield opening include Preparation and Deployment (phase I), Assault (phase II), and Stabilization of the Lodgment (phase III) (JP 3-18, 2018: pg IV-

2). In the Preparation and Deployment phase, logisticians are to identify logistics requirement sequencing, transportation prioritization, lines of communication requirements, resupply responsibility, health services, and limitations and vulnerabilities at ports and terminals (JP 3-18, 2018: pg V-2). In the Assault phase, logisticians must focus on ensuring infrastructure at the desired location can sustain planned operations and provide medical and evacuation support to combat forces (JP 3-18, 2018: pg V-2). In the Stabilization of the Lodgment phase, logisticians resolve issues with personnel and cargo flow, attempt to expand throughput capability at the ports and terminals, plan for follow-on forces and expansion of infrastructure as required (JP 3-18, 2018: pgs V-2 and V-3).

This publication is important to understanding the logistics demands at each phase of operations while supporting a developing or newly established location. While terminology between publications vary, opening an airfield requires logisticians to consider the vulnerability of the location, the needs of the initial forces arriving at the location, and find ways to expand and maximize logistics support and distribution once forces are on the ground. In addition, once a location is chosen, understanding the logistics planning considerations (listed in Figure 2) is paramount. Logisticians planning and executing operations similar to the LZ1 and LZ2 buildouts would benefit from this publication.

The second is JP 4-04, Contingency Basing, which was published on 4 January 2019. This publication identifies the different types of contingency locations (CL), and the expected infrastructure and support to be established at the location. JP 4-04 describes “an initial CL is designed and constructed on an expedient basis using organic Service capabilities and is characterized by austere facilities…common facility types

include tents, containers, and fabric shelters" (JP 4-04, 2019: pg II-2). In addition, JP 4-04 states that initial CLs have "basic quality of life", and "little or no contracted support" (JP 4-04, 2019: pg II-2). This description is consistent with conditions at LZ2 in 2016. LZ1, on the other hand, would be considered an OIR temporary CL. The researcher considers LZ1 to have been a semi-permanent CL during OIF, but given the US forces departure and ISIS destruction of base infrastructure, the state of LZ1 in 2016 was that of a temporary CL. The goal of a temporary CL is "to last up to 24 months", "using locally available materials and equipment," and with "expanded quality of life, though still minimized and relatively austere" (JP 4-04, 2019: pg II-2 and II-3). JP 4-04 is important because it clarifies logistical requirements for the various contingency locations, providing logisticians and engineers with a guideline for base development and the expected services. Ideally, the plans for an airfield are passed down to the lowest level of operations, so that tactical logisticians understand and apply priorities to the right development projects.

Lastly, JP 4-01.5, Joint Terminal Operations, found on the Joint Electronic Library + database is relevant to logisticians preparing for contingency operations. This document, updated in November 2015, details planning considerations for air, land, and sea terminals, which are beneficial to understanding distribution challenges at the various types of terminals (JP 4-01.5, 2015). This document can be useful to logisticians and planners in understanding the purpose of opening an airfield, its mission, strengths and limitations.

Case Studies

The Falklands War is an outstanding case study example of building an austere airfield during contingency operations and relays the overarching challenges of establishing an airfield from a logistician's perspective. Kenneth L. Privratsky's *Logistics in the Falklands War*, first published in 2014, depicts the difficulties of sustaining a war from an isolated, austere environment (Privratsky, 2014). Privratsky describes the conflict between Argentina and the United Kingdom, launched over the seizure of the Falklands Islands by Argentinian forces on 2 April 1982 (Privratsky, 2014: pg 15). In less than two months the airfield on Ascension Island would be operational, and British forces would begin the assault from there (Privratsky, 2014: pg 104).

Ascension Island boasted a primitive airfield constructed by the United States in the 1940s, initially to aid the search for German vessels during World War II (Privratsky, 2014: pg 60). At the time of the Falklands invasion, only 1,000 people lived on the island, water was distilled for drinking, and food was supplied by "American or British commissaries or from a couple of shops supplied by steamer twice a month" (Privratsky, 2014: pg 61). As the British army rapidly descended on Ascension Island, they were required to bring almost everything with them in order to support combat and sustainment operations. In the initial days of camp establishment, logisticians were faced with several challenges. The four main areas included: uncontrolled flow of personnel and equipment; lack of joint understanding between services; prioritization of cargo; and prioritization of limited resources (Privratsky, 2014: pgs 69-75).

Opening airfields in semi-permissive to non-permissive environments is universally difficult, largely due to the isolated nature and complexity of logistical

operations. In addition, intra-service communication and understanding are equally difficult amongst militaries worldwide, as shown in the Falklands example. Lastly, military planners and commanders often disagree on the prioritization of limited resources during initial contingency operations, particularly if the speed of executing combat operations is contingent on establishing logistical support. The Falklands War is important to understanding OIR challenges, largely due to the austerity of the airfields and their criticality in providing a launchpad for combat operations. In the Falklands example, combat operations were entirely reliant on the establishment of a logistics hub (airfield), and in the rush to take advantage of operational timing, many units were not properly equipped at the airfield as they moved into combat.

A more recent example where establishing airfields proved critical to the success of combat operations comes from a 2006 case study paper conducted on the OIF and OEF airfield openings, entitled "Adequacy of Airbase Opening Operations Doctrine" by Major James E. Long (Long, 2006). Long's primary purpose was "to improve airbase opening operations which, in turn, would improve the ability of the US Air Force to rapidly and efficiently provide airpower to Joint Force Commanders worldwide", using doctrine, contingency, and humanitarian examples from the early 2000s (Long, 2006: pg 96). Long focused on a broad assessment of functions related to airfield opening, including several points related to logistics and authorities.

First, that the concept of a dedicated airbase opening force, in his case, the Contingency Response Group (CRG), was vital to successful power projection (Long, 2006: pg 95). Second, that the BOS-I and SAA at many bases struggled to synergize efforts, and that no doctrine existed to provide guidance on their roles and responsibilities

(Long, 2006: pg 33). Third, that units were deploying into combat without the proper equipment, making them less prepared than they should have been. As Long states, "it was unexpected to find out that units deploying to Tallil were woefully equipped…based on US experiences in OEF, it should have been no surprise that the military would open seven airbases in Iraq that would need to be adequately manned" (Long, 2006: pg 98). Lastly, Long identified that "the doctrine in effect was not comprehensive to ensure successful joint airbase operations" (Long, 2006: pg 97). Up to that point, the doctrine that did exist was primarily single-service or outdated, forcing joint leaders at these locations to improvise, cooperate, and coordinate in rapid fashion during critical phases of operational execution.

In January 2007, the ALSA printed a bulletin, titled "Airfield Opening," with featured articles on Senior Airfield Authorities, Joint Task Force Port Opening (JTF-PO) and the Contingency Response Group (ALSA, 2007). This precursor to the Multi-Service Tactics, Techniques, and Procedures for Airfield Opening publication was one of the first publications to address joint airfield openings, and the challenges associated with it. Lt Col Mark Brown is one of the article contributors in this bulletin. While Lt Col Mark Brown's article "Senior Airfield Authorities" primarily focused on SAA responsibilities, his insight into previous case study examples shed light on what appears to be some long-term trends. He remarks that, "during Operation ALLIED FORCE, [the Air Force] lacked an overarching plan encompassing seizure, opening, and beddown of forces and equipment, producing uneven results" (Brown, 2007: pg 4). The Air Force rectified this issue by creating a SAA, with responsibility for "the control, operation, and

maintenance of an airfield to include the runways, associated taxiways, parking ramps, land, and facilities whose proximity affect airfield operations" (Brown, 2007: pg 4).

In OEF and OIF, however, Lt Col Brown states that, "no one was able to speak with joint authority on the configuration of an airfield after seizure, the establishment of basic airfield operations functions, or the resolution of conflicting airfield operations guidance among joint forces" (Brown, 2007: pg 4). To address this concern, USCENTCOM established the BOS-I position in 2004 when it became clear that a single authority for funding, logistics, and infrastructure would be required in addition to someone dedicated to airfield stand-up and operation (Brown, 2007: pg 4-5). What he discovered is that having two authorities (SAA and BOS-I) with authority in sustainment support and airfield development created its own friction, citing Balad AB and Bagram AB as examples (Brown, 2007: pg 5). He states, "multiple services, to varying degrees, possess airfield opening and operating capabilities. A clear delineation of these capabilities and authorities is needed to ensure success in future operations" (Brown, 2007: pg 5). While Lt Col Brown's observations do not focus specifically on logistics issues, they highlight a continued friction between base and airfield authorities that directly affect logistics processes at every contingency location where an airfield exists.

Literature Conclusion

From the Falklands War, OIF, and OEF case studies come several issues directly and indirectly affecting logistics during airfield opening operations. From the Falklands War, the uncontrolled rush of cargo and personnel, prioritization of cargo and transportation resources, and a lack of cultural understanding between the services

hampered streamlined logistics. OIF and OEF saw units deploy without the proper gear and equipment, initial attempts to establish authorities on airfield and base development (BOS-I and SAA) that were often difficult to navigate or enforce, and a lack of joint doctrine regarding how an airfield should be opened. With the recent OIR airfield openings, the researcher intends to assess whether prioritization, distribution management, BOS-I and SAA challenges still exist, and whether the most recent openings have validated joint doctrine, or whether more work needs to be done. Based on these case studies, the gap that the researcher seeks to fill is the ten-year gap in real-world airfield opening examples, which are critical to validating current joint logistics doctrine.

The AARs and interviews serve as the new data that will be used to close the gap between case study examples from OEF and OIF, and current OIR operations. This information is critical because no large organization refines processes and operates more efficiently without observing and learning from historical data. Furthermore, the nature of military operations is ever changing, prompting continual reevaluation of previous tactics, techniques, and procedures. Finally, source documentation is most valuable when analyzed as close to event execution as possible to best understand the context of the time. Thus, the use of AARs and interviews from ongoing operations is optimal.

III. Methodology

Research Scope and Design

Rarely is an operation conducted by a single service in modern warfare, leading to an assumption (and high probability) that most operations are multi-service or multi-national in nature. There are pros and cons to this "jointness", and any researcher will find a plethora of opinions for and against the fusion of military services towards joint endeavors. The question surrounding the validity of specific joint operations is beyond the scope of this paper. However, capturing "lessons learned" from the joint community with regards to logistics practices is not, although this proves rather challenging. Individually, the services are adept at producing AARs and lessons learned documents internally, but collectively lack a process and repository for storing these joint lessons learned documents. In an age of increasing joint cooperation and interdependence on sister service systems and processes, to include logistics, the lack of such a repository is problematic.

Assumptions/Scope/Limitations

This project has been scoped to discuss the stand up of two airfields in support of OIR. While there may have been more airfields opened in support of OIR, for the purposes of this paper, the researcher chose to narrow the scope down to the two described. The reason for this is that both airfields were opened under similar circumstances, around the same timeframe, making them optimal compare-and-contrast case study examples. The period of time selected for this study was a thirty-day window,

specifically the first thirty days of airfield operations at each location. This is was done in order to scope the project to a more detailed assessment for both airfields, and to highlight one of the more critical phases where logistics plays a vital role in mission success.

In order to thoroughly explore practices at both airfields against joint doctrine, the scope required a narrowing of topics within the joint logistics community. Given the research is focused on joint practices, it was important to utilize joint terminology from recognized sources, namely the Joint Publications 3-0 series and 4-0 series. The researcher selected four core logistics functions out of the seven listed, including deployment and distribution, supply, logistics services, and maintenance (JP 4-0, 2019: II-2). Operational Contract Support, engineering, and health services were not reviewed for this research project (JP 4-0, 2019: II-2).

Limitations to this research include the availability of individuals, sources, and the classification of documents. While the researcher was able to contact many of the individuals and units present at the locations, there are some personnel that either could not be located, or did not respond to requests for information. In addition, some information that would be useful to this study were of a higher classification than the researcher wished to include. In order to reach as many joint logisticians as possible, it was necessary to omit any information above the unclassified level.

Chapter Overview

The study of these airfield openings provided an ideal opportunity to conduct qualitative research, given the real-world application and probability of pattern and trend

deduction. Further, the specific method used within the qualitative context was a case study approach, also known as idiographic research (Leedy and Ormrod, 2016: pg 253). For the purposes of this study, a multiple case study technique was used, specifically to compare and contrast the two airfields initial phases, and also to compare and contract with previous examples from the Falklands War, OEF and OIF, under the umbrella of joint doctrine.

As with any research, there are both positives and negatives to utilizing a certain approach. The case study approach is no exception. Robert Yin addresses the limitations of the case study approach in his book *Case Study Research: Design and Methods* (Yin, 2014: pgs 19-22). He identifies five concerns that many researchers have with regards to the case study model. The first concern is with the perceived lack of academic rigor, presumably based upon the qualitative nature of the model (Yin, 2014: pgs 19-20). The second concern rests with the overly flexible adaptation of the model, which can be used to achieve a desired end state in many mediums (teaching, storytelling, *etc*) (Yin, 2014: pg 20). Generalization (where a single case study is used for many like-examples) is the third issue associated with case study research, as one example may not be applicable to most or all examples (Yin, 2014: pgs 20-21). Length of time and documentation required for case study research is the fourth concern, given the length of time required to study human activity or detailed events (Yin, 2014: pg 21). Lastly, the concern regarding the inability to clearly compare case study analysis and results to similar research methods leads many to doubt the quality of the case study approach (Yin, 2014: pg 21).

The researcher acknowledges the limitations and concerns addressed by Yin regarding the case study model, but believes that the assertions do not diminish the

quality of the research or findings derived from the analysis. Certainly, the flexibility of a case study approach is greater than in many analytical approaches, leading to perceived mistrust in the analysis results and overall rigor applied. However, this flexibility is also its strength. Analytics at times, cannot account for the "human factor" of research, something qualitative research is designed to take into account. These "human factors" are more difficult to quantify, but are just as important to answering the "why" of many research questions. Utilizing questions and AARs which codify what the members "felt" were positive or negative practices during this study lends itself to a qualitative research model. Comparing this approach at two airfields makes this an excellent multiple case study candidate.

While the concerns over generalization are valid, it is important for the researcher to understand the limits of their research as it applies to similar like-example studies. Multiple case study research reduces the concerns over generalization, and has been applied to this airfield opening study in hopes of minimizing the probability of generalization error. To address the length of time required for case study research, the researcher limited the scope of the project to two locations for thirty days, ensuring a manageable level of data for the project. Lastly, due to the narrow scope of the subject (joint logistics in airfield opening) and the limited number of airfield case study examples, a comparative advantage in general, will be difficult. Yin states that typical analytical approaches "are limited in their ability to explain "how" or "why" a given treatment or intervention necessarily worked (or not) and that case studies are needed to investigate such issues" (Yin, 2014: pg 21). In this instance, while the number of airfield opening examples are limited, a case study approach to answer the "why" and "how"

joint logistics practices worked or didn't work is the desired approach for this research topic.

As discussed, the researcher examined logistics practices at the two airfields as a qualitative, collective case study analysis. Once previous case studies and relevant doctrine had been researched, it was determined that foundational documentation on airfield openings existed (to a degree), but lacked recent real-world examples to validate the doctrine. Once doctrine and case studies were reviewed, the research transitioned to AARs, questionnaires, and interviews from units and members present at the two locations during the initial phases. The data sources, individual, and unit information is listed below:

Table 1. List of Data Sources

Data Source	Rank	Position	Unit
AAR	O5	CC	CRG
AAR	O5	CC	CRG
Questionnaire	O3	OIC	FLE
Questionnaire	O5	CDR	BOS-I
Questionnaire	O4	XO	BOS-I
Questionnaire	O3	S4	BOS-I
Observation	O4	OIC	SOF

One could argue that there are several instances of military exercises and humanitarian events executed in the past ten years, creating a large data pool of lessons learned that can be employed in a contingency environment. While this is true, few researchers can argue that data from real-world examples, in this case airfield openings in semi-permissive environments in support of contingency operations, is less valuable.

This researcher chose to exclude humanitarian and exercise data for the purposes of this paper, although such information could be valuable to other research projects.

As previously stated, the methodology used for this research centered on a review of joint doctrine, followed by new data collected from AARs and interviews. For both airfields, the goal was to collect data from each unit located at LZ1 and LZ2 during the first thirty days, and winnow the data to identify trends in logistics practices. The primary source documents were AARs. However, if a unit did not produce an AAR, an email questionnaire was collected to provide substantive documentation of events. From each AAR, the researcher identified data related to logistics and placed them into one of the four core logistics function categories. In addition, the researcher identified best practices from both airfields, and placed them into three separate bins. The paragraphs that follow detail the AARs and questionnaires collected for this study.

After Action Reports

AARs were chosen as primary sources due to their formal, structured organization and in-depth level of detail. Typical military procedure dictates that units at all operational levels (strategic, operational, tactical), regardless of service, construct AARs upon redeploying from a mission in order to pass 'lessons learned' to future units that will execute the same or similar mission set. AARs are meant to be catalogued in a repository and be easily accessible for later use. In reality however, many units either do not write AARs, or if they do, do not place them in a location accessible to units outside their own chain of command. Therefore, the usefulness of many AARs are significantly

degraded, as the greatest attributes of those reports never materialize for the personnel that need them.

The researcher sought data from seven units at the two airfields, and was able to obtain information from five of them. The five units included two Air Force Contingency Response Groups (CRG), an Army Brigade Engineer Battalion (BEB), an Army Forward Logistics Element (FLE), and a Special Operations Liaison Team (SOF). The researcher obtained two AARs from the five units. The other units either never created an AAR, or could not immediately locate the ones they had created. For the units that did not create or could not locate an AAR, the researcher substituted a questionnaire relevant to the unit's deployment, arrival, and observed logistics issues and best practices.

The AARs were provided by the two CRGs serving at LZ1 and LZ2. The AARs ran a similar format, detailing mission data (locations, personnel and equipment numbers) and cataloging the challenges experienced during their distinct operations. They also identified the quantity and type of assets, so that the reader understood the baseline level of logistical support at the location, and had a frame of reference for the issues presented. While the AARs were written to encompass all facets of airfield opening operations, information regarding equipment, housing assets, unit gear, and vehicle support could be found throughout the documents, making them useful for logistics analysis.

It is important to note that the researcher was unable to contact the BOS-I (Lieutenant Colonel, Army) for LZ2 during the course of this study. However, while the Lieutenant Colonel was the designated BOS-I, the FLE served as the organization executing BOS duties at LZ2. The BOS-I and FLE were from two different units, having no interaction prior to the Lieutenant Colonel's arrival at the airfield. The FLE operated

daily logistics services at LZ2, while the BOS-I managed the oversight of the FLE and interacted with unit leaders at the airfield and higher headquarters. Even though the researcher was unable to contact the BOS-I, the FLE's observations at LZ2 provide critical data for understanding the logistics processes that took place there.

Interview and Questionnaires

One phone interview was conducted for the purposes of this research project. This phone interview was conducted with a member of the Combined Joint Task Force Operation INHERENT RESOLVE J4 (CJTF-OIR J4), who worked on the staff at the time of the airfield openings. While not used as part of the data analysis found in section IV, the information from the interview was used to provide greater context throughout the paper. CJTF-OIR J4 was responsible for the overall logistics support to both airfields, therefore it is important to understand the challenges faced at the staff level as it had direct and indirect effects at the tactical level at each location.

As part of their daily tasks, CJTF-OIR J4 coordinated and moved hundreds of people and units a day, continually balancing transportation assets and priorities for cargo movement (CJTF-OIR J4, interview). Conventional forces often brought a large deployment package, requiring dedicated lift on a stringent timeline for successful mission execution (CJTF-OIR J4, interview). According to the member, the goal was to increase flow of cargo and equipment into both locations to meet mission demands. Logistics challenges included: competing priorities with limited assets: and differing perspectives between levels of command and services (CJTF-OIR J4, interview). At LZ2 specifically, planners intended to replace SOF forces with conventional forces as quickly

as possible, allowing SOF to advance with the frontline (CJTF-OIR J4, interview). Added complications regarding capability differences between SOF and conventional forces, and the constant struggle to provide "gatekeeper" responsibilities for personnel flow compounded issues as the airfield developed (CJTF-OIR J4, interview).

From the CJTF-OIR J4 member's perspective, the demand for warfighting cargo and equipment, airfield development and operations equipment, and unit support equipment posed a constant prioritization challenge at LZ1 and LZ2 (CJTF-OIR J4, interview). Further, clear and productive communication between "stakeholders" when priorities did change caused movements to slow and increased confusion at logistics hubs where equipment was staged. Ground logistics networks were utilized to alleviate some air asset limitations and prioritization issues, but ground transportation proved slow, dangerous, and at times unreliable. In addition, differing perspectives within the joint community and various levels of command tied into prioritization of cargo and equipment challenges. Lastly, the shift from SOF assets to conventional assets (both manpower and transportation) at LZ2 created some logistics capability limitations (*i.e*, training deficiencies, different authorities), which continued to contributed to slow delivery of cargo and equipment for the first 30 days (CJTF-OIR J4, interview). This shift also caused CJTF-OIR J4 to take on "gatekeeper" duties in an attempt to limit conventional force numbers at LZ2 from overrunning existing logistical infrastructure, which was initially unsuccessful, but became more successful as the problem was recognized and capacity at the airfield increased (CJTF-OIR J4, interview).

The researcher also received a modified questionnaire from one of the Special Operations Forces J4s (SOF J4), who was responsible for logistics support to special

operations forces in the AOR. The SOF J4 was given a list of five questions (from the 12 listed below) as the member was not directly located at the airfields. Similar to the action officer from CJTF-OIR J4, the SOF J4's perspective provides relevant context to operations at LZ2. While LZ1 was controlled by conventional forces, the area surrounding LZ2 was logistically support by special operations forces initially. The SOF J4 stated that SOF supported BOS duties during the conventional force arrival, due to SOF's preexisting knowledge of the area and established logistics network (SOF J4, questionnaire). With limited manpower and transportation assets, SOF moved conventional force equipment into the area ahead of their arrival, understanding that once these forces deployed to the airfield, they would begin their own internal BOS support (SOF J4, questionnaire).

From the SOF J4 perspective, the biggest logistical challenges included: a lack of understanding of the environment by military planners; prioritizing health and welfare of military members at LZ2; and cultural differences in the Services and the way they approached problem solving (SOF J4, questionnaire). In general, making plans for a location without physically observing the environment is challenging and has plagued military planners throughout history. Lacking understanding of the environment directly ties into lacking an understanding of what units on the ground need. In an austere environment, a lack of hygiene or medical supplies directly impacts the effectiveness of the overall mission set. The SOF J4 identified hygiene items such as toilet paper and morale items such as coffee and mail that were requested, but not actioned by each unit's higher headquarters (SOF J4, questionnaire). As previously mentioned, prioritization of cargo, supplies, and equipment with limited assets, proved to be a challenge at all levels.

The demand for combat and airfield equipment and cargo limited health and welfare deliveries, requiring SOF logistics planners to augment from their limited supplies as ground units asked for support (SOF J4, questionnaire).

The SOF J4 also highlighted cultural differences between services as a major challenge. The member writes "I realized that it wasn't the different languages that we were speaking that was the problem, but true cultural and priority differences that were incredibly difficult to overcome through the many bureaucratic layers on both sides" (SOF J4, questionnaire). Echoing the CJTF-OIR J4 action officer, the SOF J4 recognized prioritization at all levels, across all services, as being a continual challenge to executing mission objectives. There were positives however. In November 2016, the SOF J4 deployed a SOF Air Force liaison team consisting of a logistics officer, two aerial port enlisted personnel, and an enlisted communications Airman. This team had extensive joint training and understanding of SOF logistics and could "speak Air Force", providing a "communication bridge" between services at the airfield (SOF J4, questionnaire). The SOF J4 identified the liaison team as critical to streamlining communication up and out, articulating priorities of all vested parties, and networking conventional logisticians with SOF logisticians deployed throughout the AOR (SOF J4, questionnaire).

The researcher received four standardized questionnaires in addition to the modified questionnaire provided by the SOF J4. These included one from a member of a Forward Logistics Element (FLE) from the AOR's Theater Sustainment Command at LZ2, and three additional questionnaires from a Brigade Engineer Battalion serving as BOS-I at LZ1. The questionnaire consisted of 12 identical questions, with the intent to

discuss logistics specific support and provide context for the researcher. The questions are listed below:

Table 2. List of Questions

Questionnaire	
How was your unit tasked to provide BOS-I and when? What mission where you tasked with?	Did you have any shortfalls in personnel or equipment, before and/or during the first 30 days?
How was it decided your unit was the best logistics organization for the mission?	Did you know what a Contingency Response Group was before you arrived, or who you would be supporting?
How many personnel were tasked? What was their deployment timeline?	Did you have joint training prior to this deployment? If so, what kind?
How did your team arrive in theater? How was the deployment arranged?	What logistics issues did you experience while deployed (specifically within the first 30 days)?
What was your unit's assigned duties/responsibilities?	What lessons learned, if any, did you and your team garner from your experiences?
Did your personnel deploy with all requisite supplies and equipment?	What best practices, if any, did you and your team observe during your deployment? When did these best practices occur?

Members of the FLE and BEB answered the list of questions based upon their experiences at the airfields. The BEB provided additional documents such as powerpoint presentations and a published Engineer Bulletin detailing LZ1 development in order to provide context for the researcher. The researcher chose to analyze only the AARs and questionnaires from the units at LZ1 and LZ2 in section IV, but it is worth noting that the additional documents, interview from the CJTF-OIR J4 action officer, and questionnaire from the SOF J4 were critical to giving the researcher a full picture of logistics challenges at every level of support. This paper would not be the same without the valuable contributions and efforts of the members highlighted above.

IV. Analysis and Results

After reviewing the data from the AARs and questionnaires, the researcher took several steps to categorize data and identify trends. Deducing logistics trends between the two airfields, using joint logistics doctrine as the foundation, became the research focus. JP 4-0 was the primary joint doctrine used for the study. From JP 4-0, the researcher identified the core functions of logistics as the baseline for examination (JP 4-0, 2019: pg II-2). The researcher chose the core logistics functions because they are recognized tenets within the broader joint logistics community.

In addition, the researcher omitted operational contract support, engineering, and health services (the remaining core functions), as the Air Force recognizes these functions as their own specialties outside the logistics community (JP 4-0, 2019: pg II-2). While the Air Force considers these functions important, their logistics officers are not trained nor expected to specialize in these categories. From this, the researcher identified the four core logistics functions that would be used to categorize and assess the data, namely deployment and distribution, supply, logistics services, and maintenance (JP 4-0, 2019: pg II-2). Given the functions are recognized joint logistics terms, each function became a natural bin for separating and categorizing the data retrieved from the documents.

Once data had been extracted, the issues were binned into one of the four core logistics functions categories identified above. Best practices data was binned separately into categories designated as ingenuity, relationships, and leadership decisions. Once binned, the researcher was able to graph the data to show which logistics issues were

more frequent among units at the airfields, and what logistics best practices most often emerged during the initial build up stage of the airfield opening.

Core Logistics Functions Analysis

The first bin was deployment and distribution, which included issues such as air and ground transportation delays for passengers and equipment identified in the AARs and questionnaires. The second bin, supply, focused on issues such as units being inappropriately equipped for the mission, having no access to prepositioned stocks, and lacking supply experts and bench stock at the airfields. The third bin, logistics services, referred to a lack of camp building materials and storage for food and fuel. The fourth bin was maintenance, which focused primarily on the availability of vehicle maintenance support at the airfield locations. The list of issues identified are depicted in the table below:

Table 3. List of Logistics Issues

Core Logistics Functions	Unit	Location
Deployment/Distribution		
Movement of forces limited by transportation assets	FLE	LZ2
Slow equipment arrival to location (90 days)	FLE	LZ2
30 day shipment timeline for spare vehicle parts	CRG	LZ1
Delays due to tactical level airlift coordination requirement	CRG	LZ1
Movement of equipment limited by transportation assets	SOF	LZ2
Supply		
Insufficient access to prepositioned stocks	FLE	LZ2
Night Vision Goggles outdated	CRG	LZ1
AFCENT WRM vehicles had no MSK kit	CRG	LZ1
Lack of Supply UTC and limited bench stock available	CRG	LZ1
BOS-I lacked enough MHE for camp support/buildout	CRG	LZ2
Uniforms/personal gear did not meet requirements	CRG	LZ2
Combat gear (NVGs/IOTV/helmets) outdated	CRG	LZ2
AFCENT Security Forces personnel lacked cold weather gear	SOF	LZ2
Insufficient vehicles for daily camp operations	SOF	LZ2
Logistics Services		
Lack of fuel storage for mission support	FLE	LZ2
Lack of building materials (wood/screws/etc) for tents	FLE	LZ2
BOS-I responsibility confusion and BOS-I deployment delay	SOF	LZ2
Camp growth outpaced camp housing/hygiene capabilities	CRG	LZ2
Lack of cold food storage at location	SOF	LZ2
Lack of food heating capabilities at location	SOF	LZ2
Maintenance		
Lack of Vehicle Maintenance UTC and tools for mission	CRG	LZ1
Lack of Vehicle Maintenance tools for mission	SOF	LZ2

The data from the table was then placed into a bar graph with the results displayed below. This graph represents the number of times each issue was identified by a unit within the AARs or questionnaires. The data from the table above was then moved into the four bins listed below:

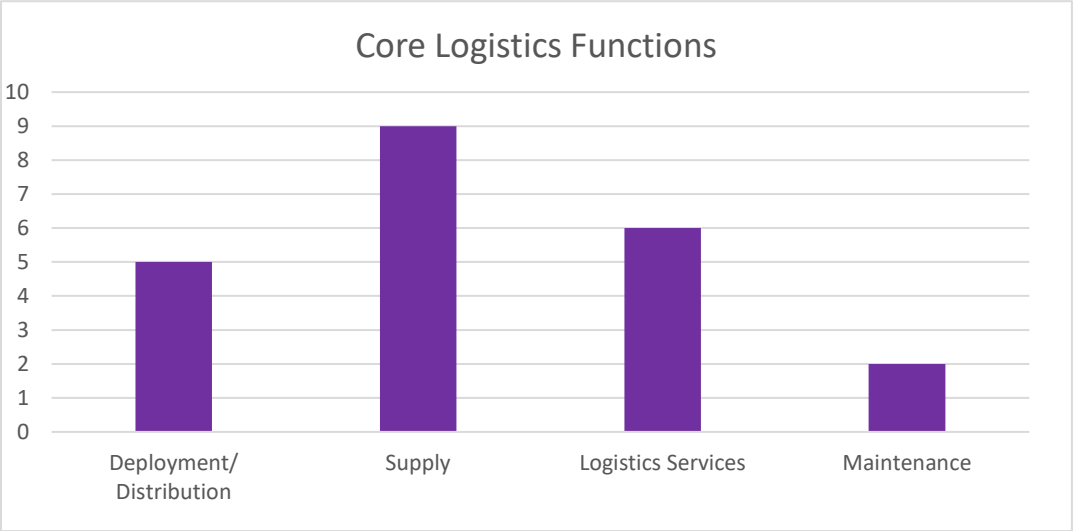

Figure 3. Bar Graph of Logistics Issues

From two AARs, four questionnaires, and eyewitness observation, 22 logistics issues were identified. As indicated from the list, the logistics issues were not necessarily service specific, showing some commonality between the services. The data shows that the issues associated with supply were the most numerous, followed by logistics services, deployment and distribution, and maintenance representing the fewest issues of the four functions reviewed.

Supply - The Leading Problem

The supply bin appeared to show the greatest number of identified issues. While the Air Force represented the preponderance of voiced supply concerns, it is clear that the Army suffered supply shortfalls as well. Interestingly, many of the supply issues identified by the Air Force were tied to military clothing and equipment, something that is generally preventable provided the concerns are identified prior to deployment (CRGs,

AARs). This particular issue was evident across all three AF units identified in the study (two CRGs and the security forces unit). The lack of vehicles mentioned by both the AF and SOF entities, reflects the unanticipated needs of a growing airfield operation with limited resources (CRG LZ1, AAR and SOF, observation). At LZ2 specifically, a rough terrain container handling system (RTCH) was needed by the FLE, but due to weight restrictions for the transportation assets, MHE could not be delivered there (FLE, questionnaire). Lastly, the inability to access prepositioned stocks raises the question of prioritization for warfighting efforts, ease of access, and the value of maintaining such stocks (FLE, questionnaire).

Logistics Services - Capacity Limitations Stymied Progress

The logistics services seemed to primarily be capacity and storage issues surfacing from LZ2. In the first thirty days, the flow of personnel and equipment were limited by transportation assets and prioritization of cargo coming into the location. This limited several items considered bulky or of lower prioritization to the initial set-up. From the food storage stand point, members mostly consumed Meals-Ready-To-Eat for the first 30 days. On one occasion, Thanksgiving meals were delivered on two aircraft pallets late into the evening. What food was not consumed the night of delivery was thrown out the following day due to lack of refrigeration capacity. Another major issue that arose was the personnel flow into the camp. At LZ1, the number of personnel entering camp was tightly restricted, ensuring billeting and hygiene pallets were not overtaxed by the flow of forces (BEB, questionnaire). This did not occur at LZ2 during the first 30 days. At LZ2, the number of personnel entering the camp exceeded the

billeting and hygiene pallets designed to service the camp, forcing a rapid manpower and resources shift towards incoming personnel bed-down (SOF, observation). This led to an effort both at the airfield and at the higher headquarters locations to place a cap on personnel entering the airfield, until more resources could be brought in to support the increased demand. Lastly, the subject of BOS-I at LZ2 created some challenges that stymied airfield development. Miscommunication regarding what unit was tasked with the dedicated BOS-I responsibility led to a delay (eleven days) in a BOS-I being designated and deployed to the airfield (SOF, observation). While logisticians at the airfield worked to minimize impact and continue airfield development, having a designated, long-term BOS-I identified at the onset is critical to overall mission success.

Deployment and Distribution – The Chokepoint

Surprisingly, deployment and distribution issues rated third among the logistics issues, with lack of transportation assets being the limiting factor. This issue was experienced at both LZ1 and LZ2, within the first thirty days and beyond. In both instances, air and ground lines of communication existed, but the limited number of resources moving to each location limited the amount of personnel and cargo being delivered. This often led to prioritization concerns, as multiple units' equipment deliveries competed with sustainment and direct combat support munition and supplies. Interestingly, LZ1 experienced a situation where the airfield units were required to coordinate their own airlift (CRG LZ1, AAR). Regardless of the reasoning, creating an extra step in the logistics chain often led to more coordination time and effort, pulling manpower away from their primary task. In the FLE's case, much of their equipment

moved into the AOR by all three modes of transportation (air, land, and sea), contributing to long lead times and delays in equipment delivery (FLE, questionnaire). Lastly, given the locations were in semi-permissive environments, any movement "outside the wire" by air or ground required risk assessment and appropriate force protection measures applied to ensure minimal risk to personnel and equipment. This extra step, while a necessary requirement in contingency environments, undoubtably slowed the logistics process down.

Maintenance – Stock Level Limitations and Environmental Factors

In the case of maintenance, both locations had maintainers assigned, but their capacity to conduct field maintenance was limited due to a lack of tools or "garaging" capabilities in the austere environment (CRGs, AARs). The supply of vehicles was small (relative to airfield population size), while the demanded usage was high. The physically harsh environment also played a role in the frequency of maintenance actions required for the vehicles (similar scenarios occurred with aircraft and generators) (SOF, observation). Dust and rugged terrain factored into the vehicle lifecycles, often speeding the need for repairs. In the early stages of airfield development, field maintenance was often performed in primitive conditions, utilizing the bare minimum tools to troubleshoot the issues. Vehicle bays and heavy machinery for making adjustments were non-existent. If the maintainers did not have the tools or replacement parts required to fix the vehicle, the vehicle simply remained parked until parts or tools were shipped to the location.

Best Practices Analysis

Similarly, the researcher chose to bin the best practices into three categories: ingenuity, relationships, and leadership decisions. These categories were chosen based upon AAR, questionnaire, and interview feedback. For example, the term 'relationships' came up in multiple AARs, including both internal relationships (at each airfield) and external relationships (with units at other locations). Far too often, individuals are prone to identify what went wrong in a situation and neglect the positive lessons learned. A goal of this research was to capture some of the positive lessons learned, or best practices, that could and should be replicated for future operations. Fortunately, these best practices were scattered throughout the AARs and questionnaires from all five units, showing that the idea of best practices was shared between services. The list of best practices identified are depicted in the table below:

Table 4. List of Best Practices

Best Practices	Unit	Location
Relationships		
Good cooperation between units	SOF	LZ2
Exercised external relationships to support location	SOF	LZ2
Spirit of Cooperation amongst units	FLE	LZ2
Shared Resources at location	CRG	LZ2
Utilized peer relationships	CRG	LZ1
Utilized relationships w/higher headquarters	CRG	LZ1
Resources shared between AF/Army	CRG	LZ1
Leadership Decisions		
Selected the right team for the job	SOF	LZ2
Selected socially adept leaders for deployment	FLE	LZ2
Good decisions on pax/resource deployments	BOS-I	LZ1
Smart decisions on gear prior to deployment	CRG	LZ1
Selected right person for job (maintenance)	CRG	LZ1
Ingenuity		
Utilized locally procured tools/equipment	CRG	LZ1
Created alternate comm signals when comms went out	CRG	LZ1
Repurposed barriers/material for camp construction	CRG	LZ1

The data was then placed into a bar graph with the results displayed below:

Figure 4. Bar Graph of Best Practices

From two AARs, four questionnaires, and eyewitness observation, 15 best practices were identified. The data shows that relationships ranked highest among best practices, followed by leadership decisions, and ingenuity.

Relationships - The Most Important Practice

The relationships bin codified many forms of relationships. These relationships included interactions between tactical and higher-level entities, networking at peer levels to obtain resources, and sharing of resources between Army, Air Force, and SOF entities. The CRG at LZ2 mentioned sharing assets with the BOS-I in order to improve living conditions, while SOF at LZ2 utilized networking to secure an additional forklift, vehicle, and hygiene items for camp buildout and airfield operations (CRG, AAR and SOF, observation). At LZ1, CRG personnel and the BEB were able to share tools in order to support minor vehicle repairs (CRG, AAR and BEB, questionnaire). These types of relationships enabled organizations collocated or in close proximity to each other to share limited resources.

Leadership Decisions – Making Informed Decisions Impact Mission Success

The leadership decisions bin produced surprising results. Oftentimes, there is a perception that military members (or anyone in a hierarchical organization) at the lowest levels do not appreciate the decisions of their leadership. However, this did not prove true with regards to the AARs and questionnaires collected for this project. Four of the five units credited their leadership with making sound decisions about limited resources, be it manpower, equipment, or supplies. The CRG at LZ1 credited their leadership with

selecting lighter combat gear prior to deployment, ensuring the reduction of combat fatigue and increasing maneuverability during operations (CRG, AAR). The BEB and CRG at LZ1, and SOF at LZ2 all lauded leadership decisions that placed the "right people or team" into the appropriate environment where they benefited the unit or operations (CRG, AAR and BEB, questionnaire, and SOF, observation). The FLE at LZ2 stated that their leadership had selected "their most socially adept leaders", which were a benefit during high stress joint operations (FLE, questionnaire).

Ingenuity – Overcoming Limited Resources

The ingenuity bin was the third bin chosen from the applicable documents. Ingenuity covered any situation where a member or team devised ways to overcome a challenge through creative means. Ingenuity happens all the time in real-world operations, but is seldom recognized post-deployment. The CRG at LZ1 praised several instances of ingenuity, such as "repurposing barriers" found at the airfields, procuring local tools and supplies rather than shipping from the United States, and utilizing 'hand signals' when communications were inoperable (CRG, AAR). While relationships often led to ingenious solutions, they did not account for all ingenious solutions. In an effort to recognize the creativity implemented by the personnel and teams at the locations, ingenuity became a stand-alone bin separate of relationships that may or may not have led to the solutions themselves.

Other Findings of Significance

While research focused on the four core logistics functions and best practices conducted at the two airfields, some other observations were noted during the course of this study. These additional takeaways are equally important to commanders and logisticians alike, and are designed to highlight issues that could negatively affect airfield openings in future operations.

Joint Training

The two conventional army units identified that they had no formalized joint training prior to deployment. When the BEB deployed to support OIR, their tasks included working with partner forces and supporting rebuilding efforts (facilities, roads, bridges) (BEB, questionnaire). The BEB was deployed for nine months, of which approximately five months was dedicated to the airfield rebuild (BEB, questionnaire). Once it was determined that LZ1 would be rebuilt, the BEB was assigned to the task given its versatility, skills, and proximity to the problem set (BEB, questionnaire). They were charged with clearing the area, rebuilding infrastructure, receiving the CRG, and providing logistics support to units moving into LZ1 (BEB, questionnaire). Similarly, the FLE deployed forward to LZ2 to provide logistics support to SOF and the CRG in and around the airfield (FLE, questionnaire). The FLE had no formal joint training, but displayed the versatility and skills required for the mission (FLE, questionnaire).

The BEB, FLE, and SOF J4 (all Army personnel) identified that they had neither worked with, nor fully understood the capabilities of a CRG (BEB, FLE, SOF, questionnaires). Similarly, the CRG and SOF liaison team were unaware of a FLE force

structure or capabilities inherent in the organization (SOF, observation). Each of these units learned of the other's capabilities either after tasking (by researching) or upon meeting the units at the airfields. Members of each unit had to rely upon previous experiences in joint environments to streamline integration with the other organizations. While this experience served individuals well, much of the cultural, structural, and procedural knowledge gain by the units (as a whole) was developed while at the airfields. This is not the best approach to synergy and integration. Dedicated exposure to other services prior to any tasking or deployment can prepare personnel for a wide variety of situations. Pre-deployment joint training could reduce some of this learning curve, simply by exposing units to the language and cultures of the other services. Joint training in logistics, field exercises, or computer-based training are all options for educating services members on the joint environment.

Logistics Officers

This insight is only from LZ2. At the start of the build out, there was a Major (SOF liaison), a Captain (Army), and a First Lieutenant (AF) serving as logistics officers at the location (SOF, observation). As the Major was temporarily assigned to the airfield, responsibility for long term BOS-I duties were assigned to the Captain (until a new BOS-I was identified and deployed) (SOF, observation). The First Lieutenant served as the "off shift" operations officer, managing communications and enabling the airfield to run 24/7 (SOF, observation).

The Lieutenant had minimal experience in logistics operations, given the member had two to three years in the Air Force (including training). This posed a problem as the

buildout of an airfield, where logistics processes are built from scratch, require logisticians with experience to accomplish a challenging and ambiguous mission set. While the member provided support as an operations officer, the member's ability to develop logistics processes for the airfield were limited. This is by no means the fault of the officer. The logistics community should look at where they assign young logistics officers and ensure they are receiving appropriate development as a logistician prior to being integrated into specialized units where they are often the only member on the team with their unique skill set.

SOF as BOS-I

In the CRG AAR from LZ2, it was articulated that SOF was the BOS-I for the airfield (CRG, AAR). A SOF team was initially deployed to "set up the camp", which included erecting the tents, positioning generators, and connecting the conventional team leaders with partner forces in the area (SOF, observation). Within a week, this SOF team departed, leaving BOS-I responsibility to the conventional forces at the airfield (SOF, observation). As mentioned previously in this paper, capability limitations led to a new BOS-I being assigned and deployed to the airfield eleven days after camp buildout began. Logisticians at the airfield filled the gap in the interim, but were focused on immediate sustainment concerns rather than long-term camp development. As stated before, this delayed joint camp buildout and sustainment efforts until approximately two weeks into airfield operations.

Per JP 4-04, "The GCC, commensurate with SOF capacity and capability, may assign SOF the synchronization of BOS functions in specific instances where SOF and

their enablers are the only forces at a CL" (JP 4-04, 2018: pg III-6). Conventional forces initially deployed to the airfield because SOF logistics assets could not support the increasing flow of combat supplies, munitions, and equipment required as frontline operations expanded. This would imply that SOF logistics assets were saturated before conventional forces arrived. The idea that adding more conventional forces while tasking SOF to serve as BOS-I appears somewhat contradictory.

JP 4-04 states "When SOF are allocated to a GCC and lack mission-essential support capabilities at a CL, SOF will identify and request conventional forces augmentation support through joint planning and force management processes" (JP 4-04, 2018: pg III-4). This appears to have occurred as joint doctrine outlines. In addition, per JP 3-05 "Most special operations missions require CF logistics support. SOF are not structured with robust sustainment capabilities, therefore, SOF must frequently rely on external support for sustained operations" (JP 3-05, 2014: pg I-7). While joint doctrine does allow for GCCs to assign SOF as BOS-I for a location, care must be taken to understand their limitations. Understandably, CJTF-OIR recognized that SOF logisticians were the most familiar with the operating environment and therefore best postured to support the arrival of conventional forces. Relying on SOF logisticians to serve as BOS-I for the duration of an airfield opening phase, however, may not be the best practice in future endeavors.

OPCON Responsibilities

The CRGs highlighted OPCON responsibilities as a problem while in theater (CRGs, AARs). This would not normally fall into logistics lanes, except that the

confusion caused delays in resupply and other sustainment required by both CRGs at LZ1 and LZ2 (CRGs, AARs). The ALSA defines sustainment as the "primary responsibility of the supported GCC and subordinate Service component commander in close cooperation with the Service, combat support agencies, and supporting commands" (MSTTP, 2018: pg 24). At LZ1, the CRG noted that "there was an unclear functional reachback ability" and "excessive delays in moving tasked equipment and personnel" due to the tactical level requirement to coordinate airlift (CRG LZ1, AAR). Similarly, the CRG at LZ2 identified the lack of clearly defined responsibilities, causing "confusion when support/equipment requests were made" (CRG LZ2, AAR). With proper planning, confusion over who provides resupply and sustainment can be easily avoided prior to unit deployment. This takes early planning by military planners at all levels, and should be clearly articulated to the tactical units prior to departure from home station.

AAR process

The AAR continues to be a work in progress in the military. During the course of this research, several issues were noted with regards to the AAR process. First, several units did not create formal AARs for either airfield. Second, if the units did create these documents, they were not uploaded in a common repository. Some units chose to store AARs in their unit files, while others were stored at the unit's higher headquarters. The researcher was required to email known individuals, or network with contacts to find personnel who had access to AARs or whether AARs were even conducted. In addition, the researcher was required to reach across MAJCOMs in the same service to collect information on the same events, let alone across services. A positive is that most AARs

ended up in a unit's "Lessons Learned" division, which was generally a good place to start.

There are attempts to standardize lessons learned repositories across the services. The Joint Lessons Learned Information System (JLLIS) is a good source of combined information, though it has yet to become the standard for all services. In addition, each service has its own version of lessons learned collection. A quick review of the Air Force's Air University site for lessons learned shows at least ten links to the different services, their various levels, and functional areas where lessons learned can be uploaded (Air University website). The Air Force is not alone in this, as each service has a similar lessons learned structure. It's both confusing and time consuming for the individual looking for the information.

The joint community needs to examine how it tracks, receives, stores, and makes AARs available for military planners and warfighters. Lessons learned collection methods seem to be designed for the researcher in an academic setting, not the military planner or tactician preparing to deploy. Anecdotally, the researcher speculates that the reason military members continue to repeat their mistakes is because they don't understand the problem set and "recreate the wheel" in every operation. While some situations are "firsts", the vast majority of situations a warfighter or planner will face have been experienced before. Creating a standard template for AARs, a standard process for reviewing and approving AARs amongst services, and a standard repository for all AARs might reduce mistakes and improve performance at all levels. If JLLIS is the medium for this endeavor, let the joint community dive in and give it robust oversight so that it becomes a habitual resource for current and future contingency operations.

V. Conclusions and Recommendations

Conclusions of Research

Airfield openings, to include the logistics processes (as a supporting function), have gained broader command and academic attention in the last two to three years. This could be a product of the 2016 airfield openings in OIR, shifting national security priorities towards near-peer competition, or a combination of the two. As identified, JP 4-0, JP 3-18, JP 4-04, and ALSA document have all been updated since mid-2018, bringing more detailed information to the logistician and military planner attempting to conduct logistics operations in contingency environments. Prior to this recent round of updates, nearly all documents were written in 2015 or before. Some documents had not been updated since 2008. The flurry of updates to joint doctrine signal an interest in advancing tactics, techniques, and procedures in an increasingly joint environment. It is a positive step towards clearly understanding and mastering rapid deployable logistics into austere, semi-permissive to non-permissive environments.

This conclusion section begins with the research questions posed at the start of the study. The two questions were: Did the two OIR airfield openings conducted in 2016 follow joint logistics doctrine? If not, why?; and what were the "best practices" noted from the OIR case study examples and how can we draw from them to ensure better airfield openings in the future? Based upon the research, the following conclusions were drawn:

1) Joint Doctrine for logistics exists, but not specifically for airfield openings. JP 3-18, JP 4-0, and JP 4-04 all reference joint logistics that can be applied to airfield

openings. The ALSA document focuses specifically on airfield openings, but only briefly mentions logistics within the airfield opening context.

2) Joint Doctrine on logistics was applied to the airfield openings (four core functions), and for the most part, logistics processes were followed.
3) The processes where logistics doctrine was not followed adequately or consistently were identified.
4) The best practices were also identified.

Research Question 1

The researcher concludes, with a few exceptions, that the LZ1 and LZ2 openings were conducted according to current joint logistics doctrine. First, all four core logistics functions from JP 4-0 were present at both airfields (JP 4-0, 2019: pg II-2). Second, Military planners and tactical logisticians navigated cargo and sustainment sequencing, transportation prioritization, deployment and distribution adjustments, APOD limitations, supported initial forces, and made plans to maximize force flow as outlined in JP 3-18 (JP 3-18, 2018: pgs V1-V3). Third, the categorization of and expectations for logistics support at the airfields were consistent with JP 4-04's definition of initial CL and temporary CLs (JP 4-04, 2019: pgs II-2 and II-3). Fourth, the logistical considerations executed at LZ1 and LZ2 were in line with logistics checklists, handoff procedures, and SAA and BOS-I responsibilities outlined in the ALSA's "Airfield Opening: Multi-Service Tactics, Techniques and Procedures for Airfield Opening" (MSTTP, 2018: pgs 53-69). By using joint doctrine processes, the missions to stand up their airfields and the follow-on missions were executed effectively.

One problem is the lack of a single joint publication dedicated to airfield opening logistics. A logistician is required to navigate several joint publications to understand expectations and timelines, and even that can be challenging given the intended audience for each publication (3-series vs 4-series). The joint doctrine appears to lack a standardized language regarding the phases of airfield opening and the categorization of these airfields ("bare-base" vs "initial CL"), but gathered together, the publications prove a useful roadmap for conducting joint logistics during airfield opening operations.

This paper analyzed airfield logistics processes against these core logistics functions, to deduce whether the functions were orchestrated in accordance with joint logistics doctrine (JP 4-0, 2019: pg II-2). Each core function was conducted at LZ1 and LZ2, and for the most part, were conducted in accordance with joint doctrine intentions and guidance. There were a few exceptions to this doctrine, which are highlighted below.

The biggest deployment and distribution challenges at LZ1 and LZ2 were delivering manpower, cargo, and supplies on a consistent basis and on the timeline requested by tactical units at the locations. This occurred due to the limited number of transportation assets available for the missions, and the competing priorities for airfield development and combat operations support. With limited transportation, commanders and logisticians were forced to maximize all available assets to deliver a mix of combat support and airfield support, while meeting the operational objectives and timelines for both. This proved challenging, particularly given the differing priorities of the decision-makers involved, and forced the units at the receiving end (airfield support and combat units) to compromise on their own needs, expectations, and timelines for mission execution.

The supply challenges at LZ1 and LZ2 revolved around bringing the wrong equipment for the environment and having a limited supply of spare equipment in the initial phase. This was further exacerbated by the distribution challenges (limited availability and weight restrictions at LZ2 for example) and lead time for delivering new equipment and supplies to the airfield locations. The research suggests that not all units had access to the appropriate equipment prior to deployment or once deployed. This could be contributed to a lack of funding or authorization, a lack of equipment availability, poor communication and planning regarding the environment, or simply a matter of prioritization towards other efforts. Regardless, the lack of appropriate equipment and access to supplies reduced the capabilities of units at the airfields until these issues could be resolved.

The logistics services issues identified at LZ2 indicate a lack of storage and sustainment capacity for the growing population at the airfield. Most initial base support and sustainment needs were met within the first few weeks, but the increased number of personnel deploying to the airfield and the growing demands for fuel to support airfield development outpaced the storage and sustainment capacity. Unlike LZ1, a "gatekeeper" for deploying personnel was not successfully implemented at the originating end, creating further challenges for bed down and hygiene support at LZ2. Ultimately, storage and sustainment capabilities were prioritized accordingly and subject to distribution limitations similar to the other logistics issues identified.

Lastly, the maintenance challenges resulted from limited capacity to deploy with tool kits and spare parts. The maintainers at each location deployed with a kit for the "most likely" mechanical scenarios, based upon the types of vehicles their units would

take with them. In austere environments, there is little ability to set up maintenance bays with heavy machinery, therefore a light field maintenance kit with a limited supply of spare parts is required. Again, the timelines associated with shipping parts to these locations exceeded planning expectations, therefore, some vehicles were taken "off line" until appropriate tools and parts could be sourced and delivered.

Research Question 2

While not considered traditional military "best practices", the themes extracted from the documents are no less important to the success of the OIR airfield openings. The study found that best practices annotated by units at the airfields were: relationships, ingenuity, and leadership decisions. There should be little surprise as to why these best practices were listed. Relationships connect people and provide the opportunity for both pooled resources, increased communication, and a wider security network. Relationships at both LZ1 and LZ2 enabled service members to bridge the communication and cultural gaps between services, share equipment, support emergency medical requests, and attain the level of trust required when working in an austere, semi-permissive environment.

Ingenuity described the creativity and resourcefulness of service members solving problems with limited resources. Cultivating an environment where service members can be creative (legally and in support of the mission), enables warfighting to continue when resources become scarce. Ingenuity was used at LZ1 for resource procurement and to overcome communication barriers, enabling the mission to continue despite setbacks. Leadership decisions comes down to understanding the unit's problems and being involved in the unit's decision-making solutions. Leadership decisions on the right

equipment, the right number and right mix of personnel at both LZ1 and LZ2 ensured the success of operations. Units lacking involved leaders rarely achieve their full potential, particularly in austere environments where units are vulnerable and resources are extremely limited.

Relationships, leadership decisions, and ingenuity are not new to military operations. Quite simply, they represent ways in which services members navigate the challenges of limited resourcing. So long as militaries have limited resources, they will find ways to overcome those challenges to ensure operational success. In the end, leadership involvement ensures that relationships and ingenuity are in line with service values and support the needs of the organization and the mission. By encouraging healthy relationships and creativity, military organizations are more likely to succeed, and remain agile and adaptable as the mission dictates. These practices will remain critical to units supporting airfield opening operations in future contingency operations.

Recommendations Summary

In the Falklands War case study, commanders and logisticians faced challenges with controlling the flow of personnel and equipment into newly established airfields, language and cultural barriers between services, and prioritization of cargo and transportation resources. In the OIF and OEF case studies, problems existed between command and control of airfield opening forces, prioritization of resources between BOS-I and SAA, poorly equipped forces, and a lack of joint doctrine to guide services throughout the airfield opening process. In the two OIR case studies, joint doctrine was better articulated but still disjointed, supply challenges continued to exist, cultural

differences in services remained, the flow of cargo and personnel was better managed in one location but not both, and prioritization of cargo and transportation assets continued to be a major factor for both locations.

The root cause of the challenges listed above is simply a lack of resources. Logistics is a way to acquire, account for, manage, move, and reallocate limited resources to meet the priorities of the commanders on the battlefield. When several services with their own cultures, missions, and limited resources are involved, tension, confusion, and miscommunication over how to move these resources (when, where, and to who) are bound to exist. In the modern era, airfields are rarely opened by a single service, therefore, sharing a common understanding of logistics and necessity are paramount. The services must get better at operating jointly, particularly when it comes to logistics. This is achieved through clear, standardized guidance, and integration or fusion of airfield opening capabilities.

Recommendations for Action

Austere airfield and airbase opening logistics can be complex, dangerous, and demanding, as the risks associated with opening any new location in a crisis or contingency environment are high. Eighteen years of steady-state operations conducted in support of OIF and OEF have forced logisticians to 'relearn' building and operating contingency locations from the ground up. The two airfield openings in 2016 validated that joint doctrine exists and is relevant to current operations, but is often dispersed amongst various publications designed for different audiences, making it a "piecemeal" endeavor to locate information.

Joint logistics doctrine for austere airfield and base openings should be contained in one document. It can be an existing document within the JP 4-0 series, MSTTP-like publication, or in its own separate document. Similar to SOF's "non-standard logistics" concept, austere logistics requires the logistician to create processes that do not exist at their location. This includes securing sustainment and supplies (at times locally), understanding resupply and reachback responsibilities, the complexities of loading and unloading all forms of transportation, airdrops and rotary wing resupply as a means of sustainment, knowing the logistical requirements to operate a base, and understanding the capabilities their joint partners bring to the fight. It would be beneficial to have one manual or publication dedicated to this endeavor.

Similarly, the services must learn how to operate together when opening airfields before they arrive in theater. Given both Army units were retasked to support the airfield buildouts, their pre-deployment training did not include supporting the CRGs. Likewise, the CRGs were deployed rapidly, having limited contact with the Army units they would be working with until after they arrived. The lack of communication and common operating picture between the services undoubtably led to tension, confusion, and mission degradation that could have been avoided. This is where the concept of the Joint Task Force Port Opening (JTF-PO) capability is beneficial.

The JP 4-0 states that the "JTF-PO is designed to be in place in advance of a deployed force, sustainment, or humanitarian/relief supplies. It provides the supported GCC with a rapid assessment of potential APODs/SPODs and their associated distribution infrastructures to facilitate crisis response in established or austere environments" (JP 4-0, 2019, pg III-14). While consolidating the various service airfield

opening capabilities under one joint force provider is bound to be met with resistance, it would ensure that deploying units were integrated, trained, and equipped well before the deployment occurred. As shown at LZ2, service liaisons streamline the integration of organizations once deployed, but they are not as beneficial as joint units that have trained together and deploy together into a semi-permissive or non-permissive environment.

Lastly, the US military as a whole is actively developing dynamic and rapidly deployable basing solutions for future airfields in near-peer competition environments. This is a significant and much needed capability. Even now, the services are developing their own answers to the dynamic basing problem, crafting solutions within their own communities. Unfortunately, this may not answer the problem of joint logistics. It is debatable whether this will answer the real-world problem of airfield openings, because the OIR examples show that a single service rarely opens an airfield alone.

A more useful approach is a collective initiative to develop joint airfield opening capabilities together. This includes creating specialized forces to complement each services tasks during airfield opening, rather than creating duplicate forces with duplicate equipment for the same purpose. Logistically, this could include pooling resources (tents, vehicles, maintenance equipment and funding), while creating unique logistics specialties from each service to "plug and play" into a joint airfield opening initiative. Without this "jointness", each service puts time, manpower, and funding into creating its own capability, draining funds and duplicating resources in an already resource constrained environment. If the services dedicated dynamic basing and airfield opening manpower and resources to a collective solution, the outcomes would provide a more realistic answer to a problem that logisticians will face in the very near future.

Recommendations for Future Research

This study has shown where joint logistics doctrine can improve utilizing analysis from the recent OIR airfield openings and previous case study examples. In addition, the study identified logistics functions where improvement could be made in future airfield opening scenarios. The main area of focus is joint logistics, and how logistics can be made better in contingency operations. This could be process-based, training-based, or doctrine and policy focused. Future research topics could include development of joint logistics doctrine for austere airfield openings, analyzing the nature and structure of joint logistics training for austere operations, or reviewing the concept of consolidating service airfield opening capabilities under a single joint organization. Regardless, logisticians must continue to look at training, logistics constructs, and process development within the joint environment, and continually assess how to make the community better prepared for operating in contingency environments.

Conclusion

Similar to the Falklands War and OIF and OEF, OIR was successfully built on the foundations of flexible and rapidly adapting logistics. In OIR, this included establishing two airfields quickly, in locations both dangerous and austere, far from traditional support lines and resupply hubs. Both airfield openings were successful and enabled the seizure of OIR's two most important military objectives. Regardless of the improvements that could be made to logistics processes at or supporting the airfields, there is no denying that what the men and women did in support of this vital mission was nothing short of exemplary. Their ingenuity, leadership, cooperation, and determination ensured success

throughout a vulnerable time and rapidly changing battlefield landscape. Both airfields played a pivotal role in the defeat of ISIS, and have helped to curb terrorism in the greater Middle East. The lessons learned from these two airfields will be crucial as the United States military adapts and expands its future airfield opening capabilities.

AUSTERE AIRFIELD LOGISTICS: LESSONS LEARNED FROM OPERATION INHERENT RESOLVE

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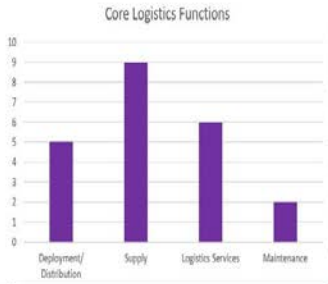
Abstract

This paper examines the joint logistics practices conducted at two recent airfield openings in support of Operation INHERENT RESOLVE (OIR). The researcher assesses real-world semi-permissive openings against recently updated joint doctrine in order to determine whether the doctrine is adequate for current contingency environments. In addition, the researcher looks to identify best practices that emerged from the airfield openings in order to capture and replicate the practices for future operations. The purpose of this research is to analyze logistics practices during the first thirty days of the airfield opening operations, with the goal of improving joint logistics processes for future airfield openings in semi-permissive and non-permissive environments. The end state is to assess current joint doctrine, identify lessons learned and best practices, and impart those findings to the logistics community for future joint airfield openings in support of combat operations.

Analysis, Conclusions, and Recommendations

Core Logistics Functions	Unit	Location
Deployment/Distribution		
Movement of forces limited by transportation assets	FLE	LZ2
Slow equipment arrival to location (90 days)	FLE	LZ2
30 day shipment timeline for spare vehicle parts	CRG	LZ1
Delays due to tactical level airlift coordination requirement	CRG	LZ1
Movement of equipment limited by transportation assets	SOF	LZ2
Supply		
Insufficient access to prepositioned stocks	FLE	LZ2
Night Vision Goggles outdated	CRG	LZ1
AFCENT WRM vehicles had no MSK kit	CRG	LZ1
Lack of Supply UTC and limited bench stock available	CRG	LZ1
BOS-I lacked enough MHE for camp support/buildout	CRG	LZ2
Uniforms/personal gear did not meet requirements	CRG	LZ2
Combat gear (NVGs/IOTV/helmets) outdated	CRG	LZ2
AFCENT Security Forces personnel lacked cold weather gear	SOF	LZ2
Insufficient vehicles for daily camp operations	SOF	LZ2
Logistics Services		
Lack of fuel storage for mission support	FLE	LZ2
Lack of building materials (wood/screws/etc) for tents	FLE	LZ2
BOS-I responsibility confusion and BOS-I deployment delay	SOF	LZ2
Camp growth outpaced camp housing/hygiene capabilities	CRG	LZ2
Lack of cold food storage at location	SOF	LZ2
Lack of food heating capabilities at location	SOF	LZ2
Maintenance		
Lack of Vehicle Maintenance UTC and tools for mission	CRG	LZ1
Lack of Vehicle Maintenance tools for mission	SOF	LZ2

Best Practices	Unit	Location
Relationships		
Good cooperation between units	SOF	LZ2
Exercised external relationships to support location	SOF	LZ2
Spirit of Cooperation amongst units	FLE	LZ2
Shared Resources at location	CRG	LZ2
Utilized peer relationships	CRG	LZ1
Utilized relationships w/higher headquarters	CRG	LZ1
Resources shared between AF/Army	CRG	LZ1
Leadership Decisions		
Selected the right team for the job	SOF	LZ2
Selected socially adept leaders for deployment	FLE	LZ2
Good decisions on pax/resource deployments	BOS-I	LZ1
Smart decisions on gear prior to deployment	CRG	LZ1
Selected right person for job (maintenance)	CRG	LZ1
Ingenuity		
Utilized locally procured tools/equipment	CRG	LZ1
Created alternate comm signals when comms went out	CRG	LZ1
Repurposed barriers/material for camp construction	CRG	LZ1



Methodology

This research was a qualitative analysis using the compare-and-contrast case study method. The study analyzed two airfield openings in 2016 (identified as LZ1 and LZ2), assessing logistics practices at both locations in order to validate current joint logistics doctrine. The study took the two OIR case studies and compared them to the four core logistics functions from Joint Publication 4-0 (deployment and distribution, supply, logistics services, and vehicle maintenance), in order to assess which practices were effective and which were not. In addition, the researcher culled best practices from the data in order to capture and share these best practices with the future logisticians. These issues and best practices were extrapolated from after action reports, questionnaires, and personal observation from five organizations.

For this study, the researcher created four bins for logistics issues. In total, 22 logistics issues were identified. The researcher also created 3 bins for best practices. In total, 15 best practices were identified. The information provided showed supply as the primary logistics issue and relationships as the main best practice identified from the data.

Future Research

This study has shown where joint logistics doctrine can improve utilizing analysis from the recent OIR airfield openings and previous case study examples. In addition, the study identified logistics functions where improvement could be made in future airfield opening scenarios. The main area of focus is joint logistics, and how logistics can be made better in contingency operations. This could be process-based, training-based, or doctrine and policy focused. Future research topics could include development of joint logistics doctrine for austere airfield openings, analyzing the nature and structure of joint logistics training for austere operations, or reviewing the concept of consolidating service airfield opening capabilities under a single joint organization. Regardless, logisticians must continue to look at training, logistics constructs, and process development within the joint environment, and continually assess how to make the community better prepared for operating in contingency environments.

Collaboration

AIR FORCE INSTITUTE of TECHNOLOGY

Significance

The gap in real-world examples between OIF/OEF and OIR made validating joint logistics doctrine for airfield openings difficult. The two airfield openings in 2016 validated that joint logistics doctrine exists and is relevant to current operations, but is often dispersed amongst various publications designed for different audiences. This research offers recommendations for future airfield openings, including creating a single document for joint logistics for airfield openings and increased joint training and integration between services as they prepare for future contingency operations.

Appendix B. Logistics Questionnaire

Purpose/Introduction

Thank you for taking the time to participate in this questionnaire. You were specifically selected as a possible participant in this study because of your experiences working at or in support of airfield opening operations. The main purpose of this study is to gain a better understanding of the logistics practices that occurred during the contingency airfield openings in 2016. The questionnaire takes about 15 minutes to complete. If you have any questions about the survey, please feel free to email: jessica.stewart@us.af.mil

You should read the information below.

- This questionnaire is voluntary. You have the right to not respond to any question. You may also end participation at any time without penalty.

- There is no compensation for this questionnaire.

- All information provided will remain confidential.

- Data collection for this project will be completed by April 2019. All questionnaire documents will be stored in a secure work space until 1 year after that date. The documents will then be destroyed.

- The data you provide will be compiled with an accompanying analysis by the summer. If you would like a copy of this report, please email jessica.stewart@us.af.mil with your request.

Click "Next" if you understand the procedures described above and agree to participate in this study.

1) How was your unit tasked to provide BOS-I and when? What mission where you tasked with?

2) How was it decided your unit was the best logistics organization for the mission?

3) How many personnel were tasked? What was their deployment timeline?

4) How did your team arrive in theater? How was that deployment arranged?

5) What was your unit's assigned duties/responsibilities?

6) Did your personnel deploy with all requisite supplies and equipment?

7) Did you have any shortfalls in personnel or equipment, before and/or during the first 30 days?

8) Did you know what a Contingency Response Group was before you arrived, or who you would be supporting?

9) Did you have joint training prior to this deployment? If so, what kind?

10) What logistics issues did you experience while deployed (specifically within the first 30 days)?

11) What lessons learned, if any, did you and your team garner from your experiences?

12) What best practices, if any, did you and your team observe during your deployment? When did these best practices occur?

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Respondent 4 (Questionnaire). Brigade Engineer Battalion Deployed S4. 28 February 2019.

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Respondent 7 (Personal Observation). Special Operations Forces Team Officer in Charge. 2016.

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14. ABSTRACT

This paper examines the joint logistics practices conducted at two recent airfield openings in support of Operation INHERENT RESOLVE (OIR). The researcher attempts to assess real-world semi-permissive openings against recently updated joint doctrine in order to determine whether the doctrine is adequate for current contingency environments. In addition, the researcher looks to identify best practices that emerged from the airfield openings in an attempt to capture and replicate the practices for future operations. The purpose of this research is to analyze logistics practices during the first thirty days of the airfield opening operations, in order to improve joint logistics processes for future airfield openings in semi-permissive and non-permissive environments. The end state is to assess current joint doctrine, identify lessons learned and best practices, ands impart those findings to the logistics community for future joint airfield openings in support of combat operations.

15. SUBJECT TERMS

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