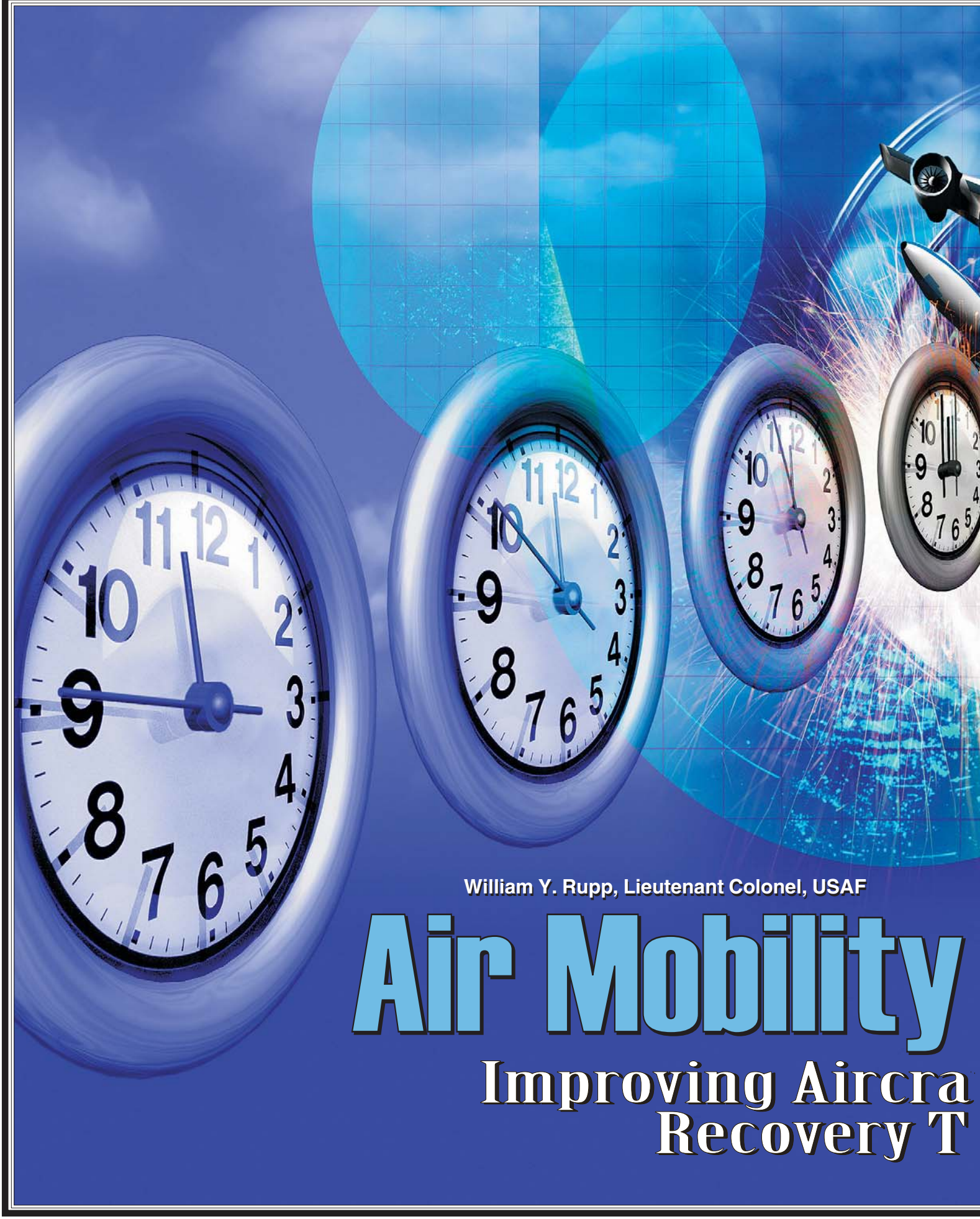

William Y. Rupp, Lieutenant Colonel, USAF

Air Mobility

Improving Aircra
Recovery T

Command

ft Maintenance
eam Processes

Introduction

The United States' (US) civilian and military leaders well recognize the need for speed in prosecuting military operations. The 2006 Quadrennial Defense Review places particular "emphasis on the ability to surge quickly to trouble spots across the globe."[1] This requirement is a testament to the position of America as the sole superpower, as well as a reflection of its willingness to engage around the world. Whether it's involved in a protracted military struggle, supporting other nations in pursuing democratic principles, or conducting humanitarian operations, the United States has the ability to quickly reach out and take the lead in world affairs. But speed is not the sole enabler of military power. In a 2001 speech, President George W. Bush noted that, "Military power is increasingly defined not by size and mass but by mobility and swiftness."[2]

Special Feature

The President's statement highlights that, in addition to bringing military capabilities swiftly to bear, the instruments themselves must be sufficiently mobile to make the transition from any starting location to any point of employment. Mobility of military assets is the responsibility of the United States Transportation Command (USTRANSCOM), whose stated mission is to "provide air, land and sea transportation for the Department of Defense (DoD), both in time of peace and time of war."[3] The Air Force plays a critical role in support of USTRANSCOM, defining rapid global mobility or, "the timely movement, positioning, and sustainment of military forces and capabilities through air and space, across the range of military operations," as a capability unique to the air service.[4] Air Mobility Command (AMC) and its airlift aircraft fill this role on behalf of the Air Force.

Given the significance of AMC's role in rapid global mobility—not just for the Air Force but for the entire DoD—the United States cannot afford to lose any of its strategic airlift capability. For research purposes, this article narrowly defines lost strategic airlift capability as any of the two aircraft types comprising AMC's strategic airlift fleet (namely the C-5 Galaxy and the C-17 Globemaster III) that are broken and away from their station of assignment. To repair these aircraft when broken within *the system*, AMC currently utilizes a dedicated system of command and control, people, parts, and equipment—some of which are prepositioned, and some of which are available on an as-needed basis. Known as the Maintenance Recovery Team (MRT) process, the system emphasizes identifying, troubleshooting, and fixing broken aircraft as quickly as possible, in order to maximize strategic airlift availability to DoD and other airlift customers.

With this in mind, this article will discuss AMC's strategic airlift role, identify AMC's MRT process, analyze

Article Highlights

Strategic airlift, now and for the foreseeable future, provides critical capabilities vital to our national interests. It is, therefore, incumbent upon the Air Force, and specifically Air Mobility Command, to work toward minimizing the amount of time our C-5s and C-17s remain broken within the airlift system.

While the current maintenance recovery team (MRT) process ensures airlifters broken away from home station are eventually repaired and put back into service (and arguably does so effectively), there is little evidence that much is done outside the normal manpower and parts placement systems to systematically analyze and improve the overall MRT process. In order to more effectively minimize strategic airlifter downtime, the Air Mobility Command (AMC) must implement analytical procedures specific to the MRT process itself, beginning with the sizing, sourcing, and tasking subprocesses. The current mechanism for reviewing and assessing historical data, the Global Decision Support System 2 (GDSS 2) database, as configured and utilized, is largely ineffective at meeting the analytical need.

In order to improve the MRT process, logistics personnel must first have access to sufficient and specific data enabling them to target areas for improvement. Currently, the only way to focus any analytical effort is to perform a painstaking, time-consuming review of each individual aircraft recovery record, a method so inefficient as to be essentially worthless. AMC must implement three AMC's historical MRT data for specific improvement opportunities, and where possible, recommend improvements leading to an increase in the efficiency of AMC's MRT process.

Background

Air Mobility Command

> The National Defense and Military Strategies call for rotating land forces in peacetime from the United States to Europe, Africa, the Middle East, and elsewhere for 4- to 5-month deployments to maintain that access and provide deterrence. Therefore, **strategic mobility is, as never before, a national imperative.**[5] [Emphasis in original.]

While strategic mobility has become the cornerstone of US global engagement, to be most effective in promoting peace and deterring aggression, mobility must also include swiftness. When the military speaks of rapid global mobility (with respect to cargo movement), the term is generally synonymous with strategic airlift. While it is true that the vast majority of DoD cargo moves by sea, it does not do so rapidly.[6] While sealift provides the preponderance of cargo movement, airlift offers the United States and its allies the speed and flexibility to move assets where needed in a timely manner. As the air arm of USTRANSCOM, AMC is the command of choice for moving cargo rapidly.[7]

The Air Force's cargo airlift mission is generally broken down into two main categories: intratheater and intertheater. Intratheater airlift, generally synonymous with tactical airlift, describes cargo movement within a theater of operations, and comprises such characteristics as relatively close range, smaller and lighter payloads to sustain units deployed within a theater, and the ability to operate on unimproved surfaces and utilize shorter lengths of runway.[8] Intratheater airlifters are generally controlled by their respective combatant commands to support the theater's cargo movement requirements. Despite the tremendous role intratheater airlift assets play in global mobility, the vast majority of requirements are logistically supported by and within their theater of assignment. This article will focus on maintenance recovery of intertheater airlift assets.

Intertheater airlift, synonymous with strategic airlift, refers to air movement of cargo between geographical theaters of operation and comprises such characteristics as size of the aircraft, range, and payload capacity. Because of the high demand and the need to prioritize use of these crucial assets, the National Command Authority apportions strategic airlift aircraft among the Services and other forces.[9]

The two strategic airlift aircraft operated by the US Air Force are the C-5 Galaxy and the C-17 Globemaster III. With regard to capacity, these are the only two aircraft in the inventory capable of transporting outsized cargo,[10] such as the Army's Abrams tank.[11] Differing from commercial aircraft with similar cargo capacity (such as the Boeing 747), C-5s and C-17s have air refueling capability and are designed to operate in ground conditions not normally conducive to commercial aircraft operations. When augmented with air refueling, strategic airlift aircraft provide practically unlimited global reach. It is the strategic airlifters' swiftness, mobility, and unique capabilities that make them key components of national security.

Central to any discussion on improving AMC's MRT process is understanding the two primary methods for strategic airlift cargo movement, the first being the hub and spoke concept, and

the second being direct delivery. In the hub and spoke concept, cargo is loaded on a strategic airlift asset at one of several aerial ports of embarkation and delivered to a centralized main operating location, or aerial ports of debarkation (APOD). The cargo is then distributed via intratheater assets to various forward operating bases (FOB) within the theater. The APODs are considered the hubs, the FOBs the spokes.[12] One advantage of hub and spoke operations is that, similar to commercial airlines, the aircraft operate in and out of dedicated locations, allowing for prepositioning of command and control, cargo handling equipment, and maintenance capabilities to support transiting aircraft.

When performing the second method of cargo movement, direct delivery, strategic airlifters overfly the APOD and deliver cargo straight to (or closer to) its final destination. A potential advantage to direct delivery is timeliness, with cargo arriving at its final destination significantly quicker than it would take to download, repackage, and deliver via intratheater means. However, due to the need to centralize and synergize efforts at cargo hubs, final destinations often do not retain the assets to fully support transiting strategic airlift assets, a distinct disadvantage.[13] For purposes of this article, this translates to an inability to effectively repair a broken aircraft. Before delving into specific discussions on more effectively supporting aircraft recovery efforts, this article must first identify AMC's current process for repairing strategic airlift aircraft broken in the system.

Global Air Mobility Support System

The Air Force attempts to minimize delays in its cargo delivery process through establishment and utilization of the Global Air Mobility Support System (GAMSS). GAMSS combines those functions essential to effective air cargo operations—command and control, aerial port, and maintenance—located in both the continental United States (CONUS) and outside the continental United States (OCONUS).[14] With respect to strategic air mobility, two contingency response wings, one at Travis Air Force Base (AFB) and one at McGuire AFB, constitute the bulk of the fixed active duty CONUS portion of GAMSS. Additionally, Air Reserve Component strategic airlift units located throughout the CONUS provide a significant amount of capability. AMC also operates key OCONUS locations as part of its fixed en route structure, all with varying degrees of aircraft maintenance capability.[15] See Figure 1 for the current GAMSS layout.

The en route locations serve two basic purposes with respect to strategic airlift. First, they act as APODs, often filling the role of the hub at which cargo is downloaded to be distributed to spokes throughout the rest of the theater. Second, and more importantly, they provide varying degrees of indigenous aircraft maintenance capability, with skilled technicians, tools, equipment, and parts to repair broken aircraft. Their existence ensures the continual flow of cargo from CONUS to OCONUS destinations—most importantly to downrange wartime locations—by minimizing the potential for cargo to be held up in the system or for aircraft to have to return to CONUS for maintenance repairs.

However, not all en route locations are equal in size and capability. En routes with higher numbers of transiting aircraft earn more manpower positions with a wider range of skill sets. Similarly, fiscal realities and parts availability necessarily limit the type and quantity of spares, with parts allocated to en route locations based on historic throughput and demand for individual components to effect repairs. Stations serving as regional hubs generally see more

Article Highlights

actions if it is to begin gathering the data to improve the aircraft recovery process. First, it must correct data input and access issues with currently existing data fields in GDSS 2. Second, in order to effectively target process improvement efforts, the Logistics Control Section, Tanker Airlift Control Center (XOCL) should work with system programmers to add specific data fields within GDSS 2 to account for the varied MRT subprocesses. Third, XOCL should develop and track basic time standards for the overall MRT process and its individual subprocesses. This will allow researchers to focus on those events having adverse impacts on aircraft recovery. While these recommendations are neither groundbreaking nor terribly exciting, they are necessary to begin the evaluation and improvement process.

Article Acronyms

AB – Air Base
AFB – Air Force Base
AMC – Air Mobility Command
APOD – Aerial Port of Debarkation
CONUS – Continental United States
DoD – Department of Defense
FCC – Flying Crew Chief
FOB – Forward Operating Base
GDSS 2 – Global Decision Support System 2
LOC ICAO – Location International Civil Aviation Organization (data field)
LRC – Logistics Readiness Center
LSC – Logistics Support Center
MAF – Mobility Air Forces
MILAIR – Military Aircraft
MOC – Maintenance Operations Center
MRT – Maintenance Recovery Team
OCONUS – Outside Continental United States
TACC – Tanker Airlift Control Center
US – United States
USTRANSCOM – United States Transportation Command
XOCL – Logistics Control Section, Tanker Airlift Control Center

Figure 1. AMC/TACC and MAF/LSC Global Air Mobility Support System Locations

transiting aircraft and, therefore, retain greater variety and quantity of supply items. Examples of regional strategic airlift hubs include Ramstein Air Base in Germany and Yokota Air Base in Japan, each with sufficient numbers of transient C-5s and C-17s to warrant forward deployment of such unique items as spare aircraft engines. Smaller en routes with less air traffic do not. As robust and effective as the GAMSS is, however, strategic airlift aircraft are often called upon to support mobility requirements outside the established system.

Part of the uniqueness of the Air Force's strategic airlift fleet is that the aircraft do not simply fly the same established routes day-in and day-out as do commercial passenger and cargo carriers. AMC is on call to support requests to carry cargo around the globe. Whether in support of DoD operations, State Department requirements, or helping free *Willy the Whale*,[16] C-5s and C-17s go to many locations around the world without organic aircraft maintenance capability. Making this even more of a challenge, unique aircraft systems and their associated maintenance requirements render support from non-US Air Force sources essentially nonexistent. In contrast, because Air Force aerial refueling aircraft are basically commercial derivatives (the KC-10 is the same basic airframe as the Boeing DC-10,[17] and the KC-135 is the same basic airframe as the Boeing 707[18]) support for those military aircraft is often available from commercial airline maintenance counterparts at non-AMC locations.

The need to utilize strategic airlifters worldwide and their unique capabilities in payload and *off-road* characteristics, combined with their airframe uniqueness in the world of aviation, makes them virtually unsupportable outside of AMC. Unfortunately, when the aircraft are broken they are not carrying out their cargo missions—enter the Tanker Airlift Control Center (TACC).

Tanker Airlift Control Center

The TACC is AMC's global air operations center, with responsibility for planning, scheduling, and tracking aircraft in support of strategic airlift and other AMC missions worldwide. The organization ensures centralized control of scarce strategic aircraft by validating customer airlift requirements, linking them with available airlift assets, and directing and tracking mission execution.[19] A significant aspect of tracking air mobility operations is identifying aircraft that are unable to perform their missions due to maintenance problems.

XOCL

Given the tremendous importance of strategic airlift to the DoD and other government agencies, centrally controlling the aircraft maintenance recovery function is a high priority for AMC. The Logistics Control section within the TACC, otherwise known as XOCL, is the command's focal point for sourcing and tasking the appropriate maintenance personnel, parts, and equipment needed to repair aircraft broken in the system while performing AMC missions. To most effectively manage maintenance recovery operations, XOCL oversees three primary components of the MRT process:

- Identify not mission capable aircraft
- Size, source, and task resources to effect repairs
- Oversee and effect repairs

As AMC's 24-hour command and control function, the TACC retains near real-time visibility of all aircraft performing missions for the command. "Successful and expedient recovery of [maintenance] delayed aircraft depends upon accurate and timely communication between field personnel and XOCL."[20] At fixed AMC locations, CONUS or OCONUS, the maintenance operations center (MOC) notifies XOCL of aircraft status and, if needed, identifies resources required to accomplish repairs. When broken at locations outside of GAMSS, responsibility for notifying XOCL falls to the mission aircrew.[21] While the aircraft commander retains overall responsibility, the crew's flight engineers and, in the case of the C-5, flying crew chief (FCC), provide general maintenance expertise while away from GAMSS locations.

Sizing the Requirement

Once notified of an aircraft requiring logistics support, XOCL begins to size, source, and task resources to effect repairs. Broken aircraft generally require three types of assistance—parts only, experienced maintenance personnel, or specialized tools or equipment—and support often requires a combination of the three. In sizing the required amount of support, XOCL works with the most knowledgeable person at the broken aircraft's location. GAMSS locations and forward deployed air bases are generally staffed with qualified maintenance technicians who are capable of troubleshooting aircraft malfunctions to the parts and equipment necessary to effect repairs. In those cases the MOC, or deployed equivalent, notifies XOCL with specific parts nomenclature, quantity, and other personnel or equipment items necessary to repair the broken aircraft. At all other locations without experienced maintenance technicians, the aircrew or FCC identifies the required resources. When the nature of a malfunction is such that neither the GAMSS location nor the aircrew or FCC can identify the solution, XOCL either solely or

in conjunction with personnel at the aircraft's location, communicates the nature of the problem to home station maintenance experts. Together they determine what is necessary to recover the broken aircraft.

Sourcing the Requirement

After sizing the requirement, XOCL then determines the source of parts, people, or equipment to most effectively accomplish repairs. When aircraft parts are required, XOCL works directly with the Mobility Air Forces (MAF) Logistics Support Center (LSC) to locate assets in the supply system.[22] The MAF LSC, collocated with XOCL at Scott Air Force Base, serves as AMC's centralized supply command and control function. With visibility over all aircraft parts in the AMC supply system, at XOCL's request the MAF LSC locates and directs shipment of parts based on recovery location and available transportation.

When maintenance technicians and equipment are required, XOCL generally sources them from one of the GAMSS locations with primary responsibility for the affected aircraft type. The en routes generally have sufficient resources to respond to MRT requests and, being forward deployed, they often offer the advantage of more timely support. However, the nature of the aircraft discrepancy is often such that the depth of experience required to troubleshoot and repair the broken aircraft must come from more knowledgeable home station technicians. Similarly, there may be insufficient specialized maintenance equipment resident in the en route system, necessitating that XOCL source the items from the better-equipped home stations. In every case, timeliness is a key consideration in sourcing an MRT.

Transportation

While it is understood that safety is always the overriding concern, the single most important factor in the MRT process is speed. As previously noted, the strategic airlift fleet is critical to the nation's defense. Aircraft broken in the system are not only unable to get their current cargo loads to the required destinations, they are also unavailable to provide timely support to future airlift taskings. XOCL works to mitigate the impact of broken aircraft by sourcing the fastest available support. Within reason, cost and other factors are considered, but priority is generally given to earliest possible recovery.[23] Given the need for speed, providing resources usually becomes a factor of available transportation.

Because resources and transportation often coincide at GAMSS locations, military aircraft (MILAIR) are a primary source of MRT support.[24] Using AMC's command and control database, the Global Decision Support System 2 (GDSS 2), XOCL identifies all existing and scheduled AMC flights into the broken aircraft's location, and then determines whether or not required resources can be collected and loaded on, or transported to meet up with, one of those aircraft. Depending on the mission priorities of both the broken aircraft and the potential support aircraft, the latter may be delayed or rescheduled to accommodate the MRT process. If currently scheduled AMC mission aircraft do not transit the broken aircraft's location or if they are not expeditious enough, XOCL pursues other means of supporting the MRT.

Due to the seemingly ubiquitous nature of commercial transportation, airlines and commercial cargo (such as FedEx or UPS) and passenger (such as United) carriers are often the most effective means to facilitate an MRT. XOCL is authorized to direct movement of recovery assets via these methods. Working with transportation management flight personnel at the sourced location, and in coordination with the aircrew and maintainers at the broken aircraft's location, XOCL coordinates passenger tickets on airlines, or parts and equipment shipment via commercial air or ground transportation, as required to expedite repairs.[25] There are, however, situations where commercial transportation is unable to meet MRT requirements. Recoveries with sizable logistics parts or equipment needs (for example, when an aircraft engine must be replaced), MRTs for items incompatible with commercial transport (explosives or other hazardous materials), or support requests to locations not serviced by commercial carriers must necessarily be facilitated via indigenous means.

A third option available to the TACC for supporting aircraft broken away from home station is to divert or schedule an AMC aircraft for the sole purpose of supporting the MRT. The advantages of using indigenous aircraft include sufficient capacity to transport large recovery packages, access to locations unserviceable by commercial means, control over such factors as sourcing and timing, and the ability to move cargo from the broken to the recovery aircraft in order to keep the mission moving. Disadvantages include the significant cost to operate an AMC aircraft, lost ability of the recovery asset to perform other missions, and the potential for the recovery aircraft to break while supporting the MRT. A careful risk or benefit assessment is always necessary when determining how to best recover strategic airlifters broken away from home station.

Analysis

Having identified the importance of timely and effective mobility of DoD and other US assets, how AMC contributes air mobility in support of USTRANSCOM, how the TACC oversees employment of C-5s and C-17s, and XOCL's significant role in keeping strategic airlifters moving through the system, this article will now analyze XOCL's process for identifying, tracking, and recovering these aircraft with an eye toward identifying potential improvements and efficiencies.

GDSS 2

AMC utilizes GDSS 2 as its centralized database for commanding and controlling aircraft. Implemented in 2004, the system provides unit- and headquarters-level managers with visibility over all MAF airlift and mobility missions from plan to task to execution.[26] As part of its integrated design, GDSS 2 includes a logistics application which allows XOCL personnel to track MRT data. Once notified by GAMSS or aircrew personnel of a C-5 or C-17 broken in the system, XOCL controllers track the aircraft by inputting into GDSS 2 specific associated factors, such as aircraft tail number, location, nature of the discrepancy, and others to include a running sequence of events detailing specific actions as they transpire from initial notification to final resolution (including the return of recovery personnel, parts, and equipment to their stations of origin). The flexibility of the system allows XOCL controllers to retain real-time visibility and to update each individual record across shift changes and over the course of several days or weeks of individual aircraft recovery operations.

More than just a system for tracking current operations, the logistics feature of GDSS 2 enables those with access to review historical aircraft recovery data, whether for purposes of recalling

Heading	Description
C-5 Tail Number	Aircraft tail number
GDSS Location	Where the aircraft broke according to GDSS 2
Actual Location	Where the aircraft actually broke according to the verbiage in the remarks section of each aircraft's historical record
Pacing Correct	Whether or not the GDSS 2 pacing data field contained correct data
Sourcing Tasked	Amount of time from when XOCL was notified of a discrepancy until XOCL tasked sourcing of recovery assets **Note: All time is in minutes**
Percent	Percentage of sourcing tasked time to overall downtime (Total time [GDSS])
Sourcing Complete	Amount of time from when XOCL tasked sourcing until sourcing was complete
Percent	Percentage of sourcing time to overall downtime (Total time [GDSS])
Trans Tasked	Amount of time from when sourcing was complete until XOCL tasked or identified transportation for the MRT
Percent	Percentage of Trans tasked time to overall downtime (Total time [GDSS])
Trans Arrived	Amount of time from when XOCL tasked/identified transportation until the MRT assets arrived at the actual location
Percent	Percentage of Trans arrived time to overall downtime (Total time [GDSS])
Mx Complete	Amount of time from when MRT assets arrived at the actual location until maintenance notified XOCL the aircraft was fixed
Percent	Percentage of Mx complete time to overall downtime (Total time [GDSS])
Total Time	Amount of time from when XOCL was notified of the first maintenance discrepancy until maintenance notified XOCL the aircraft was fixed (reflects actual downtime according to each Master Record remarks section)
Total Time (GDSS)	Amount of time from BREAK DTG to FIX DTG according to GDSS II LOGISTICS SUPPORT TOOL HISTORICAL TASKINGS data run for Jul 07 (erroneously reflects downtime)

Table 1. GDSS Report Headings and Definitions

specific issues or to facilitate analysis for process improvement. AMC appears to utilize GDSS 2 relatively infrequently in the latter capacity, at least with respect to identifying improvements specific to the MRT process. Several reasons may explain this lack of utilization.

First, the command has an existing process for determining maintenance and supply requirements for both home stations and for the en route system. Manpower and maintenance skill sets are apportioned based on aircraft workload (number of aircraft assigned to home stations and number of aircraft transiting en route locations). In other words, maintainers are stationed where the aircraft normally go. MRTs, on the other hand, are theoretically developed to support aircraft broken at locations outside the GAMSS, which are by definition, places where AMC does not anticipate the need for permanent or long-term support. While it is true a significant number of MRTs support requirements at GAMSS locations, their maintenance manpower requirements have already been factored in and risk accepted for those instances when specific skill sets have either been limited or have not been assigned. One example is fuel systems maintenance capability in the en route system. Of the AMC en route locations in Europe, only one (Ramstein Air Base) has permanently assigned fuels maintenance technicians qualified to work on C-5s and C-17s.[27] AMC banks on the infrequency of fuels-related discrepancies and accepts the risk that any aircraft that develop them will either relocate to Ramstein AB for repairs or that an MRT will be required. Given the less than permanent nature of MRTs, one does not expect historical GDSS 2 data related to aircraft recoveries to be particularly useful in determining permanent manpower basing requirements.

Similarly, AMC distributes aircraft parts based on demand data. The parts that break the most are, over time, positioned where demand has historically been the greatest. The supply system does not generally recognize demand for non-GAMSS locales, because the parts to fix aircraft at these locations are ordered from GAMSS bases, often from the broken aircraft's home station. Because the parts ordered to support MRTs *do* register for the GAMSS ordering locations, they are recognized and incorporated into the overall supply system requirements chain. In other words, AMC uniformly adjusts GAMSS supply levels for all parts ordered through the supply system irrespective of whether or not they were ordered as MRT support. Therefore, one does not expect historical GDSS 2 data to be particularly useful in determining permanent spare parts allocation.

A second reason AMC appears to use historical logistics data from GDSS 2 for process improvement relatively infrequently, is that the XOCL, TACC, and A4 (Logistics, Installations, and Mission Support) functions evaluate and adjust processes and procedures real-time. Because each aircraft XOCL supports is followed from inception to completion, anomalies to perceived norms are briefed, questioned, and dealt with as they occur. For example, when people, parts, or equipment are not ready to go on time and miss scheduled support rides, managers at appropriate levels engage to determine potential culpability, accountability, and procedural improvements to prevent future recurrence. Unfortunately, while targeted solutions to specific problems are potentially effective for the individuals, units, circumstances, and times in question, they do not necessarily prevent similar problems from occurring at other locations at other times. This is not to say AMC does not implement broad and enduring MRT process improvements based on individual situations; rather, it is to say that in the absence of a structured analytical approach to MRTs, AMC may be missing opportunities to improve the overall recovery process and potentially decrease maintenance downtime for the nation's strategic airlift assets.

As noted previously, utilizing historical MRT data from GDSS 2 may not be particularly useful for determining permanent

manpower and spare parts requirements, but it may, in fact, prove useful for analyzing past aircraft recovery efforts for potential improvements across the entire MRT process. One logical starting point, and the focus of the remainder of this article, is to analyze XOCL's interface with GDSS 2 and to determine the system's suitability for facilitating future efforts at improving the MRT process.

Analysis for July 2007

Although the TACC began using GDSS 2 in 2004, XOCL did not begin inputting data into the logistics portion of the database until June of 2007.[28] At the time data were extracted from the system for purposes of this analysis (August 2007), there were only 2 full months of historical MRT data: June and July 2007. Because June marked the data transition from GDSS to GDSS 2, that month's data were initially reviewed, but they were ultimately not factored in with this analysis because of the potential for inaccuracies associated with the transition to the new system. Additionally, given the unforeseen amounts of time and effort required to sort through 31 days worth of MRT records, the scope of this analysis was narrowed from the original intent. In July 2007 XOCL tracked 327 individual aircraft records: 129 C-17s, 88 C-5s, 55 KC-135s, 41 C-130s, 13 KC-10s, and 1 C-21.[29] The original intent of this article was to review MRT data for both of AMC's strategic airlifters; however, the monumental commitment involved made that proposition untenable. Therefore, this article's analysis focuses exclusively on the 88 C-5 MRT records for July 2007. (See Table 1 and Figure 2.)

Actual Supports versus Non-Supports

One of the first tasks was to segregate those MRT records with actual support data from those that were entered into GDSS 2 for tracking but were eventually resolved without XOCL action. As previously noted in the XOCL section of this article, GAMSS command and control functions (or the aircraft's crew if outside the GAMSS) are required to notify XOCL when aircraft are experiencing maintenance problems, regardless of whether or not support will be required. This requirement keeps the TACC

C-5 Tail Number	GDSS Location	Actual Location	Pacing Correct?	Sourcing Tasked	%	Sourcing Complete	%	Trans Tasked	%	Trans Arrived	%	Mx Complete	%	Total Time	Total Time (GDSS)
60021	KCEF	KDOV	N/A												
60014	KCEF	LERT	N	7	0.5%	13	0.8%	71	4.6%	1,283	83.1%	170	11.0%	1,544	1,542
70032	KSUU	KDOV	N/A												
00466	KSKF	KDOV	N/A												
00448	KSKF	LERT	N/A												
90008	KSWF	ETAR	N/A												
60014	KCEF	LERT	N	236		84		0		2,458		733			
				17		67		136		2,132		2,610			
				10		30		0		2,144		576			
				263	2.8%	181	1.9%	136	1.5%	6,734	72.1%	3,919	42.0%	9,339	16,890
70042	KSUU	RODN	N	6	0.4%	35	2.3%	0	0.0%	1,417	94.4%	43	2.9%	1,501	1,500
60020	KDOV	N/A	N/A												
90012	KSWF	KDOV	N/A												
50001	LERT	OKBK	N	82		34		21		917		114			
				0		0		22		1,340		114			
				3		20		26		3,495		259			
				85	1.4%	54	0.9%	69	1.1%	5,752	92.8%	487	7.9%	6,199	8,430
00466	KSKF	LERT	N	327	12.7%	3	0.1%	240	9.3%	765	29.8%	1,239	48.2%	2,571	2,550
60022	ETAR	LERT	N/A												
60023	KCEF	PGUA	N	140	5.3%	518	19.5%	61	2.3%	1,524	57.3%	417	15.7%	2,660	9,786
70043	KDOV	UNK	N	134	10.2%	0	0.0%	140	10.7%	966	73.8%	69	5.3%	1,309	2,664
60017	KCHS	KCHS	N	12	0.4%	17	0.6%	64	2.3%	2,268	82.7%	380	13.9%	2,741	2,718
60022	ETAR	LERT	N/A												
80225	KCEF	LERT	N/A												
70028	ETAR	KDOV	N/A												
60022	ETAR	UNK	N	11		58		436		1,349		1,019			
				103		67		0		0					
				8		101		315		1,797		352			
				122	2.2%	226	4.1%	751	13.8%	3,146	57.8%	1,371	25.2%	5,446	7,764
60012	LERT	PHIK	N	100		47		0		1,538		4,013			
				0		21		0		0					
				19		361		0		3,331		4,131			
				119	1.4%	429	5.0%	0	0.0%	4,869	56.4%	8,144	94.4%	8,627	8,592
90023	KSWF	LTAC	N	0	0.0%	31	0.5%	0	0.0%	5,474	92.8%	64	1.1%	5,901	5,904
80025	KCEF	LERT	N/A												

Figure 2. GDSS C-5 MRT Records for July 2007 (Part 1)

C-5 Tail Number	GDSS Location	Actual Location	Pacing Correct?	Sourcing Tasked	%	Sourcing Complete	%	Trans Tasked	%	Trans Arrived	%	Mx Complete	%	Total Time	Total Time (GDSS)
60018	KCEF	LERT	N/A												
60017	KCHS	KDOV	N/A												
50005	KDOV	KSUU	N/A												
50005	KDOV	KSUU	N/A												
50008	KSUU	UNK	N	7		22		37		1,039		45			
				462		0		0		?		?			
				469	19.5%	22	0.9%	37	1.5%	1,039	43.1%	45	1.9%	2,409	2,394
80219	KFFO	KDOV	N/A												
60019	KSUU	RJTY	N/A												
90023	KSWF	ETAR	N/A												
70029	KDOV	ORBI	N	315	18.6%	93	5.5%	2	0.1%	677	40.0%	614	36.3%	1,691	1,674
60019	KSUU	RJTY	N/A												
70032	KSUU	LERT	N/A												
90023	KSWF	ETAR	N/A												
00446	KSKF	ETAR	N/A												
70032	KSUU	LERT	N/A												
80219	KFFO	ETAR	N/A												
60018	KCEF	ORBI	N	429		44		223		448		4,373			
				541		548		0		0		0			
				0		56		90		611		3,871			
				22		0		0		1,517		1,829			
				0		52		0		1,757		0			
				0		113		0		0		0			
				992	17.9%	813	14.7%	313	5.7%	4,333	78.4%	10,073	182.3%	5,527	5,412
00465	KMEM	PGUA	N	15	0.5%	105	3.5%	0	0.0%	2,515	84.9%	267	9.0%	2,962	2,928
60014	KCEF	LERT	N	20	1.5%	28	2.0%	27	2.0%	910	66.6%	382	27.9%	1,367	1,338
50005	KDOV	PHIK	N/A												
50004	KDOV	LERT	N/A												
60023	KCEF	KCEF	N/A												
70039	KCEF	LERT	N/A												
50004	KDOV	KNKT	N	6	0.4%	56	4.0%	0	0.0%	593	42.2%	750	53.4%	1,405	1,374
40061	KDOV	LERT	N	1019		14		227		1,956		324			
				65		52		0		0		0			
				0		45		0		0		0			
				173		92		0		0		0			
				0		9		0		0		0			
				0		22		40		2,699		289			

Figure 2. GDSS C-5 MRT Records for July 2007 (Part 2)

informed of potential delays to current AMC missions and enables XOCL controllers to begin preparing for possible MRT support. It is important to note that tracking ultimately nonsupported aircraft is a necessary and potentially time consuming task, and it is only after an aircraft is repaired or determined able to continue without an MRT that it becomes in fact a nonsupport. Of the 88 C-5 records for July 2007, 54 (61 percent) were monitored without the need to generate an MRT. The remaining 34 (39 percent) were actually supported by XOCL. See Table 2 for a breakdown of the 34 C-5 actuals.

Given these statistics it is interesting to note three telling points. First, the fact that the majority of C-5 records were eventually identified as nonsupports (54 of 88) suggests that the GAMSS and those aircrews operating outside the system effectively communicate with XOCL in accordance with AMCI 21-108, *Logistics Support Operations*. In other words, field personnel aren't calling in only when they need support; they call in to ensure information flow. Second, while it is obviously difficult to draw conclusions given the limited data considered, it is interesting to note that more than half of C-5 supports went to locations within the AMC en route system designed to support these aircraft. One would expect a majority of supports to occur outside the GAMSS. Third, and related to the second point, the fact that more than 90 percent of C-5s supported required parts—to include 88 percent of recoveries affected within the GAMSS—poses potentially significant questions for further analysis within AMC's supply function. While interesting in and of themselves, and potential fodder for additional research, this article does not pursue these statistics any further but instead focuses analysis on the XOCL/GDSS 2 interface.

C-5 Tail Number	GDSS Location	Actual Location	Pacing Correct?	Sourcing Tasked	%	Sourcing Complete	%	Trans Tasked	%	Trans Arrived	%	Mx Complete	%	Total Time	Total Time (GDSS)
					19.7%	290	4.5%	267	4.2%	5,248	81.7%	1,363	21.2%	6,420	6,402
50001	LERT	LERT	N/A												
60018	KCEF	LERT	N/A												
70043	KDOV	LERT	N/A								1263				
60015	EGUN	KTIK	N	13	0.5%	106	3.8%	47	1.7%	2,618	92.8%	36	1.3%	2,820	2,814
70042	KSUU	LERT	N/A												
50002	KDOV	LERT	N/A												
80223	KSKF	PHIK	N/A												
50008	KSUU	LERT	N/A												
70031	KCEF	LERT	N/A												
00465	KMEM	PHIK	N/A												
60021	KCEF	LERT	N/A												
50001	LERT	LERT	N	156	4.3%	0	0.0%	226	6.3%	2,858	79.5%	357	9.9%	3,597	3,588
70042	KSUU	LEMO	N	45	4.0%	49	4.3%	0	0.0%	138	12.2%	899	79.5%	1,131	1,116
00465	KMEM	KSUU	N/A												
50008	KSUU	LERT	N/A												
60014	KCEF	LERT	N/A												
00460	KSWF	ETAR	N/A												
70027	ORBI	KDOV	N/A												
60019	KSUU	LERT	N	526		33		0		553		?			
				0		18		28		1,219		135			
				526	14.4%	51	1.4%	28	0.8%	1,772	48.5%	135	3.7%	3,657	3,654
70027	ORBI	KDOV	N/A												
70031	KCEF	LERT	N	911		55		14		1,018					
				0		0		11		837		694			
				911	17.4%	55	1.0%	25	0.5%	1,855	35.4%	694	13.2%	5,240	5,220
50008	KSUU	LERT	N/A												
90012	KSWF	OKBK	N	80		0		162							
				0		143		0		1,522		1,025			
				80	2.9%	143	5.1%	162	5.8%	1,522	54.6%	1,025	36.8%	2,789	2,436
50002	KDOV	LERT	N/A												
70032	KSUU	OKBK	N	56		0		mrt already moving to support another acft							
				300		209		62	1.0%	5,701	87.9%	212	3.3%		
				356	5.5%	209	3.2%	62	1.0%	5,701	87.9%	212	3.3%	6,484	6,486
00460	KSWF	ETAR	N/A												
90005	KFFO	ETAR	N/A												
00467	KMEM	KXMR	N	275	22.9%	1	0.1%	0	0.0%	631	52.5%	235	19.6%	1,201	7,740

Figure 2. GDSS C-5 MRT Records for July 2007 (Part 3)

Requirement	GAMSS	Non-GAMSS	Overall
Actual Supports	18 (53%)	16 (47%)	34
Parts	16 (89%)	14 (88%)	30 (91%)
Manpower	5 (28%)	9 (56%)	14 (47%)
Equipment	3 (17%)	3 (19%)	6 (20%)

Table 2. Requirements Breakdown for 34 Actual C-5 Supports for July 2007

XOCL Input into GDSS 2

One of the challenges with analyzing GDSS 2 historical logistics data is, given both the current structure of the logistics database and XOCL's method of inputting information, it is difficult to identify specific trend data for process improvement. There are, for example, insufficient data fields available to begin to target procedural deficiencies for individual subprocesses; this article will later make recommendations in this regard. However, given the database's current framework, it is quickly evident that either the input into individual aircraft records is flawed, the GDSS 2 database itself has software deficiencies, or a combination of the two. Utilizing the GDSS 2 historical master record for each C-5 supported in July 2007, this article will now identify challenges with XOCL/GDSS 2 interface and will, in a later section, recommend solutions.

The first of the inconsistencies appears in the data field LOC ICAO (location International Civil Aviation Organization),[30] an entry intended to show at which CONUS or international location a specific aircraft broke. Of the 88 C-5 records for July 2007, only 4 (approximately 5 percent) reflected the correct support location.

C-5 Tail Number	GDSS Location	Actual Location	Pacing Correct?	Sourcing Tasked	%	Sourcing Complete	%	Trans Tasked	%	Trans Arrived	%	Mx Complete	%	Total Time	Total Time (GDSS)
00460	KSWF	ETAR	N	22	0.6%	18	0.5%	46	1.3%	714	19.9%	191	5.3%	3,590	3,570
00455	KSWF	ETAR	N/A												
00467	KMEM	UNK	N	9		41		19		1,497					
				60		0		0		920		217			
				69	2.5%	41	1.5%	19	0.7%	2,417	86.9%	217	7.8%	2,782	6,510
90025	KNQA	RODN	N	64	3.3%	127	6.5%	0	0.0%	1,563	80.6%	223	11.5%	1,939	1932
60011	KDOV	LERT	N	23	0.5%	974	20.2%	14	0.3%	2,075	43.1%	1,728	35.9%	4,814	4,818
90018	KWRB	PGUA	N	5	0.3%	37	2.6%	13	0.9%	891	62.2%	486	33.9%	1,432	78,996
70037	KCEF	LERT	N	99	3.0%	106	3.2%	0	0.0%	2,334	71.4%	835	25.6%	3,268	900
60019	KSUU	LERT	N/A												
90012	KSWF	LERT	N/A												
70028	ETAR	LEMO	N	4	0.4%	352	38.6%	0	0.0%	692	75.8%	224	24.5%	913	846
60022	ETAR	LERT	N	117	11.9%	35	3.6%	70	7.1%	639	65.1%	121	12.3%	982	954
00467	KMEM	KNUQ	N/A												
70045	KDOV	KPOB	N/A												

Shaded areas represent aircraft tracked in GDSS II, but ultimately resolved as non-supports.

= less than 60 minutes difference between GDSS II and this analysis

= greater than 60 minutes difference between GDSS II and this analysis

Figure 2. GDSS C-5 MRT Records for July 2007 (Part 4)

This analysis was conducted by comparing the ICAO found in the LOC ICAO field with the verbiage contained in the LRC REMARKS section (input by XOCL controllers) of the 88 individual historical records. It should be noted that while in 5 of the 88 records the actual aircraft location could not be accurately determined, it was clear from the context of the remarks section that the LOC ICAO field was not accurate. Given that XOCL controllers utilize GDSS 2 ICAO information for all active records on a daily basis to make support decisions and to provide status updates, it is likely the field was properly populated when the record was active and that the problem with the historical records lies not with XOCL, but rather within the historical portion of the GDSS 2 database itself. The presence of incorrect information in the historical LOC ICAO field is, nonetheless, significant. In looking for trends associated with the MRT process, it will be extremely important to determine where the aircraft have broken and what support, if any, was sent to which location.

The second inconsistency appears in the PACING data field. In the case of multiple aircraft discrepancies, this field is designed to identify which one is causing the aircraft to be grounded and awaiting an MRT or, when multiple grounding items exist, which one is driving the most extensive projected repair time. Additionally, when XOCL is supporting a grounding discrepancy, at GAMSS or aircrew request, XOCL often simultaneously tracks and supports otherwise flyable discrepancies for the same aircraft with the intention of preventing them from degenerating into grounding conditions. In other words, the intent is to fix a problematic but flyable discrepancy while the aircraft is already grounded vice waiting for it to possibly break further down the road. In both cases, flagging the correct pacing item will enable analysts to focus future research on the major items contributing to the MRT requirement. Of the 88 C-5 records, none correctly identified a pacing maintenance discrepancy, despite the fact that 26 records (30 percent) actually contained multiple aircraft discrepancies. The only way to determine the correct pacing item is to read through the LRC REMARKS section of each individual record.

A third inconsistency appears in the DISCREPANCY data field itself, which identifies the actual maintenance problem (or problems) generating the need for an MRT. Of the 88 C-5 records, 18 (20 percent) contained DISCREPANCY data fields where the discrepancy verbiage had been replaced by the word "CLOSE." It is unclear whether this is the result of a GDSS 2 software glitch or if XOCL controllers purposely amend records to reflect that a discrepancy has been corrected. For historical purposes this field should retain the actual discrepancy verbiage; otherwise, a future analysis requirement may necessitate sorting through the LRC REMARKS section to determine the maintenance problem. While in individual cases this may not prove to be too onerous a task, in some cases the actual discrepancy is not reflected in the remarks section at all.

The fourth and final XOCL/GDSS 2 interface challenge identified as part of this analysis is the GDSS 2 accounting of total time broken for supported aircraft. Researchers with GDSS 2 access can utilize the Logistics Support Tool feature to pull up broad synopses of historical MRT taskings. These synopses are useful in that they package pertinent information by time frame and by data field, eliminating the often lengthy LRC REMARKS section and allowing for greater ease of use (assuming, of course, that individual record remarks are not required as part of the research). One of the advantages of this tool is it identifies the total amount of time each supported aircraft was broken in the system, extremely useful data in a business where downtime for maintenance equates to lost potential revenue or, more importantly, delays in getting cargo to the warfighter. The challenge in this case is that the TIME BROKE field does not always reflect the aircraft's correct total not mission capable time. GDSS 2 calculates total time broken using two other data fields on the same report—BREAK DTG (the approximate date and time GAMSS or aircrew personnel notified XOCL of a particular discrepancy) and FIX DTG (the date and time maintenance

personnel notified XOCL the aircraft was repaired or flyable)—both input by XOCL. This analysis has determined that while BREAK DTG information in GDSS 2 is reliable, data in the FIX DTG field often does not match the time reflected in the LRC REMARKS section. Of the 34 actual C-5 recoveries, 11 (32 percent) reflected FIX DTG times that differed from the LRC REMARKS section by 1 hour or greater. This resulted in GDSS 2 reflecting total C-5 time broke (for July 2007) as 153.8 days versus 79.7 days according to the more reliable LRC REMARKS section. Two potential reasons for the disparity are GDSS 2 software issues or inaccurate XOCL input (either neglecting to input completion data or incorrectly loading the time all related MRT personnel, parts, or equipment were returned to home station vice the time the aircraft was actually repaired). This issue is significant and must be addressed if GDSS 2 data is to be used for MRT process improvement.

Other Findings

In addition to the XOCL/GDSS 2 interface findings noted above, the July 2007 C-5 data yielded several other findings that should serve as additional basis for future MRT process improvement. (As a note of caution, multiple supports in Figure 2 may have simultaneous actions resulting in a combined percentage greater than 100; non-multiple supports are purely sequential by definition and the collective averages approximate 98 percent to 100 percent of their total support times.)

- The average C-5 MRT takes approximately 2.3 days.
- On average, the transportation tasking portion of the MRT process takes the least time, 85 minutes, with XOCL identifying available rides in less than 3 percent of the total process time.
- On average, the entire size, source, and task portions of the MRT process constitute approximately 13 percent of the total time, which equates to approximately 7.4 hours per record.
- On average, 68 percent of the total MRT process, or 1.6 days per record, is spent awaiting transportation of MRT assets from the sourced location to the broken aircraft's location. This requirement takes more than twice as long as the next most time consuming part of the process and should, therefore, be a primary target of future analysis. Specific areas for future analysis should include mode of transport (airline, MILAIR, and commercial cargo carrier), sourced base preparation procedures, carrier delivery procedures, and receiving base procedures.
- On average, 33 percent of the total MRT process, or 18.3 hours, is spent fixing a broken aircraft once MRT assets arrive. When multiple supports are not required for the same aircraft, the percentage decreases to 20 percent (approximately 7.4 hours per record) of the total MRT process. Specific areas for future analysis should include procedures to get MRT assets from delivery location to the broken aircraft, MRT qualifications, and troubleshooting procedures. (See specific recommendation that follows, Deploy Multiple MRT Teams.)

Recommendations

LOC ICAO Data Field

Correct the deficiency with the LOC ICAO data field in the GDSS 2 historical logistics support database. While identifying the correct LOC ICAO from the LRC REMARKS section of a single record may not be terribly onerous, to identify all MRT supports to a specific location by combing through individual records would not only be impractical in today's age of information, it would be virtually impossible. The ability to accurately identify XOCL supports by location will enable analysts to potentially target specific locales for process improvement. For example, comparing overall aircraft maintenance trends with MRT supports to certain *desirable* locations (Australia, Hawaii, or Germany in September) may result in a targeted decrease in aircraft not mission capable time. Similarly, a large or unusual number of MRTs to the same location to support cut or worn tires may help identify issues with a local runway, taxiway, or parking ramp. Finally, significant numbers of supports to a given location may point to a need to add or increase the number of flying crew chiefs (or other maintenance personnel) assigned to support a particular airlift mission.

PACING Data Field

Correct the deficiency with the PACING data field, either via software update or, if simply a procedural problem, ensure XOCL controllers properly input the required data. Identifying the grounding discrepancy or, in case of multiples, the driving one, will help focus future analytical efforts. Additionally, recommend programmers include an option to identify sequential pacing items within the same record. This will accommodate circumstances when a subsequent grounding discrepancy becomes the new pacing item once the original pacing item is repaired.

DISCREPANCY Data Field

Correct the deficiency with the DISCREPANCY data field, either via software update or through XOCL data input procedures. Identifying the actual discrepancy will help focus future analytical efforts and avoid the potential for researchers to have to read through the LRC REMARKS section of individual support records.

FIX DTG Data Field

Correct the deficiency with the FIX DTG data field, either via software update or through XOCL data input procedures. TIME BROKE is a significant metric for mission and logistics support planning, as well as an indicator for XOCL process improvement. The alternative to accurate GDSS 2 data, sorting through individual support record remarks, should make fixing this data entry a high priority.

Create Additional GDSS Data Fields

If AMC is to utilize GDSS 2 data to evaluate and improve the MRT process, it must first adjust the database and XOCL data input procedures to quickly and reliably capture and produce the necessary information. In addition to the current data field suggestions above, AMC should consider software upgrades to include new fields for data extraction and analysis. The ultimate purpose of these fields is to help analysts systematically evaluate and focus on potential subprocess anomalies, especially if paired with metrics for each of the subprocesses. See Table 3 for recommended additional data fields.

Deploy Multiple MRT Teams

With respect to maintenance time to repair an aircraft once MRT assets have arrived, another area for evaluation is work and rest cycles and the number of technicians or teams sent to repair an

aircraft. In some instances the time from MRT asset arrival until aircraft fixed is significantly lengthened by maintainer rest requirements. Obviously, work and rest cycles are a necessity and should not be violated; rather, it may be that given a known multishift recovery operation; XOCL should consider sending sufficient personnel to work around the clock (two teams on 12-hour shifts). This would likely be done only on a case-by-case basis, such as supporting high visibility mission maintenance recovery operations, when a multishift operation is determined to be feasible and effective, and when manpower availability will accommodate. The potential payoff, however, would be approximately 12 hours saved for a 24-hour job, approximately 36 hours saved for a 48-hour job, and so forth.

Develop Time Standards for MRT Process or Subprocesses

Establishing time standards for each of the subprocesses (to include those identified in Table 3), as well as an overall MRT time line, is key to process improvement. Granted, although the same basic processes apply to all MRTs, the individual circumstances such as location and nature of repair, make it difficult to draw conclusions by comparing and contrasting individual supports. However, establishing basic standards for the overall process and subprocesses will help evaluators target specific portions of specific recoveries for analysis. XOCL controllers should develop a baseline against which to compare future subprocess time lines, with possible consideration given to establishing separate standards for different categories of support, such as support to CONUS, OCONUS, GAMSS, and non-GAMSS locations outside the US. As a starting point, the average times for non-multiple supports identified in Figure 2 may be used to develop standards for C-5 MRTs. Standards for some of the proposed data fields in Table 3 will require additional analysis to determine appropriate time lines, preferably facilitated by the GDSS 2 software upgrades recommended previously. Different MDSs may require separate standards to account for variances in parts and technician availability and current support methods such as C-17 contracted logistics support. Although more detailed standards will more effectively target improvement areas, even a single set of standards for all MRTs will likely facilitate some degree of process improvement. In the absence of a standardized approach to measuring and identifying process deficiencies, MRT process improvement will continue to be situational at best.

Data Field	Rationale
Sourcing Tasked	Identifies time XOCL tasked unit to source MRT assets; targets XOCL process
Sourcing Completed	Identifies time XOCL received asset sourcing from unit; targets unit process time
MRT Assets Mobilized	Identifies time sourced unit has assets ready to transport; targets unit process
Transportation Tasked	Identifies when XOCL identified actual support ride; targets XOCL process
MRT on Hand	Identifies when MRT assets are available or delivered to maintenance; targets unit process

Table 3. Recommended Additional GDSS 2 Data Fields

Conclusion

The US government places tremendous significance on global engagement. Whether it's military action to deter aggression, humanitarian assistance to troubled areas, or supplying US embassies and other deployed personnel around the world, rapid and agile mobility plays a key role in meeting America's security objectives. That means strategic airlift, now and for the foreseeable future, provides critical capabilities vital to our national interests. It is, therefore, incumbent upon the Air Force and specifically Air Mobility Command to work toward minimizing the amount of time our C-5s and C-17s remain broken within the system as they carry out their global airlift mission. This effort begins with the TACC and its logistics control function, the XOCL.

Unfortunately, while the current MRT process ensures airlifters broken away from home station are eventually repaired and put back into service (and arguably does so effectively), there is little evidence that much is done outside the normal manpower and parts placement systems to systematically analyze and improve the overall MRT process. As noted earlier in this article, this is not to say that AMC does not make efforts to improve real-time on a case-by-case basis; rather, it suggests that in order to more effectively minimize strategic airlifter downtime, the command must implement analytical procedures specific to the MRT process itself, beginning with the XOCL's sizing, sourcing, and tasking subprocesses. The current mechanism for reviewing and assessing historical data, the GDSS 2 database, as currently configured and utilized, is largely ineffective at meeting the analytical need.

In order to improve the MRT process, logistics personnel must first have access to sufficient and specific data enabling them to target areas for improvement. Currently, the only way to focus any analytical effort is to perform a painstaking, time-consuming review of each individual aircraft recovery record, a method so inefficient as to be essentially worthless. Therefore, the journey toward MRT process improvement begins with the data accumulation and evaluation mechanisms themselves. As proposed in the recommendations section of this article, AMC must implement three actions if it is to begin gathering the data to improve the aircraft recovery process. First, it must correct data input and access issues with currently existing data fields in GDSS 2. Corrections will likely include XOCL reviewing and improving procedures to ensure maintenance controllers input clear, concise, and accurate data, as well as software fixes to GDSS 2 to ensure the data is accurately transferred from active to historical records. Second, in order to effectively target process improvement efforts, XOCL should work with system programmers to add specific data fields within GDSS 2 to account for the varied MRT subprocesses. Third, XOCL should develop and track basic time standards for the overall MRT process and its individual subprocesses, that will enable researchers to focus on those events having adverse impacts on aircraft recovery. While these recommendations are neither groundbreaking nor terribly exciting, they are necessary to begin the evaluation and improvement process.

Strategic airlift is absolutely key to the timely movement and sustainment of US and allied military forces and therefore, key to the nation's security. The members of XOCL perform a tremendous service in helping to keep C-5s and C-17s flying and delivering cargo around the world; however, the current MRT process, as effective as it is, can likely be improved upon with increased attention and analysis. By implementing the actions recommended in this article, AMC can take steps to build upon its past and present successes to ensure an even more effective process for minimizing strategic airlift downtime due to maintenance. In doing so, it will not only help the command move cargo, it will also improve the overall effectiveness of our Air Force, our Department of Defense, and our nation as a whole.

Notes

1. Department of Defense, *Quadrennial Defense Review Report*, Washington, DC: Department of Defense, February 2006, v.
2. "Overhaul of Army Puts a Premium on Speed 'Transformation' Goal: Get Troops Ready for Modern Warfare," *USA TODAY*, 16 January 2001, 2A.
3. United States Transportation Command, "About USTRANSCOM: Mission," [Online] Available: http://www.transcom.mil/organization.cfm, accessed August 2007.
4. Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, 17 November 2003, 80.
5. Torchbearer Alert, "Time to Invest in Strategic Mobility," March 2007, [Online] Available: http://www.ausa.org/PDFdocs/TorchAlert/TB-AlertMAR07sm.pdf (accessed August 2007).
6. GlobalSecurity.org, "Military Sealift Command," [Online] Available: http://www.globalsecurity.org/military/agency/navy/msc.htm, accessed August 2007.
7. Air Force Doctrine Document (AFDD) 2-6, *Air Mobility Operations*, 1 March 2006, 1.
8. AFDD 2-6.1, *Airlift Operations*, 13 November 1999, 13.
9. AFDD 2-6.1, 12-13.
10. Congressional Budget Office, *Moving US Forces: Options for Strategic Mobility*, Chapter 2, Strategic Airlift Forces, Section 4, February 1997[Online] Available: http://www.cbo.gov/ftpdoc.cfm?index=11&type=0&sequence=3, accessed August 2007.
11. Author's discussion with Lt Col Paul Greenhouse, United States Army, 9 November 2007.
12. AFDD 2-6.1, 15-16.
13. AFDD 2-6.1, 17.
14. AFDD 2-6, *Air Mobility Operations*, 25 June 1999, 57.
15. Air Mobility Command Instruction (AMCI) 10-403, *Air Mobility Command Force Deployment*, 22 February 2007, 9.
16. Technical Sergeant Tammy Cournoyer, "One Whale of a Load," *Air Force Print News*, [Online] Available: http://www.af.mil/news/airman/1298/whale.htm, accessed August 2007.
17. Air Force Link, Fact Sheets, "KC-10 Extender," [Online] Available: http://www.af.mil/factsheets/factsheet.asp?fsID=109, accessed August 2007.
18. Air Force Link, Fact Sheets, "KC-135 STRATOTANKER," [Online] Available: http://www.af.mil/factsheets/factsheet.asp?fsID=110, accessed August 2007.
19. Air Force Link, Fact Sheets, "618TH TANKER AIRLFT CONTROL CENTER," [Online] Available: http://www.amc.af.mil/library/factsheets/factsheet.asp?id=239, accessed August 2007.
20. AMCI 21-108, *Logistics Support Operations*, 30 August 2007, 4.
21. AMCI 21-108, 13.
22. AMCI 21-108 4.
23. AMCI 21-108, 5.
24. *Ibid.*
25. *Ibid.*
26. HQ AMC/A67C GDSS 2 Program Management Office, "GDSS 2 Implementation and Training Process," reviewed August 2007.
27. Author's interview with Master Sergeant Jody Nelson, Tanker Airlift Control Center Logistics Control, 18 November 2007.
28. Author's interview with Major Kenneth, Norgard Tanker Airlift Control Center Logistics Logistics Control, August 2007.
29. GDSS 2, Reports Information Database Library, Logistics Support Tool, "HISTORICAL TASKINGS 01-Jul-2007 through 31-Jul-2007," 17 November 2007, 1-14.
30. "Index of ICAO Codes," [Online] Available: http://www.airport-technology.com/icao-codes/, accessed 18 November 2007.

Lieutenant Colonel William Y. Rupp *is a career aircraft maintenance officer with 18 years of experience supporting Air Mobility Command's strategic airlift aircraft, to include the C-141B Starlifter (now retired), the C-5A/B/C Galaxy, and the C-17 Globemaster III. He has led aircraft maintenance at the squadron level and at the AMC en route at Ramstein Air Base in Germany. Lieutenant Colonel Rupp is currently assigned as a student at the Air War College, Maxwell Air Force Base in Alabama.*

I said to myself, I have things in my head that are not like what anyone has taught me—shapes and ideas so near to me—so natural to my way of being and thinking that it hasn't occurred to me to put them down. I decided to start anew, to strip away what I had been taught.

—Georgia O'Keeffe

Planning is everything—plans are nothing.

—Field Marshal Helmuth von Moltke

If I had to sum up in a word what makes a good manager, I'd say decisiveness. You can use the fanciest computers to gather the numbers, but in the end you have to set a timetable and act.

—Lido Anthony (Lee) Iacocca

If opportunity doesn't knock, build a door.

—Milton Berle