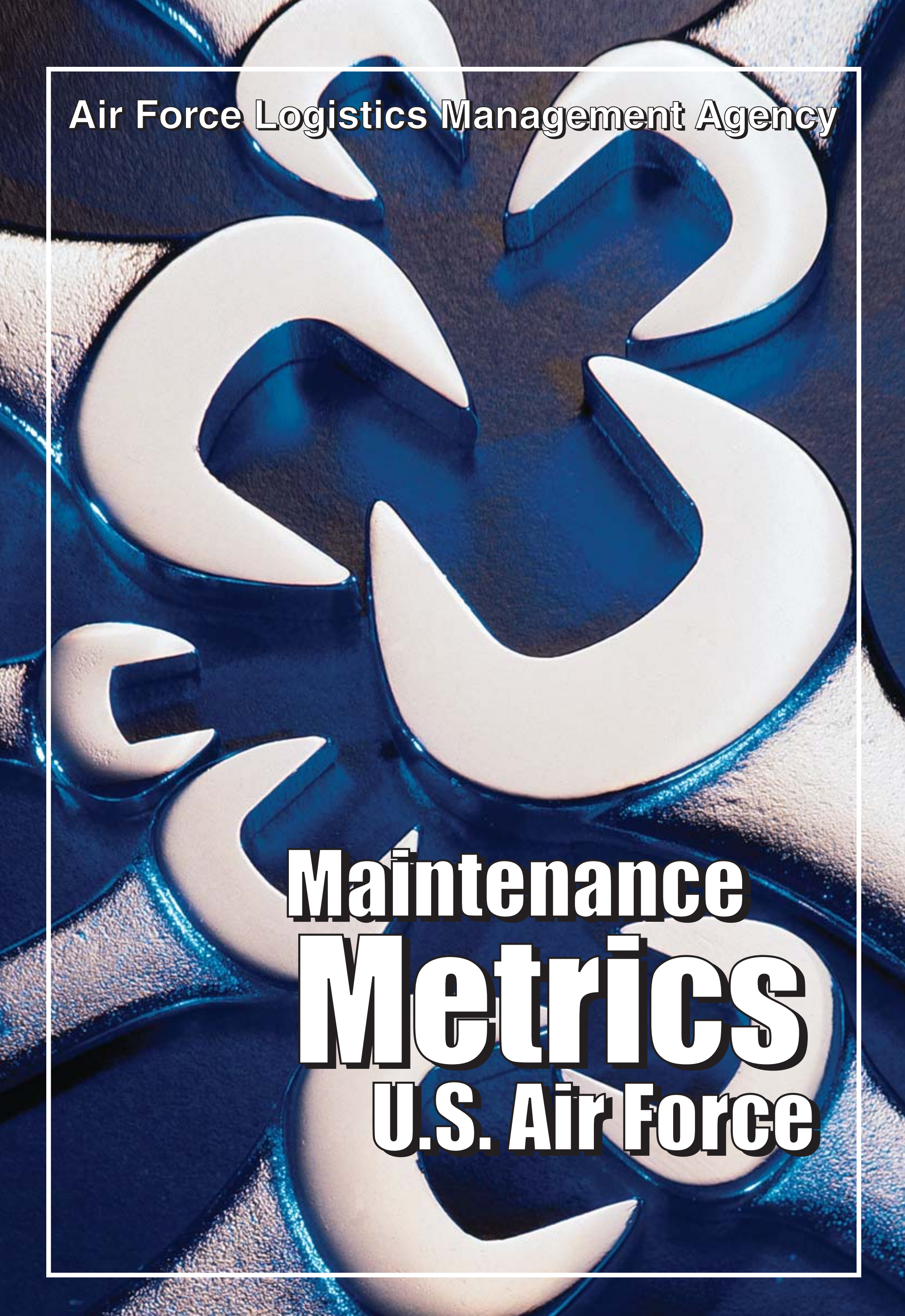

Air Force Logistics Management Agency

Maintenance Metrics U.S. Air Force

Acknowledgments

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Foreword

As the Air Force defines its future, it is critical that we continue to evaluate our performance in an effort to improve our efficiency and effectiveness. An essential element for this evaluation is metrics. Metrics is not a *bad* word, but a tool for gauging where your focus, as a maintainer, needs to be directed. Good metrics are measurable and can be mapped to goals, both strategic and tactical. It is crucial for us to understand how our processes are impacting the greater mission. This handbook will aide you in that endeavor. Critical thinkers are needed on the flight line. *Learn, think, understand* is key but your action is required to make the mission happen. As the Air Force's enterprise focus continues to develop, the way we evaluate ourselves will change. Repair Network Transformation is defining our new maintenance processes. The Expeditionary Combat Support System will give maintenance leadership at all levels visibility over logistics processes. Its goal is to improve data quality, information timeliness, and availability. This will impact Air Force leaders' decisions, and your decisions.

Use this handbook to learn how we conduct business now. The Air Force Logistics Management Agency will continue to provide knowledge for tomorrow's maintenance leaders.

R. Dean Golden, DPA
Director
Air Force Logistics Management Agency

Special Interest

Table of Contents

Introduction

The purpose of this handbook is to provide maintenance leaders at both the wing and major command (MAJCOM) levels a comprehensive guide to metrics associated with maintenance management.

This handbook is a compilation of metrics and includes an overview to metrics, a brief description of things to consider when analyzing fleet statistics, an explanation of data that can be used to perform analysis, a detailed description of each metric, a formula to calculate the metric, and an explanation of the metric's importance and relationship to other metrics. The handbook also identifies which metrics are leading indicators (predictive) and which are lagging indicators (historical). It is also a guide for data investigation.

However, a word of caution is in order at this point. Overemphasis of a particular metric while ignoring the root cause of a problem may well lead to an improvement in the metric but may suboptimize mission performance or create other problems. Metrics are indicators and, as such, should be viewed in aggregate. The relationship between two metrics may be so intertwined as to make it impossible for the maintenance manager to separate the cause from the effect. Generally, metrics should be used to identify trends and not as pass or fail indicators. Individually, they are snapshots in time, and even the best organizations will occasionally dip below standards. Good metrics analysis, however, will focus the maintenance manager on those areas that need attention.

MAJCOM formulas may deviate slightly. For exact formulas, check with the MAJCOM logistics analysis division.

Metrics are indicators and, as such, should be viewed in aggregate. MAJCOM formulas may deviate slightly. For exact formulas, check with the MAJCOM logistics analysis division.

Chapter 1
Maintenance Metrics Basics

Special Interest

CHAPTER CONTENTS

Metrics are not just charts and numbers to be looked at. They are tools for fixing problems. If the tool does not generate questions, it is a waste of time. If a lot of time is spent looking at metrics that do not address daily problems affecting the unit, their value is questionable. When there is no applicable metric for driving unit performance, build one. Watch for filtering of the metrics that show the *pain*—they are the ones with the greatest value. If a metric rarely meets its prescribed standard, the standard is probably not realistic for one of two reasons—it was arbitrarily set too high, or significant issues need resolution. Either way, investigation into the circumstances is warranted.

The flying schedule sets the pace for the entire wing. It must be built on sound principles that are clearly articulated and vigorously defended by wing leadership. The flying schedule is an important document that drives consumption of Air Force resources, and the sortie is the focal point of consumption.

Foundations for Metrics

Scheduling. The flying schedule sets the pace for the entire wing. It must be built on sound principles that are clearly articulated and vigorously defended by wing leadership. The flying schedule is an important document that drives consumption of Air Force resources, and the sortie is the focal point of consumption. We focus on the sortie and all the events required for it to succeed. We establish a schedule to attempt a smooth flow of resource use that includes people, aircraft, and consumables. Without a schedule, all the moving parts certainly would not come together efficiently.

Workforce Management. Key to any maintenance activity is the availability of personnel. A schedule allows the workforce needed to support the required task to be identified and managed. The schedule becomes a contract that identifies requirements (number of sorties and configurations) and provides a measure of stability and security for the work effort, as well as a gauge for performance. *Plan what you fly, and fly what you plan.*

The schedule becomes a contract that identifies requirements (number of sorties and configurations) and provides a measure of stability and security for the work effort, as well as a gauge for performance.

Agree on the basics with all concerned and write them down: standard flying window, rules of engagement (ROE) for surges, night flying, cross country (XC) sorties; weekend duty; quiet hours; training days; standard configurations; minimum/standard turn times; approval authority for Form 2407 (Weekly/Daily Flying Coordination); scheduling changes (if it is too easy to change the schedule, it won't be built right the first time); XC ROE; crew ready/step minimums; and so forth.

Aircraft should rarely be added. If you are adding aircraft because maintenance can't provide front lines, something else is wrong. There is a domino effect—how many more aircraft will you add to the broke pile before you call *knock it off*? Not all aircraft are prepared to fly every day. Some aircraft are selected for ground training, cannibalization (CANN), spares, or nonflyers for time management. For the combat air forces (CAF), time management is critical to a smooth phase inspection flow. It sounds obvious, but adding an aircraft means it is not doing what was originally planned for it.

The flying window drives shift scheduling, and operations and maintenance are not the only agencies involved in sortie generation. Fuels management, air traffic control, the weather squadron, and many other organizations are also involved. Supervision must cover the entire flying window. The length of the flying window determines effectiveness of the maintenance fix shift. Turbulence in the flying window creates stress on the flight line—keep the schedule consistent throughout the week. A late start on one day affects the next day's early start. Turn times must be negotiated between operations and maintenance and should be published. When building the schedule, early takeoffs and late landings should never cause a minimum turn time to be violated.

For mobility air force (MAF) units, operational requirements flow from the Joint Chiefs of Staff, Air Staff, or other customers through the Air Mobility Command (AMC) Tanker/Airlift Control Center (TACC) to the units. Most MAF operational requirements are short notice, requiring maximum flexibility. MAF units develop plans and schedules based on known requirements. However, unforeseen higher headquarters (HHQ) taskings cause units to refine their schedules daily. MAF units do not have a flying-hour window. Instead, the daily flying schedule determines the work shifts and personnel requirements.

Constant communication between the sortie generation and the plans and scheduling elements is vital to the isochronal inspection concept. This communication ensures aircraft are available for their scheduled dock input and available to meet mission requirements. The smooth flow of aircraft—through dash 6 inspection, time change, and time compliance technical order requirements—maximizes aircraft availability and reduces excessive maintenance downtime. The result is capable aircraft available to accomplish the mission.

Known maintenance requirements should be included in both short- and long-range maintenance plans. Scheduling flexibility is the key to success in the MAF, along with adherence to sound maintenance management policy. Don’t reconfigure aircraft during the day shift without an overwhelming, urgent need. Work with operations and fly the same configuration for the entire week. Unnecessary aircraft configuration drains manpower from troubleshooting, repairing, inspecting, servicing, launching, and recovering.

For the CAF, weekend duty should not be routine. Weekend duty should be based on rules, and aircraft should not be worked unless there is no other option but to work or replace a Monday flyer. XCs should rarely, if ever, return on a weekend.

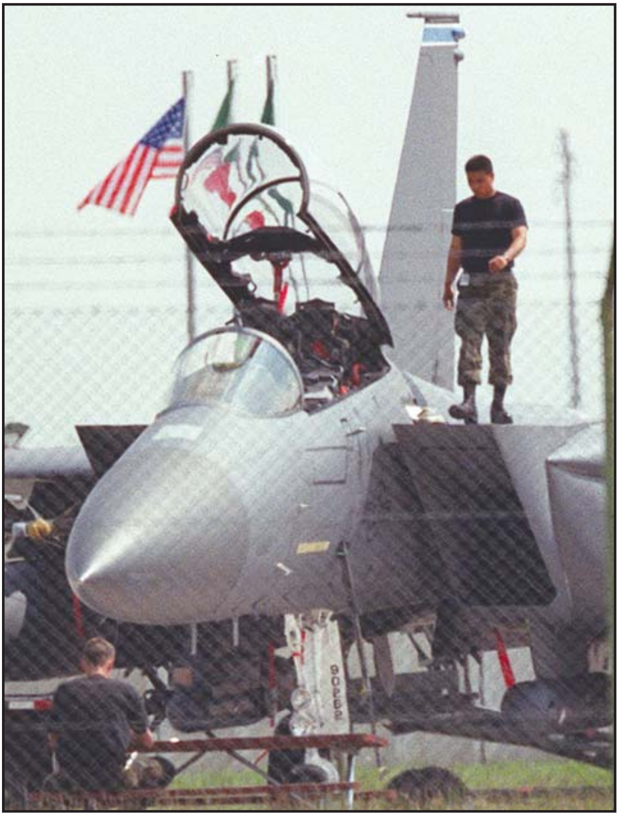
Problems occur when:

- The lead operations scheduler changes week to week.
- Forms 2407 are approved by whomever is around.
- Late landings or early takeoffs are the norm.
- You're reconfiguring instead of servicing in the turn.
- Ground abort and CANN rates are on the rise.
- A squadron regularly flies more hours off its fleet than the phase dock can regenerate.
- Day shift is not fixing any aircraft.
- Major changes occur to next week's flying schedule.
- All scheduled maintenance is saved for phase.
- The maintenance schedule does not receive the same attention as the flying schedule.
- Maintenance scheduling effectiveness (MSE) is 100 percent, but there are many overdue items in the planning requirements report.
- Weekend duty is the norm.
- Technicians do not know what time they're coming to work tomorrow.

Maintenance leaders must review sortie production and maintenance health constantly and be knowledgeable about maintenance indicators that will highlight trends before they become a problem.

Sortie Generation. Maintenance leaders must review sortie production and maintenance health constantly and be knowledgeable about maintenance indicators that will highlight trends before they become a problem. All levels of maintenance should be familiar with the daily production. Remember, sortie generation includes maintenance support, supply, airfield management, fire department, weather, safety, and civil engineers.

Maintenance Performance. Maintenance leaders' primary concerns are how well the unit is meeting mission requirements, improving equipment performance, identifying emerging support problems, and projecting current trends. Maintenance performance is assessed using standards, goals, and maintenance plans. When operational requirements are not achieved, maintenance analysis can determine root causes. Some questions for serious consideration include:



Maintenance leaders' primary concerns are how well the unit is meeting mission requirements, improving equipment performance, identifying emerging support problems, and projecting current trends. Maintenance performance is assessed using standards, goals, and maintenance plans.

- Are specific aircraft, equipment, systems, or subsystems contributing to a disproportionate share of deviations and turbulence?
- Does specific equipment fail to perform as scheduled? Does this equipment require more or less maintenance than normal?
- Are there enough people to meet mission needs? Do certain work centers document significant overtime or show consistently high utilization rates?
- Is there a good balance of skills within Air Force specialty codes (AFSC) and between the units?
- Do higher rates of repeat/recur (R/R) discrepancies indicate shortfalls in training or experience?

- Is there sufficient time to schedule and work maintenance problems?
- Are trends significant? Are the trends short term (6 months or less) or long term? Where are the units likely to be in 6 to 12 months?
- Are there seasonal or cyclical variations? Are current variations outside the norm?
- Does the rate look too good to be true? If it does, it probably should be challenged in the same way a bad rate would be challenged. If it stands scrutiny, then a better process may have been found that should be shared with other units.

Understanding Metrics

Equipment/Mission Analysis. When negative trends are identified, further investigation may be necessary to gather facts. Quality assurance (QA), maintenance analysis leaders, and work-center technicians may be contacted for assistance. Consider the following questions when reviewing negative trends:

- Which systems are creating a high not mission capable (NMC) rate? Are these the systems that normally create high NMC rates? If so, are the rates higher than normal? What are the high-rate driving components, and what is being done (or could be done) to address the problems?
- What factors are causing an increase or decrease in NMC hours?
- Are units' deployments affecting the rates? If so, to what extent?
- Are specific aircraft or equipment causing trend distortions?
- What systems are having high cannot duplicate (CND) or R/R malfunctions?
- What parts or components are causing not mission capable for supply (NMCS) conditions? Are these normal, or is a new problem possibly emerging?

- Are the items repaired on station? Are they two-level maintenance components? Could they be repaired locally?
- Is supply support sufficient and responsive? If not, why not? Are stocks adequate?
- Is the lack of training, technical data, or tools and equipment affecting certain systems or AFSCs?

Most of the key metrics fall into two categories—leading and lagging indicators. The theory of leading and lagging indicators is one of cause and effect. Leading indicators show a problem first, as they directly impact maintenance's capability to provide resources to execute the mission. Lagging indicators show firmly established trends.

Leading and Lagging Indicators. Most of the key metrics fall into two categories—leading and lagging indicators. The theory of leading and lagging indicators is one of cause and effect. Leading indicators show a problem first, as they directly reflect maintenance's capability to provide resources to execute the mission. Lagging indicators show firmly established trends.

There are two cornerstones of maintenance metrics for the CAF: fleet availability as measured by the mission capable (MC) rate and program execution as measured by the utilization (UTE) rate. For the MAF, movement of fuel, cargo, and people, as measured by departure and arrival reliability, replaces program execution (UTE) as a cornerstone.

Aircraft Availability Improvement Program (AAIP). As mission requirements, manning, and availability of money have changed, the ability of tracking the overall health of the Air Force's fleet and managing it more efficiently has become a greater priority. With these changes in mind, AAIP is working toward identifying best practices, sharing ideas across weapons systems, and focusing on cost reduction and total ownership cost.

To accomplish the above goals, MC rate will no longer be the yard stick for measuring the health of the fleet. Instead, maintenance managers will utilize aircraft availability, which takes more than just MC rate into account. NMCB, NMCS, NMCM, unit possessed not reported (UPNR), and depot times will be used when calculating the overall health of the fleet and aircraft availability.

The MC rate will no longer be the yard stick for measuring the health of the fleet. Instead, maintenance managers will utilize aircraft availability which takes more than just MC rate into account.

Leading and lagging indicators associated with fleet availability are:

- **Leading**
  - Ground abort rate
  - Air abort rate
  - MAF total air abort rate (home station air aborts + J diverts)
  - Code 3 break rate
  - 4-/8-/12-hour fix rate
  - Repeat rate
  - Recur rate
  - Logistics departure reliability (LDR)
  - Average deferred/delayed discrepancies per aircraft
  - Discrepancies awaiting maintenance (AWM) or awaiting parts (AWP)
  - MSE rate
  - Functional check flight (FCF) release rate
  - CANN rate
  - Issue effectiveness rate
  - Stockage effectiveness rate

- Bench-stockage effectiveness rate
- Mission capability (MICAP) aircraft part rate
- Average repair cycle days
- Phase flow—a phase time distribution interval (TDI)

A set flying schedule is planned, then carried out in the prescribed manner in order to execute the flying program requirements and ensure adequate time to perform fleet health functions (scheduled maintenance).

- **Lagging**
  - AA–aircraft availability rate
  - MC–mission capable rate
  - FMC–fully mission capable rate
  - PMC–partially mission capable rate
  - PMCS–PMC for supply rate
  - PMCM–PMC for maintenance rate
  - PMCB–PMC for both maintenance and supply rate
  - NMCM (U/S)–not MC for maintenance, unscheduled or scheduled, rate
  - NMCS–not MC for supply rate
  - NMCB (U/S)–not MC for maintenance and supply, unscheduled or scheduled, rate
  - TNMCM–total not MC for maintenance (NMCM + NMCB) rate
  - TNMCS–total not MC for supply (NMCS + NMCB) rate
  - UPNR-unit possessed not reported

Program Execution. These indicators show a unit's ability to fly a given schedule to accomplish the mission. A set flying schedule is planned, then carried out in the prescribed manner in order to execute the flying program requirements and ensure adequate time to perform fleet health functions (scheduled maintenance). The UTE rate is the overall indicator for a flying program or mission. Leading and lagging indicators associated with program execution are:

- **Leading**
  - Primary aircraft inventory (PAI) versus possessed aircraft rate

- Programmed UTE versus actual UTE rates
- Programmed average sortie duration (ASD) versus actual ASD
- Flying-hour execution
- Flying-scheduling effectiveness (FSE) rate
- Chargeable deviation rate:

Operations add*	Operations delete
Operations nondelivery	Logistics nondelivery**
Maintenance nondelivery	Supply nondelivery

- Nonchargeable deviations rates:

Ferry/FCF add***	Weather add
Other add****	Weather delete
Sympathy delete*****	Other delete
HHQ/TACC delete	HHQ/TACC add

*An *add* is an aircraft added to the flying schedule after that schedule goes into execution.

**A *nondelivery* is interchangeable with *cancellation* or a scheduled sortie that did not fly.

****Ferry* refers to a cross-country ferry, where the aircraft is en route from one location to another. *FCF* refers to a *functional check flight*, normally required after heavy or specialized maintenance to ensure airworthiness of an aircraft, and is not part of the normal flying schedule.

*****Other* stands for reasons not attributed to otherwise defined categories of deviations.

***** Sympathy refers to sorties that depend on other aircraft or facilities to be effective (for example, a tanker aircraft cancels its mission due to the abort of aircraft planned to receive its fuel).

Training must be planned and executed in the prescribed manner so properly trained technicians can do their part to accomplish the maintenance and flying programs.

Note: not all MAJCOMs distinguish between chargeable and nonchargeable deviations.

- **Lagging**
  - UTE rate—sortie (the average number of sorties flown per assigned aircraft per month) or hourly (the average number of hours flown per assigned aircraft per month).
  - Logistics departure reliability measures the ability of logistics to ensure aircraft depart within 14 minutes of the scheduled departure time. Indicators associated with departure reliability are:
    - Home station
    - En route (second or subsequent leg of a mission)
    - Worldwide
    - First station after home station

Maintenance Training. These indicators measure the ability of a unit to train and prepare individuals to perform

their assigned tasks. Training must be planned and executed in the prescribed manner so properly trained technicians can do their part to accomplish the maintenance and flying programs. Indicators associated with maintenance training are:

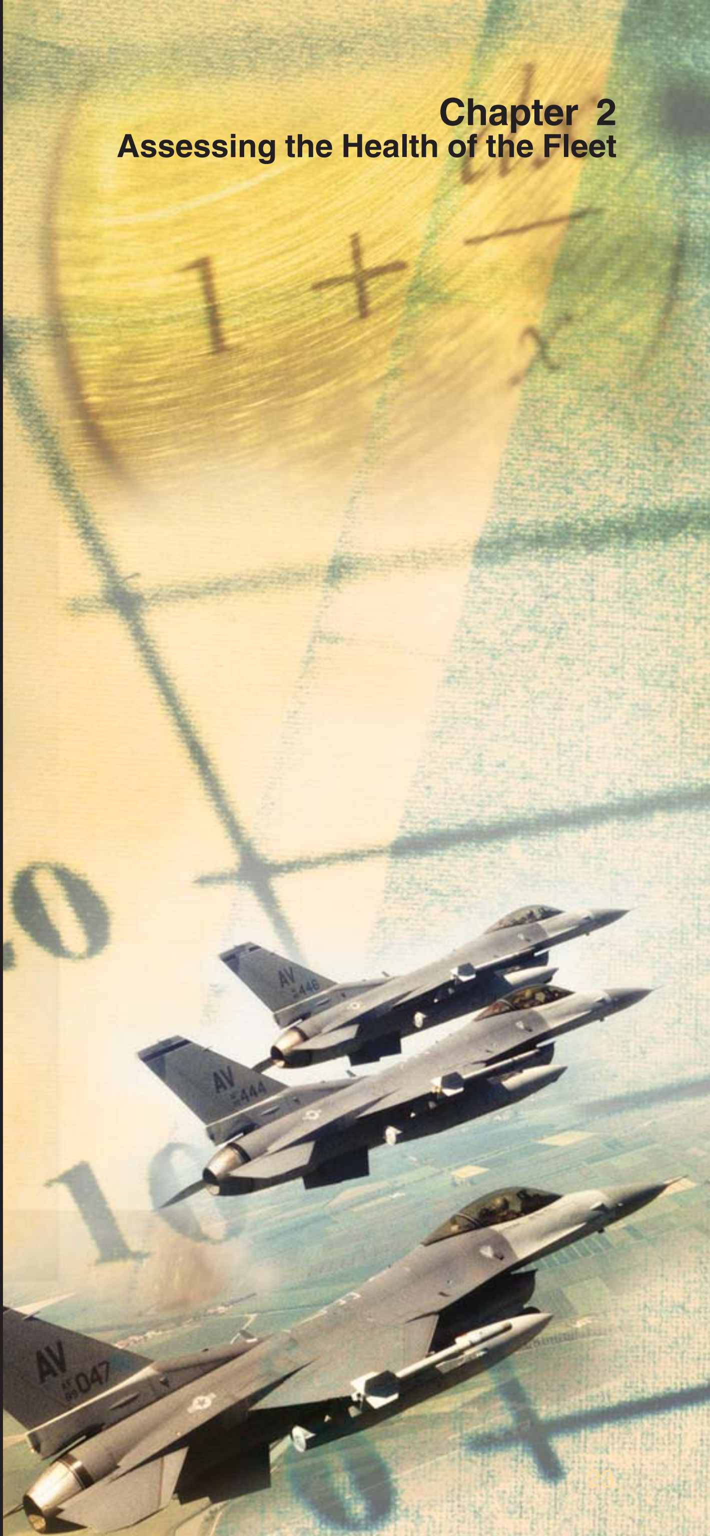
- Upgrade training (UGT) status
- Career development course (CDC) pass rate
- Training overdues (total number)
- Training no-shows (total number)

Chapter 1 Notes
Maintenance Metrics Basics

Chapter 2
Assessing the Health of the Fleet

Special Interest

CHAPTER CONTENTS



The maintenance analysis section is the key to providing data analyses and graphical presentations that illustrate how well mission requirements are being met. Its primary responsibility is to show where the deficiencies are. Maintenance analysts are trained statisticians and investigators. Their core job is to analyze raw data, identify significant trends and problem areas, and present that information to the people who can correct the deficiencies. Most importantly, they can identify impending problems that require action. Astute leaders charge analysis with investigating problems suspected of driving unit effectiveness.

Maintenance analysts are trained statisticians and investigators. Their core job is to analyze raw data, identify significant trends and problem areas, and present that information to the people who can correct the deficiencies.

Maintenance Analysts

The analysts are the focal point for the management information systems (MIS) in the maintenance complex, providing assistance with information availability and data retrieval. Maintenance analysts are experts on the capabilities and limitations of the MIS used to collect raw data from across the maintenance complex (including debriefing, maintenance operations center, and production work centers). The analysts turn raw data into information (HHQ reports, special studies, and maintenance analysis referrals) used to evaluate the effectiveness and efficiency of a unit's maintenance effort. While some of these products are devised and used only at the unit level, others are monitored at higher headquarters. The maintenance analysis superintendent can provide a thorough briefing on the specific measurements used.

Gauging the Unit

One way to gauge a unit's performance is to compare its rates to those of other units Air Force-wide with the same type aircraft and fleet size. When a unit's rates are very different from like units, it may indicate problems. Comparing present performance to past performance and current trends to past trends may also reveal insights into the relative health of a unit.

Table 1 identifies some key metrics, provides a brief description of each metric with the desired trend, and presents some things to consider when a unit's performance is not meeting the desired trend.

Metric	Description	Things to Look For
Aircraft Availability (AA) Rate REF: TO 00-20-2 Appendix L, TBD.	Percentage of a fleet that is available (Mission Capable) Desired Trend (up)	Look for increases in $NMCM_{NA}$, $NMCS_{NA}$, $NMCB_{NA}$, UPNR, and Depot.
Not Mission Capable Maintenance-NA ($NMCM_{NA}$) Rate REF: TO 00-20-2 Appendix L, TBD.	Percentage of a fleet in NMCM status (does not include Depot and UPNR) Desired Trend (down)	Look for causes (WUCs) of increasing rate.
Not Mission Capable Supply-NA ($NMCS_{NA}$) Rate REF: TO 00-20-2 Appendix L, TBD.	Percentage of a fleet in NMCS status (does not include Depot and UPNR) Desired Trend (down)	Look for causes (WUCs) of increasing rate.
Not Mission Capable Both-NA ($NMCB_{NA}$) Rate REF: TO 00-20-2 Appendix L, TBD.	Percentage of a fleet in NMCB status (does not include Depot and UPNR) Desired Trend (down)	Look for causes (WUCs) of increasing rate.
Depot Rate REF: TO 00-20-2 Appendix L, TBD.	Percentage of a fleet in depot status Desired Trend (down)	Look for causes of unscheduled depot maintenance
UPNR (Unit Possessed Not Reported) REF: TO 00-20-2 Appendix L, TBD.	Percentage of a fleet in UPNR (aircraft in some type of B status, ie. BT, BJ, BO) Desired Trend (down)	Look for causes of increased UPNR
Mission Capable (MC) Rate REF: AFI 21-103, Para A2.2	Percentage of unit possessed (reported) aircraft that are either Fully Mission Capable (FMC) or Partial Mission Capable (PMC) Desired Trend (up)	Maintenance managers should look for workers deferring repairs to other shifts, inexperienced workers, lack of parts, poor in-shop scheduling, high cannibalization rates, or training deficiencies.
Total Not Mission Capable Maintenance (TNMCM) Rate REF: AFI 21-103, Para A2.5.2	Percentage of unit possessed (reported) aircraft unable to meet primary assigned missions for maintenance reasons (includes NMCM and NMCB) Desired Trend (down)	A high or increasing rate could indicate heavy workloads (for example, people are over tasked), poor management, training problems, or poor maintenance practices, or a reliability problem.

Table 1. Maintenance Analysis (Part 1)

Metric	Description	Things to Look For
Total Not Mission Capable Maintenance (TNMCS) Rate REF: AFI 21-103, Para A2.5.1	Percentage of unit possessed (reported) aircraft unable to meet primary assigned missions for supply reasons (includes NMCS and NMCB) Desired Trend (down)	A high or increasing rate indicates parts not available in the system and could indicate stock level problems, transportation issues, or back shop issues (lack of tech data, SRUs and bits and pieces).
Abort Rate REF: TO 00-20-2 Appendix L, 7.	The percentage of missions aborted on the ground and in-flight. Desired Trend (down)	Quality of maintenance decreasing especially if aborts are caused by R/R write-ups or aircrews not proficient on newer systems (leading to erroneous write-ups), reliability problems or issues.
Break Rate REF: TO 00-20-2	This metric primarily indicates aircraft system reliability and represents the number of aircraft with a grounding write-up (Code 3 break) per total number of sorties. Desired Trend (down)	Reliability of parts, training deficiency, poor technical data, test equipment, or insufficient tools.
Fix Rate REF: TO 00-20-2 Appendix L, 12, 13, and 14.	Percentage of aircraft landing with code 3 breaks and returning to a flyable status within certain amount of clock hours. Desired Trend (up)	Lack of training, lack of experienced technicians, poor technical data, lack of tools, or lack of test equipment will greatly impact this rate.
R/R Rate REF: AFI 21-101, Para 1.15.3.61	The average number of repeat and recur system malfunctions compared to the total number of aircrew write-ups. Desired Trend (down)	A high R/R rate may indicate a lack of thorough troubleshooting, inordinate pressure to commit aircraft to the flying schedule for subsequent sorties; or a lack of experienced, qualified, or trained technicians.

Table 1. Maintenance Analysis (Part 2)

Metric	Description	Things to Look For
Maintenance Scheduling Effectiveness Rate REF: AFI 21-101, Para 1.15.3.13	The number of maintenance actions started as scheduled per total number of maintenance actions scheduled. Desired Trend (down)	If either the unit or individual tail number rates decrease a great deal look for: 1. Shortages in equipment or personnel, 2. Problems with a particular type of maintenance action being accomplished later than scheduled, 3. Resources being over committed.
Deferred Discrepancies REF: AFI 21-101, Para 1.15.3.61	The average deferred discrepancies across the unit's average possessed aircraft fleet. Depicts how well your unit is keeping up with minor repairs. Desired Trend: (down)	The total number increasing or one tail number with a great deal more than the others, look for: 1. Actions being deferred for convenience, 2. Crew Chiefs follow-up on AWP and shop chief awareness of backlogs, 3. Workload increases.
CANN Rate REF: TO 00-20-2 Appendix L, 32.	The number of cannibalizations that occur per 100 sorties. Desired Trend: (down)	Reliability of parts, problems at shop or depot repair facility, lack of discipline or supervision, poor sense of urgency, supply problems, kit fill rates, parts that never had to be CANNed before (old airplanes breaking for new reasons, insufficient stock levels on base, having to manage parts for deployments). Analyze the cause codes of CANNs. Are the parts being CANNed authorized to be on hand?
Flying Schedule Effectiveness (FSE) Rate REF: AFI 21-101, Para 1.15.3.9	The percentage of sorties scheduled minus deviations. Desired Trend (up)	Last minute aircraft being added to the schedule, frequent configuration changes, frequent changes to the flying schedule, lack of discipline on who is authorized to change the flying schedule.

Table 1. Maintenance Analysis (Part 3)

Chapter 3
The Metrics

Special Interest

CHAPTER CONTENTS

Maintenance Metrics Formula Index

Flying Related

Maintenance Related

Supply Related

Shop Related

Training Related

Air Mobility Command-Only Related

Maintenance Status/FSE. The daily status summary should focus on yesterday, today, and tomorrow—what the unit did yesterday (flying schedule summary, including number of planned sorties versus number of flown sorties and chargeable deviations), today's schedule and current aircraft status, and what's planned for tomorrow. Remember, daily statistics are a snapshot. It may be difficult to see trends by looking only at daily performance once a week. Performance indicators may improve just by virtue of being watched. What gets attention, gets fixed.

Remember, daily statistics are a snapshot. It may be difficult to see trends by looking only at daily performance once a week. Performance indicators may improve just by virtue of being watched. What gets attention, gets fixed.

Flying-Related Metrics

Aircraft Availability (Lagging). This indicator has become the cornerstone for maintenance metrics, measuring the ability of the maintenance group to provide sufficient aircraft to accomplish mission requirements. A set percentage of the fleet is necessary and must be available on any given day in order to execute the flying program. This is expressed as total time possessed minus depot possessed, NMCM, NMCS, NMCB and UPNR. Total possessed codes, MC possessed codes, and depot possessed codes can be found in AFI 21-101 with a definition of each in AFI 21-103. The Aircraft Availability rate is the percentage of a fleet's total active inventory (TAI) that is available (mission capable).

(MC Hours)/(TAI Hours) x 100

Formula 1. Aircraft Availability

Mission capable (MC) hours are the sum of MC hours in the following possession purpose codes (PPC): CA, CB, CC, CF, EH, EI, IF, PJ, PL, PR, TF TJ, ZA, and ZB.

TAI hours are the possessed hours of the following PPCs: BJ, BK, BL, BN, BO, BQ, BR, BT, BU, BW, BX, CA, CB, CC, CF, EH, EI, DJ, DK, DL, DM, DO, DR, IF, PJ, PL, PR, TF, TJ, XJ, XW, XZ, ZA, and ZB.

There are five subcomponents of nonavailability that complement aircraft availability. They are defined as follows:

The unit possessed not reported (UPNR) rate is the percentage of a fleet's total active inventory (TAI) that are unit possessed not reported.

UPNR Rate = (UPNR Hours/TAI Hours) x 100

UPNR hours are the sum of the number of possessed hours in the following PPCs: BJ, BK, BL, BN, BO, BQ, BR, BT, BU, BW, BX, XJ, XW, and XZ.

The depot rate is the percentage of a fleet's TAI that are in depot status.

Depot Rate = (Depot Hours/TAI hours) x 100

Depot hours are the sum of the number of possessed hours in the following PPCs: DJ, DK, DL, DM, DO, and DR.

The not mission capable maintenance$_{NA}$ (NMCM$_{NA}$) rate is the percentage of a fleet's TAI that is NMCM.

NMCM$_{NA}$ Rate = (NMCM Hours/TAI hours) x 100

NMCM hours are the sum of NMCM hours in following PPCs: CA, CB, CC, CF, EH, EI, IF, PJ, PL, PR, TF TJ, ZA and ZB.

The not mission capable supply$_{NA}$ (NMCS$_{NA}$) is the percentage of a fleet's TAI that is NMCS.

NMCS$_{NA}$ Rate = (NMCS hours/TAI hours) x 100

NMCS hours are the sum of NMCS hours in following PPCs: CA, CB, CC, CF, EH, EI, IF, PJ, PL, PR, TF TJ, ZA and ZB.

A high FSE rate indicates the unit has planned well and executed the schedule. A low FSE rate may indicate needless turbulence. The FSE rate is a valuable indicator because it takes into account total unit performance.

The not mission capable both$_{NA}$ ($NMCB_{NA}$) is the percentage of a fleet's TAI that is NMCB.

$$NMCB_{NA}\ Rate = (NMCB_{NA}\ Hours/TAI\ Hours) \times 100$$

NMCB hours are the sum of NMCB hours in following PPCs: CA, CB, CC, CF, EH, EI, IF, PJ, PL, PR, TF TJ, ZA and ZB.

FSE Rate (Leading). This indicator is a measure of how well the unit planned and executed the weekly flying schedule. *Plan what you fly and fly what you plan* is still valuable flying schedule guidance. Sticking to the printed schedule reduces turmoil, which helps keep people focused, allows for a better maintenance product, and eases personnel tension.

A high FSE rate indicates the unit has planned well and executed the schedule. A low FSE rate may indicate needless turbulence; however, not all turbulence is bad. When intentionally introduced to avoid additional turbulence later, it is smart management. It is all too easy to get drawn into operations requirements versus maintenance capabilities when looking at causes of turbulence. The

mission is priority number one all the time, but firm scheduling discipline is a must for effective operations. When the rate is low, leaders must search for opportunities to plan more carefully or stick to the current plan. Review chargeable deviations (situations generally within a unit's control) because they cause FSE to decrease. Ground aborts are the primary driver. A high commitment rate may also be influencing FSE. Have HHQ/TACC taskings caused a surge period? The FSE rate is a valuable indicator because it takes into account total unit performance. Some of the factors affecting FSE rates are timely aircraft preparation and repair, quality of maintenance, sense of urgency, crew-show discipline, avoidance of early and late takeoffs, and flexibility when unplanned events arise.

((Adjusted Sorties Scheduled - Deviations)/
(Adjusted Sorties Scheduled)) x 100

Formula 2. Flying Schedule Effectiveness Rate: AFI 21-101

Flying Schedule Deviations. These are reasons why an aircraft didn't fly a sortie as scheduled and are recorded as chargeable or nonchargeable for activity causing deviation (operations, logistics, air traffic control, weather, higher headquarters, and so forth).

((Maintenance Deviations) /
(Total Sorties Scheduled)) x 100 = Maintenance Rate

((Operations Deviations) /
(Total Sorties Scheduled)) x 100 = Operations Rate

Formula 3. Flying Schedule Deviations

Primary Aerospace Vehicle (Aircraft) Inventory (PAI). This inventory shows the number of aircraft assigned to meet primary aircraft authorization. A low PAI possessed forces a higher real UTE rate on fewer aircraft, possibly compromising two key areas: scheduled maintenance and deferred discrepancies (DD). Look for higher R/R rates. Break rates may increase, and the fix rate may suffer as well.

A low PAI possessed forces a higher real UTE rate on fewer aircraft, possibly compromising two key areas: scheduled maintenance and deferred discrepancies.

Total Possessed Hours/(# of Days in the period x 24)

Formula 4. Average Number of Aircraft Possessed: AFI 21-101

Backup Aircraft Inventory (AMC). BAI shows the number of aircraft above the primary mission inventory that permit scheduled and unscheduled maintenance, modifications, inspections, and repair without reduction of aircraft available for operational missions.

Sortie Utilization (UTE) Rate (Leading). The sortie UTE rate is a leading indicator, but serves as a yardstick for how well the maintenance organization supports the unit's mission. If the unit isn't meeting the sortie UTE rate, it means the average number of sorties per aircraft (based on PAI, not on assigned aircraft) is lower than programmed. Just scheduling more sorties is not the answer. The root cause of a low UTE rate may lie in maintenance scheduling practices that result in low aircraft availability, effectiveness of the production effort that repairs and prepares aircraft for the next sortie, or even availability of qualified and trained technicians. It may also mean that other factors, such as weather, have an effect on the operation.

(Sorties Flown per Month) / (PAI per Month)

Formula 5. Sortie UTE Rate: AFI 21-101

Hourly Utilization Rate (Leading). Operations and maintenance share this indicator because it reflects their combined performance. Operations are not flying the programmed ASD if the unit does not meet the hourly UTE rate. When maintenance meets the sortie UTE rate and operations meets the hourly UTE rate, the squadron can successfully execute the annual flying-hour program.

The sortie UTE rate is a leading indicator, but serves as a yardstick for how well the maintenance organization supports the unit's mission.

(Hours Flown per Month) / (PAI per Month)

Formula 6. Hourly UTE Rate: AFI 21-101

Abort Rate (Leading). A unit's abort rate can be an indicator of both aircraft reliability and quality of maintenance performed. The abort rate may be measured as a total or separately as a ground or air aborts. The MAF tracks materiel and nonmateriel aborts through the Global Decision Support System and AMC History System via diversion codes *J* and *K*. A *J* divert is an abort due to an

A unit's abort rate can be an indicator of both aircraft reliability and quality of maintenance performed.

aircraft system malfunction, while a *K* divert is for nonmateriel reasons. Examine the abort rate in relation to system malfunctions. Look for trends, root causes, and lasting corrective actions. The focus should be on preventing as many aborts as possible. Adding a preventable or not preventable indicator on the chargeable deviations slide focuses attention on prevention. A high abort rate will drive the FSE rate down. An air abort is really an operations call. Not all airborne malfunctions, however, result in an air abort. If an alternate mission is flown, then it's not an air abort. If there are a lot of air aborts, talk with operations—it may simply be a misunderstanding of the rules.

((Air + Ground Aborts)/
(Total Sorties Flown + Ground Aborts)) x 100

Formula 7. Total Abort Rate: AFI 21-101

((Air Aborts (Maintenance)) / (Total Sorties Flown)) x 100

Formula 8. Maintenance Air Abort Rate: AFI 21-101

((Ground Aborts (Maintenance)) /
(Total Sorties Flown + Ground Aborts)) x 100

Formula 9. Ground Abort Rate: AFI 21-101

((# of Air Aborts (J Diverts + Local Training Air Aborts) /
(# of Sorties from G081)) x 100

Formula 10. AMC Air Abort Rate (Logistics): AFI 21-1-1

Code 3 Break Rate (Leading). The break rate is the percentage of sorties that land in a Code 3 status. It's an indicator of aircraft system reliability and, sometimes, a measure of the quality of aircraft maintenance performed. The break rate is also an excellent predictor of parts demand. Several indicators that follow break rate are MC, TNMCS, CANN, and R/R.

The break rate is the percentage of sorties that land in a Code 3 status. It's an indicator of aircraft system reliability and, sometimes, a measure of the quality of aircraft maintenance performed. The break rate is also an excellent predictor of parts demand.

((# of Sorties that Land Code 3) / (Sorties Flown)) x 100

Formula 11. Code 3 Break Rate: AFI 21-101

Maintenance-Related Metrics

Fully Mission Capable (FMC) Rate (Lagging). Compare the FMC rate with the monthly MC rate. A significant difference between the two indicates aircraft are flying with key systems partially inoperative and cannot perform all the designed operational capability statement missions. A low FMC rate may indicate a persistent parts-supportability problem.

((FMC Hours) / (Possessed Hours)) x 100

Formula 12. Fully Mission Capable Rate: AFI 21-101

Partially Mission Capable (PMC) Rate (Lagging). An aircraft may be partially mission capable for either parts or maintenance, and the status indicates the aircraft cannot perform all assigned missions. Good maintenance practice dictates all malfunctions be fixed as soon as possible whether or not it's convenient.

((PMCB Hours + PMCM Hours + PMCS Hours) / (Possessed Hours)) x 100

Formula 13. Partially Mission Capable Rate: AFI 21-101

Mission Capable (MC) Rate (Lagging). The MC rate traditionally has been the yardstick for measuring a unit's performance. This rate is very much a composite metric, that is, it is a broad indicator of many processes and metrics. However, other metrics such as aircraft availability are becoming more responsive metrics. A low MC rate may

indicate a unit is experiencing many hard (long fix) breaks that don't allow them to turn an aircraft for many hours or several days. It may also indicate serious parts supportability issues, poor job prioritization, lack of qualified technicians, or poor sense of urgency. The key here is to focus on the negative trends and top system problems that lower the MC rate. Examining the 4-/8-hour (fighter) or 12-hour (all other aircraft) fix rates may provide clues to a low MC rate, but be careful here—the message units should hear from leadership is, fixing aircraft well is more important than fixing aircraft fast. Positive trends for a well-managed fix rate will indicate good management. Fixes on some systems predictably take longer than 4, 8, or 12 hours. Exceeding this mark is not necessarily indicative of poor maintenance. However, a unit with poor

Examining the 4-/8-hour (fighter) or 12-hour (all other aircraft) fix rates may provide clues to a low MC rate, but be careful here—the message units should hear from leadership is, fixing aircraft well is more important than fixing aircraft fast. Positive trends for a well-managed fix rate will indicate good management.

production problems may consistently exceed 4-/8-/12-hour fixes in a wide variety of systems.

((FMC Hours + PMC Hours) / (Possessed Hours)) x 100

Formula 14. Mission Capable Rate: AFI 21-101

The TNMCM rate is perhaps the most common and useful metric for determining if maintenance is being performed quickly and accurately.

Total Not Mission Capable for Maintenance (TNMCM) Rate (Lagging). The TNMCM rate is perhaps the most common and useful metric for determining if maintenance is being performed quickly and accurately. Prioritization of jobs, good workload distribution, adequate facilities, and robust coordination between the maintenance operations center, flight line, and back shops are crucial to minimizing downtime. Look for a relationship between the R/R, break, and fix rates to NMCM. A strong correlation could indicate heavy workloads (people are over tasked), poor management, training problems, or poor maintenance practices. Usually, if the TNMCM rate is too high, these other rates also indicate problems. The key is to be alert. When one is bad, automatically look at the others.

((NMCM Hours + NMCB Hours) / (Possessed Hours)) x 100

Formula 15. TNMCM Rate: AFI 21-101

Total Not Mission Capable for Supply (TNMCS) Rate (Lagging). TNMCS is driven principally by spare parts availability. However, maintenance can keep the rate lower by consolidating feasible CANNs to as few aircraft as practical. TNMCS is based on the number of airframes out for parts, instead of the number of parts that are MICAP. It does not take long to see the link between the CANN rate and TNMCS rate. The best situation is for both rates to be as low as possible. Another word of caution here—TNMCS should not be held low at the expense of increased CANN actions. Maintenance should not be driven to make undesirable CANNs (those that may be labor intensive or risk damaging the good part) just to keep the TNMCS rate low. Maintainers will let leaders know what they think if pressed to CANN a part that's not feasible just to consolidate all MICAPs on one aircraft. An easy mistake is just looking at the few components eating up huge chunks of time. Usually these are hard-to-obtain items across the Air Force or involve heavy maintenance. They are obvious, but little can be done about them. Try focusing on the items getting a lot of hits. They may be easy to get, but why are so many being ordered? Is the base-stockage level high enough? Is there a trend or reason why so many need to be ordered in the first place? Another facet is the amount of time lost due to parts in transit. Are the parts easy to procure but sitting on pallets at some port? Are the folks on base getting the old parts turned in? Could the part be fixed on base, even though the current guidance says send it back to the depot? Can the status quo be challenged?

$$((\text{NMCS Hours} + \text{NMCB Hours}) / (\text{Possessed Hours})) \times 100$$

Formula 16. TNMCS Rate: AFI 21-101

Repeat/Recurring (R/R) Rate (Leading). R/R is perhaps the most important and accurate measure of the quality of maintenance performed in a unit. A repeat discrepancy is one occurring on the same system or subsystem on the first

sortie or sortie attempt after originally reported. A recurring discrepancy occurs on the second through fourth sortie or attempted sortie after the original occurrence. A unit's goal should be no R/Rs. A high R/R rate may indicate lack of thorough troubleshooting; inordinate pressure to commit aircraft to the flying schedule for subsequent sorties; or a lack of experienced, qualified, or trained technicians. Examine each R/R discrepancy and seek root causes and lasting fixes.

((Total Repeats + Total Recurs) / (Total Pilot Reported Discrepancies)) x 100

Formula 17. R/R Rate: AFI 21-101

4-, 8-, and 12-Hour Fix Rates (Leading). This indicator shows how well the repair process is being managed. Occasionally, some repairs, just by their nature, exceed the standard timeframe. However, all repairs exceeding the standard time should be reviewed.

4-Hour Fix Rate. The cumulative percentage of Code 3 aircraft breaks recovered within 4 hours of landing. This interval is used for fighter aircraft.

8-Hour Fix Rate. The cumulative percentage of Code 3 aircraft breaks recovered within 8 hours of landing. This interval is also used for fighter aircraft.

12-Hour Fix Rate. The cumulative percentage of aircraft breaks recovered within 12 hours of landing. This interval is reported for all aircraft other than fighter aircraft.

((# of Code 3 Breaks Fixed Within 4, 8, or 12 Hours After Landing) / (Total Code 3 Breaks)) x 100

Formula 18. 4-, 8- (Fighter) or 12-Hour (other Aircraft) Fix Rate: AFI 21-101

Mission Scheduling Effectiveness (MSE) Rate (Leading). MSE is a measure of maintenance's ability to plan and complete inspections and periodic maintenance. A low MSE rate may indicate a unit is experiencing turbulence. It's a leadership issue if the turbulence could be avoided with careful planning. Maintenance missing a scheduled action because an aircraft is broken off station is a reasonable occurrence. Be cautious when maintenance misses a scheduled action because the aircraft is pulled to support the flying program. A unit should schedule maintenance first and then support the flying schedule with the remaining aircraft available. Too often, units do it the other way around—schedule maintenance with airframes left over after schedulers fill the flying schedule.

A unit should schedule maintenance first and then support the flying schedule with the remaining aircraft available. Too often, units do it the other way around—schedule maintenance with airframes left over after schedulers fill the flying schedule.

((Number of Completed Scheduled Maintenance Actions) / (Number of Maintenance Actions Scheduled)) x 100

Formula 19. MSE Rate: AFI 21-101

Delayed Discrepancies (DD) Rate (Leading). Sometimes minor maintenance actions must be deferred to a more opportune time. DDs fall into two categories—Awaiting Maintenance (AWM) and Awaiting Parts (AWP). Many deferred actions appropriately wait until a scheduled event such as phase. Supply should maintain an aggressive followup program to keep visibility on those parts ordered for AWP deferred discrepancies. Maintenance should try to keep the AWM rate as low as possible. If a discrepancy doesn't need to be scheduled with a more extensive maintenance action, maintenance schedulers can schedule an aircraft down for a day to work deferred discrepancies.

Monthly Rates: Each Monday morning, analysts take a snapshot of each reportable mission design series, and of the total number of deferred discrepancies, for both maintenance and supply, for the previous workweek. The following calculations are applied to the *snapshot* information.

(Total AWM (Snapshot) Discrepancies) / (Average Aircraft Possessed) = AWM

(Total AWP (Snapshot) Discrepancies) / (Average Aircraft Possessed) = AWP

(Total (Snapshot) AWM + AWP Discrepancies) / (Average Aircraft Possessed) = Total DD

Formula 20. DD Rate: AFI 21-101

Units use the following formulas to determine the cumulative monthly rates. At least four weekly rates must be used to calculate the cumulative monthly rate.

AWM (Week 1) + AWM (Week 2) + AWM (Week 3) + AWM (Week 4)/ Number of Samples = Monthly AWM Rate

AWP (Week 1) + AWP (Week 2) + AWP (Week 3) + AWP (Week 4)/ Number of Samples = Monthly AWP Rate

Phase Flow (Leading). A phase time distribution interval (TDI) is a product that shows hours remaining until the next phase on a flying squadron's fleet. It is common practice to convert the TDI to a scatter diagram, facilitating ease of tracking. A perfect phase flow portrays a fleet's evenly paced progression into phase (a nearly perfect upward-sloping diagonal line). Average phase time remaining on a fleet should be approximately half the inspection interval. However, a unit may have good reasons to manage its phase flow so the data points define a pattern other than a diagonal line. For example, in preparation for a long-distance overseas deployment, a unit may need to build up the average phase time remaining on its fleet, because phase capability may be limited for a short time.

A perfect phase flow portrays a fleet's evenly paced progression into phase (a nearly perfect upward-sloping diagonal line). Average phase time remaining on a fleet should be approximately half the inspection interval.

Beware of gaps or groupings, especially on aircraft with less than half the time remaining to phase.

(Total Hours of All Possessed Aircraft Until Next Phase) / (Total Possessed Aircraft Assigned)

Formula 21. Phase Flow: AFI 21-101

Isochronal Inspection (ISO) Rate (Leading): An isochronal TDI measures the average time until next major inspection remaining on the fleet. It should be approximately half the inspection interval and should appear as a diagonal line when the fleet ISO average is portrayed graphically. However, a unit may have good reasons to manage its ISO flow so the date points define a pattern other than a diagonal line.

(Total Hours of All Possessed Aircraft Until Next ISO) / (Total Possessed Aircraft Assigned)

Formula 22. ISO Rate: AFI 21-101

Cannibalization (CANN) Rate (Lagging). The CANN rate is the average number of CANN actions per 100 sorties flown. A CANN action is the removal of a serviceable part from an aircraft or engine to replace an unserviceable part on another aircraft or engine, or removal of a serviceable part to put into a readiness spares package for deployments. This rate includes all aircraft-to-aircraft and engine-to-aircraft CANN actions. The measurement is used in conjunction with the supply issue effectiveness rate. In most cases, a CANN action takes place when base supply cannot deliver the part when needed and mission requirements demand the aircraft be returned to an MC status. Since supply relies on the depot for replenishment, this indicator can also be used, in part, to indicate depot support.

(Number of Aircraft and Engine CANNs) / (Total Sorties Flown) x 100

Formula 23. CANN Rate: AFI 21-101

Supply-Related Metrics

Issue Effectiveness Rate. This is the percentage of customer requests that were filled by items in the inventory. Issue effectiveness is based on filling any request, not just requests for items supply is authorized to stock. It is used to measure how well the logistics customer is supported by supply. Issue effectiveness is usually lower than stockage effectiveness, but it is more representative of a supply customer's view of supply support.

Issue effectiveness is usually lower than stockage effectiveness, but it is more representative of a supply customer's view of supply support. The significant difference between issue and stockage effectiveness is that stockage effectiveness uses only those back orders for items supply is authorized to stock.

((Issues) / (Issues + All Back Orders)) x 100

Formula 24. Issue Effectiveness Rate: AFMAN 23-110, Vol 2, Part 2, Chapter 5

Stockage Effectiveness Rate. This is the percentage of customer requests filled by items supply is authorized to stock. The significant difference between issue and stockage effectiveness is that stockage effectiveness uses only those back orders for items supply is authorized to stock. It measures how well the logistics customer is supported by base supply and depot replenishment. This is especially important since supply cannot possibly stock every possible part. It is funded to stock only the most used or critical parts. A high stockage effectiveness rate means success in anticipation of customer needs.

((Issues) / (Issues + All Back Orders – 4W Back Orders)) x 100

Formula 25. Stockage Effectiveness Rate: AFMAN 23-110 Vol 2, Part 2, Chapter 5

Total Repair Cycle Time. This is the average time, in days, an unserviceable asset spends in the repair cycle at a unit. This indicator is for aircraft only. It does not include engines or support equipment. The clock begins when maintenance orders a repair cycle asset from supply and ends when a like asset (serviceable or unserviceable) is turned in to supply. The time the item is awaiting parts (AWP) in the repair shop is not included. This indicator is primarily a local management tool. To improve the process of repairing parts, the different steps in that process must be measured. This indicator and its components provide this capability.

Delayed Before Repair + Delayed After Repair + Repair Time - AWP

**Formula 26. Total Repair Cycle Time:
AFMAN 23-110 Vol 2, Part 2, Chapter 5**

Average Repair Cycle Time by Segments (Buckets of Time). This is a more detailed look at the total repair cycle days. The total repair cycle is broken into three segments:

- Pre—the time from when a serviceable part is issued from supply until the broken part is received by the backshop for repair.
- Repair—the time a part remains in the shop until repaired, minus time spent AWP.
- Post—the time it takes for the repaired part to be turned back to supply.

The sum of the three steps above equals the total repair cycle time. It measures the efficiency during the three major steps in a unit's repair cycle.

(Total # of Days in Pre-Maintenance) /
(Total # of Items Repaired) =Average Pre-Maintenance Time

(Total # of Days in Repair – AWP Days) /
(Total # of Items Repaired) = Average Repair Time

(Total # of Days in Post Maintenance) /
(Total # of Items Repaired) = Average Post-Maintenance Time

(Total Repair Cycle Time) /
(Total Units) = Average Repair Cycle Time

Formula 27. Average Repair Cycle Time:
AFMAN 23-110 Vol 2, Part 2, Chapter 5

The EW Pod MC Rate represents the percentage of all possessed EW pods capable of fulfilling their wartime requirements.

Shop-Related Metrics

Electronic Warfare (EW) Pod MC Rate. An MC EW pod is one that can meet its wartime missions. Therefore, this rate represents the percentage of all possessed EW pods capable of fulfilling their wartime requirements.

((# of Serviceable) / (# of Possessed Pods)) x 100

Formula 28. EW Pod MC Rate

EW Pod AWP Rate. Measures deferred discrepancies for EW pods requiring parts. Weekly AWP rate is a snapshot taken each Monday morning and covers the previous work week (Monday-Friday).

((Total AWP (Snapshot) Discrepancies) /
(Average Possessed EW Pods)) x 100

Formula 29. EW Pod Weekly AWP Rate

Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) MC Rate. An MC LANTIRN pod is one that can meet its wartime missions. Therefore, this rate represents the percentage of all possessed LANTIRN pods capable of fulfilling wartime missions.

((# of Serviceable) / (# of Possessed Pods)) x 100

Formula 30. LANTIRN MC Rate

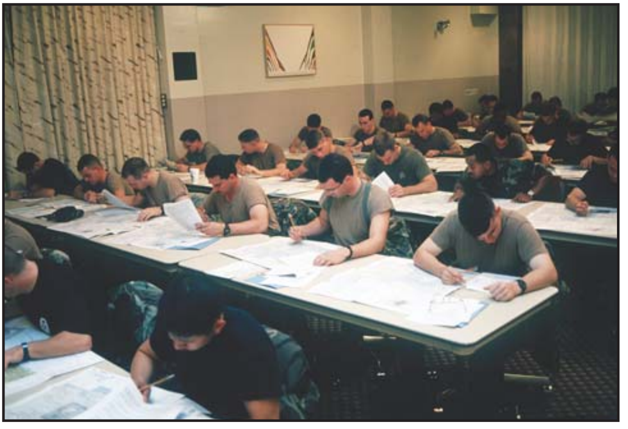
LANTIRN Test Station MC Status. LANTIRN test station capability is computed by calculating the ability of the shelter test equipment to bench check the 16 testable line-replaceable units, including LANTIRN intermediate automatic test equipment (LIATE), radio frequency automatic and electro-optical test set, power supply test set (PSTS), and the environmental control unit test set (ECUTS). The condition of the external support equipment (cooling and servicing unit, 400Hz frequency converter, and fluid-conditioning unit) is also tracked.

- **LANTIRN LIATE**—ten-unit test capability; Example: 40 percent MC = 4/10 units testable
- **Power PSTS**—four-unit test capability; Example: 75 percent MC = 3/4 units testable
- **ECUTS**—two-unit test capability; Example: 50 percent = 1/2 units testable

Spare Engine Status. The status shows the raw number of FMC spare engines available in the engine shop. Compare the number to the base stockage level to get an idea of the capability to replace engines or support deployments at a given time. Beware of snapshots in time on this indicator. A low daily snapshot is not necessarily an indicator of difficulty. The shop may have just issued engines to the line or for a deployment. The engine shop should show the annual trend line with war-reserve engine levels by month for the previous year. A particular month's data point not shown in association with the previous year's trend is not useful. Engines NMCS and engines NMCM are objective measures rating the health of engine parts supportability and the engine repair line.

Training-Related Metrics

Several indicators are useful to show the health of the maintenance training process. The following key indicators are available in a monthly status-of-training presentation the maintenance training organization develops.



Upgrade Training (UT) Status. This career-progression status reflects the percentage of five- and seven-level technicians in UT. The goal should be to keep the combined total less than 40 percent, because the higher the number, the greater the training burden.

((Number of Technicians in Upgrade Training) / (Total Number of Technicians)) x 100

Formula 31. UT Rate: AFI 21-101, para 1.15.3.20.1

CDC Pass Rate. CDC pass rate is the percent of people who pass their end-of-course tests. The goal is 95 percent; first and second fail percentages are also available.

Training Overdues. This indicator tracks the percentage of overdue training actions. The goal is to maintain this indicator at less than 5 percent. Training overdues are frequently a measure of readiness, as this measure considers wartime skills, such as M-16 and chemical warfare defense equipment training. Excessive overdues may indicate a force that feels they only have time for the day-to-day mission and don't have time to train.

Training No-Shows. This indicator tracks the number of scheduled training events versus the number of events not attended. The desired number of no-shows is zero. Every effort should be made to ensure individuals receive training once they are scheduled.

Considerations. As mentioned earlier in the handbook, some aircraft indicators, such as 8- and 12-hour fix rates or R/R, may also indicate training problems.

AMC-Only Metrics

Logistics Departure Reliability. This provides the percent of departures that are delayed because of supply, saturation, or maintenance problems. AMCI 10-202, Volume 6, *Mission Reliability Reporting System,* provides criteria for delay-code assignment. It also provides the commander with an objective measure of the health of the air mobility system and reflects the percentage of departures that are on time. On time refers to the standard for departures contained within the Air Mobility Master Plan—those within 14 minutes of the scheduled departure time. The main focus of departure reliability is to strengthen the air mobility system through accountability for process improvement.

((# of Departures - # of Logistics Delays) /
(# of Departures)) x 100

AMC Formula 1. Logistics Departure Reliability: AFI 21-101, AMCSUP 1

On time refers to the standard for departures contained within the Air Mobility Master Plan—those within 14 minutes of the scheduled departure time. The main focus of departure reliability is to strengthen the air mobility system through accountability for process improvement.

Worldwide Logistics Departure Reliability. Essentially this is the same as Logistics Departure Reliability. It provides the percentage of total departures that are delayed for supply, saturation, or maintenance problems. Local training missions that do not support an external customer are excluded because there are no requirements for the units to report delays for organically planned and executed missions.

Home-Station Logistics Departure Reliability. This delineates down to only first-leg departures of unit-owned aircraft departing home station. Local training missions that do not support an external customer are excluded because there are no requirements for the units to report delays for organically planned and executed missions.

((# of Home-Station Departures - # of Home-Station Logistics Delays**) / (# of Home-Station Departures)) x 100*

AMC Formula 2. Home-Station Logistics Departure Reliability: AFI 21-101, AMCSUP 1, para 5.8.19.5

*Home-station departure = Unit-owned (first leg of mission) departure.

**Home-station logistics delays that occur on the first leg of mission only.

En Route Logistics Departure Reliability. This is any second or subsequent leg departure of a mission. Local training missions that do not support an external customer are excluded because there are no requirements for the units to report delays for organically planned and executed missions.

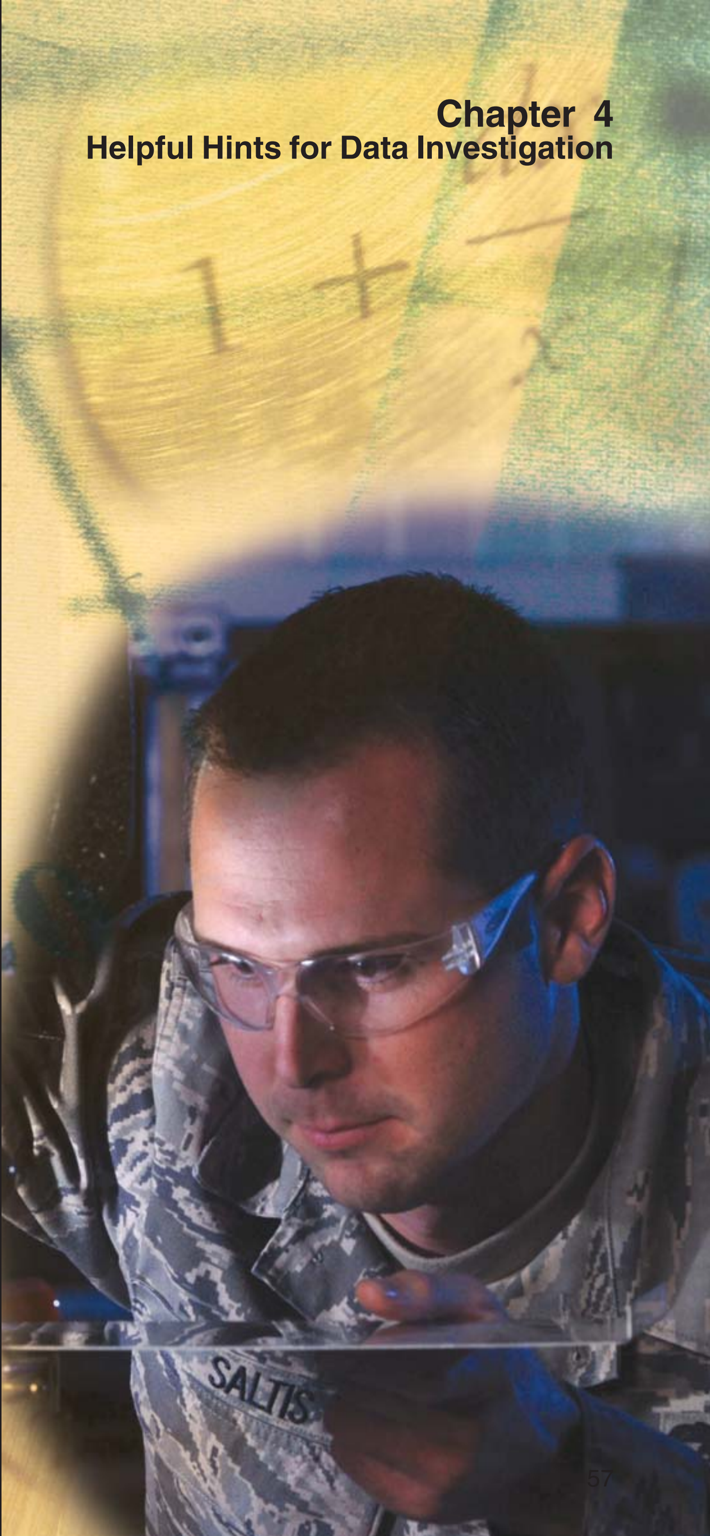
((# of En Route Departures - # of En Route Logistics Delays**) / (# En Route Departures*)) x 100*

AMC Formula 3. En Route Logistics Departure Reliability

*En Route departure = second or subsequent leg of the mission.

**En Route logistics delays that occur on the second or subsequent leg of the mission.

Chapter 4
Helpful Hints for Data Investigation



Special Interest

CHAPTER CONTENTS

57

Analytical Process

The analytical process consists of identifying contributory factors, manipulating raw data into meaningful formats; computing management indicators; performing statistical measurements; and creating accurate, complete, and easy-to-understand presentations. An analytical process uses a number of methods—for example, visual observation dependent upon the observer's experience and knowledge and statistically or visually performed comparative analysis—and involves the comparison of two or more like operations or items to identify variations or differences. Statistical analysis and statistical investigation are the methodical study of data. These methods are used to reveal facts, relationships, and differences about data and data elements, and are a useful adjunct to comparative and visual analysis. Analysts should use these tools and other methods to perform analytical studies to gain insight into unit performance and enhance process improvement.

When leaders have a hunch or a specific agenda, it is almost always better that they spell out what they think is going on or what they would like to see, if it can be done. Asking analysis for specific information or data is perfectly legitimate but fails to recognize just how much more it can provide.

AFSC 2R0X1 CDC is a good source of statistical and analytical techniques, and the maintenance data analysis section (MDAS) maintains a current copy of the five- and seven-level CDC for reference.

Management Contributions to the Analytical Process

Operations and logistics leaders have a significant impact on the usefulness of the MDAS. By challenging the MDAS with analyzing problems, they foster the in-depth training of the analysts and help the unit.

When leaders have a hunch or a specific agenda, it is almost always better that they spell out what they think is going on or what they would like to see, if it can be done. Asking analysis for specific information or data is perfectly legitimate but fails to recognize just how much more it can provide. If analysis knows what the agenda is, it is far better prepared to use all the tools at its disposal to uncover or present all the pertinent analyses.

Analysts should not just hand over raw data sheets; that is bean counting. Good analysts will always try, situation permitting, to provide a bottom-line narrative. The leader should not have to analyze the data; that is the analyst's job. It is easy to miscommunicate what is really wanted or how it is to be presented. The leader must be willing to go back to the well several times, because there are infinite ways to present information. There needs to be a dynamic relationship between leadership and analysts, where the latter feels free to probe for the real agenda. In the end, this saves a lot of time, and leaders get far better analyses and information.

Leaders should constantly review how information is being organized and presented. The lack of focus regarding use of data, improper arrangement of data for analysis, or unclear presentation of results can obscure meaningful information. Leaders should be familiar with how data are developed, interpreted, and presented to ensure accurate presentations for decisionmaking. Studies and analyses specifically targeted for areas of concern are valuable in helping units isolate factors surrounding problem areas.

Analytical Studies. MDAS will provide work centers the results of investigations, analyses, or studies. Specific studies are provided to the requester, and a file copy is retained for future reference. Reproducing the study or including it in a monthly maintenance summary achieves widespread dissemination.

The study should state assumptions up front, summarized plainly, and state how the significance is measured.

Most studies should begin with some sort of background information. Each study should include the data, research, investigation, and statistical findings, along with their respective sources. Conclusions relevant to the study should be drawn from this information. Finally, the study should include recommendations to address the conclusions relevant to the problem (other issues uncovered can be identified but should be kept separate). The most effective study is one that goes beyond

Most studies should begin with some sort of background information. Each study should include the data, research, investigation, and statistical findings, along with their respective sources. Conclusions relevant to the study should be drawn from this information. Finally, the study should include recommendations to address the conclusions relevant to the problem.

superficial conclusions and helps solve a problem relative to mission performance.

Maintenance Analysis Referrals

Referrals should not be determined by a quota system. They should be used only when necessary to effect a permanent solution to a problem that cannot be solved by other means.

Referrals are highly effective for making many agencies aware of a common problem. Referral reports are simply tools to aid in process improvement and should never be used to attach blame. A referral identifies, investigates, and proposes corrective actions for management problems.

Referral reports are used to start the referral procedure and document corrective actions for implementation and future reference. Given the amount of investigation and research needed to properly process referrals, they should not be used for problems that can be resolved more efficiently through verbal or other less formal communications.

Referrals should not be determined by a quota system. They should be used only when necessary to effect a permanent solution to a problem that cannot be solved by other means. Referral reports must be concise, accurate, and timely to provide operations and logistics leaders with information for making decisions. Anyone can initiate a referral, but MDAS is the office of primary responsibility and maintains a log of all referrals, assigning a referral number before processing begins. Referrals are routed through the affected agencies for comments, with the final addressee as the MDAS. The MDAS retains copies, indicates whether additional monitoring or follow-up action is necessary, and provides a completed study to the A4/A3 quality assurance.

Functions of Deficiency Analysis

Deficiency analysts serve a dual role. They provide analytical support to the squadrons and maintenance leaders and also provide technical expertise for the MDAS. They use analytical data and technical knowledge to identify problems, work with the customer, and help find solutions. They should not limit themselves to pointing out general areas for investigation. They should identify deficiencies applicable to a work center, particular equipment end item, maintenance practice, or management action. Deficiency analysis responsibilities include:

- Review QA summaries for positive and negative trends.
- Review debriefing data and abort information daily to assist in the identification of problem aircraft or systems.
- As a minimum, perform monthly reviews of:
    - Deferred discrepancy lists for technical errors or negative trends.
    - R/R discrepancy lists for problems.
    - High CND rates and incidents for inadequate troubleshooting or technical data problems.
    - Aircraft scheduling deviations for negative maintenance practices and trends that impact work force and workload stability.
- Monitor and evaluate the maintenance portion of the base repair program and intermediate repair enhancement program.
- Analyze the performance of selected systems, subsystems, and line replaceable units to help determine the source of problems affecting the mission.
- Attend the QA program and product improvement working group meetings, providing trend data as needed.

  Note: The function of the deficiency analyst is not to become the full-time data integrity team monitor.

The following are questions the assigned analysts have been trained to ask.

Building Narratives for Out-of-Standard Indicators

- **Weekly Reports**
    - What are the major contributing systems?
    - What are the common write-ups within the major contributing systems?
    - Are there aircraft with multiple write-ups in the major contributing systems or different systems?
    - Is MICAP information available on aircraft with high supply times?

- Are there any previously stated facts that apply?
- Are there any systems trends?
- Are there technical data limitations?
- Is there a lack of proper tools?
- Answer the questions: what is the problem, what is the unit doing to resolve the problem, and/or what does the headquarters staff need to know to resolve the problem?

- **Monthly Reports**
  - What are the major contributing systems?
  - What are the common write-ups within the major contributing systems?
  - Are there aircraft with multiple write-ups in the major contributing systems or different systems?
  - Do pilot reported discrepancies (PRD) indicate a recent trend in system write-ups for major contributors?
  - Do PRDs indicate a recent trend in write-ups for a particular tail number within major contributing systems?
  - What type of corrective actions were taken? Do similar discrepancies still reappear?
  - Could CANNs have been a factor?
  - Did the aircraft/system cause problems with other maintenance indicators?
  - Is MICAP information available on aircraft with high supply times?
  - How has the aircraft/system performed since the last incident?
  - Are there any previously stated facts that apply (previous weeklies, studies, and so forth)?
  - Check repeat/recurs in an effort to identify actual component failures versus maintenance procedural, training, or skill-level problems. This will involve contacting the shop responsible for the repair.

- Are there any systems trends?
- Are there technical data limitations?
- Is there a lack of proper tools?
- What is the problem, what is the unit doing to resolve the problem, and/or what does the headquarters staff need to know to work resolution of the problem?

The following hints can be applied to all processes under investigation. (breaks, aborts, and CANNs are used only as examples.)

Technical Information. Always check with deficiency analysis for answers to technical questions. It's a good idea to review their summaries. Sometimes they've already gathered information on the same aircraft/systems. Make it a point to talk to the appropriate shops concerning problem aircraft and components.

Fix Rates and Write-Ups Exceeding the 4-/8-/12-Hour Requirement. Deficiency analysts or the shop responsible for repair may have the average time it takes to troubleshoot and repair some items.

Supply. The MICAP section of supply should have information on supply issues and actions affecting aircraft and components with high supply times.

Trends. There are various types of trends that should be investigated. Detailed analysis will depend on how much time is available and the type of data being researched.

Ask:

- Are the failures seasonal (more failures in hot or cold temperatures)?
- Are the components that are failing environmentally sensitive (that is, responding to temperature extremes, corroding)?
- Could the failures be operating-time related?
- Do corrective actions point toward lack of training or workarounds caused by lack of parts or proper tools?

After weekly reports and spreadsheets are updated, it's a good time to start looking at historical data for possible trends affecting current data.

Break Rates

Verify documentation of Code 3 aircraft:

- Are debriefing forms loaded correctly?
- Are landing times correct?
- Are the proper system break codes used?

Verify accuracy of aircraft status:

- Are start and stop times of NMC conditions correct?
- Do the work unit codes match the identified Code 3 systems on the debrief form?

Isolate the problem system:

- Once verification of Code 3 documentation and aircraft status is completed, what systems stand out?
- Past history?

Identify components within suspect systems:

- Does documentation seem reasonable?
- Do start and stop times for maintenance actions agree with aircraft status times?

Track problem items through the backshop:

- Can the failure be confirmed?
- Can the common repair actions in the shop be identified?

Check for R/R/CND actions:

- Were they good fixes?
- Is there a chance some Code 3 actions are self-inflicted?

Abort Rates

Verify documentation of aborted aircraft:

- Are debriefing forms loaded correctly?
- Do the data correlate with the daily flying schedule?

- Are the proper systems used?
- Are the proper *when discovered* codes used?
- Are the proper abort cause codes used?

Isolate the problem:

- What systems stand out?
- Past history?

Identify components within suspect systems:

- Does the IMDS/G081 documentation seem reasonable?
- Do start and stop times for maintenance actions agree with aircraft status times?

Track problem items through the backshop:

- Can the failure be confirmed?
- Can common repair actions in the shop be identified?

Check for R/R/CND actions:

- Were they good fixes?

CANN Rates

- If CANN logs are maintained, do they match what is documented?
- Are there obvious gaps in the CANN log (missing or incomplete data)?
- Are there notes of CANN actions initiated but canceled?
- Does it appear parts have been sitting around?

Isolate the problem:

- What systems stand out?
- Past history?

Identify components within suspect systems:

- Does IMDS/G081 documentation seem reasonable, or is everything coded to the next higher assembly or

subsystem level (that is, actual components not identified)?
- Was the CANN action faster than removing, repairing, or replacing the item?

Check for R/R/CND actions:

- Was the CANN action a good fix?
- Did the CANN action only provide a partial fix?

Take the list of problem or suspect subsystems and components to quality assurance and the technical representatives.

- Have the problems been identified previously?
- Have material deficiency reports, safety reports, and so forth been submitted?
- Are there pending modification programs?

Identify problem aircraft. Correlate findings with other areas. Is there a common thread with:

- Causes for NMC/PMC conditions?
- Overall system/component failures in the fleet?
- Problem items in the Base Self-Sufficiency Program?
- Overall PRDs?
- Air and ground abort causes?
- Overall R/R/CND problems and rates?

In General:

- Are sufficient samples tracked to get an accurate picture?
- If updates to IMDS/G081 are backlogged or if IMDS/G081 has been down, was time allowed for data to be updated before taking samples?
- Was the sample or monthly average compared with past samples?
- Is there a large change in overall rates?
- Examine data by squadron, flight, and aircraft.

- Is there a large change in overall rates from one month to another or from one sample to another?
- Can a problem aircraft be identified as a CANN bird or one in an inspection or modification?
- Could the problem be tied to nonavailability of IMDS/G081 or other documentation problems?

If possible, compare data with other units that have like aircraft and missions:

- Are the numbers comparable?
- Are there similar trends?
- Are there common systems or component problems?

Document findings and distribute to the A3/A4 and other appropriate maintenance activities.

Chapter 4 Notes
Helpful Hints for Data Investigation

Chapter 4 Notes

Helpful Hints for Data Investigation

Instructions

AFPD 21-1	*Managing Aerospace Equipment Maintenance*
AFI 21-101	*Aircraft and Equipment Maintenance Management*
AFI 21-103	*Equipment Inventory, Status, and Utilization Reporting*
AFI 21-105	*Air and Space Equipment Structural Maintenance*
AFI 21-118	*Improving Air and Space Equipment Reliability and Maintainability*
AFI 90-1102	*Performance Management*
AFI 21-556, V2	*Integrated Maintenance Data System*

Air Force Technical Orders

00-5-1	*Air Force Technical Order System*
00-20-1	*Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures*
00-20-2	*Maintenance Data Documentation*
00-25-107	*Maintenance Assistance*
00-25-254-1	*Comprehensive Engine Management System Engine Configuration, Status, and TCTO Reporting Procedures*
00-35D-54	*USAF Deficiency Reporting and Investigating System*

Manuals

AFM 23-110	*USAF Supply Manual*

Aerospace Vehicle and Trainer Purpose Identifier Codes[1]

The following codes were extracted from the Air Force Data Dictionary maintained by SAF/FMPT, Budget Information Systems, and are provided as a convenient list for users. MAJCOMS will determine which codes are applicable for use among their units.

A18.1. BJ - Crash/Battle Damage Awaiting Air Force Materiel Command (AFMC) Assistance or Decision. Aerospace vehicles and trainers for which Air Force AFMC assistance has been requested for repair of crash or battle damage and will be effective upon submission of *AFTO Form 92 Condition Inspection Report* in accordance with (IAW) Technical Order (TO) 1-1-638, *Repair and Disposal of Aerospace Vehicles* and will apply until actual transfer of possession to AFMC.

BK - Command Programmed Maintenance. Aerospace vehicle being processed through a major command directed funded and operated maintenance program (for example, command central corrosion facility). Not used when aircraft are undergoing unscheduled maintenance, scheduled inspections, or time compliance technical order (TCTO). Must be approved by major command (MAJCOM) headquarters prior to use.

BL Extended Transient Maintenance. Applies to aerospace vehicles when transient maintenance requires more than 7 days to repair the transient aerospace vehicle. The gain will be reported by the organization responsible for the maintenance.

BN - Crash Damage Base. Aerospace vehicles and trainers on which Air Force Materiel Command (AFMC) assistance is not required for repair of crash damage.

BO - Battle Damage. AFMC assistance not required. Applies to battle damaged aerospace vehicles on which AFMC assistance is not required for repair of the damage.

BQ - Major Maintenance Awaiting AFMC Decision/Action. Aerospace vehicles and trainers for which AFMC has been requested to provide repair assistance beyond the possessing command's ability. Use will begin when the aerospace vehicle or trainer is no longer usable for its intended purpose and the request for assistance is submitted. The use will continue until the decision is provided the repair action taken or possession transferred to AFMC. Crash damaged aerospace vehicles will not be reported as BQ.

BR - Major Maintenance Awaiting Parts. Aerospace vehicles and trainers which require major maintenance for which the necessary major components have not been programmed and are not available in Air Force stocks. Use of this code is restricted to large scale programs (for example, replacement of all T-38 wings) and not to single isolated incidents. Use of the code must be agreed upon by both the operating MAJCOM and the system manager. Aerospace vehicles and trainers in BR status are not mission capable reportable.

BT - Aerospace Vehicle Transfer. Applies to aerospace vehicle transfers for the period of time that the aircraft is not available to accomplish its assigned mission. To be used for reporting during the period of transfer beginning with preparation for transfer through recovery after arrival at the new location. Aircraft assigned this code will not be considered available for generation during operational readiness inspection and will not be chargeable to unit not mission capable/mission capable rates. Use of this code is optional but must be approved by MAJCOM headquarters prior to use.

BU - Depot Level Maintenance. Depot level work performed at unit level when AFMC has formally acknowledged acceptance of the responsibility to repair the aerospace vehicle IAW TO 00-25-107 and the air logistics center has authorized repair by possessing unit. Work is performed by the owning unit to expedite the repair action when the unit possesses the technical expertise support equipment and is qualified to accomplish the repair. Use of this code must be agreed upon by both the operating MAJCOM and the system program manager. The use will continue until the repair action is complete or the possession is changed to flyable code.

BW - Weather/Bird Strike Damage Awaiting AFMC Assistance or Decision. Aerospace vehicle has been requested for repair of aircraft damage and will be effective upon submission of AFTO Form 9Z *Condition Inspection Report,* IAW TO 1-1-638, *Repair and Disposal of Aerospace Vehicles,* and will apply until actual transfer of possession to AFMC. Use of this code is optional but must be approved by MAJCOM headquarters prior to use.

BX - Weather/Bird Strike Damage Base. Aerospace vehicles and trainers on which AFMC assistance is not required for repair of aircraft damage. Use of this code is optional but must be approved by MAJCOM headquarters prior to use.

CA - Combat Support. Aerospace vehicles assigned or possessed for the primary mission of direct support of units engaged in conflict. Includes: tactical and aeromedical airlift, weather reconnaissance or surveillance, intelligence and security activities, navigation, air refueling, air rescue, airborne warning and control, airborne command post, photo mapping, communications relay, or special operations missions.

CB - Combat Tactics Development and Equipment Evaluation. Aerospace vehicles assigned or possessed for developing, improving, or evaluating operational employment ability (for example, operational test and evaluation).

CC - Combat. Aerospace vehicles assigned or possessed for the primary mission of delivering munitions or destructive materials against or engaged in direct contact with enemy forces. Includes: strategic or tactical bomber, strategic or tactical interceptor, strategic or tactical reconnaissance, forward air control, tactical electronic warfare, tactical fighter or attack, tactical drone/RPV, or fixed wing gunship special operations missions.

CD - Combat Unit Missiles—Semi Ready. Includes: missiles possessed by missile units in process of being assembled and checked out, and missiles which are assigned in excess of the number of launchers available.

CE - Initial Alert Preparation of Ground Launched Missiles. To be used to report missiles which are mated to launchers during the period between acceptance by the using command and initially being placed on alert. When alert status is assumed, the missiles will be identified as CC.

CF - Combat Auxiliary Support. Aerospace vehicles assigned or possessed to accomplish essential functions that cannot be performed economically in the primary aerospace vehicles of combat and combat support units. Includes: Radar site evaluation and support, target support, range support, missile site support, and traffic control and landing system inspection missions.

CR - Combat Unit Missiles—Crate. Missiles possessed by missile units that are crated or in unassembled storage.

DJ - Depot Level Maintenance Possession—Depot Level Work. Applies to aerospace vehicles awaiting depot level work either at a depot or contract facility, or the base organization location (to be performed by depot contract or rapid area maintenance (RAM)/field teams), or awaiting shipment to the appropriate repair facility. To be used when AFMC assistance has been requested and AFMC has formally acknowledged acceptance of the responsibility to repair the aerospace vehicle IAW TO 00-25-107.

DK - Contract Work. Aerospace vehicles and trainers on contract to a civilian repair facility (domestic or foreign) for the performance of programmed depot maintenance (PDM) repair, modification, modernization, instrumentation TO compliance, or reconditioning. Aerospace vehicles receiving maintenance as DK will be reported as possessed by AFMC.

DL - Depot Delivery Flight. For use by AFMC flight test activities for aircraft delivery to or from depot facilities. Includes: training flights prior to input into the work facility.

DM - Depot Level Maintenance Possession—Depot Level Work RAM/Field Teams. Aerospace vehicles undergoing maintenance beyond organizational/ intermediate level capability. Includes: depot level work being performed at the base organization location by depot contract or RAM/field teams.

DN - Depot Level Assignment—Depot Level Work Resulting In Mission Design Series (MDS) Change. Aerospace vehicles in Air Force depots (domestic or foreign) or contract facilities for the performance of maintenance modification, modernization, technical order compliance, or reconditioning of a magnitude that results in an MDS change. Aerospace vehicles in this category will be reported as both assigned and possessed by AFMC.

DO - Depot Level Maintenance Possession—Depot Work. Aerospace vehicles and trainers at Air Force depots (domestic or foreign) undergoing programmed depot maintenance repair modification modernization technical order compliance instrumentation reconditioning.

DR - Post Depot/Contractor Maintenance. Applies to aerospace vehicles after depot work (DO or DN), contract work (DK), or RAM/field team (DM) maintenance have been completed and the vehicle is in preparation for functional check flight (FCF) or delivery to the organization that will possess it. To be used from the time when the aircraft has been released for FCF, during FCF, and the maintenance required after the FCF.

EB - Contractor Test/Test Support. Aerospace vehicles provided to contractors as government furnished property (GFP) in support of a prime Air Force contract. These aerospace vehicles will be utilized for complete system evaluation testing to improve the capabilities of the designated aerospace vehicle support of specific test programs or production support.

ED - Prototype Test. Unaccepted prototype experimental or preproduction aerospace vehicles procured and utilized in support of a prime Air Force contract when conditions of acceptance are contingent upon contractor achievement of a specified milestone. Aerospace vehicles in this category are assigned for overall inventory accounting purposes only. Assignment action does not affect contractors or program management. Reporting requirements applicable to accepted aerospace vehicles do not apply.

EH - Test Support. Aerospace vehicles assigned or possessed for participation in test programs. Includes: Pace Chase Test Bed Range and test pilot training support.

EI - Test. Aerospace vehicles assigned or possessed for complete system evaluation or for testing to improve the capabilities of the aerospace vehicle designated.

EJ - Ground Test. Aerospace vehicles assigned or possessed for nonflying ground testing and evaluation of the aerospace vehicle or systems.

IF - Industrial Fund. Aerospace vehicles assigned to or possessed by AMC for the accomplishment of single manager operations for airlift service. Includes: aircraft assigned to or possessed by strategic airlift, tactical airlift, domestic aeromedical, or airlift units.

NY - Nonappropriated Fund. Aerospace vehicles or trainers on loan to Air Force nonappropriated funded activities (for example aero clubs).

PJ – En Route Aerospace Vehicles or Trainers—Other Than Delivery Flight. Aerospace vehicle and trainer transfers involving the disassembly crating or preparation for means other than flight. To be used for reporting during the period of preparation for transfer and reassembly or check upon arrival at the new location.

PL - En Route Aircraft—Delivery Flight. Applies to all aircraft transfers accomplished by a neutral flight crew (crew not under the control of the losing or receiving command). Used for reporting from the time of acceptance by the flight crew to the time of delivery to the receiving organization.

PM - Security Assistance Program (SAP) Aerospace Vehicles Temporary Diverted to USAF. Aerospace vehicles programmed for delivery and assignment to foreign countries under SAP which have been temporarily diverted to the Air Force for any purpose.

PN - Other Than SAP. Aerospace vehicles temporarily possessed by the Air Force for any purpose for delivery and assignment to recipients other than SAP countries; for example, US Navy, US Army, and the Air Force Museum.

PP - New Production. To be used only by government plant representatives to indicate aerospace vehicles which have been accepted but have not been reported/released to intended recipient.

PR - Flyable Storage. Aerospace vehicles which are not currently used for accomplishment of any Air Force mission involving flight, but which are maintained in readiness for flight IAW technical orders.

TB - Operational Readiness Training (ORT). Missiles which have been excused from emergency war order alert requirements for the purpose of accomplishing operational readiness training.

TF - Training: Aerospace vehicles assigned or possessed to accomplish student training, combat crew training, dissimilar air combat training, or combat crew training.

TJ - Ground Instruction Active. Trainer and temporarily assigned or possessed aerospace trainers, and temporarily assigned aerospace vehicles used for ground instruction purposes.

TX - Ground Instruction Inactive. Aerospace vehicles normally with a G prefix permanently assigned or possessed for ground instructional purposes.

VJ - Contract Work (AFMC only). Aerospace vehicles or trainers on contract to a civilian contractor (domestic or foreign) for the performance of modification, maintenance, or instrumentation not funded by AFMC. To be reported as possessed by the contractor at the physical location of the vehicle or trainer (contractor facility or base).

VN - Contract Work Resulting in MDS Change. Aerospace vehicles on contract to a civilian facility for the performance of vehicle modification or instrumentation resulting in an MDS change. Aerospace vehicles in this category will be reported as both assigned and possessed by AFMC.

XJ - Excess to Command. Aerospace vehicles or trainers which have been reported to HQ USAF as excess to the requirements of the possessing command or vehicles designated by HQ USAF as not currently required by a command and on which the possessing command is awaiting disposition instructions. The processed vehicles will be maintained in a serviceable condition.

XK - Inactive-Standby. Trainers in a standby status until required to meet a projected training requirement. Standard modification procedures will apply while the trainer is in a standby status.

XR - Inactive Aerospace Vehicles for Which Headquarters Air Force Approval is Required. This code will not be issued or withdrawn without specific approval of HQ USAF. The assigned command will determine how these vehicles will be used, however, no change in external configuration is authorized and disposal requires HQ USAF approval.

XS - Inviolate Storage Inactive Aerospace Vehicles or Trainers Stored Intact in Anticipation of Specific Future Requirements. Aerospace vehicles in this category will normally be prepared for a storage period in excess of 90 days in a manner which will provide maximum aircraft preservation (AMARC [Aircraft Maintenance and Regeneration Center] 1000 type storage). Parts (including engines) will not be removed without approval of HQ USAF. If parts are removed the weapon system system program director (SPD) and engine PGM will take concurrent action to acquire serviceable replacements which need not be reinstalled but which must be earmarked for the specific aerospace vehicles from which removed. Parts need not be stored at AMARC if inventory managers can assure accountability by MDS and aircraft serial number at an alternate storage location. If it is not feasible to acquire replacement parts, the SPD will submit a waiver request to HQ USAF or a request to reclassify the aircraft to another storage category to HQ USAF. Aerospace vehicles or trainers will not be moved from other storage categories to XS until all replacement parts are acquired to restore the aircraft to a flyable condition.

XT - Security Assistance Program (SAP) Hold Storage. Inactive aerospace vehicles or trainers stored in anticipation of specific future SAP requirements for transfer to foreign governments either as a foreign military sale (FMS) or at no cost as excess defense articles (EDA). Aerospace vehicles and trainers in this category are excess to DoD needs as flyable aircraft but may not be excess to DoD spare parts or component requirements. Aerospace vehicles in this category will normally be prepared for storage period in excess of 90 days and in a manner which will provide maximum aircraft preservation (AMARC 1000 type storage). The SPD may initiate selected parts removal on input to storage and priority parts removals during storage without action to acquire or replace the removed parts. Since SAF/IA expects aerospace vehicles and trainers made available for sale will usually be whole, the SPD will coordinate parts removal actions with SAF/IA through HQ USAF. Acquisition of replacement parts will be initiated if the aircraft is reclassified to XS or designated for withdrawal in other than as is/where is condition. Before aerospace vehicles and trainers in this category may be offered for transfer as EDA (for example, Foreign Assistance Act (FAA) Section 516517519) HQ USAF shall coordinate with HQ USAF to determine if DoD spare parts or components must be removed to support DoD needs as required by federal property management regulations (41 CFR 101-43.102) and DoD policy (DoD 4160.21-M).

XU - Contractor Other. Aerospace vehicles or trainers provided to approved USAF contractors as government furnished property for other than RDT&E purposes.

XV - USAF Storage. Inactive aerospace vehicles or trainers stored to provide spare parts and components for the remaining operational mission aircraft. Aerospace vehicles and trainers in this category will normally be prepared for a storage period in excess of 90 days and preserved in a manner that will minimize expenditure of resources while maintaining components and parts in a reclaimable condition (AMARC 2000 type storage). The weapon system SPD may direct selected parts removal on input to storage and priority removals during storage with no parts reprocurement or replacement action required unless the aircraft are recategorized to XS or designated for withdrawal in other than as is/where is condition. Aerospace vehicles or trainers in this category are not excess to DoD requirements.

XW - Awaiting Determination. Aerospace vehicles lost as a result of a flying accident awaiting determination of applicable termination code (5, 6 or 7).

XX - Inactive Aerospace Vehicles or Trainers Placed in Economical Storage With No Preservation of Airframe and Engines (AMARC 4000 type storage). The weapon system SPD may direct selected parts removal and/or preservation upon input to storage and priority removals during storage with no parts reprocurement or replacement action required unless the aircraft are recategorized to XS or designated for withdrawal in other than as is/where is condition. HQ USAF will ensure aircraft are excess to DoD operational needs. Components and repair parts are not excess until DoD reclamation requirements have been satisfied. Aircraft remain in this category until HQ USAF directs reclamation or other disposition.

XY - Lease Loan. Aerospace vehicles or trainers on lease to commercial agencies or loaned to other governmental agencies for accomplishment of tests or other projects.

XZ - Lost or Missing. Aerospace vehicles missing in flight to be used when an aerospace vehicle fails to arrive at its destination due to an en route mishap (combat loss or other). Its location and condition may be known but physical verification cannot be made or official termination requirements have not been completed. Missiles will be reported in this category when they have been destroyed by any means but have not been terminated from the inventory.

YZ - Air Force Museum, Aircraft Battle Damage Repair (ABDR), and Non-Air Force REMIS Accountability Only. Aerospace vehicles assigned to the Air Force Museum, ABDR, and non-Air Force agencies (for example, US Army, US

Navy, and foreign military sales). Not to be used for foreign government owned (FGO) aircraft under Air Force operational control.

ZA - Special Activity. Aerospace vehicles assigned or possessed to accomplish special mission. Includes: aerial demonstration, attaché, military assistance group, military group, and other special missions.

ZB - Operational Support. Aircraft assigned or possessed to perform Air Force-directed support airlift during peacetime contingencies and wartime. These missions include priority movement of personnel and cargo with time, place, or mission sensitive requirements.

Acronyms

AA – Aircraft Availability
AAIP – Aircraft Availability Improvement Program
ABDR – Aircraft Battle Damage Repair
AFCSM – Air Force Computer Systems Manual
AFI – Air Force Instruction
AFM – Air Force Museum
AFMC – Air Force Materiel Command
AFSC – Air Force Specialty Code
AFTO – Air Force Technical Order
ALC – Air Logistics Center
AMARC – Aircraft Maintenance and Regeneration Center
AMC – Air Mobility Command
AMCI – Air Mobility Command Instruction
AMCSUP – Air Mobility Command Supplement
ASD – Average Sortie Duration
AWM – Awaiting Maintenance
AWP – Awaiting Parts
CAF – Combat Air Force
CANN – Cannibalization
CDC – Career Development Course
CND – Cannot Duplicate
DD – Delayed Discrepancies
DoD – Department of Defense
ECUTS – Environmental Control Unit Set
EDA – Excess Defense Articles
EW – Electronic Warfare
EWO – Electronic Warfare Officer

FAA – Foreign Assistance Act
FCF – Functional Check Flight
FGO – Foreign Government Owned
FMC – Fully Mission Capable
FMS – Foreign Military Sales
FSE – Flying Schedule Effectiveness
GFP – Government Furnished Property
HHQ – Higher Headquarters
IAW – In Accordance With
IMDS – Integrated Maintenance Data System
ISO – Isochronal (Inspection Rate)
LANTIRN – Low Altitude Navigation and Targeting Infrared for Night
LRS – Logistics Readiness Squadron
MAAG – Military Assistance Advisory Group
MAF – Mobility Air Force
MAJCOM – Major Command
MC – Mission Capable
MDAS – Maintenance Data Analysis Section
MDS – Mission Design Series
MICAP – Mission Capability
MIS – Management Information System
MSE – Maintenance Scheduling Effectiveness
NMC – Not Mission Capable
NMCB – Not Mission Capable Both
NMCB – Not Mission Capable Both – Unscheduled or Scheduled
NMCM – Not Mission Capable Maintenance – Unscheduled or Scheduled
NMCM – Not Mission Capable Maintenance
NMCS – Not Mission Capable Supply
O&S – Operations and Sustainment
ORT – Operational Readiness Training
OT&E – Operational Test and Evaluation
PAI – Primary Aircraft Inventory
PDM – Programmed Depot Maintenance
PMC – Partial Mission Capable
PMC-B – Partial Mission Capable Both
PMC-M – Partial Mission Capable Maintenance
PMCS-S – Partial Mission Capable Supply
PPC – Possession Purpose Code
PRD – Pilot Reported Discrepancies

PSTS – Power Supply Test Set
QA – Quality Assurance
R/R – Repeat/Recur
RAM – Rapid Area Maintenance
ROE – Rules of Engagement
SAP – Security Assistance Program
SPD – System Program Director
TACC – Tanker Airlift Control Center
TAI – Total Active Inventory
TCTO – Time Change Technical Order
TDI – Time Distribution Internal
TNMCM – Total Not Mission Capable Maintenance
TNMCS – Total Not Mission Capable Supply
TO – Technical Order
UGT – Upgrade Training
UPNR – Unit Possessed Not Reported
USA – United States Army
USN – United States Navy
UTE – Utilization (Rate)
XC – Cross Country

End Notes

1. Codes taken from AFI 21-103 *Equipment Inventory, Status, and Utilization Reporting*

Notes

Notes

Air Force Logistics Management Agency

STUDIES / TRANSFORMATION / WARGAMES / PUBLISHING

Since its inception, the Air Force Logistics Management Agency has grown to be recognized for its excellence—excellence in providing answers to the toughest logistics problems. That's our focus today—tackling and solving the toughest logistics challenges facing the Air Force. It's also our focus for the future and why we are a leader in Air Force Logistics Transformation efforts.

We use a broad range of functional, analytical, and scientific expertise to produce innovative solutions to problems and design new or improved concepts, methods, systems, or policies that improve peacetime readiness and build war-winning logistics capabilities. We provide focused, responsive answers to our customers' needs and problems. Let us put our team of experts to work for you.

Our key strength is our people. They're all professionals from logistics functions, operational analysis sections, and computer programming shops. Virtually all of them have advanced degrees. But more important, virtually all of them have recent field experience. They've been there and done that. They have the kind of experience that lets us blend innovation and new technology with real-world common sense and moxie. It's also the kind of training and experience you won't find with our competitors. Our special blend of problem-solving capabilities is available to every logistician in the Air Force.

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