

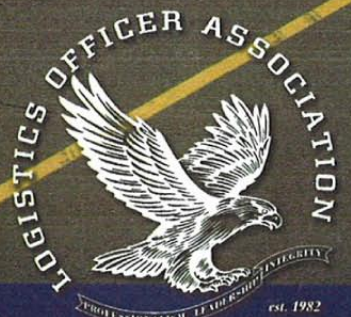
THE EXCEPTIONAL RELEASE

ER

FALL 2008

Managing the Materiel Enterprise

A Professional Military Journal



Re-baselining Air Force Scheduled Maintenance for the C-5 Galaxy



By Mr. Peter M. O'Neill and Mr. Scott P. Vandersall

The C-5 System Program Manager and Air Mobility Command are revamping the scheduled maintenance inspection program on the C-5 Galaxy by instituting the Maintenance Steering Group 3 (MSG-3) concept. This will affect all scheduled maintenance inspections from preflight, thruflight, and basic post-flight to minor isochronal, major isochronal and programmed depot maintenance.

WHAT IS MSG-3?

MSG-3 is commercial aviation's decision logic process for determining initial scheduled maintenance inspection requirements for newly acquired aircraft and/or power plants. MSG-1 was originally designed in 1968 by the Air Transport Association (ATA) to build scheduled inspection programs for new commercial aircraft (specifically the Boeing 747). In 1970, MSG-2 removed specific Boeing 747 terminology for use on other aircraft (L-1011 & DC-10). Like MSG-1, MSG-2's philosophy was parts-driven, bottom-up, and process-oriented. By 1979, aviation experience and events drove significant changes in the methodology resulting in MSG-3. This MSG variant, still exclusively used by commercial aviation today, is system-driven, top-down, and task-oriented.

MSG-3 analysis is a rigorous, structured process that determines optimal scheduled inspection tasks and intervals. It employs a LEAN set of building-blocks consisting of zonal/enhanced zonal, general visual, detailed visual and non-destructive inspections.

Coupled with a hierarchical inspection/check process, higher-level tasks include or meet the intent of all lower-level requirements.

WHY IS MSG ANALYSIS SUPERIOR TO STANDARD RCM PROGRAMS ON COMMERCIAL AND MILITARY AIRCRAFT?

MSG has evolved over 35 years and was designed specifically for aircraft. MSG concepts incorporate a simple and concise inspection convention with Standard and Enhanced Zonal (e.g. aged wiring) Inspections. MSG-based maintenance programs are compatible with hierarchical maintenance concepts, allowing for a shift in structural inspections to later intervals to capitalize on aircraft downtime (Right Time to Find, Right Time to Fix). This, in turn, allows increased focus on systems degradation checks at earlier intervals for increased reliability. The result is a list of tasks and defined intervals that are fully justifiable and defensible through the analysis process and achieve consistent, standardized results. This ensures only required inspections are performed, eliminating "over-inspecting" the aircraft.

MSG and RCM started down the same path in 1968. The RCM experts of the time, Stanley Nolan and Howard Heap, assisted the ATA in developing the MSG inspection convention. The RCM approach to failure analysis worked well for systems analysis, but was deficient in the areas of structures and zonal analysis. The MSG approach diverted from the RCM approach, as the analysis structure was developed for structures and zonal under the governance of the ATA. The extent of RCM

development beyond the basics of structure analysis and the full zonal concept is dependent upon the involvement of the integrating entity and, to our knowledge, has not fallen under any governance, such as the ATA, to

ensure periodic updates and reviews. The MSG-3 construct of establishing the scheduled maintenance inspection program has been used for nearly 29 years, and is employed by every commercial aircraft operator in the world, excluding the Eastern Bloc countries. It is a proven and trusted methodology.

WILL MSG-3 WORK ON AN AGED AIRCRAFT?

The MSG-3 construct was initially designed to determine the appropriate tasks and intervals of the scheduled maintenance inspection while an aircraft is in design/production. The airline industry applied a refined MSG-3 decision logic to review the maintenance program of an aged aircraft, the DC-9. Technicians

AN INDUSTRY DC-9 MSG-3 ANALYSIS RESULT

Interval Check Months	Pre-MSG-3		Post-MSG-3		Savings Percent
	Flow Days	Man Hours	Flow Days	Man Hours	
18	16	12,000	7	5,250	56
36	40	30,000	30	25,000	25
108	50	37,500	40	30,000	20

who worked the aircraft assisted in the analysis, which resulted in the realization that the MSG-3 process has a higher degree of accuracy on an older aircraft because of the wealth of available empirical and reliability data.

Implementation of MSG-3 on the DC-9 resulted in a decrease in flow days and labor-hours expended for each interval check. The departure reliability rate for the DC-9 fleet rose from 96.8 percent to 98.5 percent, a 53 percent reduction in the remaining "not mission capable" time.

WILL MSG-3 WORK ON MILITARY AIRCRAFT?

The answer is a resounding "Yes!" MSG-3 will be implemented on the C-5 on 1 Oct 2009. The systems, structural, and zonal

Continued on next page...



A C-5 Galaxy takes off from an airfield at a forward-deployed location. (USAF photo by TSgt. Justin Pyle)

tail numbers. Once system degradation is identified, the nature of the problem is thoroughly researched to isolate root cause(s). All viable solutions or repairs are studied and supported with return on investment type analyses, ensuring the most economical and effective solution is recommended to our customers.

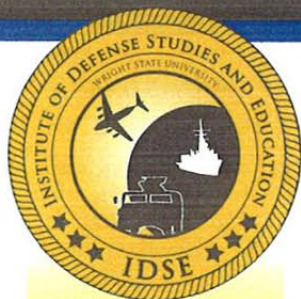
There are many avenues to correct reliability issues, depending on problem sources or root causes: MSG-3 task and interval adjustments, process improvements, training, supply improvements, maintenance Reliability Enhancement Visits (REVs), and recommended modifications or redesigns are all possible remedies to correct degradation.

REVs are planned maintenance actions or repairs that are accomplished during scheduled inspections or opportune downtime. All resources, labor, and support equipment required is planned in advance so the aircraft can be repaired in a cost-effective manner.

After repair or process improvement, Intergraph's PBP&L process continually monitors and tracks system and inspection task health to verify that implemented solutions restore reliability to inherent design levels.

On 1 October 2009, the MSG-3 scheduled maintenance inspection convention will be instituted on the C-5. Coupled with the reliability improvements of the PBP&L program, the warfighter will have seven fewer aircraft per day tied up in scheduled and unscheduled maintenance. The C-5 System Program Manager and C-5 Operations and Maintenance groups will have the confidence that the OSS&E of the C-5 is adequately covered, that documented analysis and task tracking numbers ensure we are not over-inspecting the aircraft, and a mechanism is in place to adjust the scheduled inspection program over time. This hierarchical inspection program eliminates the need for any field-level inspections immediately following PDM. It is estimated that over the remaining life of the C-5 out to 2040, the USAF will achieve a \$1.38 billion cost avoidance.

WRIGHT STATE UNIVERSITY INSTITUTE OF DEFENSE STUDIES AND EDUCATION



Contact Info
075 Allyn Hall
Wright State University
3640 Colonel Glenn Hwy.
Dayton, OH 45435-0001
(937) 775-4565
idse@wright.edu
www.wright.edu/idse

The **Wright State University Institute of Defense Studies and Education (IDSE)** is dedicated to providing high-value educational programs using best practices relevant to the United States Department of Defense.

IDSE meets your transformation needs, whether you are corporate, Department of Defense, or seeking best practices:

- Degree programs in collaboration with the Raj Soin College of Business and the College of Engineering and Computer Science
- Custom-designed certificate programs
- Executive programs for leaders



About the Authors: Col Peter M. O'Neill, USAF (ret) is now a Senior Technical Manager with Intergraph Corporation. He served on active duty for forty years in various maintenance and logistics command and staff positions. Prior to his retirement in 2006, he was the Commander, 830th Aircraft Sustainment Group (F-15) at Robins AFB, GA.

Scott P. Vandersall, YF-3 (GS-15) is the C-5 Chief Engineer in the 730th Aircraft Sustainment Group (C-5) at Robins AFB, GA. He has been intimately involved in the development of the MSG-3 application to the C-5 since 2004. He is scheduled for reassignment to the 580th Aircraft Sustainment Group (SOF) as their Chief Engineer. ✈