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Setting up a Strategic Architecture for the Life Cycle Management of USAF Aging Aircraft

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Abstract

The average age of United States Air Force (USAF) aircraft is over 22 years and increasing. The USAF is buying only a fraction of the new aircraft necessary to simply stop the declining age trend. The real effects of aging are seen in increased costs of ownership, and decreasing availability of aircraft to accomplish their mission. With thousands of aircraft in the USAF fleet, managed by numerous agencies, the job of managing the affects of aging is as much a managerial and leadership challenge as it is a technical one. Considering the immensity of the USAF and its breadth of locations around the world, the effort to develop and implement a strategy for managing the USAF's aging fleet is enormous.

This paper offers an overview of the management approach being taken by the USAF to manage it's aging fleet and to mitigate the unique effects of aging experienced by its aeronautical weapon systems.

First, we offer an understanding and scope of the problem posed by the aging of air vehicles and the systems that support them. Naturally, a strategy for management and technology is developed accompanied by an implementation plan. To carry out the strategy, an execution plan is developed and implemented. To assure continuous refinement of plans and strategies, methodologies for feedback and measurement of metrics must be put in place. Finally, adjustments must be made to strategies and plans to reflect corrective actions necessary in response to metrics, feedback, and environmental changes to assure we continue to lower the cost of ownership, and increase the availability of the aircraft and their supporting systems. This paper will describe these steps and how they were developed in support of a Comprehensive Aging Aircraft Strategy for the USAF.

Background

In 1998, the United States Air Force (USAF) established a funded program to begin addressing the issues peculiar to the aging aircraft in its inventory. The purpose of the program was to evaluate problems being experienced in the area of structures, and to develop technical solutions to those issues. The Aging Aircraft Office was established at Aeronautical Systems Center (ASC) at Wright-Patterson Air Force Base, Ohio to focus this effort.

Also in that year the Chief of Staff of the Air Force challenged ASC to address the growing problem of obsolete parts and diminishing manufacturing sources being experienced in the avionics of USAF aircraft. ASC reacted by establishing the Affordable Combat Avionics (ACA) initiative to address this problem. Because the viability of USAF avionics was the real goal of the initiative, in early 2001 it was renamed to the Viable Combat Avionics (VCA) initiative.

The Aging Aircraft Program's focus on structures and the inclusion of the VCA initiative were clear indications the USAF recognized a growing concern with its aging aircraft fleet, and the determination to concentrate on solving the aging issues. As additional aging systems issues were identified, it became apparent the small office, established as the Aging Aircraft Office, was not going to be up to the challenge.

On 25 January 2001, the USAF established the Aging Aircraft System Program Office (AA SPO) with the clear mission to extend the service life of its aging aircraft, and to significantly expand the scope of issues to be addressed.

Aging Aircraft System Program Office Focus

Develop Comprehensive Strategy and Plan to Extend Aircraft Service Life

- **Ensure Investments Systematically Address Aging Issues**
- **Drive Policy, Process Improvements**
- **Enable Optimal Fleet Sustainment**

Develop an Aging Fleet Management Framework that is:

- **Proactive**
- **Predictive**
- **Focused on Operational Capability**

Executing the Focus

First, we must understand and scope of the problem posed by the aging of air vehicles and the systems that support them. Naturally, a strategy for management and technology is developed accompanied by an implementation plan.

To carry out the strategy, an execution plan must be developed and implemented. To assure continuous updating of plans and strategies, methodologies for feedback and measurement of metrics must be put in place.

Finally, adjustments must be made to strategies and plans to reflect corrective actions necessary in response to metrics and feedback to assure we continue to lower the cost of ownership and increase the availability of the aircraft and their supporting systems.

Strategy Development

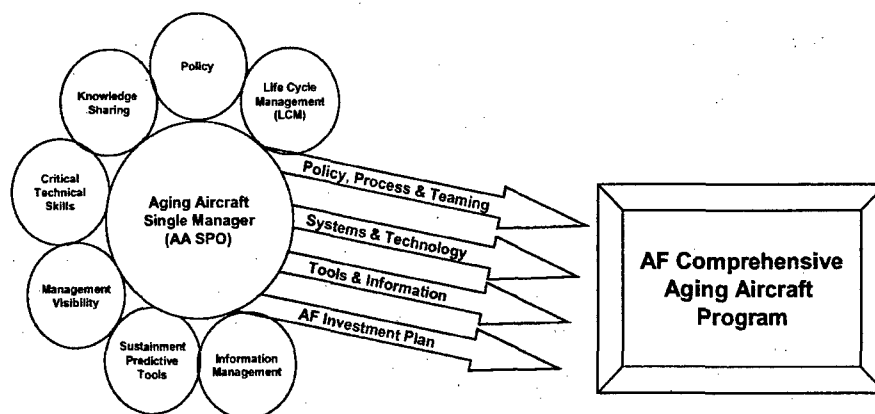
In 1998 the USAF commissioned a study to understand the issues that must be addressed as the aircraft fleet ages. The study group, called the Aging Aircraft Integrated Product Team (IPT), delivered eight recommendations.

1. Policy - Review/revise fleet management policy
2. Life Cycle Management - Reinvigorate mandatory weapon system Master Plans

3. Information Management - Provide a knowledge management tool set
4. Sustainment Predictive Tools - Develop tools to quantify impact of aging aircraft, and task the scientific community to incorporate realistic sustainment factors in Simulation Based Acquisition
5. Management & Technical Skills - Re-baseline military and civilian career fields, and add Sustainment curriculum to current acquisition certification programs
6. Knowledge Sharing - Intensify level of shared information by creating an aging aircraft website, host an annual USAF Aging Aircraft Working Group, and disseminate all Aging Aircraft Meeting information and results
7. Management Visibility - Mandate inclusion of aging aircraft metrics in CSAF briefings for enduring, total system management visibility
8. Aging Aircraft Single Manager - Establish an Aging Aircraft Office as a Single Manager

The last recommendation was satisfied by establishing the AA SPO. This provided the USAF with the leadership necessary to tackle the other recommendations.

The AA SPO translated the eight recommendations into four thrust areas – Policy, Processes and Teaming; Systems and Technology; Tools and Information; and an AF Investment Plan. Concentrating on these thrust areas would lead to the USAF Comprehensive Aging Aircraft Program.



Because the AA SPO had an immense job in front of it but was emerging from being a small office, it needed to ramp up its efforts. The four thrust areas were converted to Ramp-up Plans. Because technical strategies for structures and avionics were the most mature, the Systems Ramp-up Plan is offered as an example.

<u>Focus</u>			
<u>Focus</u>		<u>Focus</u>	<u>Focus</u>
• Avionics (Limited) • Structures • Other (Very Limited)	• Avionics (Expanded) • Structures(Expanded) • Training Systems • Engines • Depot Systems (Ltd) • Other (Limited)	• Avionics (Full) • Structures • Training Systems • Engines • Depot Systems • Subsystems • Human Systems • Other (Expanded)	• Avionics • Structures • Training Systems • Engines • Depot Systems • Subsystems • Human Systems • Support Systems • Other Systems
CY00/FY03 APOM	CY01/FY04 POM	CY02/FY05 APOM	CY03/FY06 POM

The Systems Ramp-up Plan shows for each calendar year (CY) the subsystems that will be assessed for aging issues and a technical strategy developed to address those issues. As a result of developing the technical strategy, funding is sought to develop the technologies necessary to address the strategy. Each calendar year's strategy development areas drive budget inputs for each fiscal year (FY) program objective memorandum (POM). This connects the Systems thrust area back to the AF Investment Plan which is one of the thrust areas itself, thus providing the funding necessary to implement the Systems strategies.

Each thrust area has its own ramp-up plan and must be reflected in the each year's budget. With each thrust area reflected in the budget requests, the AF Comprehensive Plan has an full set of efforts to undertake and the funding needs identified for each.

Execution

The AA SPO has been tasked to look for cross-cutting issues and pursue common solutions for aging aircraft. In parallel most aircraft types have a weapon system manager, in the form of its own SPO. For instance, the KC-135 tanker aircraft has a SPO located at Tinker AFB, Oklahoma. It is the responsibility of that office to take care of the peculiar issues experienced on the KC-135 fleet. Some issues that the KC-135 SPO will encounter, such as corrosion, may be experienced by several aircraft types. Rather than ask the KC-135 SPO to solve all issues related to corrosion, it makes some sense to have a central office develop solutions developed that can be used on many aircraft types, to include the KC-135. That is the role of the AA SPO, to concentrate on shared problems and develop solutions that can be used on multiple type aircraft. These cross-cutting solutions can then be tailored for use on a particular type aircraft by their responsible SPO, such as the KC-135 SPO in the case of the KC-135 fleet.

The AA SPO has its own dedicated funding to address cross-cutting aging aircraft issues. Since 1998 the majority of that funding has been focused on aging structures issues. In particular, much of the AA SPO current funding is concentrated on four cross-cutting initiatives: Corrosion Effects on Structural Integrity, Advanced Non-Destructive Evaluation for Aging Structures, Bonded Repairs Enhanced Capabilities, and Advanced Aircraft Corrosion Protection.

These initiatives form the foundation of executing the USAF Aging Aircraft Program, but many other less focused efforts are underway, as well. At the writing of this paper, there are 24 active

projects in the Aging Aircraft Program. For each dollar spent by the AA SPO on these type projects, the USAF avoids spending 27 dollars in its warfighting units to support their 6300 aging aircraft. Or the dollars saved could go toward modernizing the fleet to slow the overall aging trends.

It is obvious the USAF is not the only agency suffering from the issues of aging aircraft. Just as each individual SPO doesn't have the resources (funding, people and infrastructure) to solve all the aging aircraft issues, neither does any one agency. The AA SPO is attempting to develop collaborative efforts with several of those agencies affected by aging aircraft. While there is much more to do, some progress is being made.

Within the US Department of Defense, several agencies are suffering through the emergence of aging aircraft – the USAF, the US Navy, the US Army and the Defense Logistics Agency (DLA). Collectively these agencies have begun a DLA/Multi-Service Technical Cooperation Group with the initial focus of identifying technical areas to direct collaborative efforts. The initial thrust areas were corrosion, NDE and wiring. One result of this group has been the establishment of an annual Aging Wiring Strategy Working Group. Under the leadership of the AA SPO, the intent of the AWSWP is to identify problems with aging wiring and develop collaborative efforts that can collectively address those problems.

With the Air Force Research Laboratory (AFRL) providing the leadership, the USAF has established a Memorandum of Agreement (MOA) with the National Aeronautical and Space Administration (NASA) that targets four "common interest areas" to direct collaborative aging aircraft efforts. Those common interest areas are corrosion, NDE, aging wiring, and integrated vehicle health management. This MOA establishes specific projects that NASA and the USAF will fund which target problems each agency must solve on aging aircraft. By working together and coordinating efforts, the meager dollars each has to solve these problems is leveraged.

The AA SPO along with the North Atlantic Treaty Organization (NATO) and several aircraft SPOs (E-3, E-6 and E-8 SPOs) have decided to work together to address aging issues being experience on weapon systems that are based on the commercial Boeing 707 platform. As a sponsor of the B-707 Users' Group, the AA SPO hopes to help identify and solve specific technical issues shared by these aircraft, all of which are Low Density, High Demand aircraft supporting the US Navy and USAF, and several NATO and other foreign allies.

The potential exists for many other alliances and collaborative efforts. The largest challenges to establishing these alliances will be having the visibility of all the initiatives that could be focused into collaborative efforts, and the lack of willingness in some instances to eliminate barriers to cooperation.

Adjusting Strategies and Plans

As with any strategy or plan, it is appropriate to periodically reevaluate the direction the strategy or plan. The USAF Comprehensive Strategy and Plan is no exception. There are several reasons for reevaluation – results from those initiatives, changes in funding for identified initiatives, surprise problems, changed aircraft missions, etc.

Considering that the AA SPO has only been in existence since January 2001, and that the strategies have yet to provide substantive improvement in aging aircraft issues, it is a bit early to expect too much to be done to change the strategies. The exception is in the area of structures.

The USAF has had a Structures Strategy since 1997 when the National Research Council (NRC) delivered its study on Aging Aircraft. The USAF used the NRC report to establish a focus for technologies to address problems with aging structures. As a result of the study, the USAF also established the Aging Aircraft Technology Team (AATT). During the ensuing years, the AATT conducted Air Force-wide surveys to determine the health of USAF aircraft structures, evaluate the improvements expected from the structures technology thrusts the USAF had instituted via the Structures Strategy, and consider additional areas requiring focused research and development. In December 2000, the AATT concluded its third round of annual surveys and was prepared to adjust the USAF Structures Strategy. Under the direction of Dr. John "Jack" Lincoln, the USAF made modifications to the Structures Strategy. This change validated the need to continue some of the technology pursuits already underway. It also identified additional research and development necessary to proactively address emerging aging issues. Subsequently, the AA SPO adjusted its budget requests to reflect the new Structures Strategy.

The USAF structures community, effectively monitored by the AATT, has provided the feedback necessary to adjust the strategy it executes, which demonstrates in this one area of aging aircraft how the full cycle of Strategy-Execute-Adjust can be instituted in the entire aging aircraft community.

Conclusion

As the average age of the people of the industrialized nations of the world increases, peculiar ailments and conditions caused by age are becoming more prevalent. To improve the quality of life and productivity of the aged, the health and medical community is reacting by addressing those ailments and conditions with new and innovative technologies and care methodologies.

The USAF recognizes this same phenomenon in its aging aircraft fleet. It has bestowed the leadership of this effort on the Aging Aircraft System Program Office. The AA SPO has reacted by charting the path needed to tackle the challenge. It has established a strategy for managing the problem, and plans to target specific problem areas. Building upon the successes of the structural community, the AA SPO is expanding and institutionalizing in other disciplines, such as avionics, wiring, fuel tanks, depot repair, the processes and procedures already clearly understood within the structures community.

The existence of the AA SPO is a clear indication that the business practices and management philosophies which must be addressed as a result of aging aircraft are at least as much of a challenge as the technical issues. The journey to improve our technologies, business processes and management philosophies has only just begun.