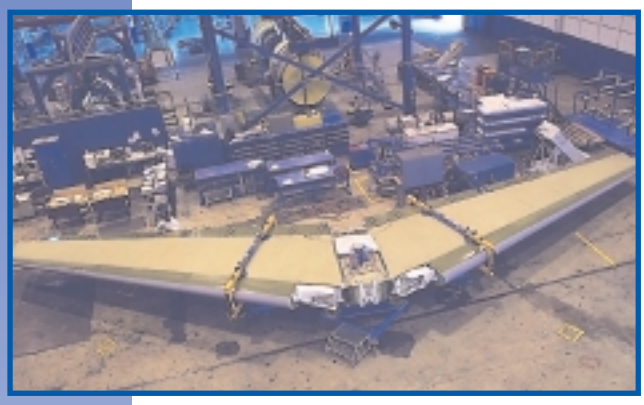
ASC ENGINEERING FACT SHEET

... An Engineering Success Story

C-17 Composite Horizontal Stabilizer



DESCRIPTION

The objective of the Air Force MP-C/MP program is to develop military products using the best commercial and military practices and to extend these practices throughout the factory to every part designed and manufactured in the enterprise. Thus, new ways of doing business are standardized that result in significant gains in product affordability. This revolutionary research and development effort supported by Air Force Research Laboratory's Materials and Manufacturing Directorate led to the successful development of a less expensive, lighter weight

SUMMARY

Problem:

- Discounting the effects of learning (rate production), the C-17 Horizontal Stabilizer was over two times more costly than its commercial equivalent. A comparison, based on the production of more than 2,700 commercial horizontal stabilizers and the first 20 production C-17 stabilizers, identified significant differences both in processes and practices as potential areas for affordability improvements.

Solution:

- This Military Products Using Best Commercial/Military Practices (MP-C/MP) pilot program identified three targets of opportunity: 1) product-related initiatives derived from product design and drive cost, weight, and product descriptions; 2) process-related initiatives independent of product design that had major impacts on cost, span time, or flow-down requirements; and 3) programmatic initiatives impacting the total acquisition cost.
- A new C-17 Composite Horizontal Stabilizer (CHS) outer torque box was developed that incorporates three significant improvements: upper and lower carbon/epoxy skins with integral hat stiffeners, carbon/epoxy front and rear spars, and integrally machined clips and brackets as part of the rib design.

C-17 Composite Horizontal Stabilizer *... An Engineering Success Story*

horizontal stabilizer outer torque box for the C-17 aircraft. The improved tail component demonstrates and validates a host of far-reaching, important innovations directly impacting aerospace business practices, manufacturing infrastructure, and process technology. This combined effort by the Boeing Company, Northrop-Grumman, the Materials and Manufacturing Directorate, the C-17 System Program Office, and the Air Force Defense Contract Management Command successfully demonstrated that the new horizontal stabilizer outer torque box resulted in a 20.4% weight reduction. Also, the acquisition cost of the new tail component is significantly lower than the previous all metal tail (based on a first-unit comparison and the acquisition of 120 aircraft). Furthermore, the new outer torque box component resulted in a 90% part count reduction, an 81% fastener reduction and a 69% required tool reduction compared to the previous configuration. .

The MP-C/MP integrated product team (IPT) used a structured approach for comparing commercial and military practices and processes and documenting cost/benefit analyses and risk assessments. In reality, the team reinvented the ways government and industry work together. This new way of doing business resulted in significant cost savings and performance improvements to the C-17 as well as successful transfer of new business practices, manufacturing infrastructure, and process technology to commercial industry.

Contrary to popular observation, the IPT found that commercial practices were not always the best and that military practices did not always add significant cost. The IPT also identified more than 40 separate process and programmatic improvements that would result in significant savings at both the program and organizational level. These improvements reduce overall touch labor, support labor, and material requirements. The team also incorporated electronic design tools, modeling, and virtual reality into the design process, saving more than two million dollars by eliminating engineering mock-ups.

The MP-C/MP program led to the transition of this major structural redesign directly to a major weapon system production program. Also as a result of this pilot program, important new business practices were implemented, true government-industry teaming was demonstrated, and cost was set as an independent variable. In addition, new design and simulation tools were used in an electronic design environment culminating in the manufacture of a cost-effective, large airframe structure.

In December 1998, the CHS successfully completed all static tests up through 200% loading without failures or degrading conditions. This test success fully exceeded all production and flight test requirements. As an added bonus of not damaging the test article, the CHS team is able to provide the CHS static test article to the Air Mobility Command and Boeing as part of a maintenance and repair training program. The flight test program was successfully completed in March 1999 at Edwards AFB. Also in December 1998, Northrop Grumman delivered the first production CHS to Boeing one week early, thus fully supporting the aircraft assembly requirements. Through mid-November 1999, Northrop-Grumman has delivered a total of eleven CHSs to Boeing, with no disruptions to the production schedule. Also through mid-November 1999, a total of five C-17s were delivered to McChord AFB with the CHS installed and no technical problems have been noted.

For more information, contact:
Mr. G. James Rzecznik
CHS Program Manager
Production Ops IPT
C-17 SPO

ASC/YC(PO-IPT)
Bldg 558
2590 Loop Road West
Wright Patterson AFB-OH 45433-7142
(937) 255-1052