Executive Summary

Integrated Mechanical Diagnostics/

Commercial Operations and Support Savings Initiative (IMD-COSSI)

PNUM 45

Background: In March of 1997 the Naval Air Systems Command, Program Executive Office, Air ASW, Assault and Special Mission Programs (PMA-261/299), choose to support an IMD proposal submitted by B.F. Goodrich (BFG) Aerospace. BFG proposed a Stage I demonstration under the Dual Use Application Program (DUAP), Commercial Operations and Support Savings Initiative (COSSI). The proposal, which represents a significant BFG corporate investment (cost share with the government), was selected by the COSSI Executive Steering Group, 2 May 1997. Also an 845 "other transactions" Agreement was signed by the Navy and BFG on 21 July 1997.

Requirement: BFG's IMD system for helicopter power trains and rotor system dynamic components responded to a compelling operational need, documented in an Operational Requirements Document (ORD) for the H-60 and a draft ORD for the H-53E utility helicopters, which extends to each of the military services'. The proposal represented an innovative packaging of commercial products, emerging technologies, and acquisition reform strategies that provide a very substantial reduction in operational, depot and logistics support costs as well as increased aircraft availability, and enhanced safety for helicopters. Current diagnostic techniques depend heavily on manual fault detection and isolation with limited recorded data. Thus they are labor intensive and dependent on experienced personnel. The process is inexact, leading to a sequential "remove and replace" approach based on incomplete or inaccurate data. This may result in maintenance-induced damage or retirement of components with remaining useful life. The IMD system combines several individually-significant diagnostic capabilities into an even more capable integrated system.

System Description: The commercial technology is generic and can be applied to other platforms. The products and processes utilize sophisticated automated diagnostic and decision-making techniques to recognize and interpret deviations from expected operating characteristics at every level of component and airframe complexity. The system includes; an onboard continuous monitoring and diagnostics subsystem, a commercial cockpit display interface (if required), data recording and transfer on industry standard PCMCIA memory cards, and a ground based maintenance planning, diagnostics, trending and post flight subsystem (Windows NT based software - can reside on users maintenance information ground station). System functions include; structural usage and fatigue life tracking, rotor track and balance, rotor system monitoring, flight data / cockpit voice recorder (provisions for), engine and drive train diagnostics/monitoring, and exceedance monitoring.

In order for a system of this type to be effective, it is imperative that the users of the system be able to maintain total visibility of all tracked components (life limited). This is accomplished through the use of a robust configuration management/parts tracking system. More and more end users have established or are establishing such a system. For Navy users, the IMD ground based system must interface with the Naval Aviation Logistics Command Management Information System (NALCOMIS), which will incorporate such a capability in 1998.

Open Systems Implementation: BFG was required to propose an open system approach and/or a migration plan to an open system. Open systems architecture is considered important because; it allows the best functional technologies to be integrated into the system, it allows the system to be upgraded as technologies mature or new functions are established, and fosters commonality across aircraft types. Draper Laboratory, a key member of the BFG team, provides independent system architecture analysis. Draper's review of the BFG architecture for compliance with DoD open system guidance provides significant risk mitigation in the area of open systems. BFG has committed significant corporate resources in support of system modifications to address the Navy's Open System requirement.

Program Milestones: BFG has joined forces with the Navy in an Integrated Product Team, lead by BFG, to bring the 24-36 month Stage I prototyping phase to a successful completion. The first prototypes for each aircraft are scheduled for installation in February 1999 and the remaining 5, of each type, will be installed in June 1999. An operational assessment of system function, implementation, safety implications, and cost benefit will commence at HMT-302, the H-53E Fleet Replacement Squadron (FRS), and HSL-40, the H-60 FRS, as prototypes systems are installed. A full rate production decision for the H-53E and H-60 is targeted for early 2000.