Managing the Modernization of CASS
By CAPT (Sel) Mike Belcher

Introduction

When I deployed on CONSTELLATION in 1999, it was CONNIE’s first deployment without Versatile Avionic Shop Test (VAST) stations. During the turnaround period between deployments, the VAST stations that had supported many air wings over the years were ripped out and were replaced with brand new Consolidated Automated Support System (CASS) benches. A couple of years later, prior to my deployment on THEODORE ROOSEVELT in 2003, three brand new CASS High Power stations and one CASS E-O were installed and six legacy testers were removed. That’s why it seemed odd to me when I transferred to the Aviation Support Equipment Program Office (PMA-260) at NAVAIR, that major focus areas for the CASS program included equipment obsolescence management and the development of a long-term strategy to modernize the CASS family of testers.

From my perspective as a Fleet maintainer, CASS was still fairly new, especially when compared to all the legacy testers that have been around for as long as I can remember. However, when looking at the acquisition history of CASS, and the factors that drive the requirement to recapitalize and modernize, those focus areas became much more obvious.

This article will discuss the evolution of CASS, the requirements that are driving the need to modernize, and CASS modernization goals and objectives.

History of CASS

The Consolidated Automated Support System (CASS) is the Navy’s standard Automatic Test System for electronics and avionics. It is in use throughout the Navy both afloat and ashore, at Navy Aircraft Intermediate Maintenance Departments (AIMDs) and Depots, at USMC Marine Air Logistics Squadrons (MALSs), aboard aircraft carriers and amphibious assault ships, and at many other sites, including several foreign countries.

Mainframe CASS is fielded in five versions that are designed for specific testing requirements. The Hybrid version is the basic core five-rack station that provides analog and digital test capability. Other CASS configurations add capability to the basic Hybrid Station to test radio-frequency components (CASS RF), high power radar systems (CASS HP), electro-optics (CASS E-O), and communications/navigation/IFF systems (CASS CNI). The Reconfigurable Transportable CASS (RT CASS) tester, a sixth configuration, was initially developed to support USMC and US Special Operations Command V-22 mobility requirements. The Marine Corps has since expanded the requirements for RTCASS to support all USMC fixed wing aircraft (F/A-18, AV-8B, and EA-6B). RT CASS will eventually replace Mainframe CASS at all USMC maintenance units.

The initial CASS stations were ordered in 1990 and CASS entered the Fleet in 1994. The last of the 613 production Mainframe CASS stations was delivered in December 2003.

Mainframe CASS was acquired in three major blocks:

- Block I includes the Low Rate Initial Production (LRIP) stations acquired in four production lots from 1990 – 1994.
- Block II introduced a Value Engineering Change Proposal (VECP) that brought upgrades to the computer, the Digital Test Unit, the display, several test assets, and included timing changes and asset relocation. Block II stations were acquired from 1995 – 1999.
- Block III brought another upgrade to the computer, changes to improve reliability, and addressed a few production obsolescence issues. Block III stations were acquired from 2000 – 2002.
Requirements Driving Modernization

Several drivers have led to the decision to modernize mainframe CASS.

Obsolescence

CASS is 85% Commercial-off-the-Shelf (COTS), semi-COTS or Non-Developmental Items. This made CASS considerably less expensive to develop and procure than the alternative, but it has made CASS more susceptible to individual instrument or component support problems.

Experience with older legacy testers shows that obsolescence in automatic test equipment is pervasive and not limited just to CASS or COTS testers. History shows that cost spikes to address obsolescence occur on 5-year intervals, and that a more major spike occurs near the 15-year point, especially with testers that contain a high percentage of COTS. This data coupled with the actual experience on legacy testers shows that the age of the initial Block I CASS stations indicates that the time is right (17+ years since first procurement) to begin a modernization program.

Technical Capability

Weapon systems are continually being upgraded to incorporate the latest in warfighting and net centric technologies. CASS must evolve to remain abreast or, ideally, ahead of changes being incorporated into weapon systems and test capability must be added where needed. Emerging weapon system testing requirements will drive the replacement or the upgrade of test instruments to meet higher performance requirements.

Differences Between Blocks

The three blocks of CASS stations are increasingly more capable. However, it has been necessary to develop Test Program Sets (TPSs) to the Block I station configuration, which is the lowest common denominator. Since CASS stations of any block may be assigned to a given Intermediate Maintenance Activity, TPSs must be transportable among all blocks of CASS. This results in TPSs generally being written to play on Block I stations, which means that TPS engineers sometimes cannot take advantage of increased processing speeds, instrument capabilities, or software algorithms available in the Block II and Block III stations. On the other hand, if TPSs were to be written to exploit the capabilities of the Block II and III stations, maintenance management would be more difficult and flexibility in utilizing all available CASS stations would be decreased.

By modernizing the Block I stations to match or exceed the speed and instrument capabilities of the Block II and III stations, TPSs will be more efficient. Unit-Under-Test (UUT) turn-around times will decrease and maintenance management can be optimized. Moreover, modernizing Block I stations will also reduce requirements and costs for logistics and training by optimizing parts and management commonality between Blocks II, III, and the modernized Block I stations.

Deterioration of the CASS Station Infrastructure

A majority of CASS Block I stations have seen more than 100,000 hours of use and, as a result, are beginning to physically deteriorate. The physical infrastructure of the CASS stations includes components such as wiring, rails, slides, power supplies, and card connectors all of which are subject to corrosion, metal fatigue, and normal wear and tear. While obsolescence has typically been limited to instrumentation, as the CASS stations age, replacement of these physical components incurs greater costs and down-time. Therefore, CASS modernization must also provide for a planned program to upgrade and replace the physical infrastructure.

Architecture

Since CASS was developed in the mid 1980s, its electrical and software design is based on a closed architecture, which is inflexible and does not permit easy modification or upgrade. When it became necessary to add functional test capability to mainframe CASS to support offload of the F/A-18’s Intermediate Avionics Test Set (IATS), the CASS computer was incapable of managing a functional test environment. As a result, a Slot 0 PC controller had to
be added to manage the new functions. Incorporation of an open architecture will better address situations such as this and better facilitate future changes to reduce the cost of ownership.

**CASS Station System Software**

Mainframe CASS has millions of lines of system software code, which is becoming archaic, and while technically supportable, it is likely to become so cumbersome that it is no longer cost effective to maintain. Therefore, modernizing CASS will allow the Navy to take advantage of the latest state-of-the-art in system software, operating systems, bus architectures, and TPS programming environments. Modernizing the system software will also facilitate the cost effective addition of “better, faster, cheaper” instruments and TPSs.

**The CASS Modernization Program**

PMA260’s ultimate goal is to have all CASS stations in equivalent configuration based on an open ATS architecture; for current and future TPSs to be transportable among all configurations, for CASS to be capable of interoperability with other Services, for new test technologies to be easily inserted and for stations to be easily reconfigurable (scalable) to meet specific UUT testing requirements with only the minimum required assets in the stations. Specific objectives, which support these goals, are:

- Update current test capability
- Add test capability to support emerging weapon system requirements
- Deal with obsolescence
- Address the ageing station infrastructure
- Reduce logistics footprint – both in the shops and inside Mobile Maintenance Facilities - and for ancillaries/spares as well
- Implement an open system via the DoD ATS Technical Architecture Framework
- Fewer configurations of CASS
- Facilitate interoperability with other Services
- Decrease station mean time to repair
- Reduce Total Ownership Costs
- Add user-friendly enhancements

**Identification and Evaluation of Alternatives**

Since the entire modernization project is ultimately based on cost, PMA260 decided to step back and employ an outside organization to conduct an Independent Cost Estimate (ICE) and Cost Benefits Analysis (CBA) as the basis for subsequent decisions. As this analysis unfolded, it became apparent that CASS truly needed a modernization effort of some sort and that continued piece-meal incorporation of ECPs was very sub-optimal. PMA260 made the decision to modernize and then focused the CBA on identifying and evaluating alternatives for modernization.

The analysis showed that replacing the older mainframe CASS stations with a new procurement has the lowest total ownership costs, the lowest costs due to asset obsolescence, the lowest maintenance costs, and the greatest cost savings due to footprint reduction, improved TPS throughput, and improved TPS development and maintenance methodologies.

**eCASS**

The modernized CASS concept, named eCASS, will be a product of all of its predecessor testers. The technologies inserted into RTCASS and other technology development projects will flow into eCASS and it is expected that additional test technologies beyond these (only some of the candidates are shown in the figure) will flow into eCASS.
What to expect of eCASS:
- Much smaller footprint with more test capability
- Faster run times
- Multi-lingual test environments
- Interoperable with other Services’ ATE
- More scalable to needs
- Reduced acquisition and support costs
- “Smarter” diagnostics concepts

The Plan

PMA260 plans to competitively award a development and initial production contract in 2009. The development period will be 2009 – 2011, or maybe a little beyond. Low Rate Initial Production stations will be procured in 2011 and 2012. Production will begin in 2014 following formal testing, and eCASS stations will begin fielding in 2015.

Wrap-Up

The basic objectives of the CASS modernization project are to satisfy weapon system support requirements while reducing the logistics support burden and reducing ownership costs.

Having completed my tour as the CASS Officer, I highly recommend a tour in PMA260. Every AMDO position offers the opportunity to significantly help the fleet, and you may even be lucky enough to get in on the ground floor of the eCASS program.