

**U. S. DoD CAD/PAD  
Joint Program**  
*(CAD/PAD – Cartridge Actuated Device/Propellant Actuated Device)*

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**ABSTRACT:**

The CAD/PAD Joint Program is a full life cycle commodity program for which the U. S. Navy has been designated as the Lead Service. There are over 11,000 aircraft currently utilizing approximately 550,000 CAD/PAD installed devices. These installed devices represent 3,100 U.S. DoD distinctly managed items. All aircraft, from the oldest to the newest in their respective fleets, utilize CAD/PAD items to accomplish a wide variety of applications such as aircrew escape, stores separation, fire suppression, countermeasures deployment, and emergency release, among others. The mission of the CAD/PAD Joint Program is to deliver quality, cost effective products and timely life cycle support to the warfighter. The CAD/PAD team accomplishes this mission by implementing best practices and government/industry/academia partnerships in an environment of open communication. This paper presents an overview of the CAD/PAD Joint Program and how this program supports on-going U. S. DoD activities.

**BACKGROUND:**

In the early 1970s the Joint Logistics Commanders (General Miley U. S. Army, Admiral Kidd U. S. Navy, and Generals Catto and Phillips U. S. Air Force) approved an implementation plan based on the conclusion that the majority of CAD/PAD logistics functions, excluding inventory control, requirements determination, and in-service engineering, should be consolidated within the Navy at Indian Head. This was the recommendation of the Joint Logistics Commanders' Panel for Consolidation of Functions and Facilities Subpanel chartered to determine if, by interservicing or consolidation, resource expenditures associated with CAD/PAD could be reduced and/or management improvements achieved. The Subpanel found that substantial duplication existed and that unneeded facilities and equipment could be eliminated from the consolidation. Hence, in 1973 Indian Head was designated as having the tri-service role for CAD/PAD.

Cartridge Actuated Devices (CAD) and Propellant Actuated Devices (PAD) are commodity items that function as a system component. In operation, they release precise explosive or propellant energy to perform controlled work functions in a variety of applications, including aircrew escape, fire suppression, and stores/emergency release systems.

CAD/PAD items generally contain an energetic material along with a mechanical or electronic actuating component. About 3,100 different configurations are in use by the U. S. military. Many are man-rated requiring a high degree of reliability.

Some CAD/PAD are expended in normal operations, such as those used for stores release; others are used only in emergencies. All have a predetermined shelf/service life and must be replaced periodically. CADs and PADs that are needed for safety of flight can cause grounding of aircraft if they are defective or past their defined service life.

For twenty years the consolidation implemented by the Joint Logistics Commanders was the framework within which the CAD/PAD Program was conducted. In accordance with the Joint Logistics Commanders' direction the in-service engineering and other sustainment functions for CAD/PAD continued to be executed at the Ogden Air Logistics Center for the Air Force and at the Indian Head Division of the Naval Surface Warfare Center for the Navy. Though the two organizations worked together, often these functions were performed independently within the individual service.

### **ESTABLISHING A JOINT PROGRAM:**

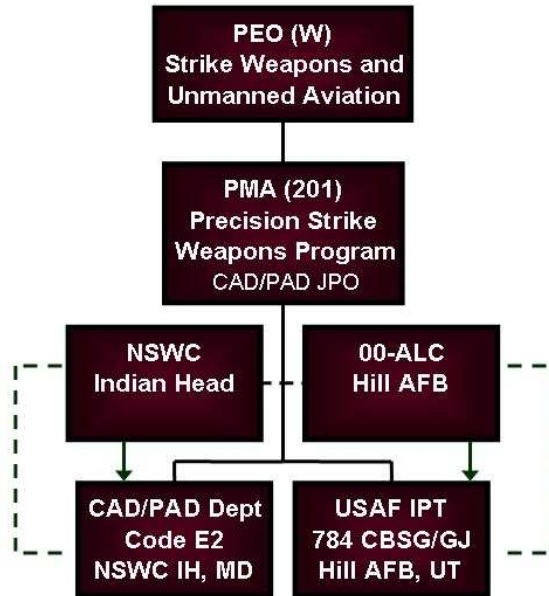
The mid-1990s, after the conclusion of Operation Desert Storm, began a period of increasing efforts to reduce costs within the Department of Defense. One of the results was reduced manpower at the Ogden Air Logistics Center that was making it more and more difficult to meet the demands associated with the sustainment function for the CAD/PAD Program of the Air Force. These same circumstances existed at Indian Head with regard to the Navy CAD/PAD Program however, because the work is industrially funded the required support was not threatened to be diminished beyond the minimum necessary.

In response to the continuing pressures a team of representatives from the Ogden Air Logistics Center and the Indian Head Division was established to study the alternatives to the status quo that would provide the means to preserve adequate support of the CAD/PAD Programs in the Air Force and Navy in the face of the relentless cost cutting initiatives.

The findings of the team concluded that establishing a Joint Program would increase efficiency and also the effectiveness of the support being provided would be improved. Efficiencies would occur from the elimination of unnecessary duplication in engineering, acquisition, and testing. Establishing a single office, the CAD/PAD Joint Program Office that was responsible for CAD/PAD would promote the sharing of knowledge and the breaking down of barriers to standardization within the program thereby improving effectiveness.

In 1998 the CAD/PAD Joint Program Office was officially established with the approval of the CAD/PAD Joint Program Business Plan by flag officers of the Air Force and Navy. The Navy is designated as the lead service and management of the program is under the direction of the Navy's Precision Strike Weapons Program Manager (PMA201). The CAD/PAD Joint Program (PMA201CP) was established within PMA201 and has the responsibility for the day-to-day activities supporting CAD/PAD for the services.

### CAD/PAD Program Organizational Alignment



The objectives of the CAD/PAD Joint Program Office are to continuously seek improvements, reduce duplication and costs, improve interoperability and increased standardization, and to achieve resource efficiencies.

#### **SUCSESSES/ACCOMPLISHMENTS:**

A significant success is the consolidation of quality evaluation programs resulting in fewer tests and reduced costs to both services. For example, recently instead of each service performing its own quality evaluation of a cartridge actuated thruster and also an impulse cartridge the services were able to benefit by combining and performing a single quality evaluation for each item. These items are used in the same applications on rotary aircraft by each of the services and each service will save approximately \$40,000 as a result of the combined execution of the quality evaluation that was enabled by the CAD/PAD Joint Program Office.

The CAD/PAD Joint Program Office is able to more often seek second sources for CAD/PAD items as a result of sharing the costs among the services that use particular items. The reasons for seeking second sources are the potential for procurement savings and also avoiding the potential for delivery delays. Procurement savings are realized either from

significant reduction in the cost of an expensive item, or a modest cost decrease in the case of an item that is produced in high volumes. Delivery delays may occur for a variety of reasons; sometimes it is just a problem with the existing production capacity of a single sole source supplier. The successful completion of the current joint second source efforts are estimated to save in excess of \$1,000,000 in procurement costs.

Another promising new initiative that is possible because of the ability to share costs for CAD/PAD among the services as managed by the CAD/PAD Joint Program Office is the development of electronic delay cartridges to replace pyrotechnic delay cartridges. The pyrotechnic delay cartridges in use today utilize energetic material burning at a controlled rate to achieve a specified delay time prior to the cartridge providing its ballistic output. The ability to capitalize on the advancement of electronic technology will benefit the services in several important ways. The electronic delay cartridges will provide considerably more precise delay times than that achievable with pyrotechnic delay cartridges thus giving systems designers more flexibility when employing delay cartridges. The use of electronics versus energetics or chemical energy has the potential to establish a longer service life for the delay cartridge that will lessen procurement costs because the items will not need to be bought as frequently. Electronic delay cartridges also have the potential to reduce the maintenance time and associated costs as a result of not needing to change out delay cartridges as often because service life is expiring.

As a result of the CAD/PAD Joint Program Office the implementation of the "Single Engineer" concept was made possible. Traditionally, there was an engineer at Hill Air Force Base that was responsible for overseeing the work being conducted by an engineer at Indian Head. In practice the situation often was analogous to having a "checker checking a checker". Implementation of the "Single Engineer" concept is reducing duplication and overlap of tasking within each service. For those projects such as the CKU-5 rocket catapult, the "M series" catapults, trajectory divergence rocket motors and the various FLU inflation devices no longer is there an engineer who is overlooking the work of another engineer. The savings from this is approximately three workyears annually.

Within the CAD/PAD Joint Program Office the merits of employing a structured mathematical model to determine procurement requirements was well known. Many years ago the Navy had its CAD/PAD budget withheld because it lacked the disciplined forecasting of what specifically would need to be procured. As a result Material Planning Studies were developed for the Navy procurements that accounted for the many factors such as aircraft inventory, items with service life expiring, and items that were due to be delivered. This mathematical model is used each year to determine with great accuracy the numbers of what specific items need to be procured and also predicting very accurately the readiness impact on specific aircraft of any budget reductions. The Air Force was able to leverage the work done by the Navy and develop a Requirements Determination Module that provides the Air Force with an accurate forecast of how many of what items need to be procured. The Requirements Determination Module was first used in Fiscal Year 2006 and the projected cost avoidance as a result of being able to procure what will be needed is \$2,000,000.

Another intangible benefit is that, as a result of the breadth of responsibility of the CAD/PAD Joint Program Office, emerging issues in one service can be addressed and the CAD/PAD Joint Program Office is able to ensure the resolution of the issue is shared among all services. Therefore a lesson learned in one service doesn't have to be learned again by another service costing time, money, or potentially increasing the risk to adequate performance.

### **FUTURE INITIATIVES:**

Another innovation, currently being deployed, initially for Navy/Marine Corps needs, is a web-based Virtual Fleet Support (VFS) system. The objective is to use commercial, off-the-shelf technology to allow input and updating of core technical, engineering, acquisition, and logistics/supply data directly from the source. Wherever possible, embedded programming will automate business processes, electronically completing tasks previously performed by sailors, marines, and other support personnel. The benefit of this is that not only does it relieve the users of the tedious task of maintaining data, it also quickly provides the same information to all at the same time, and eliminates the potential for confusion caused by information among the users being different.

A number of initiatives are using Lean Six Sigma as a means to improve the efficiency of the variety of processes supporting CAD/PAD. An example of a current initiative underway is the value stream mapping of the procurement request process that leads to the award of contracts that will be followed by improvement events to reduce the cycle time of the process. These projects now being done in conjunction with the CAD/PAD Joint Program Office allows the sharing of any improvement by all services without having to repeat the extensive work done to achieve the results.

### **CONCLUSION:**

The CAD/PAD Joint Program is meeting the challenges of declining resources and increasing workload by continuing to seek efficiencies throughout the CAD/PAD Program as a whole. The CAD/PAD Joint Program Office promotes shared goals and objectives that are the same throughout the program rather than having service goals and objectives that may hinder achieving success because of the differences.

Though there is more to be done, there is no doubt that the CAD/PAD Joint Program is operating more effectively achieving current readiness utilizing or leveraging a joint approach to become as efficient as possible to afford future readiness. The CAD/PAD Joint Program is committed to meeting customers' needs and closing the gap between readiness and available resources.