A Weapons Acquisition Case Study: Cost Overruns and Schedule Slips

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This story is true. Certain details – names, dates, descriptions, and dollar values – have been omitted to "stump the audience" and protect the guilty. The trials and tribulations of an acquisition program cost overrun are explored for persistent lessons and future applications. This saga includes materiel difficulties, workforce issues, congressional interest, funding and schedule perturbations. The purpose is to educate, as the persistence of fundamental acquisition problems and the insignificance of acquisition reforms are framed for discussion and/or contemplation.

There have been countless acquisition case studies written. As our fathers would have said, "more than you can shake a stick at." This paper takes a slightly different tack in examining one particular acquisition effort. As opposed to dissecting what went wrong and how issues could have been avoided, this paper presents the reader with a thumbnail sketch of the scenario with some pertinent data. The reader is then "quizzed" on some possible scenarios to determine the correct option. The story is true and only names, dates and specific dollar values are excluded. At the end, "all will be revealed" (to quote Agatha Christie) and closing comments will be provided.

As the story opens, it seems that terrorist attacks had occurred, and American citizens were being held hostage overseas. The President was very concerned about the situation and about the state of national security in general. These concerns led him to believe a rapid long-range strike capability for the nation was crucial. The President lobbied Congress and an emergency appropriation was pushed through with bi-partisan support and the bill was quickly signed by the President. It should be noted that some minority members of Congress grumbled about the cost and the vote was somewhat close in the House of Representatives, the bill passing with an eleven vote margin.

The acquisition approach used had aspects that are common with many. Work was awarded to as many viable sources in as many Congressional districts as possible, to broaden the positive

economic impact. Broad impressions were of a sluggish economy, and the hope was that the major new defense work would prove to be an economic stimulus. Additionally, the system used an advanced design with exotic materials, seeking to advance the state of the art, introduce new technology, and leapfrog potential adversaries in fielded capability. So far, so good…

Problems, however, quickly developed. The advanced materials so crucial to the system design were much harder to procure, manufacture, and assemble than the designers had envisioned. Also, the necessary skilled labor force was very difficult to obtain, retain, and keep qualified to work with the advanced materials. As a result, schedules began to slip. In view of the problems, the Secretary was forced to inform the President that the contracts would likely overrun. In reality, the contracts were nearly at stop work status due to lack of program funding.

As a result of the problems, program cost estimates were revised, with a resulting 30% increase. The Secretary requested an emergency supplemental appropriation in order to complete the program. Congress however, refused to fully fund the request and only appropriated 85% of the increased cost estimate. The grumbling heard initially about the cost of the program now increased greatly, with some congressional membership becoming publically very vocal in their opposition to the program.

Time passed and work continued, but the initial problems that surfaced in dealing with the advanced materials never really went away, persisting to frustrate the program throughout. Program cost estimates were revised again, and program cost increased by an additional 22%. This time, Congress agreed to fund even less of the cost increase and only appropriated 55% of the requested increased amount. A great furor erupted when Congress discovered the increased amount did not fully fund the program. As a result of the increased cost and budget concerns, the initially planned production was cut in half.

As our saga continues, Congress was very unhappy when it learned that the revised cost estimates now only funded half of the original planned quantity. Costs had now increased 58% over the original program estimates. To fully fund the originally planned production quantity would have required an additional 55% increase in program funding (in addition to the previous increases). The total projected system cost was now 245% of the original program baseline; and this weapon system was now the largest item in the defense acquisition budget. The system and

the increased cost were so controversial that there were actually demonstrations at the contractors' facilities.

The problems with the program ultimately led to the special project stage that is sometimes referred to as the search for the guilty. The Secretary informed Congress that it would be impossible to field the system without added funding. The furor over increased program costs now became an uproar. The bipartisan support the program enjoyed initially had now evaporated. Congressional hearings began, focusing on the increased program costs and schedule delays. A result of the hearings, the Service Secretary was required to submit a report on cost growth – perhaps a selective acquisition report (SAR)? The Secretary subsequently submitted the required report, citing the difficulties with the advanced materials and labor problems – skill mix and general availability – as the main drivers for the cost growth. As a result of the report and the program issues, the President requested the Secretary's resignation.

Now for the rest of the story… Congress eventually fully funded the system, but only after much partisan debate. The cost of the system was used for political purposes during Congressional elections, with the minority party saying they were really against the system all along and that it really hadn't been required.

The system was eventually fully fielded, but high operating cost continued to be a sore spot. However, the system performed well in later conflicts. The user was very happy with the performance and adversaries held it in awe.

So, what weapon system could be the subject of this sordid tale? Calvin Coolidge and the Lexington class carriers? Franklin Roosevelt and the B-29 bomber? Dwight Eisenhower and the Minuteman missile? John F. Kennedy and the Polaris submarine? Jimmy Carter/Ronald Reagan and the B-1 bomber? George H. W. Bush and the B-2 bomber? Bill Clinton/George W. Bush and the Joint Strike Fighter? Or, could we be referring to something else entirely? Can you choose wisely?

In words that Paul Harvey made famous, "…**and now, for the rest of the story**.

If this was an actual test, the correct answer would be "none of the above;" …something else entirely. While many modern weapon systems and defense acquisitions have certainly had their

problems, this scenario goes back much further in history. This scenario and case study is actually based on the first six ships of the United States Navy, primarily during the administrations of Presidents George Washington and John Adams.

To provide a few more of the actual details, the impetus behind the acquisition was the practice of the Barbary pirates to capture American shipping and hold the crews for ransom. This was a major issue at the time, since the burgeoning American economy was heavily dependent on overseas shipping and commerce. (After all the West was still a mercantile economy, at the time.) Due to unrest between England and France, the resulting British blockade of French ports, trade via the Mediterranean – within, throughout, and beyond – became crucial. The activities of the Barbary pirates severely threatened this trade and President Washington became convinced the new nation needed a naval force to help protect the shipping on which the economy was so dependent.

The War Department (there was no Navy Department at the time) turned to noted naval architect Joshua Humphries of Philadelphia to design the six new ships. Mr. Humphries was a brilliant designer and in some ways ahead of his time. Knowing that the new nation would never be able to build a fleet of sufficient size to compete with the European powers, Humphries designed the ships to be able to operate independently. These goals required a design with overwhelming firepower for their size, but also great speed. If these performance goals were attained, this meant the new American ships would be able to not only overpower any adversary of equivalent size, but also be able to outrun the larger ships of the line that had the capability to blow them out of the water.

To accomplish these performance goals, Humphries designed a unique bracing system and made heavy use of American Southern Live Oak as wood integral to his construction design. Live oak is an unusually strong and dense wood; this unique construction helped the ships carry a heavier armament load than European ships of equivalent size.

While the use of the live oak helped provide outstanding capability, it also brought many unforeseen issues and was the cause of many of the cost and schedule problems during construction. Because it is such a strong and dense wood, live oak tended to quickly dull the saws and blunt the axes used to cut the trees, finish and shape the wood. The wood was so

difficult to work with that many experienced ships carpenters gave up and refused to perform further work. Live oak only grows in the swampy coastal regions of the American South, which caused additional problems. On average, only one tree in fifty was large enough to provide wood of the necessary dimensions for construction. This search for the prize trees involved lengthy forays deep into Southern coastal swamps. Once found and cut, transportation of these sizable trees out of the dense swamps was another difficulty. Many workers became severely ill with malaria from the mosquitos prevalent in the swamps and were too sick to work. Because of the severe conditions, it was difficult to recruit replacement workers. Many of the laborers that recovered from the malaria left and refused to return.

Eventually, the problems were overcome and the ships, including the *USS Constitution* (Old Ironsides due to the tough live oak planking) went on to perform well during the undeclared war with France and the War of 1812 with Great Britain. In fact, one testament to the robustness of the design and materials used was the *USS Constitution* becoming the oldest ships of the line in the U.S. Navy – 219 years old and currently in dry dock undergoing a scheduled three-year program of restoration.

The point of this article is to show that problems with defense acquisitions are not new. From the nation's earliest days, with its very first major defense acquisition program, acquisition strategies were: political; creative; contentious; used as electoral fodder; broke along party lines; and suffered both cost overruns and schedule slips due to most of the same problems and risk categories we experience today. The difficulties of estimating the costs of advanced designs and exotic materials are rooted in the experiences of our earliest American cost estimators/analysts. One might say these problems are foundational to the country and weapons procurement. Estimating a system that advances the state of the art was just as difficult in the 1790s when dealing with Southern Live Oak, as it is today when dealing with cosmic software configurations, advanced composite and radar absorbing materials.

This paper is based on Mr. Ian Toll's book, Six Frigates: The Epic History of the Founding of the U.S. Navy. The six frigates comprising the major defense acquisition program considered above are the *USS Chesapeake*, the *USS Constitution*, the *USS President*, the *USS United States*, the *USS Congress*, and the *USS Constellation*.