

Maverick Airframe Team Scores Stunning Acquisition Reform Success

A's for H's - Let's Make a Deal

COLLIE J. JOHNSON

A unique bartering arrangement between the U.S. Air Force and Raytheon offers renewed hope and inspiration to defense program managers who are faced with a reduced procurement budget and the tough choices of not funding a needed weapons upgrade program. A bold, initially risk-laden idea that was previously abandoned for lack of takers, has resurfaced out of the old West as a vital program.

The resultant Maverick Missile Exchange Agreement, a team effort led by former Maverick Development System Manager (DSM), Air Force Lt. Col. Greg Kuntz, and Raytheon's Air-Launched Strike Director, Glenn Kuller, stands as one of the most innovative Acquisition Reform success stories in recent memory.

Establishing a Need

To understand this story, we need to look at two of the eight variants of the Maverick missile: the first Maverick, the AGM-65A; and the last to complete operational testing, the AGM-65H.

In 1972, Hughes Aircraft Company [now Raytheon] delivered the first Maverick, the AGM-65A, in response to an Air Force request during the Vietnam era for a close air support (CAS) weapon to pro-



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GLENN KULLER • GREG KUNTZ • M

vide a catastrophic kill capability when launched from tactical fighter aircraft against mobile targets.

The original Maverick, with a forward-looking, electro-optical (TV) seeker, was a rocket-propelled guided missile that carried a 125-pound, shaped-charge warhead. Once launched, it was designed to knock out mobile tanks and trucks as well as stationary targets.

Following up on their first effort, through the years Hughes and Raytheon deliv-

ered seven more variants of the Maverick (Figures 1 and 2).

Now let's fast forward to 1997. Maverick's evolution isn't quite over yet. The AGM-65H, with its charge coupled device (CCD) modern TV seeker technology, circuitry, and associated software provides greater reliability, a clearer picture, longer standoff range, and enhanced tracking capability. Totally replacing some technology on the earliest variants of the Maverick, the "H" Maverick complements, but does not replace

the Imaging Infrared (I²R)-guided missiles.

But despite its capabilities and the Air Force's critical requirement, the AGM-65H variant, which has completed a successful Qualification, Operational Test and Evaluation (QOT&E) by the Air Force, was unable to gain the necessary funding from an Air Force procurement account that has come under constant attack.

In fiscal year 1998 Congress, seeing the urgency of maintaining a TV Maverick capability, added \$8 million to keep the upgrade program on track. Due to the two-year Program Objective Memorandum (POM) cycle, the Air Force could not request AGM-65H funding in the fiscal year 1999 procurement budget request...which is where our Airframe Exchange story begins.

Necessity, the Mother of Invention

The concept of exchanging A's for H's was a response to that loss of funding. The government's DSM at that time, Wanda Siefke, was searching for a way to keep the program alive.

Meanwhile, Ron Stenstrom, Raytheon's Maverick Production Manager, and Glenn Kuller, Raytheon's Air-Launched Strike Director, had their own problems. Katema, Maverick's airframe supplier of 20-plus years, had decided that with the stop-and-go procurement nature of the Maverick airframe business, they could no longer commit the floor space required to keep the equipment up and ready to build. This situation is not unique to Maverick; many second- and third-tier suppliers are taking a hard look at their defense business and asking tough questions about their continued involvement.

Said Stenstrom, "Finally, they [Katema] basically told us that their portion of factory floor space currently dedicated to airframe production could be put to better use making commuter airline



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assemblies.” Stenstrom went on to note that Katema did make Raytheon a one-time offer to build as many airframes as needed to fill current and future requirements. However, the company could not accept the risk of buying airframes against an ill-defined future requirement and chose to immediately seek an alternate source.

The Air Force’s need to keep the program alive...Kuller’s need for a supplier. At some point no one can precisely remember, a meeting of the minds took place. Kuller, after assessing the situation from all sides, resurfaced an old idea that had never gotten off the ground.

An Offer Too Good to Refuse

In essence, Kuller made Siefke an offer the Air Force couldn’t refuse: “Trade in missiles, let me take them apart; I’ll give you credit for like Maverick hardware purchases,” he told Siefke. In other words, Raytheon would buy 1,000 of around 8,000 AGM-65A missiles the Air Force had in “deep storage,” take the missiles apart, retain the airframes for use in Foreign Military Sales [FMS] or Direct Commercial Sales, and return the warhead and other explosive components back to the Air Force for demilitarization.

Raytheon would give the Service a credit of \$2,155 per airframe to be applied to the AGM-65H. In essence, they’d take the only piece that’s really worth anything – the aluminum airframe – and use that in their new-build production.

In making the offer, Kuller risked cutting off Raytheon’s only supplier. “The Air Force had not totally committed to this idea – there were a few sleepless nights on my part. Had I done the right thing?”

Kuller notes that the program encountered several delays, “But once Greg [Kuntz] came on board as the government 65H DSM, he had a single focus: Before his retirement, he was going to ensure that Siefke’s initial efforts in ‘getting the ball rolling’ were carried through to completion of the final Maverick Airframe Exchange Agreement.”

Figure 1. Other Maverick Missile Variants — 1972 to 1998

AGM-65B	“Scene Mag” seeker-improved optics; refined target acquisition capability; increased single-pass kill probability.	13,579
AGM-65C	USAF laser missile.	Not put into production
AGM-65D	World’s first operational imaging infrared (I ² R) missile, designed to meet Air Force’s requirement for a night precision strike weapon with adverse weather and night operations capability.	10,943
AGM-65E	U.S. Navy laser-guided missile, first variant with 300-lb. Maverick Alternate Warhead (MAW) with selectable fusing. Increased effectiveness against high-value targets.	2,165
AGM-65F	Refinements in the I ² R seeker, guidance processor, and system software; added ship attack mode for tactical operations at sea and included heavy-weight warhead.	1,732
AGM-65G	Added system software to give Air Force capability of attacking an expanded spectrum of land and sea targets. Optimized use against high-value targets.	10,414
AGM-65H/K	Upgraded Guidance Unit with Charge Coupled Device (CCD) technology; clearer picture, longer standoff range, haze penetration; enhanced tracking software. Guidance Unit mounts on either airframe with shaped-charge warhead (65H model) or with the heavy-weight warhead (65K model). Completed operational testing.	35 “R&M 2000” units built; 1,200 GCSs initial production.

Kuntz, for his part, knew that the Air Force had about 8,000 AGM-65A TV-guided missiles in “deep storage” that were no longer capable of economically performing their intended mission. He also was fairly certain that the airframes of those never-used Mavericks were in pristine condition. And from his vantage point, that looked like a steady, reliable supply of airframes for the near future.

Raytheon, in June 1997 sent a letter to the Commander, Aeronautical Systems Center, proposing the Maverick Missile Exchange Agreement. By mid-December 1997, the General Services Administration (GSA) had signed off on the agreement – largely due to the incredible level of defense-industry cooperation; and superior technical, financial, and systems management skills of the Maverick Airframe Team.

Says Kuntz, “After all was said and done, in essence the U.S. Air Force entered into a ‘strategic supplier’ arrangement with Raytheon to supply AGM-65A airframes for all future Maverick production.”

Demilitarization — What’s Left?

Kuntz explains that the “A” Mavericks currently maintained in deep storage are not periodically tested, and are slated for eventual demilitarization [destruction]. This is a costly process, he notes, whereby the various subsystems are dismantled and the components disposed of in accordance with federal and state regulations.

Elaborating on that process, Glenn Kuller puts it this way: “Basically, you end up with a warhead, fuse, and a rocket motor. Chemicals, particularly rocket motors and warheads, are destroyed by the Army; and metal parts are rendered militarily useless and sold by the pound as scrap.” (At the going rate for aluminum, Kuller points out that the airframe, if sold by the pound as scrap, is worth only about \$57.)

Raytheon’s shaped-charge warhead manufacturing team is currently working with the Air Force trying to reclaim some metal parts during the warhead

demilitarization process. Kuller explains the process in layman's terms: "Essentially, we take the lid off the warhead, remove the warhead closure, and then heat and remove the existing explosive. After steam cleaning all the metal parts, we mix a new batch of explosives and vacuum-pour the new mixture into the warhead case. The reclaimed explosive," says Kuller, "is then recycled for sale as a commercial product."

The rocket motor, according to Kuller, is also a candidate for reclamation. Raytheon and the Air Force are investigating a similar approach for the AGM-65A rocket motor, whereby a Raytheon supplier would accept the motors for demilitarization. During that demilitarization process, the supplier would reclaim the nozzle portion of the assembly. This proposal, Kuller notes, is in the midst of technical evaluation to ensure the nozzle can, in fact, be reused.

He goes on to say that Hill AFB also has plans to use several dozen of the AGM-65A batteries for aging and surveillance purposes. A series of tests will be conducted at a variety of temperatures to verify that the current and voltage characteristics of the thermal battery are within specification. Kuller states that, historically Maverick has used batteries for aging and surveillance testing that were removed from supply stock. The demilitarization process, however, offers an opportunity for the Air Force and Raytheon to assess batteries that have been in a wide variety of missile storage conditions.

Commonality, Acceptance, Stable Pricing

Gary Card, Hill AFB Maverick Systems Engineer, speaks of the innovative nature of the Airframe Exchange. "The concept was certainly something to think about, but the way programs in the past have occurred, you normally don't go back and revitalize a lot of old systems. If you've got the money to pay for new systems, you use new money."

Card readily admits his surprise at the willingness of the Department of Defense community to accept the role of

revitalizing a weapons system in this manner, and states that he thinks it's a good idea. "When Congress basically said, '[You] have no money,' and we knew of the great need the user has for the 65H missile to replace the old vidicon guidance program, it just made a lot of sense to try to continue on and develop a system that was still a viable, television-guided system that the user definitely wants, and at as low a cost as possible."

He attributes some of the success of the Exchange Agreement to the commonality of the center aft section of the Maverick family of weapons concept (Figure 3). This allowed different guidance units and control sections to be mated to the same airframe configuration. "Fortunately," says Card, "the system was developed with the concept of easily removing and replacing the guidance units, resulting in a very flexible core application in other areas for future applications."

Overall, this arrangement appeared to make sense to the government, Maverick buyers, and Raytheon. Once the numbers were agreed upon, it became clear that instead of the taxpayers paying nearly \$1 million to demilitarize 1,000 AGM-65A missiles, Raytheon would buy the missiles for \$2 million and convert the older airframes for use in current missile production. The net savings to the U.S. taxpayers was \$3 million, \$2 million of which is assigned as a credit for like Maverick hardware purchases (in this case the 65H). From any angle, this looked like a "win-win" situation for all parties.

The bartering arrangement, according to General Services Administration (GSA) regulations, had to be a hardware-for-hardware exchange; that is, the Air Force couldn't give Raytheon hardware in exchange for engineering support work. Therefore, the Air Force would give Raytheon the hardware (AGM-65A airframes), and Raytheon would then deliver hardware by upgrading Maverick "B" guidance units to Maverick "H" guidance units.

Said Kuntz, "Glenn [Kuller] was looking across the needs of all Raytheon's Air

Force and FMS customers, trying to make a match, and that drove him to come up with the Airframe Exchange."

Besides being a win-win situation for the government and Raytheon, FMS customers also benefit. It would have been easy for Raytheon to simply develop a new airframe manufacturer and pass on the additional costs of bringing online a new supplier to their FMS [Foreign Military Sales] purchasers. However, FMS customers will now reap the benefit of stable pricing for the airframe.

Kuller notes that in the past a small Maverick order could result in high airframe costs. That will no longer be the case. He also points out that *only pristine missiles are being accepted for FMS sales*. Raytheon is refusing any missiles that have been out of deep storage, such as captive-carry missiles. "To date," says Kuller, "of 480 missiles inspected, 30 have been rejected – 29 showing signs of being captive-carried and one with a bent fin. Even though these missiles would likely have yielded good airframes, why bother. We have 8,000 to choose from, so there is no problem with getting 30 replacement units."

Like New — Nothing Less Will Do

Before the government and Raytheon could execute the Exchange Agreement, they had to first assess the condition of the AGM-65A's in deep storage. Were the airframes in "like new" condition? Could they meet the definition of GSA's "New Materials" clause?

Ben Harris, the Maverick System Program Director at Hill AFB, Utah, was determined to facilitate that process. Harris explains that his office at Hill manages all models of the Maverick that are in the sustained part of their life cycle, all FMS sales and contracts, and any issues associated with support of weapons in the field.

He notes that Eglin AFB, Fla., however, is the Maverick development agent. All of the new systems and technologies are developed at Eglin. Once they're fully mature, they transition to Hill AFB.

RETRIEVING THE AIRFRAME

FROM DEEP STORAGE TO S

Step 1. AGM-65A's are removed from "deep storage" at the Red River storage facility and shipped to Raytheon Missile Systems for disassembly. The Maverick missile is composed of three major sections: the guidance and control section (left), airframe section (center), and the hydraulic actuation system (HAS) section (right).



1A. CONTAINERIZED MAVERICK AGM-65A'S.



1B. MAVERICK AGM-65A

Step 2. Key Maverick Airframe Exchange team members inspecting an all up-round missile. Only missiles that pass a series of inspection points are selected for disassembly. To date, of the 487 missiles inducted, 30 have been rejected for having been captive-carried or, in one case, dropped. Pictured from left: Retired Air Force Lt. Col. Greg Kuntz, former Maverick Development System Manager; Marc Trinklein, Maverick AGM-65K Development System Manager; Glenn Kuller, Air-Launched Strike Director, Raytheon; Steve Roberts, Project Engineer.

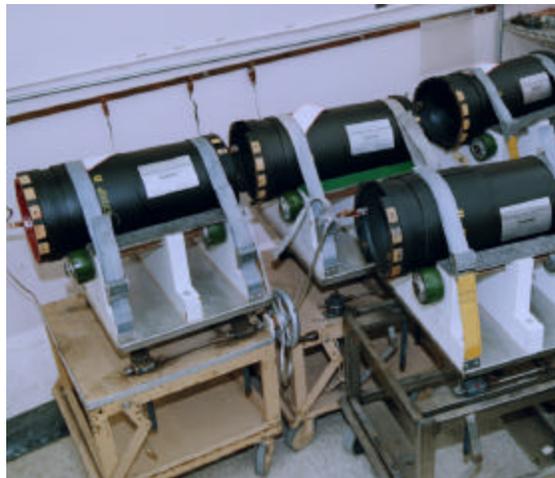


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Step 3. The Guidance and Control Section (GCS) units are removed and sold as scrap. A dealer purchases the GCSs by the pound and melts them down in order to separate various metals. The remaining "slag" is poured into ingots and sold to specialty metals houses, which further separate the various metals.



4A. SHAPED-CHARGE WARHEADS

Step 4. The shaped charge warheads, fuses, thermal batteries and rocket motors are removed and packed for shipment to a government disposal facility.



4B. FUSES

— MAVERICK AGM-65A

TRIPDOWN TO NEW AIRFRAME



4C. ROCKET MOTORS



5A. WARHEAD WITH FUSE WELL COVER PLATE INTACT

Step 5. Raytheon and the warhead supplier (HiTech) demonstrated their ability to reclaim various metal parts from the shaped-charge warhead. The original warheads have their fuse well cover plates removed. The warhead case and explosive are slowly heated until the Composition B explosive is released from the case. The residual Composition B is then used in commercial grade explosives. The warhead case is then steam-cleaned, inspected for reuse, and a new mix of Composition B is vacuum-poured.



5B. WARHEAD REMOVAL



6. HYDRAULIC ACTUATION SYSTEMS

Step 6. The Hydraulic Actuation Systems (HAS) are also sold as scrap. They are shipped to Raytheon's property disposal, four at a time, in the original AGM-65A missile container.

Step 7. The airframe is stripped of its earlier primer and top coats and inspected for any corrosion. To date, no underlying corrosion has been found. A powder paint coat is sprayed on the airframe, which is then heated to cure the coating.



7



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Step 8. Before and After. On the left is the reclaimed, "like new" Maverick AGM-65A airframe.

Figure 2. Maverick Timeline

Milestone Event	Date
209 Contract Award	January 1997
RFP to Supplier	March 1997
Supplier's Decision to Stop Manufacturing Airframes	April 1997
Hughes' Offer to 'Purchase' 65A Missiles	June 1997
Six AGM-65A Missiles Disassembled for Analysis	June 1997
Requested Waiver for Equipment on MTL	August 1997
GSA Approval	December 1997
Release of 'A' Missiles by AF/XORBP	January 1998
Exchange Agreement	January 1998
First AGM-65A Missiles Disassembled	January 1998
First AGM-65G TGMs Delivered	September 1998

Speaking of the Exchange Agreement, Harris said, "Once it was explained to me what they [Maverick Airframe Team] were trying to do with this original Airframe Exchange program, our folks at Hill worked to have six of the 'A' model missiles released from storage and then analyzed to ensure that they were indeed suitable for use in new production."

He went on to say that release of the missiles was not a simple process. "A lot of people had a lot of questions because the exchange was a new concept to them – and something that's not really thoroughly covered in the regulations. But we had some forward-thinking people in the office, we worked well with Greg's group, and we got it done."

Gary Card, the Hill AFB Chief Maverick Engineer, has total system responsibility as the manager for transitioning Mavericks to sustainment-type activities.

"We always have a great deal of interest in aging and surveillance of the Maverick assets," says Card. "And we've always recognized there was quite an arsenal out there that was aging, particularly the AGM-65A's, some of them in excess of 20 years old."

Card said that generally speaking, the AGM-65A is hardware that has been put on a shelf, maintained, and well kept. "There's no reason," he points out, "why you can't reuse the airframe."

Ben Harris and Gary Card readily admit that the bartering arrangement was, at first, a hard concept to accept since it went against everything they had always been taught as far as in the contracting field. They emphasize that they're not opposed to it, but characterize it as "a bit of a culture shock."

"There's a certification process that the contractor is required to go through to ensure that the airframes do meet the definition – the FAR definitions and the FAR clause provisions – of 'new material.' As long as they're meeting the terms of the contract," says Harris, "and the FMS countries are getting a good product, that's my main concern."

Tests and More Tests

Dean Nelson, Raytheon's Production Lead, received the stored missiles and was in charge of putting them through a variety of corrosion analyses. "The Air Force had about 8,000 old AGM-65A TV-version missiles that were headed to

the scrap barrel for demilitarization. So we said we'd like to select half a dozen missiles – some of the oldest, even some that had been shipped overseas. We really tried to get a good mix of what had been out there for 20 years. In other words, we wanted a worst-case representative six."

The object in selecting missiles exposed to varying climates and environments, according to Nelson, was to ensure that the Maverick Airframe Team did not use missiles for their analyses that included only those that had gone directly to a bunker and sat on a shelf other than to be taken out and periodically tested.

With local Defense Contract Management Command and Hill AFB representatives present, Raytheon stripped the missiles down to the bare airframes and set about determining which two of the six were in the worst condition. "Actually," says Nelson, "it was kind of hard to spot because we were all shocked at what excellent condition those missiles were in. They were in outstanding, absolutely pristine condition!"

Two of the missiles ended up being cross-sectioned in Raytheon's Components and Materials Lab where Raytheon technicians went into the areas of the airframes probably most susceptible to deterioration or corrosion.

The bottom line – they found absolutely nothing that would indicate deterioration or corrosion. Said Nelson, "These were as good as new. In fact, we used to also do an undercoating on the inside of the airframe, not just the outside, probably 10 or 12 years ago. There was an engineering change that said, 'No, you don't have to put a preventive rust coat on the inside of the frame.' So these older airframes do have extra protection in that way."

"Some might even venture to say," Nelson offered, "that they're slightly better than the ones that we've built in the last 10 or 12 years." All in all, everyone associated with the analyses felt that the Maverick AGM-65A was a good missile, stored in an air-tight container, and Air

Force personnel had maintained them according to the Tech Orders.

However, the government and Raytheon did not rely on Raytheon's analyses alone. As a cross-check, they split the sample cutouts in half and sent them to Hill AFB Lab, where Hill's technicians also analyzed the airframes for corrosion and deterioration. Performing the same tests, Hill's technicians achieved the same results – that the airframes were in absolutely "like new" condition.

GSA a Key Player

The GSA is responsible for the resale of government property, and a number of regulations cover the exchange of hardware. As discussed earlier, the team knew the exchange must be "similar" and must be conducted on a "one-for-one" basis.

In addition, missiles are currently excluded from resale to companies and

must be destroyed after their useful life. Identifying the major issues and beginning discussions with GSA for the necessary waivers quickly became one of the team's top priorities. Coordinating the waivers was a major effort by Becky Kirk, the Maverick Airframe Team's contracting officer at that time.

Says Ben Harris, "Once the analyses were done, that paved the way for Greg's group to complete the work with the GSA waiver and finish the Exchange MOA [Memorandum of Agreement]. Although we played a small supporting role to Greg's team in the Exchange Agreement, in terms of the effort involved, the lion's share of the real negotiation was done by Eglin."

Dean Nelson also spoke of GSA's certification process. "As a taxpayer, I like this arrangement because we're re-using some components and saving some

monies that revert back to our customer; hopefully, our efforts will allow us to sell a missile for a little less. Also, by re-processing some of these parts, we have reduced the cost of demilitarization of these missiles – costs borne by you and me, the taxpayers. I think it really is a significant win-win situation for everybody."

Ben Harris agrees. "I think there's a valuable lesson here for other program managers of aircraft weapons systems or other missiles that are aging. They could probably use this concept in their programs as well.

"However," he cautions, "You've got to be able to back up what you do. Coordination and communication, achieving buy-in from all the stakeholders will be the biggest challenge. But once that's done, you press on and get the job accomplished."

Determining the Value

Harris notes that he often speaks to other program managers or members of the acquisition community; they're always interested in how the Maverick Airframe Team determined the value of the airframes, and invariably ask how to go about determining the value for their own programs.

Harris speaks of the tremendous amount of work involved in assessing value. "There were a lot of meetings and many different means of assessing the value of the airframes, a lot of different ways you could approach it; sometimes it seemed as though we looked at all of them. And it took a lot of time and discussion to work that out, but it was worth it." He states that "Determining the value of the asset you're turning in is definitely the key to the whole Airframe Exchange."

Worth the Effort

Greg Kuntz is quick to acknowledge he had a lot of good help in bringing the Exchange Agreement to the table. And both Greg Kuntz and Glenn Kuller stress that without the tremendous efforts of everyone on the Maverick Airframe Team, there would still be no Maverick Missile Exchange Agreement.

MAVERICK AIRFRAME EXCHANGE TEAM

System Program Managers

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"Basically," says Kuntz, "we had six to 10 people in a room. And collectively we kept coming up with better ideas and better ways of doing the exchange, better ways to make it happen."

"The people that worked on the program – the entire team – literally took the bull by the horns, and without a whole lot of "Mother-May-I's" went out and made this thing happen."

Says Gary Card, Hill AFB Maverick Chief Engineer, "I think the airframe is a prime example of the way of the future. I think with the scarcity of funds, that we should be looking at more systems and ways that we can economize and develop improved capabilities without the high cost of original development.

"It's always nice to get a new system out there," Card continues, "but when you have a good viable system it always has made sense to me to try to salvage the value you already have there. It's very frustrating to think that we have about 13,000 AGM-65A's and B's out there that probably will just go to the scrap yard if they are not utilized. This is a great way to increase efficiency – utilizing the assets you already have in place."

According to Lt. Gen. George K. Mueller, Principal Deputy, Assistant Secretary of the Air Force (Acquisition), "This

Exchange Agreement is a great example of outstanding leadership and teamwork. It is a benchmark whereby future bartering arrangements will be judged. You have laid the groundwork for similar arrangements in the future..."

Darleen A. Druyun, Principal Deputy Assistant Secretary of the Air Force (Acquisition & Management) comments, "Too often I encounter program managers who think Acquisition Reform can only happen at the earliest stages of a program's life cycle...your approach epitomizes the precepts of Acquisition Reform."

The team's success in managing risk and accelerating the pace of the Airframe Exchange Agreement through the use of sound Acquisition Reform principles and strategies, is directly reflected in its ambitious milestones (Figure 2). From the time Kuntz and the Maverick Airframe Team agreed on the numbers, got the AGM-65A's out of storage at Hill AFB, Utah, and had them at the gate waiting to be delivered to Raytheon for analyses was *less than 21 days*.

They're Not Through Yet

The Maverick Airframe Team is not stopping with their first successful venture. Currently, they're concluding another cost-reduction effort with upgrade of the electro-optical seeker for the AGM-65 Maverick.

Led by Marc Trinklein, Eglin's new 65K DSM, the AGM-65K upgrade program will exchange between 1,200 and 2,000 AGM-65G missiles built since Desert Storm, thereby generating the necessary funds to upgrade TV Guidance Control Systems (GCS) with charge coupled device (CCD) technology. (This exchange will be the subject of a future article in *Program Manager* magazine.)

Author's Note: As part of my research for this article, I visited the Raytheon plant in Tucson, Ariz., and saw first-hand an AGM-65A recently removed from deep storage, still in its shipping crate. Although many years had passed, the missile was new, "not even a speck of dust," I commented at the time.

Air Force Lt. Col. Greg Kuntz retired from active duty in July 1998. Currently, he is the Director of Air Ranges at Comptek Defense Systems, Buffalo, N.Y.

Those interested in further information on the Airframe Exchange Agreement are encouraged to E-mail any of the following Maverick team members:

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FIGURE 3. Maverick Missile Arrangement

