

Why Did AEGIS BMD Succeed?

At the end of the Boslough book, there is a section called “why did they succeed” that motivated me to occasionally capture my thoughts on the AEGIS BMD journey. This list covers the period from end of LEAP through initial deployment of SM-3 Blk IA. I carried the draft list for years, occasionally adding to it. After letting it languish for five years, the RADM Meinig IAMD event provided some impetus to completing it.

Foundation of AEGIS

The Cruiser and Destroyer fleet, existing infrastructure, etc. We only had to focus on our additions. We had a solid HM&E and weapons system foundation. We were just a little “ECP” or “Shipalt” on a rock solid base. (But see destruction of AEGIS Project later in list.)

Vision of key leaders

Leaders personally invested in making Navy BMD real. ADM Boorda really got things moving - sent the first additional 10 officers to BMDO, among many other actions. VADM Rempt was tireless in pushing every door open. Others mentioned in the WEM Commissioning book & ALI History.

FOA was there in the building with us, always challenging us, often frustrating, but always unrelenting.

The Senior Advisory Team was part of staff, hands on, taking assignments, and helping wherever they could.

We were adopted by many leaders at the right time. John Young around the time of FM-7, etc., etc.

Right Idea at the Right Time

Fleet foundation was mature, you could upgrade performance with “just computer program changes.” LEAP Technology was ready, BLK IV had developed the booster and upgraded VLS. The pieces were all there, just needed to focus on tying them together. Desert Storm I showed the requirement.

Strong Congressional Support

Without the consistent plus ups through our history, we never would have gotten started.

When Dr. Kaminski prioritized THAAD over NTW, cutting budget to life support, Congress provided the first \$170M. (BMDO had many plans for the \$170M that did not involve NTW - how we got the funds released to the project through BMDO spanking machine is another story.)

Support has mostly continued.

2003 was a rare exception, when we had a Congressional mark.

Consistent Messaging

We never over promised. Good news or bad, we told the facts, but with an operational context.

We started with Mitch Crosswaite when he was a LCDR at PA&E. Later, when grilling us on Professional Staff, he knew that we told the truth, whether he liked it or not. There are many other examples.

Realistic and Stable Performance Requirements

Started with the “realistic” performance requirements in the ORD, as championed by VADM Rempt. We did not have to change underlying AWS performance allocations, nor require excessive performance from the missile. NTW was envisioned as a tactical system, with tactical levels of requirements, that could be realistically delivered with margin.

Rummie cancelled the ORDs. We never threw ours away, and drank the koolaide of Capability Based Acquisition. We renamed ours as the ECS, and just kept working to the requirement.

Well, we tried one capability based design review in Dec 2002, which was a miserable failure. We then went back to traditional requirements based approach. But the failure of that review was actually good, as it set us solidly back on the traditional SE requirements based path and produced some artifacts that became cornerstones of early AEGIS BMD. (Deserves a chapter on its own merits.) This may have been one of the last reviews in control room where FOA was in full classic style.

The requirements czar was in most meetings, and kept us on course.

Traditional Systems Engineering

FOA kept us true to the five “pearls” of NTW. He kept challenging us to find the sixth pearl.

We developed a fundamental error tree approach to closing the fire control loop, with careful flowdown to the combat system elements.

The program office led the SE process, but APL, MIT, and Industry were all in together.

The Professor, who could find a SE solution to any problem.

M1=M2

[Developmental missile = deployment design missile]

Key concept from the Blue Ribbon Panel, chaired by Gen Welch at IDA. After Terrier LEAP failure to intercept, BMDO D wanted to continue with another experiment, VAMD Rempt championed tactical development. BRP came down on the side of the AEGIS LEAP Intercept, but the missile was to be identical to that needed for tactical requirements.

We refused to give up our margin

Frustrated Lt Gen Kadish on many occasions. Every time we detected a target much earlier (spec radar vs fully operational radar, etc., etc.), he wanted to figure out how to hold the margin at his level. But keeping realistic performance margin, starting from the ORD, ensured that the system would work in real world combat, not just scripted test events. (Many stories of “enhanced” mission planner, etc., here.)

When TSRM IPD was limited, or SDACS pulse didn’t work, just rebalance margin within the system and keep moving.

[I note with dismay the evolving belief of some that all margin, at all levels, is now a contract deliverable. This is not how the program became successful, and is not consistent with the requirements.]

Dedicated military, government civilians, contract support, laboratory, and industry

NTW was not seen as stepping stone. In early days, very few folks promoted out of the program (the “Gillespie rule” to this day has very few exceptions). Early folks that made the program successful were iconoclasts, and paid the career price, but they didn’t care.

When Mac, under Lt Gen Kadish direction, took the contracts for LM and SM-3 from NAVSEA, CNO personally told him to knock it off. He kept going. More than one person was casualty to the fighting between NAVSEA and MDA over program ownership.

When another personnel casualty was in process and was brought to VCNO attention — he said to just let it happen.

No doubt that people paid the price for the success.

Isolation of AEGIS LEAP Intercept from the BMDO/MDA fire drills

Seemed that BMDO/MDA never believed NTW would be fielded in this particular configuration. Instead, for years they played program of the week, infinitely replanning the ultimate system while ALI was left alone to achieve the intercept. High Power Discriminator, Baseline 1 BMD “only” ships, Sea-Based Missile Defense (SMD), etc., all came and went. In Dec 2002, the music stopped, and we just completed the ALI program into BMD 3.0.

Capability Based Acquisition

While we ignored most of capability based acquisition, it kept much of the OSD attention away from us.

Meanwhile, we kept doing things as close to traditional acquisition requirements as possible. This meant that when we were ready to deploy, or get OT report, that there were very few liens to fill in. The most significant was O&S planning, which was repeatedly juggled between MDA and USN, finally seems to have stabilized. But see Foundation of AEGIS above — we changed very little, leaving little new O&S requirements.

One useful precept of capability based acquisition was letting 95% of the base requirement be good enough. We never had to fight for the last 5% of capability, always the most expensive to get. [This concept seems to have been forgotten in more recent years.]

Cancellation of Navy Area

There will be disagreement on this, but I believe only one program could have succeeded. Several axes to this concept:

Once you had the Area Defense completed, Navy would have had zero interest in the NTW capability.

Cancellation of NAD froze BMD out of Baseline 6. Navy did a rough termination of the capability, meaning that it would require extraordinary effort to reintroduce any BMD code, even as late as Baseline 7. This meant the only easy way forward would be with the "OR" ship concept, bringing us back to the Goat Island concepts. We did not have to focus at all on AAW integration, deferred until the Baseline 9.C efforts.

Cancellation also freed the BLK IVA assets, which we turned into the SM-3 BLK Is, allowing even earlier fielding. (The original Blk I concept became the IAs.) These accidentally helped a second time, when upon return from four year service life, the remaining SM-3 BLK Is became the aged SLEP assets to help extend BLK IAs to twelve years.

[The immediate, pencils down, termination of NAD left partially developed BMD code through baseline 6. The code fragments should have been removed, but there was no appetite for additional cost from the termination. This meant BL6 ships could not risk even receiving a remote BMD track, and closed the forward fit BMD path for some time. The BL 6 ships could not even do NTDC ops.]

Industry Partnership

Without a doubt, NTW was a partnership between 452, LM, and RMS. No threat of competition, industry contracts were developed together, award fee was tied between LM and RMS. We all succeeded or failed together. NTW is a team sport.

Note this does not mean the Fee Determining Official was a pushover. Failures got spanked, success rewarded.

Most importantly, once earned, money moved fast. We were still operating under the old PEO direction of issuing award fee within 24 hours of board results.

LM Baltimore is particularly notable, after a late start to engagement IDO for VLS, they caught up in grand style.

Trust.

Particularly with Industry. Most of the IDO work got started on verbal direction. Contracts followed much later. See note on LM Balto above. Not sure there was any way to get them \$ when we started, but that did not stop them. The bills eventually got paid.

Second axis to this - we broke through barriers to share models and even developmental computer programs early during the push to IDO. There was significant fear that potentially incorrect negative information would get to leadership based on incomplete work. But it worked — partners got early insight, we were able to make adjustments, without too much noise in the channel.

“Stealing” the Contracts

About the time MDA was established, we “stole” the contracts from NAVSEA. This ensured our requirements got our priority, funds were not lost in fixing baseline issues, etc. But this started the rift between NAVSEA and MDA.

Funny, but true, after “stealing” the contracts, we used NAVSEA contracting officers to execute the contracts. Fortunately, no one ever saw the conflict in this. The contracting officers, Cindy and Sharon, turned a complete room of whiteboard scribble into the first executable contracts for NTW (6110 and 6111.) Jack stood on a table, in the middle of the room, and took pictures of all the white boards which were used throughout the process.

And you had a NAVSEA program office, with Navy leader, for much of the time nominally under IWS, still overseeing and executing the contract. So what was this stealing the contracts?

Modeling and Simulation

Probably one of the first real simulation based acquisitions. We kept competing models going between APL, LM, and RMS, and would not proceed until they matched. Waiting for the first intercept meant we had time to keep refining the models. The FM-2 mission data review showed model errors in single digits, not bad for first intercept. We never tested to learn, but tested to confirm what the models had told us. We don't proceed until all three amigos are consistent.

Open minded, involved OTA

OTA Rep from COTF was one of the believers, rolled up sleeves, and figured out how and what we needed to test. When Fleet would not develop the operationally realistic employment scenarios, he did it himself. He helped us move from the scripted nature of FM-2 to the operational realism of FM-7 in appropriate steps.

Test integrated with Development

Our test lead had instinctive feel for what needed to be tested next. They were so prescient, never quite sure that SE or Test was in charge of program development. We had the right test, at the right time.

The focused ALI test program, based on the BRP recommendation, kept a very realistic, achievable set of test requirements for the first intercept. We controlled every aspect of the intercept, didn't so much as let the missile or target change radar faces.

Once the first two intercepts were achieved under controlled conditions, we walked carefully to full operational realism by FM-7. One particular focus was killing all the sneak circuits that allowed the ship to be notified of target launch.

The focused test agenda, achievable steps, allowed us to concentrate on just the capability growth required for the next test.

This careful but rapid growth ensured we were ready to deploy once FM-7 was successful.

[But this same team later on decided that the first IB firing needed to be against the most difficult target, outside requirements space. “We have wasted all this \$ if you don’t want to shoot at this target. No, we just wanted to start inside requirements — recall we did FM-2 first, not Burnt Frost.]

Correct Design Choices at Lower Levels

Don’t know how you require this, but there were significant numbers of “good” design choices that enabled system success.

One example — the separately loadable adaption table (SLAT) for the missile. Seems obvious, but wasn’t at the time. After FM-5, we needed to turn off SDACS pulse operation. Need to adjust TSRM IPD? No recompile necessary, just change one bit in the SLAT. Ready to go!

The key SPY changes that turned the ABMD treaty hard-coded limitations into positives.

Many more examples throughout AWS and SM-3.

One negative example — somehow we got the threat parameters hard coded in the first mission planner. Sometimes you are lucky, sometimes not. I was not happy when I found this out. But MP success on all other fronts outweighed this one temporary limitation, and it was subsequently addressed.

Competent Threat Modeling

The threat team kept our threat models appropriate and balanced. How many programs have had problems with threat stability, chasing unrealistic or poorly defined threats? What our team did was parse the threat universe to digestible pieces that aligned with growth in our capability. Never overreaching, never under stating, while genericizing away from point solutions.

So no one ever liked our alphabet, but it sure worked for us, matched what we could achieve, and grew with us. Then we woke up to a new bunch of threats for IDO, had to quickly learn some new letters. Like so many things, we had to fight to stick with our alphabet.

The engineer needs to work with precise numbers, and the team was able to process the unknowables into the numbers that were needed, while at the same time helping ensure that we did not overdesign to a point solution.

The Sailor needs to work with concepts that easily flow into tactics and doctrine.

And we always had to balance flexibility with the “a priori knowledge” boogey man.

It is not that we were “comfortable” with the taxonomy that developed, or that we just wanted to be different, but that it fundamentally worked. Like so many of the reasons we succeeded, those in the family understood why we did it this way, those outside could never comprehend, and fought to change us.

[This threat team eventually became a casualty of cost efficiency.]

People

Could go on for a long time here. Bork’s book has a good matrix. Some called out in this paper, but no way to remember them all. Our Industry PMs, contract support, labs, etc. We had lots of believers. Some additional specific examples follow.

Peter “Mac” Grant

Six plus year PM, got the program to first intercept, survived the infinite replans by BMDO/MDA. One of the first to pay the career price for dedication to NTW.

Don Mitchell

How do you reconcile the “realistic” performance requirements established by VADM Rempt’s ORD with the unforgiving nature of BMD test? Don Mitchell. He knew how to take the xx.x% spec system and deliver the high confidence of success necessary in the realm of BMD. His unflinching pursuit of uncovering and addressing the unknowns, leaving only Rummie’s unknown unknowns, has enabled our current test record.

He mentored an entire generation of engineers in disciplined approach to missile testing.

RADM Paige

She blatantly stole the best folks she could find from NAVSEA to expand the core NTW program office.

She built a strong rapport with Seventh Fleet and CTF 70 that had them receptive to the IDO deployment, to the extent that they deployed the initial Destroyer without signal from headquarters, satisfying the IDO requirement. She commissioned F Troop.

She built a strong rapport with MG Holly, aligning AB and GM, setting the foundation for the LRS&T IDO.

She took the Op Center concept from MG Holly, and we made it work. [See below]

She made the tough decision for FM-6, and then convinced LtGen Kadish.

Scott Perry

The guardian of vision, consistent messaging, and future concepts for many years.

Blue Collar Captains

Specific example of people excellence is what I refer to as the Blue Collar Captains — senior officer knowledge and experience combined with a junior officer roll-up-the-sleeves-and-solve-the-problem-not-worried-about-getting-dirty approach. Techmatics, BecTech, etc. had a lot of these on staff, and they pulled the program along.

[Compare with later approach of low-budget contract support. Really capable, experienced folks do not work for peanuts, and the race to bottom dollar drove many away.]

Op Center

The Op center became the hub of knowledge for AB. Everyone came to the op center to monitor progress, all the way to OSD rep, DOT&E, Industry, GM, etc. Total inclusion, no one was left out. TD led and focused the OP center review.

[The Op Center was one casualty of the move to Dahlgren.]

IMS

With the Op Center, we established a linked IMS, that kept all activities aligned on critical path to IDO, without missing the off critical path items. Ideally, we would have had an automated system that integrated the primes, field activity, support, and test activities. Instead, Gerhard's team spent all month manually integrating disparate entries into an integrated view, highlighting disconnects and negative margin.

We kept the schedule under strict configuration control, dated and signed, and only distributed in uneditable image format. (Critical interrupt here on the fallability of Powerpoint schedules where taco chips just get pushed around and edited without ownership or understanding of the relationships.)

The NAVSEA Field Office & MDA Joint Construct

Meant you could never really pin us down — take the best from both, ignore things we preferred to ignore.

Somewhat the ADM Rickover concept. We could either be insiders, or outsiders, with either NAVSEA or MDA, as the situation required.

At that time, we were organized, MDA was just getting started. Was easy to stay ahead of MDA on most issues. We did not send large crowds to every meeting, just enough to get the job done. We had no problem sending one LCDR to represent AB with MDA leadership. The Texas Ranger Rule - one riot = one ranger.

Famous story about one ranger accompanying D to provide quiet backup to four star brief, only to be told to give the brief on no notice, and successfully convincing the four star.

Hard to recall, but at the time, but NAVSEA was in chaos with the downsizing, NAVSEA Placement Plan, etc., etc. When the AEGIS Project was imploded, We were able to sign an MOU with Larry Rogers (IWS) and Jim McManamon (Ships) to set up the billet construct we wanted. We deliberately funded billets in their organizations to keep aligned, buy good will, etc.

Navy folks called us “MDA,” MDA folks referred to us as “THE NAVY.”

We were small and well internally aligned.

Communication

We worked to keep communication focused, precise, and efficient. One thing that Mac started and we very effective was immediate debriefs on return from HQ events, for all hands, usually based on Stan’s exhaustive notes. Everyone knew what was at stake, what their part in it was, and what was next. The weekly report was short, relevant, received wide distro, and read.

Destruction of the AEGIS Project

(CcmT as executive agent, many other guilty parties.) Another item there will be disagreement on, but it meant there was a vacuum to be filled.

In absence of AEGIS support, we were the only team fixing and grooming ships on the waterfront. Meant the early AEGIS BMD ships had the best condition, passed INSURV, etc. The Sailors might not know what BMD means, but it did mean their Casreps would get fixed and they would get training, among others. So gimme some of that BMD.

Not good for the Navy, eventually had to be undone, working party mustered to restore the AEGIS Fleet.

This destruction also freed lots of talent for us to steal. John Geary, Joe Williams, Steve Kuvik, Bob Shevock, Larry Rogers, etc., etc. We became the AEGIS Project in exile, waiting for the day AEGIS became fashionable again. It did.

One thing we never planned was the drop in fleet maintenance and support following the destruction of the AEGIS project. There was a great void, where the BMD ships were the only ones getting attention. In a surprise evolution, the Navy BMD booth became an extension of the detailing process — Sailors would come in to review the list of ships that were BMD capable before calling their detailer. The non-BMD AEGIS ships were not even deploying for a while.

Focus on Excellence in Fleet Installs

The prime directive for B6 was that we leave the ships in better condition after install than before (c.f., some (most?) of the west coast PEO installs.) No drive by installs. Lasted for some time. We had a strong install team, key project officers. There were a few LM folks that had been living on the road doing installs since Tico pre com.

With the number of ships and missiles delivered today, it is hard to recall the uphill battle we had for acceptance in the early days. Leadership did not want AEGIS BMD, would not use it if

necessary, neither here nor there, not on a train, not in the rain, not even with green eggs and ham. [Hmm, maybe things have not changed as much here.]

The Sailor's first impression of NTW was the install. We focused on making that as positive as possible. Had to get through install before they saw the system work.

The install became the face of AEGIS BMD to the fleet. We followed up with grooming, training, and attention that the ships were not getting. See "**money**" item below - we had to spend our \$ wisely, and this was one of the best investments.

Recall RADM Horn's first all hands as PE. He confirmed this had worked with his strong first impression — AEGIS BMD was the install. But by then, proly only Kuv and Roel knew what he was talking about.

Alignment with SPAWAR

We needed the comm channels for IDO, we needed the NAVSSI GPS feed for GPS, etc., etc. We fed them lots of \$, got their interest, and they got onboard. Quarterly PMRs went a long way to keeping us aligned.

NAVSSI CDR did not want to sign the MOU giving us the necessary NAVSSI feed - SPAWAR might need it for "something" in the future. Kuv and Younjin took him out steaming one night in Baltimore. He signed the MOU the next day. I asked no further questions.

GMD

They were the big dog, and sucked up most attention for IDO. We seemed to be an afterthought, so they got most of the attention, and all that implies. But we allied with them. MG Holly and RADM Paige aligned were a powerful force in MDA.

[To this day, I remain convinced that NTW was supposed to be the fall guy for IDO, a role we refused to play. This remains a minority opinion, but I believe my evidence is clear.]

The "crazy" IDO execution plan.

The only way to make schedule for LRS&T IDO was to disable all AWS AAW capability, removing most self defense capability. I never suspected anyone would buy this crazy plan. But they did, almost without question.

See RADM Paige work with C7F, etc. above. All they wanted back was TLAM, which we could do stand alone.

I was the happiest person to hear that BMD 3.0E was retired. I feared for several years that the guilty party that disabled AAW on LRS&T would get called in front of the green table if something went wrong. "You took the fleet premier air defense weapon capability and turned it off??? And then sent the ships into harms way?" (Correct fear, wrong charge, as it turned out.)

Again, shout out to deft management and employment of the 3.0E capability by C7F, etc. And RADM Sam Perez as the Desron CDR for the IDO ships.

LAKE ERIE

A dedicated test ship, which meant we could keep building on our foundation.

Navy “sold” LKE to MDA for \$666M. MDA stole the money back, Navy never actually transferred OpCon, but it worked out anyway. (Never figured out if this was a triple or quadruple cross.) Was sort of good not knowing exactly who was in charge of LKE, MDA or USN, so meant we could figure out an approach that supported what we needed.

With LKE, we also ensured that the Sailors were always the operators. There was little transition from DT to OT. [We avoided the CEC Opeval problem of Sailors surrendering the the ships to the test team.]

LKE would occasionally wander away to the west for a while, but was mostly available for BMD tasking when needed.

Courage to make tough decisions

Returning to flight after FM-5, when technical recommendation was to continue ground testing, disabling AAW performance for LRS&T, among others.

Not sure the current MDA decision process would allow such difficult decisions, especially somewhat unilaterally at the program level. Not sure we would fire FM-6 today.

Mission Planner

New AEGIS component explicitly extending the CIC concept to Plan, Detect, Control, Engage, Assess, and Communicate.

We were surprised how well the mission planner was received, and the demand signal for planners at staff levels. We got MP Jackie out to the ships early to see how the Sailors would really use the tool, and were able to make some adjustments.

The mission planner was key to getting DesRon buy in on the 3.0E IDO deployment. Again key to have RADM Sam Perez as CDS, when his ops first tried to plan defending the entire Pacific, smoking the MP. We were able to come back in, assuage the CDS fears, and show how the ships would be employed to support IDO.

One of the benefits of the early MP was portability, being able to plan and brief in the wardroom, then take the plan to CIC to execute. I think we lost something when the MP was subsumed into AWS.

Some leaders did not like a mission area that “had to be planned.” They wanted it to be more like AAW, where you just turned the radar on and shoot. Hmm. How many AEGIS had vandals go by, undetected, when they just turned the radar on? Success in BMD is no different than AAW, and starts with planning, and we gave the fleet the tool.

Side note #1: We had to make the MP stand-alone, since we did not have time, room, etc., to incorporate directly to AWS. LM ordered the hottest laptop available at that moment, then targeted the program to squeeze every flop out of the machine. Also, we deliberately wanted code that would only run on "our" laptop. All of a sudden, everyone wanted one. We called back to [Dell?], and they were already obsolete, on to the next model. So we got stuck in a temporary MP drought while the program was recoded to the next model.

Side note #2: See note on no drive-by installs, pictures of TIC console in early 2000s, loose computers all over CIC, USS Cole, etc. MP was a permanent install, and would have a shock grade mount by the RSC console. The resulting laptop mount was a thing of beauty. The ships wanted many more of these mounts for all the other installs that had just dropped loose computers.

F-Troop

A dynamic, fleet facing team, kept the message flowing to the operational commanders, CPF, etc. Developed the initial operational employment guides, tactics. General missionaries about NTW capabilities.

Administration Priorities

The focus on IDO was a great motivator, and cleared many impediments.

The ABMD treaty cancellation was a key step, opening up a new mission area. One day RADM Sam Perez is getting a MSM from ADM Boorda for proving to ACIC that NTW has no strategic capability, then we are tracking ICBMs with just software changes. (Well, a few years, but that is the concept.)

I had to brief John Rood at NSC the week after cancellation of Navy Area, which was only a few weeks after the administration announced the new focus on missile defense. He kept asking me, what is the administration thinking? We (the administration) announce we are getting serious about MD, which means \$, and you (BMDO) cancel a near term MD program for \$.

(The apocryphal story continues that whenever something went wrong in DoD after that, Bush was convinced Aldridge was involved.)

Presidential priority opened lots of doors.

I may have mentioned shortcuts to normal processes in this list. This is not an endorsement of the shortcuts, but an acknowledgment that when the President establishes a deadline 18 months out, you cannot give the first 15 months to contracts, for example.

In another weird axis, the closer we got to IDO, it became less politically correct to refer to the Presidential Mandate - it almost completely vanished by Sep 30th, even as it was the impetus for the success.

Money

We never had as much as we needed, but we got the maximum value from what we did have, and spread it around. Mac developed an early focus on funding execution. Not sure Rob Snyder ever figured out we bought an LPAC for LKE with MDA R&D, and it prolly wasn't the only example. There was a certain pleasure in using MDA funds to fix waterfront issues in the vacuum of AEGIS sustainment by the fleet.

I don't "know" that we ever used MDA funds to repair water tight doors, but no way we were letting the first BMD ship to face INSURV fail (PHM). (The answer to that question is "safe" with Kuv, another one of our heroes.)

Unfortunately this includes the 1-n List. Invented for and saved us during the 2003 Congressional cut. Albatross ever since. (Financial and program folks know what I mean, the rest of you are lucky.)

We also managed to avoid the shared funding approach that was one of the weaknesses of Navy Area. I saw too many POM cycles where both BMDO and Opnav waited to the last minute to reduce their portion of the share, hoping it was too late for the other to make a similar reduction.

Bringing the Missile CDR to FOB-2

Six months after the Blk IA CDR, a whispering campaign started in FOB-2 that we had "gun-decked" the CDR. The quote from the SE was "AB held another one of the 'you-had-to-be-there' CDRs." [What other kind of CDR is there? And his two reps on the panel gave unconditional pass.]

How do you build a brief, six months after the fact, to prove to a skeptical audience, that you held a CDR that satisfied all the appropriately established exit criteria?

After numerous failed attempts to build a brief, we changed course and directed RMS, on a Friday, to re-present the CDR in FOB-2 the next Wednesday. Every piece of hardware, every paper artifact, every presenter. Somehow, Cheryl got it all into a FedEx custom critical with appropriate security escort. Dale got the FOB-2 MIC re-wired over the weekend to be ESD safe for the missile hardware.

We focused on SDACS and TSRM, but were ready for any part of the CDR, depending on how discussion went. A few minutes into the presentation, Lt Gen Kadish just sat back and smiled. Some of the SE folks kept trying to trip Vic with technical propulsion questions, but he had all the answers.

RMS used the fact of losing all the IA assets for a few weeks for all EV variances over the next few months.

Block IA was real, and survived the whispering campaign.

MDA did eventually force a second Blk IA CDR, but the result came out the same. Because of M1=M2, we really were not changing much.

Ellen Pawlikowski

Seriously. When the BMDO/MDA bureaucracy got too out of hand enroute to IDO, she led the charge for the elements in getting things back under control. There is nothing we loved more than Ellen getting Dr. Sanders (or Keith, etc., etc.) on the ropes on a topic quoting the DFAR or FMR. (Not sure I knew what the FMR was then.) She provided temporary breathing space for all of us from the spanking machine. [Also story here on how a good PM is not enough to rescue a doomed program.]

Surviving the first major leadership turnover

RADM Hicks and CAPT Grecco continued the tradition established by Mac, KKP, and RHK, including many of above. Once this extended into the BMD 3.6 deployment, flight test machine in 2007, culminating in Burnt Frost, the success was institutionalized (for a period).

Other Histories

There are at least three other related projects, but with different paths to success. I have some evidence on the first two and may work on them in the future. [But like much history, it needs some time before it can be related dispassionately.] The third belongs to others to relate. For IB and IIA some elements are common with above, but a surprising number are different.

- SM-3 Block IB Path to Deployment
- SM-3 Block IIA Path to Deployment
- Restoration of the AEGIS Project through AEGIS Ashore and Production Line Restart

Some history sources:

[Radar History of World War II](#) (explains how radar came to be)

[When Computers Went to Sea](#) (picks up at end of above, goes through NTDS, introduces CDR Meyer)

AEGIS History (govt document, both classified and redacted versions available)

ALI History (covers the ALI era, compiled by the Bork, now at SI)

Brief: AEGIS BMD DR Trace (companion to this list, captures 1994 - 2005 by way of the key decision studies and briefs)

WEM Commissioning Book

There are some APL Technical Journals that also cover some key topics, particularly on development of Standard Missile.

USNI Proceedings articles on Missile Defense

I have a draft leadership chart, building on the leadership chart in the back of ALI History

IB and IIA Draft DR Traces

A Few Other Key Documents:

Navy Area COEA, vintage 1995-1996 (clearly defines role for Navy Missile Defense. Key concept is turning the Army assumption of “perfect lethality” upside down, assuming zero lethality, and how such a system would be militarily useful.)

Blue Ribbon Panel (after Terrier Leap, established any further “experiments” had to be on path to tactical system, vice demo or stunt, M1=M2 concept)

NTW ORD, vintage 1996-1997 (established the “realistic” performance requirements, again going against the Army lethality establishment standard of perfection)

Goat Island Study, late 90s (established concept for the original tactical deployment as an “OR” capability, which somewhat inadvertently became BMD 3.0)

Balanced Investment Strategy Study (2004, established path and requirements for BMD Signal Processor and SM-3 BLK IB)