

RADM RODNEY P. REMPT graduated from the U.S. Naval Academy in 1966 and holds master's degrees in systems analysis from Stanford University and security and strategic studies from the Naval War College. His commands at sea have included USS *Antelope*, *Callaghan*, and *Bunker Hill*. He also served as Anti-Air Warfare Commander for the Seventh Fleet and led the Midway Battle Group in winning the Fleet AAW Award from among the nine Battle Groups deploying to WESTPAC in 1989.

RADM Rempt's acquisition experience began in 1975 with 3 years in the Weapon Prototyping Office of NAVSEASCOM, including duties as the initial Project Officer for the Mk 41 Vertical Launch System. He served on the CNO's Staff as Program Coordinator for the Aegis Weapon System. Additional duties included Director of both the PCO/PXO Department at the Surface Warfare Officers Schools Command and the Anti-Air Warfare Requirements Division on the CNO's staff. He also worked in the Theater Defense Directorate of BMDO, where he initiated the development of Naval TBMD.

After his promotion to Rear Admiral in 1994 he was ordered to be Head, Surface Ships and Combat Systems on the CNO staff. The CNO also assigned him as Director, TAD, where he was responsible for establishing requirements, planning, and budgeting for Aegis, Standard Missile, Surface Launchers, Cooperative Engagement, and Ship Self-Defense systems. In 1996 he assumed duties as PEO(TAD), providing leadership for more than 25 Air Defense programs. In 1998 RADM Rempt became the first Deputy Assistant Secretary of the Navy for Theater Combat Systems. As such, he is the principal advisor on the introduction of Naval TBMD and the development of advanced shipboard combat systems.

His personal awards include the Legion of Merit (Third award), the Meritorious Service Medal (Third award), and the Navy Commendation Medal (Third award with Combat "V").



RADM Rempt spoke at the Millennial Challenges Colloquium series on 14 April 2000. The text of "The Navy in the 21st Century, Part II: Theater Air and Missile Defense" follows.



The Navy in the 21st Century, Part II: Theater Air and Missile Defense

RADM Rodney P. Rempt

It is a great pleasure to be here today, to see so many friends, and like VADM Mullen (see the companion article, this issue), to have a chance to talk about the future with the people who are going to make it happen. VADM Mullen and I both believe very strongly that the future of all the grand ideas we talk about will come to fruition only through the hard work of all of you here at APL. It is especially nice to share the podium with VADM Mullen, our lead Surface Warfare Officer. He and I started out together as young lieutenants in the Mediterranean, where we experienced the extreme highs and lows of operating on small ships in stormy weather and in tough times.

The Navy greatly depends on APL. We critically need your innovative ideas, technical expertise, and engineering discipline to help us find our way because the crystal ball we are looking into is not clear.

My topic today involves Theater Air and Missile Defense operations as well as a potential future naval contribution to strategic or National Missile Defense. My Army friends tell me that the United States is just another theater of operations in which they will operate, and that's fine. But my response to them is that the Navy's role is to ensure that the theater of operations is never in the United States, but rather always on the other side of the ocean. That is no small goal. The reason we have a Navy is because the nation was blessed with oceans which serve to buffer us on both coasts.

We are in a period of "inter-war" years. We have seen the demise of the Soviet threat, which until a few years ago VADM Mullen and I spent our entire active duty service learning how to counter. What we have in its place is a series of constant conflicts around the world where we are called upon to act on a daily basis. Our Navy seems to be busier than ever. The fact is that we have significantly fewer people and about 40% fewer ships than in 1990. However, these ships are deployed more and are underway equally as much, if not more. At the same time, our Air Force and Army brothers have brought the majority of their forces back home to the continental United States, so we find the Navy and the Marine Corps in even greater demand.

We are continuing to conduct our same missions, but they seem to be more frequent. They seem also to be occurring faster than ever and in different areas of the world than we anticipated during the long years of the Cold War. Of course everywhere we go, we are the

target. There are tens of thousands of cruise missiles and thousands of ballistic missiles today. They weren't built as mere shiny symbols of power—they were built to hit U.S. forces. The Navy is about power projection. We provide projected Air Defense over the shore, but our countrymen expect us to achieve that in absolute perfect order. They want us to be very good at our job while not suffering any losses.

THE CHANGING NATURE OF AIR DEFENSE

Why talk today about Theater Air and Missile Defense? We have certainly discussed Air Defense over the years. In fact, the modern Air Defense era comes from the kamikaze attacks of World War II, as many of you are well aware from the history of APL and its connection to the Navy. Effective Air Defense is needed more than ever because of the size of the threat. I hear people say that SDI (Strategic Defense

Initiative) or its current rendition has spent billions of dollars but has not deployed anything. Yes, this is true, but we are not working on such efforts because we want to or because they keep large numbers of laboratory and industry personnel employed (although that is certainly OK). No, we are building these weapons systems because others are going to come after us if we do not have a strong enough defense to deter them or defeat them if they attack.

You all know that fighting close to the shore is extremely hard. We are by heritage blue water sailors, but we're adjusting rapidly to the changing world. Our focus has shifted. Virtually every program today is focused on the littoral (Fig. 1), not on the blue water operations that most of us in the Navy grew up with.

From 1945 to the present, threats have driven us in Air Defense. This is a *reactive* game. We are not designing defensive systems in advance of some future hypothetical action; rather, we are reacting to an enemy that is becoming more and more clever and determined to

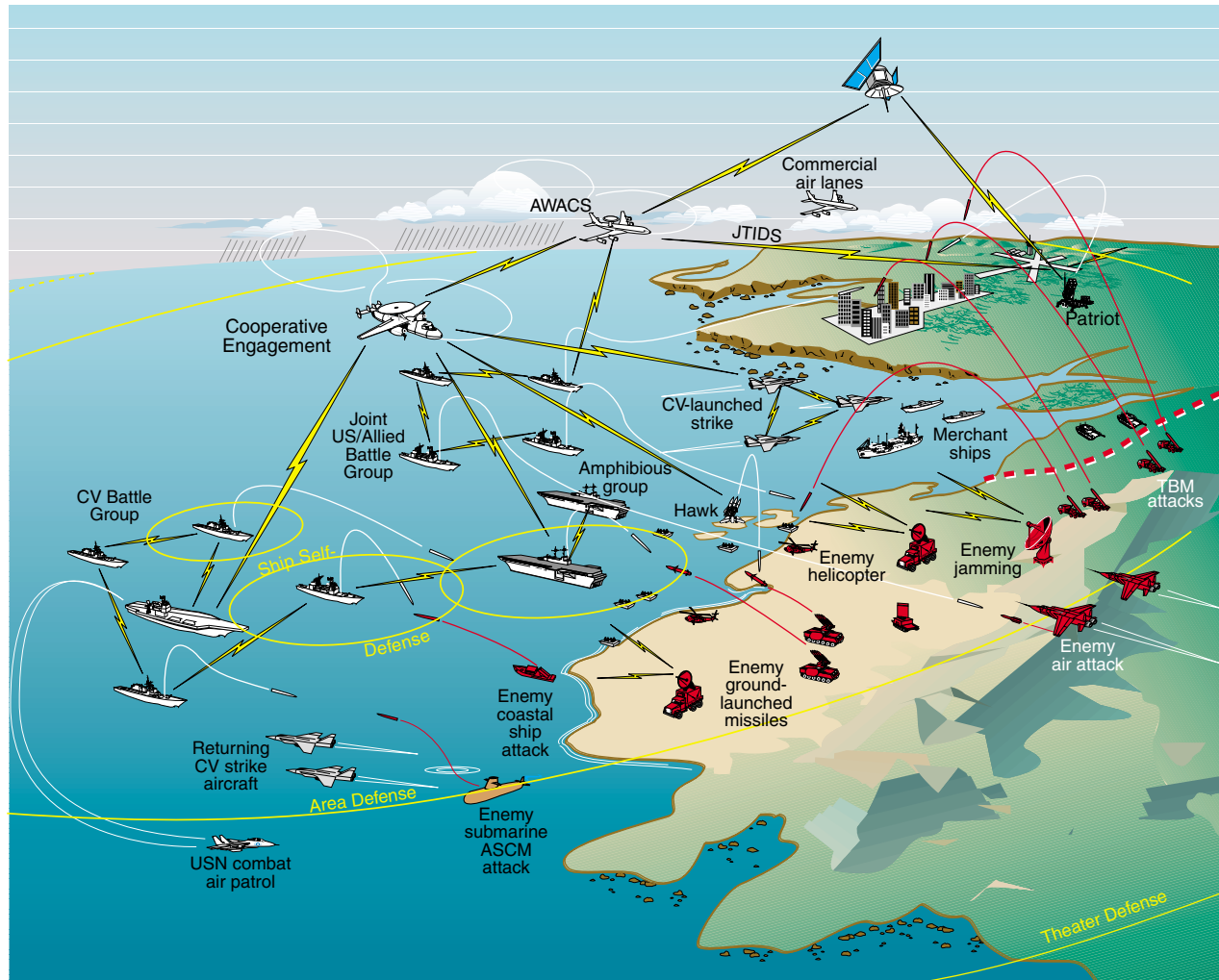


Figure 1. Today's littoral operations (ASCM = Anti-Ship Cruise Missile, AWACS = Airborne Warning and Control System, CV = Navy aircraft carrier, JTIDS = Joint Tactical Information Distribution System, TBM = Theater Ballistic Missile).

Table 1. Theater Air Defense evolution.

Time frame	Context	Context/object	Operational concept
Past	Cold War	ASCM	Open ocean CV Battle Group
Present	Regional/littoral conflict	ASCM TBM	Extend naval capabilities over land
Future	Expeditionary warfare	ASCM TBM Overland Cruise Missile	Theater-wide engagement Integrated Joint force

find a way through our defenses. What is the nature of defense as opposed to offense? We pride ourselves on being an offensive Navy, which we are. We carry the fight to the enemy. Again, we want the battle to occur overseas and not at home. The fact is, however, that some level of *defense* is the price of admission if we are going to sail in harm's way. If we can't provide some protection for our forces, then we aren't going to be able to carry out the required tasks. We are not providing this defensive capability for forces on shore or at sea, as I mentioned, just because we want to. We are doing so because we can't do our job if we don't have some level of protection.

Air Defense has changed over the decades (Table 1). In the Cold War era we were focused on the open ocean. Today we are in the process of evolving and changing in response to the need to defend against ballistic missiles. Almost all the work that APL is performing in Air Defense, with the exception of some continued focus on force protection, is now against ballistic missiles because that is where the enemy has gone. In the future it will be against cruise missiles flying over land. That is the next challenge we face, and we hope that APL will help us with a solution against this threat as well.

Our strategy is pretty clear. We can't just stop what we're doing and work on new systems, because we have a whole Fleet that daily sails in harm's way. We need a plan and the wherewithal that will enable us to build the next-generation system in this inter-war strategic pause so that we can at least stay up with the threat. Actually, we would like to get ahead, but that's not easy to do in the defensive world. We will continue to expedite upgrades in the Fleet, but we can't just continue to make incremental improvements to existing systems. VADM Mullen has a whole list of items that he would like to upgrade, but the pocketbook only goes so far. We have to make critical trade-off decisions about which pieces we're going to continue to employ, and we're going to err at this point on the side of future systems.

With limited resources, we will need to focus on developing and installing systems that will move us forward. We need to perform the research and development to get the next-generation systems out to the Fleet.

The trends seem fairly obvious. Cruise missiles will get tougher for us. Ballistic missiles will carry weapons of mass destruction. Fighter-bombers will come after our ships and our forces ashore with standoff and smart weapons. Unmanned vehicles will continue to increase. The nations that concern us—those we want to keep from obtaining our information—will in fact gain access to satellite and other target information as a matter of course. As our force structure decreases, we will be even more dependent on operations with allied forces. Air Defense alone will not get the job done, but it is a uniquely Surface Warfare attribute. The other forces in our Navy, submarines and aviation, can perform strike and other aspects of the naval role, but it is the surface ships that provide the sensors and the missile capability for Air Defense. We're going to have to be the leaders in Air Defense among the other services to fulfil this role in a rapidly changing technical and operational environment. As VADM Mullen noted, we will be doing more and more peacekeeping. That appears to be what lies ahead.

What role will our cruisers play as we look at Ballistic Missile Defense? Will our ships be forward-deployed for long periods and change crews? Are they going to be on missile defense stations? We don't know how these issues will evolve. But I can tell you that it will take some tough systems engineering work to resolve them and determine how we will actually operate our ships. You have started a revolution here at APL with the AADC (Area Air Defense Commander) installation, and you are developing the advanced planning and tactical operations tools in Air Defense because you have the expertise to do it. The extension of that foundation, for Strike and Undersea Warfare and other aspects, will be a significant step forward.

DETECT, CONTROL, ENGAGE

What do these operational trends mean in specifics? If we look at the “detect” side of detect/control/engage, we see multispectrum, netted, data fusion (critical to the Navy and the bread-and-butter to a number of you working in this area), active arrays, passive staring IR, bistatic sensors, and precision bearing and cueing from Electronic Warfare. On the “control” side, we have automated doctrine aids (APL has been the leader in that development), advanced decision aids, and the single integrated air or battle space picture mentioned by VADM Mullen. Air Defense is leading the way in this arena, but it must expand to the other warfare areas if we are to take advantage of it. Where are some of those advanced capabilities in man/machine interface found in the video arcades? Where are the holograms over my table so that I can figure out what is going on in three dimensions? I’m still waiting.

Look at what is happening to the Standard Missile (SM). We’ve gone into a 21-in. or larger caliber (Fig. 2). We think we’re going to do TBMD (Theater Ballistic Missile Defense) and eventually Land Attack, penetration capability in strike, and possibly a strategic defense capability. On the 10-in. caliber size, which is at the ESSM (Evolved Sea Sparrow Missile) size, we are starting out on Anti-Ship Missile Defense. You will probably see us use that vehicle to do strike capability as well. We’re also going to revisit laser weapons because the technology has moved further along there.

I use the Standard Missile as an example, but I can substitute Tomahawk and other weapons. For the immediate future we are probably looking at the 21- and 10-in. caliber weapon and then some kind of laser. In fact, the Standard Missile makes a good news story—good for VADM Mullen because every time we reuse some components of an existing missile, he saves money, and he can get more missiles for the same amount of dollars. The more we can evolve and adjust existing production and design efforts to make something militarily useful, the more we save (Fig. 3). That is exactly what we are doing—both at home with our weapons and overseas with our allies.

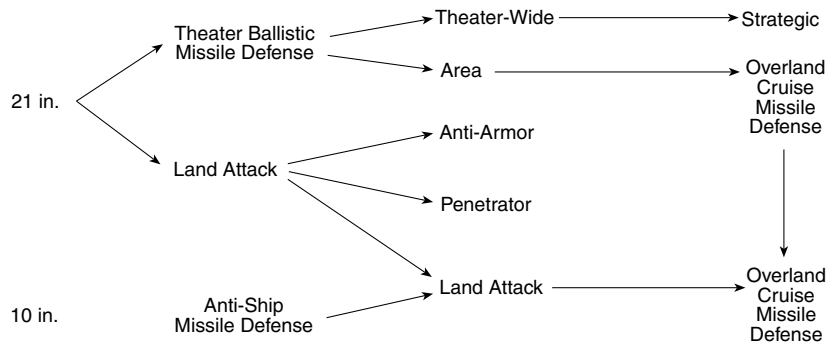


Figure 2. Standard Missile family neck-down.

How do we get these new systems deployed? Like our weapons, our ships are also evolving to give us these new capabilities like Land Attack, Ballistic Missile Defense, and AADC. If we don’t find a way to rapidly install these new capabilities through conversion and modernization, we’ll only be able to introduce them on two or three ships per year at best. That’s not good enough. We must find a way to go faster and to get new warfighting improvements into the Fleet sooner and at a lower cost.

It is hard to articulate the importance of the backfit modernization of existing ships in the present budget environment. Historically the Navy has achieved this a number of times, such as with the two Terrier cruiser classes, the DDG2 class, DLGs, etc. But today it’s very difficult to package the incremental improvement we expect through backfit. This issue is a particular concern to VADM Mullen and me. It is critical. We need these Land Attack, Area TBMD, Theater-Wide TBMD, and AADC capabilities, but we can’t afford to put them

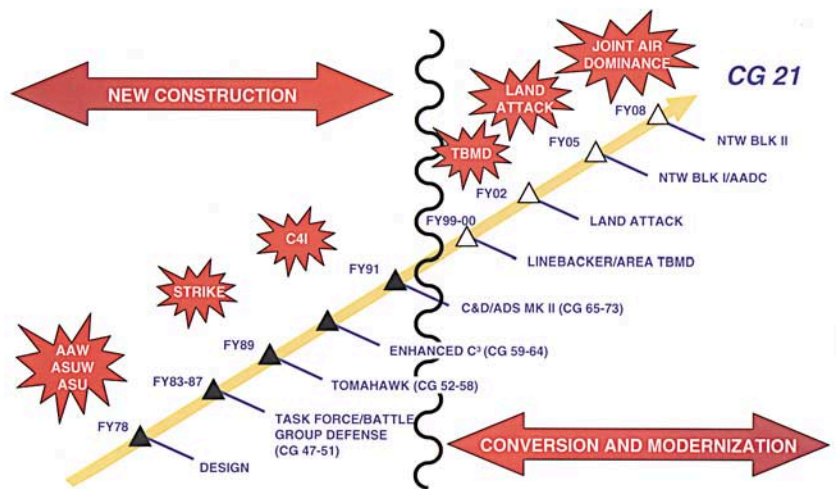


Figure 3. Mission changes drive new combat systems requirements. (AAW = Anti-Air Warfare, ADS = Aegis Display System, ASU = Anti-Submarine Warfare, ASUW = Anti-Surface Warfare, C3 = Command, Control, Communications, C4I = Command, Control, Communications, Computers, and Intelligence, C&D = Command and Decision, NTW = Navy Theater-Wide.)

all on every ship. We need to put them in packages that make sense in order to accomplish this goal.

The Navy's Ship Self-Defense has been beefed up significantly over the last 10 years. We took that lesson from Desert Storm, invested in R&D, and made significant steps. We now have several developmental efforts in process that put us on the verge of deploying the next-generation system if we can stay focused. Our problem here is a real one. During the Cold War era, we bolted anything that worked against cruise missiles on the ship. We found a sensor here, a radar there, a little Electronic Warfare component from somewhere else—whatever it was, we installed it. We were terrified of not being able to deal with the ASCM threat, and we took *anything* that would work at all. Now the problem is that the Navy is saddled with trying to maintain what we have, keep up the manpower and the training, and buy the repair parts. We can't do it. We have to find a way to reduce the cost and still improve our ability to deal with the worsening threat.

A look at VADM Mullen's budget shows support money to maintain and operate legacy items at sea. Procurement to enable evolutionary changes to existing systems is also part of the budget. His R&D dollars are developing the revolutionary next-generation capabilities. This has been the general trend for Ship Self-Defense over the last several years.

The control side of detect/control/engage looks much the same way. We're trying to do a serious neck-down here to enable us to reduce our software development and maintenance costs over the long term. We need a common CDS (always a pie-in-the-sky goal), but we can't continue to pay multiple software development costs for the same capability across different programs and industry teams. For instance, the Navy is now actively supporting five different combat ID computer programs that all come to different conclusions, even though the same data are run through their algorithms. We can't afford that outcome, either operationally or from a cost perspective.

On the "engagement" side, the Navy's weapons are well into neck-down. We are focusing in on ESSM, RAM (Rolling Airframe Missile), and CIWS (Close-In Weapon System). CIWS is coming to the end of its run, but we are combining it with RAM into what we call SEARAM. Of course, we are continuing to invest heavily on decoys and AIEWS (Advanced Integrated Electronic Warfare System).

AIR DEFENSE CHALLENGES

Our approach to command and control has evolved (or maybe expanded) as we have gained the information technology to support it. We have moved from the rather centralized control approach of the Cold War period, to a decentralized approach, to today's practice

where the vision is to enable people on different units to collaboratively plan and improve operations.

- All weapons and sensors will be used in a common battle space to the full extent of their capabilities.
- There will be a shared, precise, highly accurate tactical picture.
- All friendly forces will operate from the same playbook.
- Information flow will be transparent to the operators.
- A single Joint Air Defense Commander supported by AADC decision aids will be in place.

Where are we headed? Well, we want to take full advantage of available information technology to ensure that we are ready for the 21st century. That's where APL comes in. You have to help us figure out which "real ponies" to ride so we can get the maximum bang for the buck while our budget continues to constrain our wild ideas, and we need to stay focused on what is important.

VADM Mullen and I believe that CEC (Cooperative Engagement Capability) is fundamental to all our efforts (Fig. 4). It puts us in a new mind-set. We are not going to have each unit, or each sensor, or each piece tackle its own part of the problem, but rather we will combine all that information synergistically in a new way. We will install a force-wide web throughout the Joint force that will enable us to obtain and provide the data to the person or system that needs the data at that moment. This is a tall challenge, but the Navy is leading the way.

APL has set the path for the Department of Defense in AADC development. I believe that this effort will allow commanders to access dependable, real-time data to do their job in a constantly changing world.

I want to talk briefly here about how we get space data aboard ship in a sensible way. I have challenged some of you at APL several times on this issue. You have your stovepipes here too in terms of your own organization and setup. I want to figure out how we can get APL organized so that you can help us obtain tactically useful space data in real time (Fig. 5). The operating Navy isn't very good at this. How can we bring real-time targeting data and eventually real-time cueing and tracking data directly aboard our ships for Ballistic Missile Defense? We can't route the data through some favored spot in the middle of the United States. This is a tactically critical issue and one that I cannot overemphasize. We are *not* going to do National Missile Defense without putting the satellites into the fire control loop. We are not going to do it at a level that the nation is going to demand until we can bring satellite data into the fire control loop with great confidence.

Opportunities for introducing new combat systems into ships are relatively limited. We only have a few ships in development that will enable us to introduce

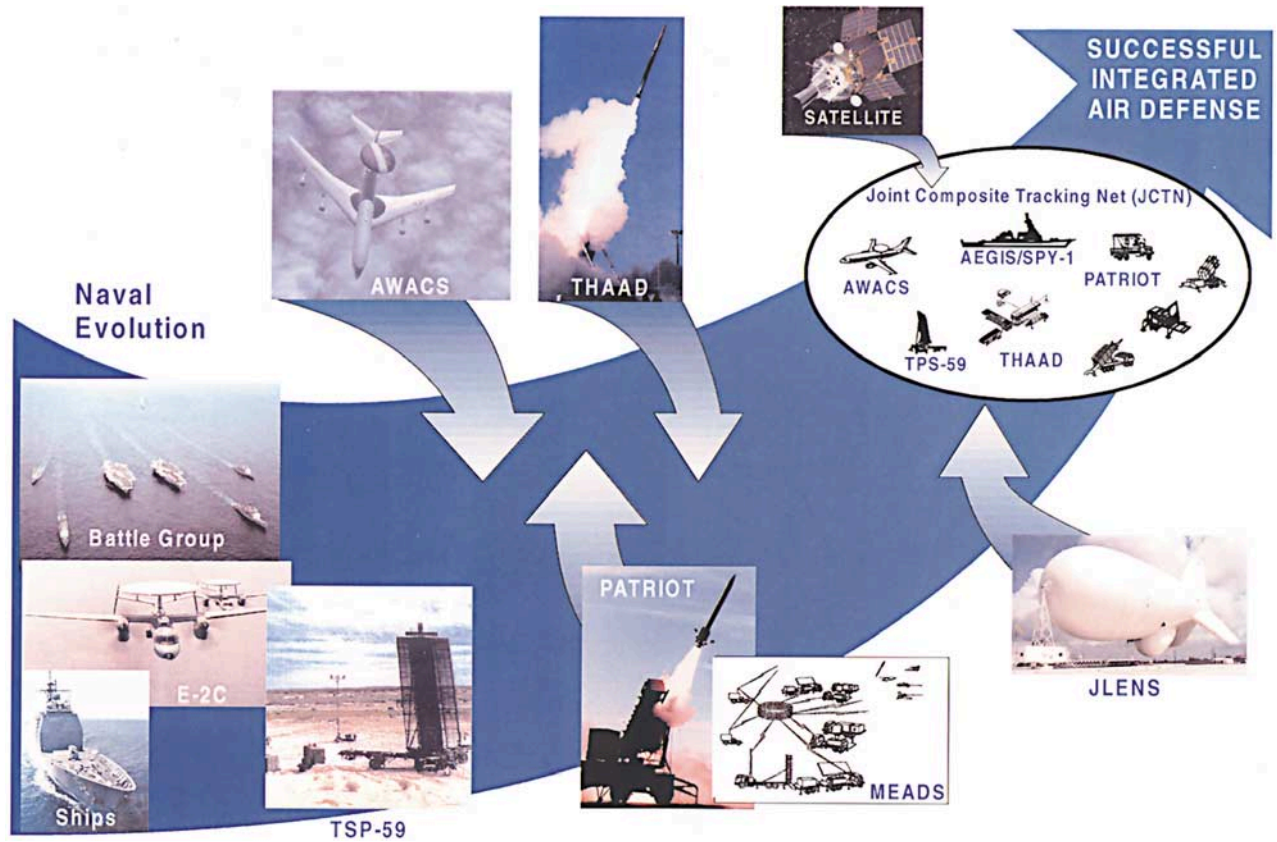


Figure 4. CEC Joint road map (JLENS = Joint Land-based Elevated Netted Sensor, MEADS = Medium Extended Air Defense System, THAAD = Theater High-Altitude Area Defense).

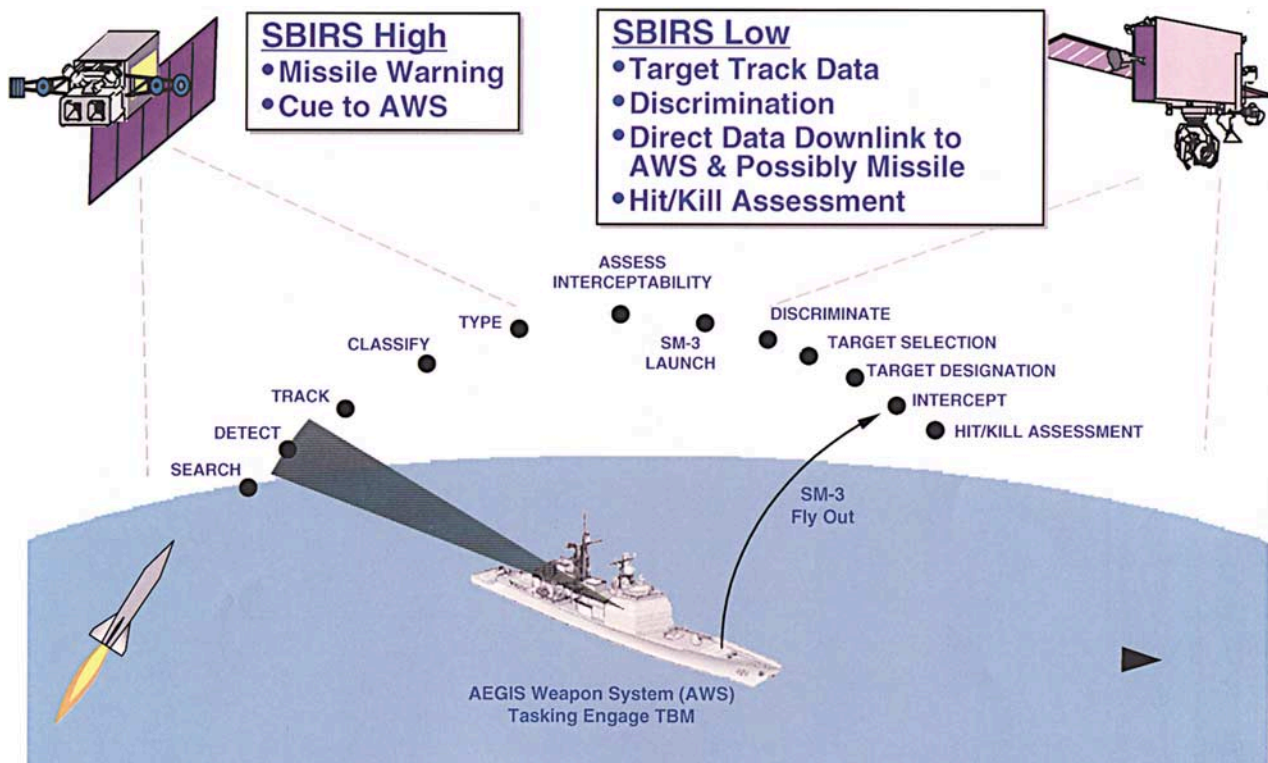


Figure 5. Potential Space-Based Infrared System (SBIRS) benefits.

either new radar suites, new combat direction systems, or new weapons systems. We must therefore ensure that we take advantage of each one of these capabilities to make an incremental jump in our overall capability. This means that we cannot develop a new system for each ship type or each system itself. The struggle we face is to find a general overall game plan for introducing these new capabilities across different ship classes and to do it right.

What lies ahead? First, a single integrated air picture is important because it will enable us to sort out the battle picture in real time and use the information to maximum advantage. CEC is the critical piece, not just for the Navy but for *all* of the services. We need command and control improvements, and AADC is leading us in that regard. Then in the two areas of doctrine and tactics and techniques and procedures, how do we incorporate space systems data into our day-to-day operations and change our paradigm to work space systems in a tactical sense? Those three areas are, to me, key to the interoperability we are trying to achieve. They are areas in which APL will be leading, not only for Navy efforts, but also for the Department of Defense.

I want to emphasize international cooperation (Fig. 6). In the area of Air Defense I have observed several things over the last years. If you look across the different systems APL is working on, you will note that almost every one has an international aspect. That's because VADM Mullen cannot afford to develop these new systems with just his own nickel. He has to ask other nations to contribute both toward development costs and procurement to bring our unit costs down. What we see is an explosion in international

cooperation. So another challenge I have for APL is to help us deal with this issue. How do we deal with the changing environment in which we are interacting on a routine basis with engineering teams comprising people, for example, from Spain, Italy, and the Netherlands as well as their government-funded laboratories and industries? Fortunately, we have some experience under our belts now, but how can we do this better?

The proper role for our ships in a National Missile Defense effort is also a critical and impending issue. Recently, Chief of Naval Operations ADM Johnson sent a memo to the Secretary of Defense which basically cautioned that we must consider the role of our ships very carefully before we go too far. This is critical in terms of how we will be perceived in the 21st century, and I believe that it will become the centerpiece of APL's efforts.

These are daunting issues. We've all seen the charts—the threat is real and the need is urgent. The potential for our contribution is huge here. The nation needs APL to make this a reality. You need to figure out how to gear up and prepare for a major change in focus as we look to the next few years. I am not overly optimistic that we are going to move ahead rationally. Some crisis will occur that will force us to act in a flash. We—because we want to keep engagement theaters far from our shores—provide the best chance for success in that regard.

You at APL have also helped us define our direction. Based on a session on Theater Air Defense Cornerstones (Fig. 7) to work this issue, we believe that the political/strategic and operational/tactical cornerstones are basically correct for today's scenario and situation.

The next step is to take the system design cornerstone and turn them into a system that we can evolve as the situation dictates in the next few years. The challenge is to define, in system-level terms, the Navy's contribution to our national mission and our capabilities. We have done this a number of times before. The question now is what is next? What system will follow Aegis, which was born in the 1970s? We have adapted it and will continue to adapt it because of the wisdom and forward thinking of the people involved at that time. But we have to think of the next approach.

We have made some progress already, as you well know. VADM Mullen and I hope to kick off a Theater Air and Missile Defense study (TAMD 21) in the coming

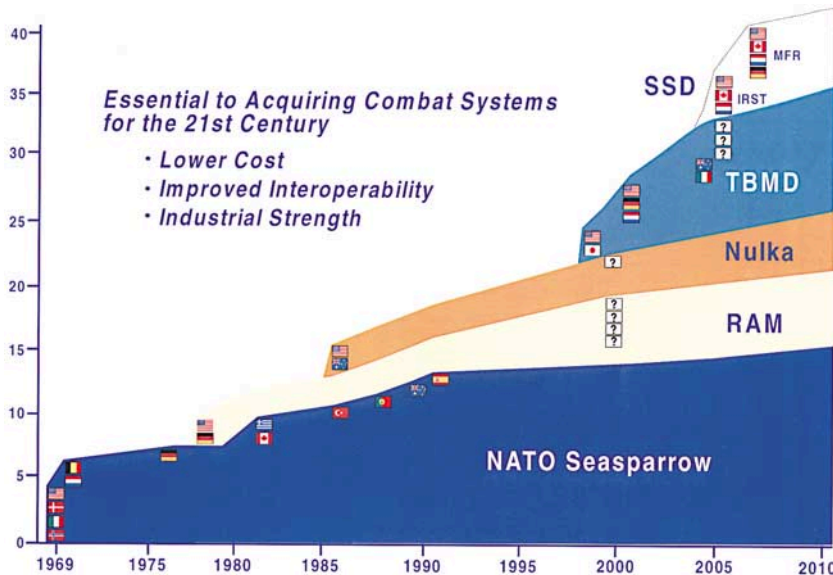


Figure 6. Number of countries involved in international programs projected through 2010 (IRST = Infrared Search and Track, MFR = multifunctional radar, RAM = Rolling Airframe Missile, SSD = Ship Self-Defense).

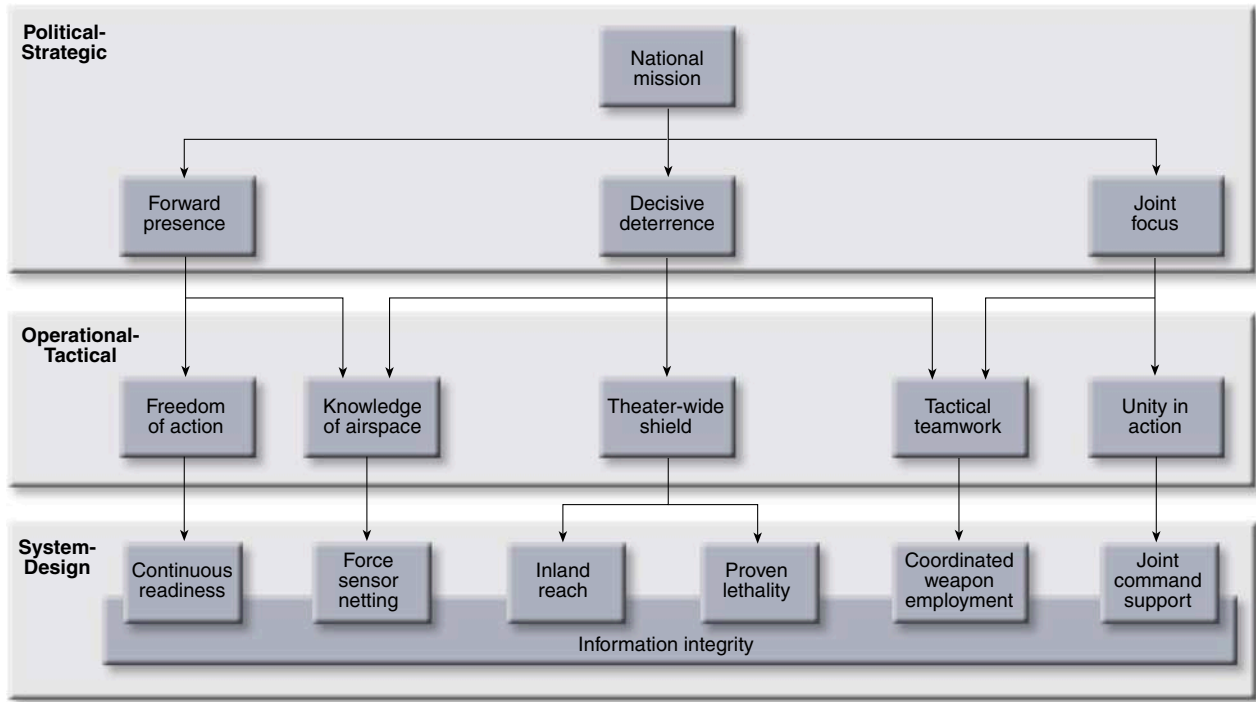


Figure 7. Theater Air Defense (TAD) Cornerstones.

months (Fig. 8). Of course, this is a major undertaking. We have a number of serious events going on to support it like a National Missile Defense Concept Definition study, an engineering effort to decide what our Theater-Wide Block I system is, and attempts to define a Theater-Wide Block II system. We haven't yet put it all together and figured out what it all means for Air Defense in the future.

Almost 35 years ago ADM Withington's study resulted in the Aegis system. It is probably time at the dawn of this new century, this new millennium, to take another careful look at where we are headed. We hope to get that going, and we rely significantly on you at APL to guide us through this difficult task.

We need to be able to project power ashore and protect our forces when they do that. We have to introduce new technology. Within this strategic inter-war pause, we hope we have the time to accomplish this task. We cannot, however, ignore our existing forces while the threat is worsening. I am very excited about our current direction in Air Defense because, of course, it is my area of interest. But I can tell a similar story about Strike and Undersea Warfare. We are at a turning point. The potential that

technology brings us is huge, but we need direction before we rush down that path. All the rules and situations that we have become comfortable with have in fact changed dramatically over the last few years.

APL's ability to help us sort out what is, in an engineering sense, our most critical task in the next 10 to 20 years is absolutely essential to our goals. We are counting on you to help us walk forward, see the crystal ball clearly, and come to conclusions on issues that are critical to our national defense.

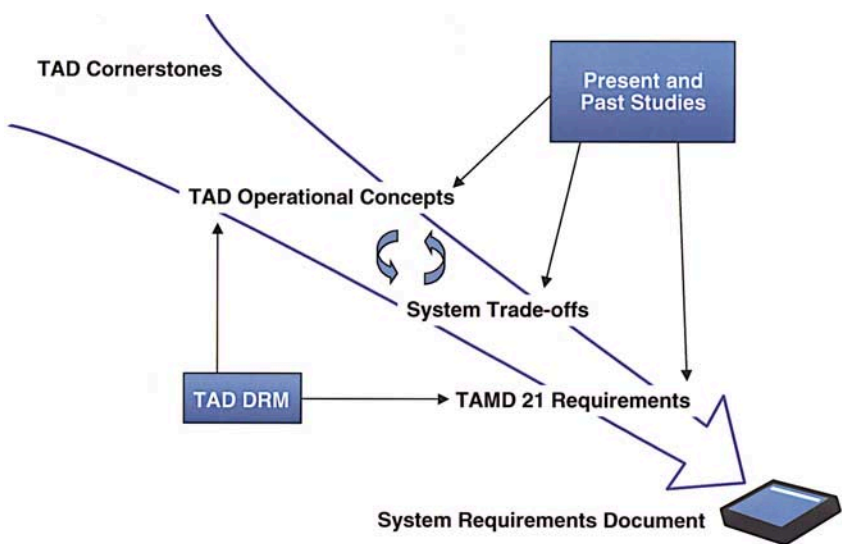


Figure 8. Next steps (DRM = Design Reference Mission).