FINAL AGENDA – May 21, 2001

WELCOME: E. William Colglazier, The National Academies

OPENING REMARKS: RADM Malcolm MacKinnon, USN Ret., Member, Marine Board

FUTURE VISION: RADM Jay M. Cohen, Office of Naval Research

KEYNOTE ADDRESS: RADM George Yount, Naval Sea Systems Command

Professional Societies Perspective
Moderator: R. Keith Michel, Herbert Engineering
- RADM David Sargent Jr., USN Ret., American Society of Naval Engineers
- Joseph Cuneo, Society of Naval Architects and Marine Engineers

Industry Perspectives
Moderator: Edwin Roland, ERMC
- RADM Millard Firebaugh, USN Ret., General Dynamics/Electric Boat
- RADM Marc Pelaez, USN Ret., Newport News Shipbuilding
- William Rogalski, Northrop Grumman Litton Ingalls Shipbuilding
- Peter Gale, John J. McMullen Associates, Inc.
- Duane Laible, Glosten Associates
- Robert Scott, Gibbs & Cox

Academia I: University Perspectives
Moderator: Malcolm Spaulding, University of Rhode Island
- Michael Bernitsas, University of Michigan
- Chrys Chryssostomidis, Massachusetts Institute of Technology
- Roger Compton, Webb Institute
- Bahadir Inozu, University of New Orleans
- Wayne Neu, Virginia Polytechnic University

Academia II: Academies Perspectives
Moderator: Billy Edge, Texas A&M University
- David Byers, U.S. Naval Postgraduate School
- CDR Kurt Colella, U.S. Coast Guard Academy
- Jose Femenia, U.S. Merchant Marine Academy
- Charles Munsch, SUNY Maritime College
- Bruce Nehrling, U.S. Naval Academy

Federal Agency Perspectives
Moderator: Martha Grabowski, Le Moyne University and Renssalaer Polytechnic Institute
- CAPT Jeff Gamble, United States Coast Guard
- Gregg Hagedorn, Naval Sea Systems Command
- Jean McKeever, Maritime Administration
- Stuart Williams, National Oceanic and Atmospheric Administration

Summary and Overview of Panel Discussions - Albert Tucker, Office of Naval Research
Closing Remarks - Paris Genalis, Office of the Secretary of Defense
Workshop Mission

A key national responsibility of the Office of Naval Research (ONR) is to maintain a robust capability in Naval Engineering. To meet this responsibility, ONR is committed to a robust science and technology base so that the education, research, and engineering communities can provide the needed talent, ideas and products to today’s and tomorrow’s fleet. This planning workshop will explore opportunities and initiatives to attract people to the community, in research to support innovation, in engineering to develop advanced naval vehicles, in production to enhance efficient acquisitions, and in the application of commercial approaches.

The U.S. Navy must have a robust and focused research community to advance the state-of-the-art; generate an adequate pipeline of new scientists and engineers in naval engineering disciplines; and provide operational forces with the science and technology to enhance fleet performance. In this regard, naval engineering disciplines include all arts and sciences as applied in the research, development, design, construction, operation, maintenance and logistics support of: (a) surface ships, submarines, and marine craft; (b) naval maritime auxiliaries; (c) combat systems including command and control, electronics and ordinance systems; and (d) ocean structures and associated shore facilities used by the naval and other military forces and civilian maritime organizations for the defense and well-being of the nation. In summary, the long-range objective is to develop the people infrastructure and knowledge base that will produce and enable creative ship designers and ship researchers for the future.

This planning workshop brings together representatives of various universities and federal or state academies to review and discuss the current issues associated with this complex subject. Representatives from the shipbuilding industry, U.S. Navy, U.S. Coast Guard and the Maritime Administration, interested professional societies, academia, and other sectors of the marine industry will join them to explore programmatic solutions to these current issues. The Marine Board and Transportation Research Board are hosting the meeting, with support from the Office of Naval Research.
WELCOME
E. William Colglazier, The National Academies

My name is Bill Colglazier and I would like to welcome all of you on behalf of the National Academies and National Research Council. Two of my bosses hoped they could be here today – Bruce Alberts, President of the Academy of Sciences and Bill Wulf, President of the Academy of Engineering. They are both overseas at the moment. They wanted me to wish you a warm welcome.

I was particularly interested in your workshop today on naval engineering and research in education. One of the primary missions of the Academies is to help facilitate communication and dialogue between government, industry and academia and that is also a prime purpose of this workshop on Naval Engineering Research and Education. The Academies were created back in 1863, when Abraham Lincoln was President, to facilitate dialogue on science, engineering, technology and health issues for the government and the American public.

The focus of this workshop is to foster engineering research and development and addresses future challenges to the nation. That is also at the heart of what the academies are interested in. Also, I think particularly important, it is looking at what are the needs in the future for the workforce – for educational programs dealing with an important area that is vital to our national defense.

On behalf of the Academies, I certainly look forward to hearing as much as I can today at the workshop and also hearing the results later today.

I would like now to introduce RADM Malcolm MacKinnon, who has been very much responsible for helping organize this, working with the Office of Naval Research. RADM MacKinnon is a member of the National Academy of Engineering and of the Marine Board.
It is very heartwarming for me to gaze out on this collected audience and see so many old friends and so many old friends of longstanding. The subject that we are going to cover in this workshop is one that has been very important to me because I retired 11 years ago from the Navy as the Vice Commander at the Naval Sea Systems Command and as the Chief Engineer of the Navy. I spent a career designing, building and maintaining war ships, mostly submarines and a few aircraft carriers thrown in. In retirement, I’ve been running a small consulting business but still worrying about ships. The subject of this workshop, naval engineering research and engineering, as it is a national naval responsibility and one that is a key ONR interest.

Naval engineering, I feel, is a generic term that means more than just gray ships, and it really means more than engineering. It encompasses design and includes propulsion engineers, structural engineers, combat systems electronics engineers, all of the disciplines that are necessary to integrate a complex total system that is, indeed, a ship.

The subject is one that has concerned me for a long time. How do you sustain a profession in a shrinking industry at a time of continued change where change always seems to be in the decline mode? How do you keep a pipeline of qualified engineers available to the profession? How do you ensure timely insertion of innovative technology into the design of our ships? How do you provide the impetus to keep the momentum and keep the profession going? I think another question that will, I hope, be answered today is how do the stakeholders play? I think we are very fortunate to have covered the spectrum of stakeholders. We have the professional societies of ASNE and SNAME. We have industry, which include the shipyards and design agents. We have academia, civilian institutions and government academies. We have federal agencies, all of whom are stakeholders in this important area and really the very heart of our profession.

Our first goal is to define the problem. Or, I probably should better qualify that by saying, define the envelope of the problem. I suspect it will be multi-dimensional. I suspect it will reflect the views of the individual stakeholders. But, it will be interesting to see how well we can define the problem by the end of the day.

Our second goal is to take that problem and figure out some next steps. These workshops are great and everybody’s adrenaline gets up, we make very strong points, we all perhaps even can sing from the same sheet of music, but then we go home all fired up, we are back to our respective jobs, wait for something to happen, and sometimes it never does. Our goal here is to take the results of this workshop, develop options for what we might do next, and proceed.

I have been asked to introduce two flag officers, I’ve known both of these flag officers I suspect since they were lieutenants and then I begin to wonder where all those years went. I am absolutely delighted to be here to do that.

First up is George Yount. George has been a leader in the profession of naval engineering as one of the Navy’s senior engineering duty officers. He has been involved in the most direct way. He is now the Deputy Commander for Ship Engineering and for Engineering at the Naval Sea
Systems Command. It gives me a great deal of pleasure to introduce to you one of my top flag friends and colleagues in the profession, George Yount.
FUTURE VISION

RADM Jay M. Cohen, Office of Naval Research

Good morning. I would like to thank Dr. Al Tucker and all of you for this tremendous investment of time and talent and energy in such an important area. The good news is that many of you here in the audience know me and trained me, and the bad news is that many of you in the audience know me and trained me. So, let’s get right to the problems.

With the exception of the young ladies in the audience, by a show of hands, who here has not turned 40? I see one hand. So, I would tell you, and I realize we are dealing with the leadership here, that is somewhat indicative of the problem we have.

Today is not about a plan of action. It is about what I believe is a crisis in the maritime industry. The facts of life are that in the 1970’s, many of us would not buy an American car. I think Chrysler, nearly going through bankruptcy, was the first one to realize they needed to make better, higher quality, better designed and engineered cars, and be more customer friendly. Ford was next with “quality is job one”. They went down to the construction line, talked to the people who assembled them, and they got the engineers together, and I think GM was the last to get on board. Today, 25 years later, American cars are absolutely the craze in the world. We all look forward to having those well-designed, fuel efficient, very safe cars. Our companies are even designing them where they can have right-hand drive to be exported.

Why do I bring that up? Some of you in the audience and I have had this discussion. I have to tell you, as research chief, I am tired of excuses. I have heard about the Jones Act. I have heard about subsidies. I have heard about all of the different things – labor rates. The facts of life are that our maritime industry, as it relates to the Navy in this country today, is beyond crisis. I’m not so sure it is not terminally ill and we’re just keeping it alive artificially on life support.

The Navy is a niche customer. The Navy has always been, except in time of world war, a niche customer. It is best for us to leverage off the industrial base all the good things that are going on in commercial shipbuilding, design, etc. Today, for our major shipyards, and they are represented here, and this extends to the Coast Guard as well, we are keeping the industry alive. So, we should not be talking about reinvigorating. We should be talking about saving the industry. We can talk about the edges, but I have too much respect for the individuals who are assembled here today and the day’s effort that you’re going to give to go with those platitudes. I think Admiral Yount captured some of the statistics very well.

I believe we are on the verge of a revolution. I believe that the electric warship fundamentally changes the equation just like the efforts of the car companies in the 70’s and 80’s. To me, one of the toughest things in shipbuilding is the integration of the propulsion plant where the customer tells you I want this diesel, I want that reduction gear, and I want you to make the shaft, I want this kind of electric distribution, etc., etc. Now, it is up to you to integrate that.

We are looking at four principal areas in the electric warship. First, propulsion – that includes power generation, conditioning, handling, transmission, storage and propulsor. We are looking at auxiliaries – air systems, hydraulic systems, steam systems. We are looking to launch aircraft
off of aircraft carriers using EMALs – electro-magnetic air launch. The technology exists today to launch an A-4 aircraft. Regrettably, the weight of our naval aircraft is four times the weight of an A-4. But, we know the technology exists.

We are looking at wide-band gap electronics. There are about 100 antennas on an average gray hull warship – some big, some small. With wide-band gap electronics we will be able to get rid of most of them. We will be able to do weapons direction, EW, communications, even high-power microwave with flat panel arrays. We have the technology. Right now it is $20,000 a square foot. So, I can either have the array or I can have the ship – but I can’t have both. We’re working to drive the cost per square foot down.

Finally, when we talk about electric warships, we talk about quieting, we talk about flexibility of damage control, we talk about reconfigurable, we talk about fewer people, and we talk about individual state rooms, we talk about survivability, habitability, and all these wonderful things. What is the punch in the electric warship? One example is directed high energy weapons, speed of light weapons – through electron laser, solid state high energy laser, high power microwave or classified programs that we’re working on. This is really exciting stuff. This is like President Kennedy saying we’re going to the moon this decade. Why did you become involved with naval architecture and marine engineering? You thought it was fun. You dreamed about designing an America’s Cup or you dreamed about designing a hull form that was impressive as a battleship. It is fun. It is challenging.

Not only are we looking at electric warships, but we’re looking at new and unique hull forms. We are looking at the application of drag-reducing non-neutronian fluids. Some of the information that we have gotten from the Russians since the end of the Cold War really makes a difference. We are investing in that.

I’ve been reading Popular Science and Popular Mechanics for a long time. We have been going to have superconductor technology for my entire life. Now, we are talking about high temperature superconducting – that means liquid nitrogen instead of liquid helium. Ladies and gentlemen, this month three such cables are going in the streets of Detroit. Three cables will be replacing nine oil-cooled cables, leaving six spots either for expansion or for fiber optics. We are going to have a 5,000 shaft horsepower superconducting electrical generator within a year in Boston and it is going to be providing power to the good city of Boston. We are going to show that versus the oldest commissioned warship in the United States Navy. If we get it right – if we get electric warship right, we will have a jump on the rest of the world on integrated propulsion systems with the flexibility of design. This is a chance to regain that technological edge and I’m really excited about it.

So, why are we in crisis? Why aren’t more people coming to naval architecture? Why do we have so few schools teaching it? Ladies and gentlemen, if we build the ships, the students will come. This is an exciting area. But, you can see the number of nuclear engineers. We are not going to build nuclear power plants. You can see the crisis that NASA has as the space budget has declined. I would tell you that I believe we can make a difference. If we make our shipbuilding industry robust, the people will follow. That is what I hope we will get out of this session.
Now, what can I do at ONR as Chief of Naval Research? I can be a little bit of a cheerleader. I was on an ONR display vessel last week. We have over 30 research displays, military, academic, civilian, and we are taking this to New York City as part of fleet week. It is going to be opposite the *Intrepid*. Then we are going to take it down to Norfolk. We have kept our official basket on naval research for too long. We are taking it off.

Some of you are familiar with SLICE – a unique hull form that is dynamically stabilized. It has been out in Hawaii for a long time. We are painting it up like a NASCAR – blue/gold, red stripping from the Marines. We have changed the name to *Sea Slice* and in June we are taking it up to Anchorage and we are going to work our way down – Seattle for Sea Fair Week; Portland; San Francisco for Fleet Week; Monterey for our students there; Los Angeles and then San Diego for Fleet Week. With the Navy League, we are going to bring people of influence out and give them a ride. It is designed to attract young people and make them understand that the Navy is forward-looking. Although we may never build the SLICE as a class of ships, doesn’t it catch your imagination? It is my version of the Blue Angels. We will probably call it the Blue Dolphins.

We used to have a big ONR symbol, black letters, about six-foot high – ONR. We put that on Sea Lab and we put it on ALVIN. In the future we are going to come up with some kind of contest, similar to manned balloon flight around the world. We are going to do some kind of underwater vehicle contest from Hawaii to La Jolla, California.

In 2001 the Navy, with your help, is looking 10 years ahead in the area of electric generation transmission handling, stowage, etc. The car industry is desperate for this technology. The country, if you watch the Sunday talk shows, is 10 years behind in this area and is in crisis. What a golden opportunity to show the leadership to have the Department of Energy combined with the Navy, to work together not in the nuclear area, but in these very important areas for the way ahead.

I’ve tried to stimulate you. I notice even though no one here is under 40, most of you haven’t fallen asleep. Marc and Millard, as always, will correct me on the factual errors I have made. It is fun and that is why we still do it. Thank you very.

MacKinnon – We will shift now into our panel format.
KEYNOTE ADDRESS
RADM George Yount, Naval Sea Systems Command

Good morning ladies and gentlemen. I’m honored to have the opportunity to be with you and with this distinguished group today. A fraternity, if you will, of men and women with common interests in naval engineering, with representatives of academia, industry, professional societies and government, we have the earmarks of a championship squad. We have brains, brawn, stamina, and a little bit of money. I would say we are ready. But, just what the heck are we ready for?

I submit the purpose of being here today is to “define the problem”, and I submit it will be tough because not unlike that Yankee team that George Steinbrenner first bought, we are loaded today with the very best players in the league. The trouble is, are we all playing the same brand of ball? That I’m not sure. Let me explain.

I was first approached by Dr. Tucker of ONR to explore and support naval engineering and maritime technology as a national naval responsibility. How could you not be for this? I mean, we’re talking about ship concepts for military and commercial, advanced technology, research and development, producing new naval engineers – what’s not to like? There is something in there for everyone. That is when it started to nag me. My old statistics professor’s mantra – state the problem. My enthusiasm is that I just knew we needed more naval engineers. After all, I worry about that almost every day. That had to be the issue. Then, I started talking to a number of you and reading a variety of different studies, two that you may be most familiar with – Naval Engineering: A Naval Obligation and Naval Security Assessment of the U.S. Shipbuilding and Repair Industry. I cite these two studies not because they are particularly better than any others, but because they are current and because they present a broad range of issues that face the shipbuilding business today.

Now, I could be parochial and say I really don’t care about the industry – I’m only interested in Navy ships. It is the defense side of things that I care about. But, the problem is that the preponderance of work done by the industry today is done for the U.S. Navy. Not only that, the acquisition strategy that has evolved over the years continues to lead us to a situation in which Navy in-house design is now the domain of private industry. Then, when you examine the notion of private industry with respect to naval ship production, all the individual shipyards are all part of the corporate entity. It is also somewhat unique in American industry that the shipyards are essentially wholly-owned subsidiaries of the U.S. Navy. So, there you have it. The Navy cannot divorce itself from the interest and the health of the industry itself.

What is that industry? It is really the sum of the collective people, the men and women coming to work every day and trying to do the best they can to produce a product. Broadly speaking, the workforce consists of three categories: the business folks, the engineers and the mechanics. I submit that everything stems from the business side. What we are concerned with today is the product side, and most specifically, the engineering of the product.
Right away, just by making the arbitrary reduction to consider only the engineering side of the marine industry, we find that the investigation is still complex. Permit me the analogy of a continuum. In the Navy, and I submit in all the aspects of our lives, we talk of technology in terms of right now; a delivered, ready-to-use commodity. But, technology is not a moment in time. Rather, it is a continuous chain of discoveries, problems and solutions. In fact, the elements of technology that is available for our use today really developed many years ago. Depending upon where you stand on the continuum, technology takes on different aspects. In academia, it is the pure science and technology, the discovery work. In government labs, it is the research and development into a product, a notion, or moving from theory to practice. In the program offices, it is the advanced, but de-risked, solution. In the building yard, it is the application of all of the above. And, to those that sail the ship, it is the difference between victory and defeat. The race is always the same – how can we get the latest, most advanced technology in-use at-sea in the shortest period of time?

Though I submit that engineers are like technology – depending upon where you sit in the development of engineers, you have a view of the problem of engineering. In academia, the problem is one of throughput of students and sustaining research dollars to support the quality of faculty required to deliver knowledgeable and well-trained engineers. In the government, the problem is sustaining a cadre of engineers with sufficiently distributed age and experience so as to ensure the ability to be both a peer of industry and capable of certifying the products that we buy and maintain. In the program offices, the problem is relying upon engineers to be able to provide intelligent, technology choices with sound understanding of engineering economics. In the industry, the need is for conceptual and detailed designers with production, testing and systems engineering to turn materials into finished products. It is the need to have engineers qualified to operate and maintain these complex machines far from support of the shore.

So, what is the problem? One problem might be just trying to define what a naval engineer is. To be sure, there are some in our business that would say a naval engineer is a naval architect – period. Yet, others would say it is a collection of engineering disciplines to work exclusively on marine products. They are the naval engineers. In the end, I submit that what we see in the workplace today is realistic – a blend of engineering disciplines who work together to assist one another in a synergistic manner employing the knowledges of their fields of study.

Some would say the problem is that we don’t have enough work for the engineers we have today, particularly the claim that is frequently expressed that we don’t have enough design work. When you look at this slide -- the R&D design budgets over time starting in 1987 to today -- what you see is a spike in the design budgets for submarine design.
This is slanted towards Navy. Then a rising chart here in the last four years – where we have more R&D money today than any time in the last 15 years. What we have under this envelope of funding today is the new carrier, the CVNX, the new surface combatant, the DD21, the new amphib – the LAOPD17, the command ship, JCCX, and the new LAHD8. But, you have to watch out when you look at these kinds of slides because back in the part where it didn’t look like there was a lot of money, there was a lot of heavy government involvement. The cost of that is buried in that the salaries don’t show in that. So, I think this looks very optimistic and they would say we have more money today than ever before. We would need to study this a little bit farther to determine do we really have more money when you pare it down on equal basis of what it is we were doing in design before with salaries paid elsewhere. The fact is, this money today is predominantly heading for the private sector where that work is accomplished.

Is the problem that people are not going to college and getting college degrees? Here is a national picture of degrees by degree-granting institutions:
We have tried to remove those that require only that you can read a book and write one term paper in six weeks, something I heard about on National Public Radio (NPR) yesterday. Apparently, a fellow was teaching at an institution and didn’t find it a bit funny that he had six arduous weeks to get his PhD and they thought he had met all the degree requirements. Pretty amazing. Anyhow, we think those folks are out of here. So, what you see is now we have a pretty good trend of kids going to school, getting degrees, more so than we did back in the hay-day of our business.

Maybe the problem is that we have plenty of students, but not enough engineering students. You knew we had to get to it at some point. What you see in the red line is the business students at the top, a fairly healthy increase in the early 80’s and staying up there.
Education – here is an interesting one – many of you are in academia. As I look around the room at the number, the 60’s and 70’s ballooned with students going and studying for an education to the point where there were no jobs available for awhile. That dropped off and where are we today? A lot of those folks are going to retire and the nation is going to be in a big bathtub career again of trying to generate more of these educators.

If you look at engineering and the solid yellow line, it is interesting – a solid increase in the early 80’s, a little bit of a decrease, but for the most part we have been pretty steady-state for over a decade in terms of engineering students earning degrees. Below that, the blue line, is the computer science and physical science and mathematics degrees. It shows that we are doing pretty good as a steady-state producer of engineers. But, if you break out naval architects as a specific candidate and you would look at this last year alone, the number would be 69 naval architects. As a fairly large user of engineers at the Naval Sea Systems Command, I took a look across the Command to see what is the representation and the distribution that we use for engineering types in the Navy, and that is on the basis of about 15,000 engineers. What you see here is we actually do need a variety of engineers:
In all of NAVSEA, approximately 5% of our engineers are pure naval architects. Out of that crowd, a large group of mechanical, electronic, electrical engineers. When I looked at this, I was trying to draw some conclusions and I determined that I don’t know that this is either good or bad; it just is. This is what life is out there right now. In some cases, I would think, without any data, that if we went and looked at various industries, we would find similar type break-downs and we would find that is probably pretty typical of what exists in our utilization of engineers.

So, what have we seen? R&D budgets are higher, mostly centered in the private sector. Graduating engineers are pretty steady when the engineering workforce is distributed. Yet, despite all that good news, my life, probably like yours, is still difficult. The shipbuilding plan is averaging only six ships per year. No matter how you cut it, that is not a 300-ship Navy. If you are generous and give a 40-year ship life, the math works out to a 180-ship Navy. So, from a consumer view, the numbers of naval ships continue to get smaller. The “smart buyer” role that I need engineers to play gets harder as time goes on, particularly when I am less involved in the details of the design.

The Navy is not developing design tools. My budget for design tools is exactly zero. I think that starts to be a problem not only for us, but for industry people that have relied on those tools in the past. Also, specs and standards are constantly under attack. There is a feeling that somehow people don’t need specs and standards. Trying to get people to see the intrinsic value of having specified standards and specifications is really difficult.

But, if we have all of these good news things, why are we still struggling to get engineers? What do the students want or what are they looking for when they look for a career? We went out to some of the societies and collected data that they have been gathering from graduate over the last decade. In the last two years, the graduates that come out of school are more interested in mainstream companies than in dot.coms or start-ups – which may sound a little counter-intuitive

but if you place yourself back into this position, maybe 20 years ago – for some of us it is nearly 40 years ago – what were you looking for? A little stability, a little security somewhere. Today’s young people value balancing work and personal life more than money, location and advancement. They value flexible hours and that is the most desired benefit that they get. You have an industry that makes that pretty tough. When choosing an employer, room for advancement, geographic location and continuing education and training play foremost in their choices of where they want to go work.

Each of us has a specific need for engineers. But, it seems to me most appropriate that we work together to solve the total need, and that is to ensure a sound maritime industry for the protection and commerce of America.

You will hear from your counterparts for the remainder of the day. As you learn of their perspective, keep notes, focus the ideas, but in the end, your price of admission is to help us collectively and clearly define the problem. Any problem that we can write down, we can solve. Let’s make sure we are solving the right problem. Thank you very much and good luck in your efforts.

MacKinnon: – Thank you, George. I think you certainly have set the stage.

I would like to present to you now a friend of long standing – Jay Cohen. If I could make one statement about Jay, I would say that given where he is now, I think he is the ideal guy to be the Chief of Naval Research at this particular juncture. Jay is many things, but he is enthusiastic, he’s articulate, he is smart, and he has some money. If you put that together in this town, that can either be extremely beneficial or very, very dangerous. I’m happy to say that in my opinion, Jay will be very beneficial.

Jay is a submariner and I think you have a full biography in your materials, so I will not stress it. We have served together in different capacities at COMSUBLANT staff. When we served together, he was part of the crew of a complex refueling overhaul at Newport News that I was in charge of delivering. Those were interesting times. Jay, it gives me a great deal of pleasure to introduce you to this audience.
PROFESSIONAL SOCIETIES’ PERSPECTIVE
Moderator: R. Keith Michel, Herbert Engineering

This session will provide the perspectives of two professional societies. We will then have a short break and then a panel offering industry perspectives. Our first speaker today is RADM David Sergeant, Retired U.S. Navy, and he is representing ASNE – the American Society of Naval Engineers. David is a mechanical engineer, a graduate of Cornell and the Naval Post-Graduate School, and he is a licensed professional engineer in the State of California. He was a surface warfare officer in the U.S. Navy. He a long-time member of ASNE and he is currently President-Elect of ASNE.

RADM David Sargent, Jr., USN Ret., American Society of Naval Engineers

I’m very pleased to be here today representing the American Society of Naval Engineers, and also as a long-time Sailor. Also here today is Dennis Kruse, Executive Director of ASNE, who is really the one with the background and knowledge both as a marine engineer and ASNE leader. Denny, we appreciate your support.

The subject of a declining number of naval engineers is clearly not a new one. I’ve been concerned with this problem for at least 10 years – probably more, as has everybody in this room. It occurred to me that with all this talent working on this problem for so long, perhaps we should question why we haven’t made more progress, or at least we should sit back and think about what is it that we’ve done and what can we do differently. I will re-endorse George Yount’s suggestion that, in fact, what we need to do is ensure that the problem is properly defined before we go off to work on it.

I was very glad to hear what Admiral Cohen had to say because I think he has some really interesting programs underway, and I think they give us opportunities to work on this challenge in several coordinated ways.

Now, in reviewing the fact that despite 10 years of attention the decline of naval engineers continues, I concluded that perhaps we have been working, all of us, at a tactical or a symptom level as opposed to the root cause level. Clearly the shortage of naval engineers, although very important to this community, is not unique. If you go talk to the aeronautical engineers in their societies, you get a very similar answer. If you go talk to transportation, you can get very similar answers. As you saw by the charts up there – and you have to be very careful with charts – we’re not out of engineers – we just don’t happen to have folks motivated to go do what we believe is critical. Why do we believe that? Because naval engineering is our “sport”, our profession. That is one reason. Because we are a maritime nation – that’s another reason.

So, I conclude, we’re not dealing with just a naval and marine engineering problem. We are dealing with a national problem. It seems to me that we have a supply and demand issue here. We want to supply more engineers, naval engineers, marine architects, than our nation demands. Until we have a national demand, it will be difficult to achieve our objective, if not impossible. I endorse what Admiral Cohen just said, about advertising some of these new technologies and approaches to the Congress. I believe that is one extremely important step.
In reflecting on the decline in naval engineering community over the past 10-12 years, it occurred to me that there is a correlation between that, the membership in ASNE, and the Department of Defense S&T budgets. All seem to have similar declining slopes. ASNE membership peaked in 1988 and has been on a decline since. From about 1990 on, when the “Wall” came down and the “defined enemy” of the Cold War vanished, DoD S&T and R&D budgets have continuously declined. I contend that this decline in DoD research finding is symptomatic of the root cause of the national problem we are working on. I contend that the root cause for the decline in the number of naval and other more traditional engineers is the dramatic shift of national research investment policy. Prior to 1990, the nation invested substantially in long-term science, basic and complex engineering through DoD R&D programs. Since 1990, that national investment through DoD has been dramatically reduced and has not been replaced by other government investments. Instead, national R&D investments are seen as an industry obligation and are thus much shorter term, require a return on these investments, and tend to be concentrated on computer and IT fields.

I believe that today’s national demand for concentrated “high technology” computer and IT investments comes from the a misguided belief that these technologies alone will “solve our economic problems” and thus keep us as the world leader in science and engineering. I contend that this view is short sighted and that the US as a nation is not investing in long-term science, engineering, and technology.

As I look back 10 years or so, before the US started consolidating and closing many of our DoD laboratories and engineering centers, it seems to me that the process we had in place then as a nation, was to put significant research dollars through our defense department as the “national agent” to manage long-term investment in science, technology, and engineering. That is dramatically changed today. DoD R&D budgets are dramatically smaller and commercial industry R&D has increased. Yet, we have not taken the national agent role of managing science and technology, formerly accomplished by DoD, and given it to any other government activity or agency. As a nation we have let it almost vanish. I contend for the long-term, and I’m talking about 10-20-30 years out, only a government organization can be accountable for and manage the long-term process of S&T. Since S&T typically involves areas of interest vice defined products, investing for the long term does not fit the industry profit and loss model. S&T requires paying very talented people to work in those areas and discover things – not invent things. There is a difference between science and engineering, as we all know. I contend that perhaps we have a broken process in this nation that folks have not yet recognized.

Clearly, today’s high tech and other industry investments are exciting, crucial to our economy, and are one vital part of the long view. However, our industry – and I’m part of industry now – is primarily motivated by what is required by the customer base in the next couple of years. Oh yes, we have some very important investment by industry in long term focus areas such as biomedicine, and I see those as essential. Yet bioengineering is relatively new and competes with naval engineering and other fields for the qualified and interested candidates we seek.
I have not done extensive research, so you will have to accept that this is my opinion but I suggest that part of what this two-day forum may be able to do is put some meat on my theory or prove it wrong.

I’m limited in time available, so what I suggest that in the next two days we discuss whether or not there is some basis to my proposition. If there were consensus that there is, I would further say that the community of naval engineers and marine engineers, which is represented here, could, in fact, do something about that. We have academia here. We have our professional societies. We have industry representatives. We put an incredible effort into all of those every year. If we were to develop out of these two days a commitment to work on what I will call a “national initiative”, focused on what it really takes as a nation to have the broad range of technologies that we are convinced will keep us ahead. We need to focus on trying to stimulate a national debate about whether or not we do, in fact, have in place the process as a nation to do that, to generate some real discussion about what industry can and cannot do for us as a nation. We can get industry reps to stand up and tell their part of the story and I will be happy to participate.

In closing, representing ASNE, we are here and prepared to participate in whatever this forum comes up with. We would like to suggest though that we get out of the symptom level of not enough naval engineers, that we get out of the tactical level of trying to figure out how to encourage people who are about to go to college to take this course instead of that course. We suggest doing a root cause to analysis to determine why we are not building the national awareness, and therefore the demand, for our students, our youth, our industries to better support naval engineering. We can utilize RADM Cohen’s initiatives and others to educate Congress and rejuvenate a “national agent” concept for S&T investments, a process that has proven over 50 years to be successful, but which I contend we have lost. As a nation we are pretending that we can outsource it to industry when, in fact, that cannot get us to the goals that we believe are needed.

Thanks very much.

Michel – Our next speaker is Mr. Joseph Cuneo. Joe will be representing the Society of Naval Architects and Marine Engineers. By education, Joe is a naval architect with a business background. He has degrees from Webb Institute and the Harvard Business School. For many years, he was CEO of a shipping company moving liquid natural gas and he is currently a consultant with his own company. He has shown dedication to education over the years, both at SNAME and also as a trustee at Webb Institute, and he is currently President of SNAME.

Joseph Cuneo, Society of Naval Architects and Marine Engineers

I must say it is a little difficult to confine my comments to those from the perspective of the Society of Naval Architects and Marine Engineers. That is because as Keith mentioned, I have a very strong and vested interest in the educational process that produces what Webb refers to as naval architects and marine engineers and what I hear being referred to here today as naval engineers, which is perhaps an even more comprehensive term. I also have spent my entire professional career in the commercial side, from the naval side of the maritime industry.
I have a perspective that spans 45 years in the industry. I’ve seen all kinds of variations. When I joined the industry, the commercial field appeared robust, the naval field was also robust and there was a really strong industrial base to a certain extent cross-feeding technology from one to the other. But, that has all changed now. In our shipbuilding industry, it is basically a non-existent commercial presence, other than for very few vessels being built under the Jones Act protection, which is almost a virtual assurance that shipyards in this country will never, as long as that exists, be internationally commercially competitive. I could go on at length about the industry side, but I would rather hear what they have to say about the educational side, so I’ll try and re-focus what I have to say on what SNAME itself does in trying to support the educational process that we’re all talking about.

First, SNAME has a fairly extensive program of producing textbooks that run the full gamut from small craft to principles of naval architecture to marine engineering, to the offshore technologies. Really, much of the range of what we talk about, or what I’ve been hearing about, is naval engineering. Textbooks are used country-wide and to a certain extent worldwide, because they are excellent texts and SNAME has invested a lot of money over the years in making those texts available and in keeping them in current form. SNAME also has a fairly active scholarship program. SNAME, like ASNE, probably peaked in membership 10-12 years ago. We have been able to maintain a fairly level membership only through an increasing presence of international members, now almost 25% of SNAME’s roughly 11,000 members is of international origin, and by that I mean outside of the United States and Canada. But in our scholarship budgets, we spend a good deal of time and effort trying to identify promising young men and women going on primarily for graduate work. This year, we have apparently had three awardees of scholarships of SNAME who said we don’t need the scholarship, we are going to give the money. That tells you something about either the competition that is existing from universities who are willing to provide scholarships of their own, or the scarcity of people who are going on to higher areas of education in the disciplines related to the broad category of naval engineering. This is more evidence of some of the problems that exist.

SNAME supports student sections. We have about 600-700 student members out of 11,000. But, surprisingly, when the time comes for these students to graduate and go on to professional careers, we lose probably four-fifths or more of them as members. This is another symptom, I think, of difficulties that we are hearing about here today.

We have a commitment to research and technological development. SNAME has a T&R steering committee and under that committee’s guidance, there are some 60+ panels that deal in all areas of research. The budgets are modest and our basic philosophy is to try to provide seed money to generate more serious funding from other areas. Everyone contributes their time voluntarily, and many of these areas of interest and activity may have little apparent interest or apparent relationship to naval vessel construction. However, I would submit to you that many of the innovations that we talk about, perhaps not some of the ones we heard about this morning, but that we talk about in various aspects of shipping do, over time, cross-fertilize. They don’t always come from the Navy to the commercial industry. Rather, I think many of them come from the commercial industry to the Navy. I can’t prove that. I don’t know for a fact that I can even cite a specific example today, nor do I want to. I just think that we have to be very careful
when we talk about where the need is coming from. If it just Navy-driven, that is one thing and that is a specific set of problems. If it is a more broad feeling that we need to be a maritime nation for defense and/or national security issues, that is quite a different issue.

A company I founded with some others and ran for 15 years built eight liquefied natural gas carriers, back in the 70’s. At that time there were highly technological, sophisticated ships, built by General Dynamics, Quincy -- a shipyard that no longer exists. They ran under American flag without operating subsidies in full competition in the world marketplace successfully for roughly 21 years. Those same ships are still running today, all eight of them. They are all registered foreign flag and some still have American crews and some don’t. But, when the time came to re-register those vessels, the Maritime Administration said these vessels are not useful as naval auxiliaries. Maybe today we are starting to think that liquefied gas is a little more important to the American economy that it was 3-4 years ago, even 2 years ago, but the rationale was, because they were not good naval auxiliaries, they are not important from a national security point of view. Well, if there is ever a channel thinking in any one area, I don’t know what was more clear than that because we lost a cadre of trained ship operating personnel to foreign operation with the blessing of the United States government -- that of the Maritime Administration.

What is the budget of the Maritime Administration for research and development? It is like the budget that Admiral Yount talked about earlier – exactly zero – not about zero. However, we call ourselves a maritime nation. Well, ladies and gentlemen, we have four seacoasts if you count the Great Lakes, to the south, north, east and west, and we are the largest trading nation in the world. But, we carry virtually nothing of our international trade in American ships, built in America or operated by American crews, and it has been Washington more than any other single source that has created that situation. You can go back to construction subsidies, operating subsidies, tax laws and the like. They have systematically driven commercial shipping away from the United States. If you want to talk about where is the problem and how to fix it, don’t look to this town to fix it unless the government will respond and listen to the people who understand the industry rather than to what seems politically expedient at a given time.

Thank you.
I’m Edwin Roland, a member of the Marine Board. I am a graduate of the U.S. Coast Guard Academy, did some graduate work at the University of Michigan, and have been in the commercial sector for most of my career. I ran a couple of tanker companies in the oil transportation area and am now a consultant.

I have a few comments to offer to help define what it is this panel will be talking about. The industry panel can provide first-hand to ONR the message of concern. The panel includes ship designers and builders who deal with technical personnel shortages every day. You’ll hear some very interesting perspectives on the problem, which conveys both organizational and personnel issues. Hopefully solutions can be found in both these areas.

Commercial vessel design and construction has found its way overseas. The question is, did the same thing happen with Naval construction? Support for development and improvement of both military and non-military marine vessels requires broad, diverse technical input, well beyond the bounds of naval architecture and marine engineering. However, I would argue that naval architecture and marine engineering is the foundation that provides a definition of the operating limits of the units and the capability of the units. I think naval architecture and marine engineering is the key. The graduates with this specialty are disappearing, primarily because of the lack of dollars and because of the attractive engagement elsewhere. We can bridge this gap by retraining technical specialists, or we can figure a way to rebuild the naval architecture and marine engineering industry. Re-trained specialists may help to bridge the gap, but I’m not sure they are in a position to advance to state-of-the-art. I believe that we need to identify the weak spots.

The focus today is on the problem that faces ONR; however, the problem is broader than naval research. The entire Naval infrastructure or maritime infrastructure of this country is becoming weaker, and solutions must recognize the entire maritime environment. The U.S. foreign trading Merchant Marine is gradually becoming extinct, despite federal subsidies. The problem here is higher cost for U.S. flag operations. Of course, shippers shop for the cheapest price, and U.S. flag operators are hard pressed to match foreign competition. With declining large merchant vessel building, U.S. shipyards have a reduced need for retaining design expertise. The same goes for foreign flag operating companies based in the U.S. They compete at a disadvantage because of tax differentials and have been migrating overseas. Therefore, design offices, which support these operations, have moved offshore as well.

This is a tough picture, but not without hope. The Jones Act shipping and associated businesses are quite healthy at the moment, and appear to be growing. This is not, of course, equivalent to naval operations, but it does provide demand and employment for graduate naval architects and marine engineers.

The other bright spot is the offshore business. Much of the industry is based on the U.S. Gulf Coast. This business is booming. At a recent offshore technology conference in Houston last week, 45,000 people attended. This is an exciting, leading-edge technology, closely associated
with the naval operations, but unfortunately U.S. maritime training schools, that is naval architect and marine engineering schools, have been slow to recognize this as a source for employment of their graduates.

An interesting fact that I heard just last week – some 40% of the American Bureau of Shipping business is now done in the offshore area. Think of what that means in terms of employment and the importance of that industry. I think this will provide a basis to rebuild. Obviously, there is more than just depending on the existing opportunities though.

It is my job now to unleash this panel on you. As I have said, this is a good panel of breadth and depth, with an interesting diversity of opinion. We will start with the shipyard representatives and move to ship design in the order of presentations.

The first speaker is RADM Millard Firebaugh, Vice President and Chief Engineer at Electric Boat Corporation in Connecticut. He is a retired Admiral, engineering duty officer, mainly submarines. His last Navy assignment at NAVSEA was Deputy Commander Design and Engineering and Chief Engineer. He is a member of the National Academy of Engineering. He has a doctorate from MIT in ocean engineering.

**RADM Millard Firebaugh, USN Ret., General Dynamics/Electric Boat**

ONR recently discussed their NA/ME education proposal with shipyard representatives. ONR’s program was going to involve a commitment of resources annually – in the ballpark of about $15 million. The funds would be for research and development activities for faculty in NA/ME, which would provide for new naval engineering knowledge and capable faculty for education. This proposal received a somewhat hostile reception from the shipbuilders, which I think was a surprise because looked at uncritically, it seemed like a good idea. The question is, why would the industry representation react negatively to what seemed like such a beneficial activity for the industry?

I’m hoping to shed a little light on that now. I’m not addressing the broad scope of the initiative, but rather just dealing with why I’m here representing my company, General Dynamics/Electric Boat Corporation. I’m not representing the industry as whole, although I have been present at the presentations made to industry by individuals representing the ONR initiative.

At Electric Boat, we are a ship design and engineering company, a naval engineering company, and we are a ship construction company. I put them in that order to emphasize a particular point today. If I had a different audience, it would be a different order. But, for this audience, it is important to understand that my company has gone a long way past being simply a shipbuilder. You should take away from this that we are a naval engineering entity. We employ, in my piece of Electric Boat, about 3,000 people split between what we call designers, which is a blue collar occupation, and engineers. The designers create the design representation of the actual pieces and components that will be built. We provide design products to our waterfront for submarine construction and, in the case of the Virginia Class Submarines, to the Newport Shipbuilding
waterfront where it gets built. In the Electric Board/Newport News Teaming Agreement, construction of Virginia Class Submarines proceeds in both shipyards.

I mention this because there is a tremendous amount of integration in our business. This is a highly integrated enterprise -- the conceptualization, the creation of requirements for design engineering, the design embedded in the engineering, followed by a lengthy construction experience. There is a tremendous amount of tie-in every step along the way. This needs to be a very integrated process. Increasingly, the work involves combat system and combat system electronics and communications, that is the electronics that goes into the ship.

For the academics in the room, I’m not suggesting that academic programs should be decided by people with the supposedly short-term view of the industry. The industry, at least as I experience it at Electric Board, has a short-term view embedded in the long-term view. I believe it would be a great help in the process of forming the naval engineering university research and teaching agenda if the industry got a vote, not necessarily a definitive vote, but an opportunity for a real say in the academic process so that there could be enhanced relevance to the program.

I believe that through such integration there could be a somewhat more focused and energetic program. It will also be an incentive to those in the industry to spend more time in the academics and improve our prospects for hiring graduates of these programs.

We need a strong approach to improving the connection between government, academia, and the shipbuilding and repair industries. This is not a new idea. There are several ongoing efforts that follow such a collaborative model. One in which we are involved is the National Shipbuilding Research Program, which focuses on a somewhat different segment -- the shipbuilding process itself, as opposed to focusing more on the technologies that underlie the products, which would be fundamentally the theme of the ONR activity we are discussing here.

Another ongoing effort is the Gulf Coast Regional Maritime Technology Center located in the University of New Orleans at the Avondale shipbuilder. It combines shipbuilding activities, including the vendors and supplier base, who have their own engineering staffs and who contribute a great deal to our process, with the academic institution, the University of New Orleans.

With regard to next steps, I think this conference, among other things, needs to identify potential approaches. We need to select the best candidate. We need to quickly evolve and mature our approach and get moving.

Roland – The next is Bob Scott, President of Gibbs & Cox, a naval architect and marine engineer group. He has had 42 years with that particular company. He is Past President of ASNE and is still active in SNAME.
I’m speaking on behalf of the independent naval architectural community and I have several associates of mine here with me. You have heard a lot about the problems we have in maintaining naval engineers and so forth, and I think that has been pretty well covered. Rather than go after that particular problem, I have a particular issue that I want to talk about and that is the dissemination of R&D information to our community – not just the naval architects, but the shipbuilders and everybody else in the user end of this process. Even though we do get involved in actual development of R&D, our real role is in using research and development to design ships.

As Admiral Yount pointed out, there has been a major shift in the last five years in the way ships are designed, as a result of acquisition reform. At this point, most of that responsibility is turned over to industry, such as major shipbuilding teams or shipbuilder integrator teams. In each case, there is a fair amount of research and development that goes on as part of that process. In fact, in some cases a great deal goes on. In both the arsenal ship and the DD-21, there is a significant amount of work in the area of signatures, survivability and manning reduction. Even in somewhat more mundane things, there is a lot of R&D in cargo handling, manning reduction, and things to get life cycle costs down.

We’ve been involved in all of these programs, so I am speaking from the perspective of what I’ve seen and some of the concerns I have as to the availability of data relative to those programs that are being developed in a competitive mode. In particular, I see a problem with the exchange of data -- basically, putting the data on hold, certainly until the announcement of an award is made, and even after that. Even though the data on R&D from these programs are developed under government sponsorship, and therefore government funding, each of the industry teams puts a substantial amount of their own money into these programs. I believe there is a natural reluctance to release that data without, shall we say, having arms twisted.

In a case like DD-21, it will probably not be as significant a problem in the sense that both shipyards will share in the production and I think this will create a much more open environment for distribution and sharing of data on research and development activities. In a winner-take-all environment, however, which several of the other programs are, there is going to be a natural tendency of the losing team to try to hang on to the R&D that they feel they contributed to developing. I’m not sure how the government is going to handle this issue to make sure that R&D is, in fact, available.

One of the other problems you have in programs of this nature is when you select the winner, the loser has a bunch of great ideas in their design – no question about that. Some very good R&D initiatives should be cranked back in if you have the luxury of doing so. But, the problem is that in most cases none of us has either the funding or the time to go back to square one in the design and start over again to incorporate those ideas. As a result, many of them end up on the cutting room floor in terms of evolvement in that next program.

We have seen a lot of this in the aerospace industry where we have had these fly-offs or shoot-outs where one team wins, one team loses, and it is a while before the loser’s technology can get
put back into the mainstream again. Yet, they will hang onto it as much as they can. So, again, it is a concern I see and I’m not sure how we are going to handle it. But, it is something I think all of us should be aware of. Since we are involved in whatever comes out of this forum, keep in mind that a lot of that research and development is going to be locked up unless we take steps to make sure that it is out there for all of us.

On a somewhat related issue, there is, in fact, a huge amount of data out there. One of the things I think we need as a community is a central clearinghouse for that. Whether it is ONR, SNAME working with ASNE, the universities, or whatever it might be, we need some way to get that data visible to all of us. The availability of the web obviously makes it much easier. I think all of us are getting quite adept at furrowing through whatever databases exist out there of research and development projects. It would be nice to have a single, centralized clearinghouse with necessary links to other programs and so forth that would allow me to go in – if I’m doing a propeller design, just hit propeller and everything falls out of that – everything SNAME has in their database, everything that ONR has, and everything at NSWC, etc. I think that is something that would be of tremendous value to all of us and it is not going to be cheap, but I think it is absolutely essential. Certainly we in the independent naval architecture community would look forward to something like that.

Roland – The next speaker is Marc Pelaez, Vice President of Business Development at Newport News Shipbuilding. He is a 1968 graduate of the Naval Academy. He served for 28 years in the Navy, retired with a rank of Rear Admiral. His experience in the Navy was very broad, and included command of nuclear-powered attack submarine, Sunfish. In his last assignment in the Navy, he served as Chief of Naval Research. Upon joining Newport News in 1996, he served as Vice President Engineering until he assumed his current position.

**RADM Marc Pelaez, USN Ret., Newport News Shipbuilding**

I think George Yount had it right – we have to define what problem we are trying to solve here. We cannot solve everything in two days. If the focus is on what ONR can do, then I think we need to address that. If part of it is what the ONR program should be, then we need to develop solutions that are consistent with what ONR’s real capabilities are.

I think we all acknowledge that the naval environment is unique and complex and the Department of the Navy must invest in areas that are critical to ensuring naval superiority. I think today we have the greatest Navy in the world. Nobody is going to try to build a competitor to us today. They are going to focus on anti-access and other things to thwart our ability to operate, but they are not going to build peer competitors to us.

That said, we are in the midst of a huge slowdown. Other people have talked about it. We have an almost non-existent shipbuilding industry and I would say that without subsidies there wouldn’t be one. In education we have two fundamental goals – recruit and educate students, Bachelor through PhD, and sustain the faculty. All these things are feeding towards something called jobs. Falling out of those jobs are three branches: creative ship researchers, designers,
and constructors. I would like to make some observations that I think will be useful in the rest of our discussions, and at the very end I’ll make a few points I think we should have as take-aways.

With regard to jobs, the market is limited. If you look to us at Newport News for instance, as for naval architects, we have approximately two dozen. We hire, in a really big year, two. So, that puts it in context, and we are a pretty big engineering and design house. More importantly, a number of the individuals that we have working in our naval architecture department actually started in other disciplines – civil engineering, for instance, and went on to get graduate degrees in naval architecture. In the hydrodynamics area, we have a handful. On the other side of the coin, we have trouble hiring the numbers of electrical engineers that we need. Therefore, it is safe to say that in today’s environment, the pull from industry for specialized students in the marine field is limited, if you are looking at the shipbuilders.

I would now like to address those two other pieces that we are talking about, the education arena and the innovation arena. Again, I would like to put both of these in the context of ONR’s role.

On the education side, I will offer the following observations. We are, in general, not getting the cream of the crop nationally in the maritime-specific disciplines. We are over-capacity in the creation of maritime unique undergraduate degrees for the job market available. Now, what we should not do to fix this is create some mechanism to try and sustain the entire infrastructure that we have today. I believe we should let Darwinism play out in the university infrastructure. I believe that leveling leads to mediocrity and that clearly runs counter to our objectives.

Secondly, it is not at all clear to me that innovation in the marine field is best served if we don’t broaden our horizons. Some of the most exciting and innovative work is coming out of the aerospace industry, which is more vibrant and arguably more exciting than ship design today. I would move more towards broader undergraduate degrees -- students who are well-grounded in engineering and have sound exposure in different fields, in addition to the marine field, such as aerodynamics.

That said, we do need to have mechanisms to excite and attract this talent and this, I believe, is where ONR plays a role and I think that Jay Cohen’s comments today actually were on the right track. We need to have an ongoing program of grand challenges in naval engineering, spurring competitions and new thinking, a truly competitive effort with a future. That “with a future” is an important underlying point. By that I mean there needs to be a continuum from basic research through engineering development and higher. Some programs that actually design, build and test, on a meaningful scale, create innovative concepts. I believe that it is about creating programs, not centers or institutions.

Another very important point is that it is very nearly impossible to put technology on the shelf. We can do it in some of the design areas, and we can actually build our libraries and we do need to do that and I don’t want to take away from that, but in general, technology doesn’t sit well on the shelf. Therefore, it is important that once these efforts mature and begin to be aligned with real Navy insertion opportunities, that ONR stands ready to adjust programs to insure the risk is sufficiently defined to allow its incorporation in a new ship design. I don’t think we do that very well at all.
I don’t think that, in general, the research side of the house, the S&T side of the house, really understands the few program sides of the house where there are opportunities to insert, and the point at which we shipbuilders have to make commitments and decisions in that process to mitigate the risk of delivering the platform.

My hat is off to ONR. They have done some interesting things. I think the DD-21 actually is arguably the only real new ship hull design that has a chance for production in the near future. There hasn’t been a bad opportunity for us to get some real innovation going in terms of ship design.

In summary, I would like to make the following points for you to consider today and tomorrow. First again, let Darwinism play out in the university infrastructure. We have probably too much maritime-specific and we need to broaden our views. Fund innovative science and research programs competitively. Do not establish mechanisms that are little more than welfare programs. Do have national challenge initiatives. Do not set up an entity to oversee them that will attempt to find common ground and keep everyone in the game, which is the thing we tend to do. Do look to new players to meet these challenges – open it up. And, last but not least, involve industry in a timely manner so that the new ideas you develop have a real home.

Thank you.

Roland – The next speaker is Duane Laible, who has served the marine industry for nearly 40 years in commercial vessel design and construction. He has spent 30 years with Glosten Associates, a Seattle-based marine engineering and naval architecture consulting firm, serving clients worldwide. The firm has designed a significant portion of the Pacific Northwest tug and barge fleet, and serves the ferry fleets of the Washington and Alaska. Mr. Laible was Glosten’s President from 1981 through 2000, and now serves as Chairman of the Board. He is a member of SNAME and also a trustee at Webb Institute.

Duane Laible, Glosten Associates

I come from a background of what would be called the industrial vessel base. This is not the big ships, but it is a very important segment of our diverse industry. A very important aspect of our industry is the support that ONR, the National Science Foundation, and other government programs provide, albeit not directly to our industry. Let me just tell you some things about the program influences that have been important to me and to my colleagues and my competitors in the design of these industrial vessels.

The first is people. We have complex problems in small ships, just as you do in the large naval combatants and certainly the large commercial ships. The problems are not any less challenging and to address them effectively, you need good people. We have, in our office, any number of folks who have benefited from study under ONR grants in advancing their education. It is a very important aspect of our work to have the kind of support that ONR provides our universities.
Similarly, the basic information that ONR programs provide in funding scientists and doing basic research enhances information that is available to us on ocean environments. That kind of work is being used today in this little project we are doing moving a large concrete platform out of the Arctic. There is a researcher who is funded by ONR, whose data we are using directly, as well as the underlying baseline data that are important to doing the routing of that move. It seems very straightforward, simple and practical; however, I know that we wouldn’t be able to do the work that we can do today in serving our segment of the industry without the underlying work that has gone on before. All I can say is that I think we must encourage continuing that contribution and that investment.

Thirdly, there is a very practical and simple business opportunity that I can attest to in my personal career. I have had the privilege of working on essentially all of the AGORS that have come out of the Navy over the last 35-40 years. A long time ago, I participated in re-powering the AGOR-3’s. I worked on the Hayes, the AGOR-16. I was involved with the Melville and Nora – the AGOR 12 and 13. Those ships are incredibly successful and they are doing important work. Today, we have the privilege of participating in the design of the new ship that will support scientists working in high latitude research.

This is just a very direct application of the work that our basic research programs have contributed to our industry, which is, at first blush, very far removed from the esoteric things that go on here. But, I have to say that the problem is general and our needs are not unique. But, without that support, our industry is going to die. We still have the water out there and I look out the window of my office and I see Puget Sound and tugs, barges, ferries, and research ships. I see the occasional large foreign flag containership, but the people that make up that waterfront are Americans who are working in furthering the needs of the local community and the broader national community and may need the work that we’re going to address here today.

From my perspective – the need is simple. We need effective leadership. I was excited by Admiral Cohen’s comments that he is going to embark on what I think is an exciting and creative public relations activity. I think public relations is a big part of what we need to do as an industry and I know that Joe Cuneo feels the same way and SNAME is going to embark on furthering the presence of our industry in the consciousness of our nation. We need effective leadership here in Washington and we need effective leadership in every segment of the industry to make our citizens appreciate the fact that the water we are surrounded by is an important part of our whole lifeblood and we are the people that have to make sure that is used effectively.

Thank you.

Roland – The next speaker is Bill Rogalski, Program Director with Northrop Grumman Litton Ingalls Shipbuilding and currently Technical Director of the DD-21 goal team. Bill has over 25 years in ship designs, specifically early stage design and systems engineering. He is a graduate of the Naval Academy. He has a Masters in naval architecture and marine engineering. He is a fellow of SNAME and a member of ASNE, and has been active in both societies.
What I would like to do today is primarily focus on people, specifically naval architects and marine engineers. We do need naval architects. We need systems people, and naval architects have historically been systems people. We need technical people, but we need technical leaders and we need people with creativity and vision. I think that is where the real problems are that we are facing today. We have to build for the future. As was noted earlier today, we had one person under 40 in the room. I’m not sure that is reflective of the demographics of our total society or our total industry, but nevertheless, we do need to look toward the future. And to do that, we need to be putting people in the pipeline, into our industry, but even more importantly, we need to retain the people. I think the issue is one of making sure we have a pool of quality people that forms the foundation of our future leadership of the industry. It is that leadership which, in my mind, is the critical issue.

We’ve talked a lot about us being a maritime nation and I think those of us in the room agree that is, in fact, the case. We are a maritime nation. However, the focus of our nation has always tended to be away from the shore. The great expansion of the United States has been westward. When you talk to the average citizen, he or she probably has very little realization of the importance of maritime commerce and maritime superiority to our overall national health. On the other hand, you can tell someone you’re a naval architect and when they ask you what does a naval architect do, and you say, I design ships. We have a real perception problem and I think the key to a lot of this is making sure we get the right story out so that the right perception becomes the right reality.

As was mentioned earlier by Admiral Yount, there are a number of motivations that bring people into any profession and more specifically into our industry. One is job satisfaction or job challenges – quality of the work itself. That plays an important role. The other is basically job security. What is my future like? Do I have a future? And what is the potential for growth in my career? The third is compensation. Compensation takes different forms. It is your actual salary, salary and bonuses, whatever, but it is also the other benefits – the vacations, the time off, and some of the other things that Admiral Yount mentioned. The three combine to add up to total job satisfaction, and those are the things that recruit the people, and if they are done right, those are the things that retain the people in our industry. In some cases, we must be doing something wrong because there has been a trend over the past 10-12 years – it has happened all along but I think it has accelerated – we are losing the good people. The good people see those three things as being much more attractive in other areas and they go out and leave our industry. The key is determining how we restore our industry to a position of preeminence or prominence with respect to potential careers.

Part of the answer is that our industry really does need an advocate. Naval architects and marine engineers need an advocate. We have talked a lot today about making people excited about it. Admiral Cohen talked about some of the initiatives that he is trying to do to bring what we do and the exciting things we do out in front of the people so they really have a better understanding and realize the importance of it, but also attract people to the industry. I think it is that advocacy that we are missing. Engineers are good engineers generally, but they are not good salesmen. They tend to be very focused on the problem – the problem being a technical problem – but I
don’t think we sell our profession to the outside world, and I don’t think we sell our profession to people we want to bring into it or keep it as well as we should.

I think one of the things we really need to take out of today’s sessions, and I know this has been a topic of discussion in the past and it is something that professional societies have always wrestled with – how do we, in fact, ensure that advocacy? How do we tell the story and how do we tell the story from Congress on down? Until we can sell ourselves to the outside world and broaden our horizons, then I think the tendency will be for us to continue to contract or at least hold our own. I think growth really does require a strong advocate position on the part of the profession, on the part of the societies, and on the part of the industry in ensuring that we are, in fact, seen as one of the places to really be.

You can draw some analogies. You go to Europe and in many of the countries of Europe, particularly Scandinavia, the maritime professional seems to have a much more preeminent position in society and is understood and is more appreciated. In a lot of cases, wheat it takes to carry out something like this really comes down to policy issues. That is not to say we, within our profession, don’t have to do things to improve; however, we also have to recognize that there are policy issues that we have to somehow influence. Thank you.

Roland – The final speaker will be Paul Mentz, who is presenting material from Peter Gale of J. J. McMullen, who unfortunately is not able to be here this morning. Peter has been engaged in ship design for over 40 years. He is currently involved in DD-21 goal and previously served as Professor of Naval Architecture at Webb Institute. Peter has some unique views in terms of the perspective of young people in early-stage ship design as it currently exists in our naval engineering and maritime community.

Peter Gale, John J. McMullen Associates, Inc.

I speak from the perspective of a ship design firm, that is, a design agent. Design agents seem to have been ignored in the advance briefing materials for this workshop. However, design agents have played a key role in early stage ship design in this country in the past, are doing so today and will continue to do so in the future, I believe. My focus in these remarks is on the education, recruitment, training and retention of skilled ship designers.

This is basically a supply and demand issue. The key is creating and maintaining attractive jobs. High quality talent will be drawn to attractive jobs and held there. What are the characteristics of attractive jobs? Surely these characteristics include a good salary; exciting, challenging work; important work, stability of workload; and job security. We must analyze the jobs that are currently available in early stage design. Where are these jobs? How many positions are there? What is the salary structure? What is the stability of these jobs? How can we make these jobs more attractive?

The current job market in early stage design is unstable and fragmented; pay scales are low. In general, the field is little known and the industry is perceived by those in the general public who are aware of it as a stodgy, over-the-hill, retracting industry with no future in this country.
Even within the industry, it is not clear where the responsibility for early stage naval ship design lies and where early stage design is performed. Acquisition reform and the downsizing of NAVSEA have created a fragmentation of responsibility and design activity. Contrast this with the situation in 1959 when I was considering a job in this field. At that time, there was only one place to work if one was interested in early stage naval ship design: the Preliminary Design Section in the Bureau of Ships, Code 421. Today, it’s not clear to anyone where early stage design responsibility lies. SEA 05 has been downsized nearly out of existence. NSWC-CD is taking over the responsibility for early stage design, or is it? Under acquisition reform, early stage design responsibility has been turned over to industry, or has it? We read that there is insufficient work to sustain our six major shipyards. Ownership of the yards is being consolidated. Design agents are closing their doors or are being bought up, often by larger firms active in other fields. The current situation is confused, at best, and the future is bleak. This is bound to be a negative for attracting young talent into our industry.

Pay scales are low. Starting salaries for naval architects and marine engineers are typically in the mid-40s, near the low end of the scale for engineers. Even in our industry, the oil industry is typically paying their naval architects and marine engineers $15k more in starting salary. The low industry pay scales are the result of the intense competition. The government is the principal customer for ship design work these days and the government has become very good at driving costs down by competing all jobs, large and small. For some large design/build competitions, such as DD 21, the government will pay for a portion of the design work. In many other cases, designs developed for competitive proposals must be developed at the shipyards’ own expense. This forces the shipyards to cut the amounts they are willing to pay for design support. The design agents can’t cost share; they have no IR&D budgets and no big overhead accounts.

The early stage design workload is very unstable with large swings between peaks and valleys. Little thought is given by the government to leveling the industry workload by phasing major programs so as to provide increased job security.

R&D funds for the traditional ship design and HM&E technologies have always been meager. In recent decades they have been further cut. More research funds are required for the basic ship technologies. In addition, research in the ship design process itself is urgently needed. Our overseas competitors are far ahead of us in such research, which has not really been addressed in this country. The NAVSEA R&D budget line for early stage ship design was historically funded at $30M to $40M per year. Over the past six or so years, this line has been progressively cut until this year it has essentially disappeared.

It seems to me that the numbers and the quality of recent graduates in naval architecture and marine engineering are adequate for the current downsized and retracting industry. I don’t have access to data to confirm this, however. I do know that we at JJMA have been successful in hiring quality early stage ship design talent when we need it. At the present time we have six or so young total ship naval architects less than five years out of school in our Alexandria office. They are as good as any I’ve ever worked with. We have had greater difficulty retaining top talent over the long term. All too often after a few years of experience, top young talent will
leave us to attend business school or law school or take a position with a firm in the computer field. This often occurs in one of the workload valleys between exciting large projects.

How can we make the jobs in this field more attractive? In order to sustain a viable industrial base for early stage naval ship design expertise, the government must artificially generate work on a continuing basis. A continuing concept formulation effort for major ship types could be used to fill in the gaps between major new ship development programs. ADM Sonenshein initiated such activity in about 1970 when he was COMVNAVSEA. The CONFORM program died in the mid to late 80s in the face of funding cuts. Responsibilities for early stage design within the Navy must be clarified. The in-house early stage design organization must be identified, strengthened and given increased visibility. The R&D funding line for early stage design activity must be restored and augmented.

Design competition fosters design innovation. Competition between design teams focused on real, high priority needs should be encouraged. We need to link practitioners with academia. The idea of structuring design teams with government, industry and academic members is a good one. Mini-competitions involving feasibility studies and point designs can be executed at low cost. In this way, students can be exposed to the exciting real world of practical engineering methods and problems. Some can be expected to “take the bait” and sign up for long and fruitful careers in the industry. Much more emphasis must be placed on mentoring, teaming beginners with seasoned veterans who can guide and critique their work. Bear in mind that most upper level ship design skills are learned on the job after leaving college. Experienced ship designers can also be brought into the classroom to present lectures and advise on design projects. This offers the potential to “turn on” students and attract them into the industry.

I’m not sold on the idea of National Technology Centers, Research Centers, etc. I need to better understand the concept. I’m concerned that such Centers might divert R&D funds from more urgent needs, create unnecessary bureaucracy and overhead expense, further fragment early stage naval ship design activity, and focus precious design talent on academic “make work” design problems rather than real, pressing national needs.

Finally, the government must be willing to pay more for design work if the industry is to offer more attractive salaries to young architects and engineers.
Each panelist briefly introduced himself.

Michael Bernitsas, University of Michigan
I am Chair of the Naval Architecture and Marine Engineering Department at the University of Michigan. I joined the faculty in 1979 after doing my undergraduate and graduate degrees in our field. My teaching and research interests are mostly in marine mechanics, with funding coming from the Office of Naval Research and the offshore industry.

Chrys Chryssistomidis, Massachusetts Institute of Technology
I am the head of the Department of Ocean Engineering at the Massachusetts Institute of Technology. I have been a SNAME member since 1970. My research interests are both in seakeeping as far as ships are concerned, and maybe for about the last 10-11 years, I’ve been working almost exclusively in autonomous underwater vehicles. I have ocean graduate education from MIT.

Roger Compton, Webb Institute
My undergraduate degree is naval architecture and marine engineering from Webb Institute. I wish I could say I have a research interest right now, but I’m the Dean at Webb Institute and that completely eliminates that kind of thing. I spent 32 years at the U.S. Naval Academy in the Department of Naval Architecture and Ocean and Marine Engineering, without the marine engineering part. I’m here to represent what must be considered a feeder institution to both the industry as well as to my colleagues here who have graduate programs since we are strictly undergraduate at this point.

Bahadir Inozu, University of New Orleans
I’m the Chairman of the School of Naval Architecture and Marine Engineering at the University of New Orleans. I am also the Director of the Reliability Operation and Maintenance Division of Gulf Coast Region Maritime Technology at the UNO. I joined UNO in 1990 after getting my Masters and PhD from the University of Michigan. My research interests are in ship repair and maintenance, hull diagnosis, and simulation of marine propulsion systems.

Wayne Neu, Virginia Polytechnic Institute
I’ve just finished my 20th year at Virginia Tech in the Department of Aerospace and Ocean Engineering. I’ve been the Ocean Engineering Program Coordinator there for about the last 10 years or so and was recently named the System Department Head for the whole Department. My research areas have been in fluid mechanics and in ship design.

David Byers, Naval Postgraduate School
I’m here probably as the most junior member of this illustrious panel in that I’m a visiting Professor at the Naval Postgraduate School. I am permanently an employee of the Naval Sea Systems Command and Head of the Innovation Center. I have been at the Postgraduate School for the last eight months substituting for Professor Chuck Calvano, who is head of the Total Ship System Engineering Program there. I have been teaching in that program since September.
background is general naval architecture with a specialty in hydrodynamics. I have both my Bachelors and Masters from the University of Michigan.

**Kurt Colella, U.S. Coast Guard Academy**
I’m Chief of the Naval Architecture and Marine Engineering Section at the Coast Guard Academy, which is part of the Department of Engineering. I’m a 1981 Academy graduate in Ocean Engineering. I got my Masters from MIT in Naval Architecture and Marine Engineering and a PhD from University of Connecticut. My research interest is fluid mechanics, but my primary mission is providing the Coast Guard with the best officers I can provide them with.

**Bruce Nehrling, U.S. Naval Academy**
I’m the Chair of the Naval Architecture and Ocean Engineering Department of the U.S. Naval Academy. I’ve been there since 1975, having received my Bachelors and Masters and PhD from the University of Michigan prior to that. I teach the design courses to those students majoring in naval architecture at the Naval Academy.

**Jose Feminia, U.S. Merchant Marine Academy**
I am Head of Engineering at the U.S. Merchant Marine Academy. I’ve been there for six years. Prior to that, I was in 31 years of City Maritime College which I chaired the Engineering Department for 21 years. My undergraduate work was in City Maritime in the area of marine engineering, and my graduate work was in mechanical engineering from CCNY in New York. I’m a licensed marine engineer and licensed professional engineer in New York State and I’m Past President of SNAME.

Spaulding – In a spirit of cooperation, the university group here has selected one of their individuals to make a presentation. This is extraordinary cooperation and surpasses anything we could possibly dream of happening. In any case, Mike Bernitsas is going to present a summary of the university panel’s perspectives.

**Michael Bernitsas, University of Michigan**
There are some faculty members in the audience today who have contributed directly or indirectly to this presentation and I would like to acknowledge their contribution: David Burke from MIT; Tom Lamb from the Transportation Institute University of Michigan, Transportation Research Institute; Kirsi Tikka from Webb; and Bill Vorus from UNO.

On behalf of the universities, I would like to make a statement regarding the role of the universities in this national responsibility initiative. We believe it is going to take a joint effort of academia, government and industry in order to achieve the goals of this national naval responsibility initiative. We have already seen goals of the national naval responsibility initiative are to develop people, to expand the knowledge infrastructure, and to cultivate innovation.

We would like to make three points. The first is the need for a strong working environment. In other words, what we can contribute and how our contribution would be better coming from a strong academic environment.
Second, we would like to take a few minutes to explain to the community the challenges we face in our environment. Of course, the bottom line for not doing well in attracting students is how well we do not only in this community, but also in the academic environment where we compete with other departments, not just naval architectural departments.

Third, we will talk about the needs of universities to succeed. We will present two conclusions that our panel has reached.

Regarding the first goal of this national initiative, which is to develop people, I think we have to consider that universities are the beginning of the pipeline. It supplies future designers and analysts of marine systems. We educate typically at three levels – bachelors, masters, and PhD levels. Typically, the bachelor’s degree is an incubator of designers. The master’s degree is an incubator of analysts. And the Ph.D. is an incubator for professional researchers. Of course, there are lots of exceptions to these rules. There are lots of designers that have a Ph.D. and they are very prominent in their profession.

Also, universities provide new research. A very important factor is continuing education for faculty because we need to continuously upgrade our knowledge and our ability to teach. Universities also provide consulting resources to government and industry.

The second objective of this national initiative is to expand the knowledge infrastructure and universities contribute to this in two ways: first, by generating new knowledge typically at the research level, and second, by educating people who are going to develop further knowledge. Again, this is the beginning of the pipeline, so we want to make sure this is a good beginning.

The following exemplify what typical universities do to expand the knowledge infrastructure:

- Pursue new ideas and design concepts.
- Develop new tools for designs of new concepts.
- Develop new tools for analysis of new concepts.
- Identify and solve basic research problems in marine mechanics.
- Maintain relevance of applications.
- Introduce new tools for design and analysis into curricula.

You have heard about diversity and you’ve heard about funding from other industries as well. Applications drive people to the corresponding industry -- not just faculty, but also the graduates.

The third objective of this national initiative is to cultivate innovation. We need to teach in universities the latest in ship design concepts, teach students to think innovatively and develop new concepts, and both develop new technology and implement new technology.

What challenges do we face in universities in order to succeed? First, engineering departments compete for everything – students, faculty, positions, resources, space, etc. -- with all the other departments. For example, when a faculty member retires or leaves because the person doesn’t make tenure or because he or she finds a better job, the faculty position disappears. Departments have to compete with all the areas that are currently hot, like computer science, microelectromechanical systems, and biomedical engineering. In order to be able to get a position from the
college, we need to make sure it has a research future, particularly in research universities where educational need alone cannot secure a faculty position. Equally important is status, because students are aware of which departments have high status and they want to go there.

Second, nationally we compete for research projects to support between 3.8 and 4.8 faculty months per year plus students and facilities. Third is the need to maintain diversity and flexibility. This is particularly true for small departments, and most of our departments are small within our college of engineering. We need to integrate well into the college of engineering. Here we have a situation where the measure of success within our environment is different from our measure of success in this community. On the one hand, we want to have relevant applications, work on issues that are important to our field. On the other hand, we need to be a member of the college of engineering community. We need to work on multi-disciplinary projects, be integrated well into the college. We have examples of departments actually larger than ours that have been marginalized and they get practically zero resources from the college of engineering. The better we integrate into the college of engineering, the more successful we are considered by college of engineering standards, which is important to us.

A typical example – 4-5 years ago it became very clear not just from the Office of Naval Research, but from many funding agencies, that we have to diversify. If you go back this many years, you will see that 90% of the applications at all levels – Ph.D., Masters and Bachelors – were marine related. At this point, one-third of our funding comes from the Office of Naval Research; one-third comes from other government agencies, and one-third from industry – not the traditional naval architecture industry. Automotive, aeronautics, mechanical and offshore industries are funding our programs. Of course, you understand that applications educate people. So, we may be feeding other industries.

Many people probably have pointed out that research may not be of as direct use to the shipyards as to some other sectors of our industry. On the other hand, research educates faculty as well. We invest our time in bringing all this new knowledge into the graduate and undergraduate program. We do that because we love our profession, we love the naval architecture and marine engineering field.

Something that has been taking quite a bit of our time in recent years, the past 5-6 years, is how often we need to make changes to the curriculum because of the fast-changing nature of engineering education.

Another issue is the diversity of our industry. We have industries that need completely different education. For example, if you compare shipyards to the offshore industry, the type of education that they need is very different. Our prime responsibility is to educate students for a 30-40 year career. Another issue is to keep the best U.S. students in the graduate program and in that respect, the Department of Defense and ONR scholarships have been very effective.

A problem we face, and I think it is important in our industry, is skewed demographics. There are many state students and few naval architecture and marine engineering students. The statistics, for example, from the University of Michigan show that two-thirds of our undergraduates are from Michigan. Therefore, we do not have a nationally diverse group of
students. This means that from a typical 35-student class, 22 are Michigan residents, about 10 are from the rest of the states, and 3-4 are international students. That means we are not tapping to the entire population of the United States. Other universities like Webb or MIT or UNO or VPI may not have that problem; however, at Michigan it is a typical problem.

A shrinking pool of Ph.D.’s is a problem we are facing recently. We do not get as many applicants for faculty positions as we used to. I remember 4-5 years ago you would find typically 80-100 applicants per faculty position. This is down to about one-third. In fact, most applicants are not from our own field. Our experience shows that the people who don’t have education in our field, either undergraduate or graduate education, take quite a few years to integrate, to understand our profession and be able to teach effectively in the undergraduate program. Some of them don’t really integrate well.

What needs do we have in universities in order to succeed? We need assistance in many areas. We are trying in all of these areas. We are doing well, but I’m sure we can do a much better job. First, feeding the student pipeline. I think that societies, both SNAME and ASNE, can help in that respect to make our profession more attractive. This is a very time-consuming task for our colleges and departments. Second, it is important to develop exciting new concepts with visibility to attract young people. We need to bring out new concepts that will become challenging and very exciting for young people. Third, the ONR and government labs can definitely help in deciding which are the important relevant applications for our curricula. Fourth, attracting funding for innovative research on the order of $300k per year per faculty member. Finally, teaching the latest in design. This could happen in two ways: one by faculty taking sabbaticals and two by industry people taking sabbaticals and teaching at our universities.

We have two conclusions. First, a strong academic environment is needed in order to be able to achieve the goals of the national naval responsibility initiative. The other is that universities cannot succeed in the competitive academic environment by focusing on national challenge initiatives unless (1) NCI’s include innovative basic research; (2) they deal with future design concepts; and (3) that NCI’s are multi-disciplinary. This is important for integration of our departments within our colleges of engineering. Even though that drives some applications away from our immediate field, it brings new knowledge and interaction with other disciplines.

We agree that funding must be long-term and continuous. By that I mean that if it is not continuous, faculty and students, are going to move to areas where there is funding, whether it is the automotive industry or projects from NASA or other disciplines. That does not mean in any way that we want funding to be in the form of subsidies. If there is no fundamental contribution in research, researchers and new faculty are not going to make it in research universities. The purpose of having long-term funding is to make sure that people stay in our field, and the longer we stay in our field with relevant applications, the more effective we are going to be in continuing research and in teaching. Thank you.
I’m the Head of the Ocean and Marine Program at Texas A&M University. I guess I got my practical experience working with a shipyard a long time ago. We are going to finish up the academic component from the perspective of the various academies. I would like, first of all, to address the fact that the academies are not just other educational institutions that are only different by virtue of the fact that the people attending classes there wear uniforms. There is more to it than that. Our format will be somewhat difference, in that I am going to ask a set of questions to each of the academy representatives. Through this series of questions, we’ll have an opportunity to explore the differences between the academies and the research universities we have heard from, and also a lot of the similarities and the common problems that are shared between them.

I will first turn to the U.S. Naval Academy and Bruce Nehrling. Are you concerned about having an adequate number of qualified faculty for the future?

Nehrling – The short answer is yes. I see a major shortage of qualified faculty to teach naval architecture, ocean engineering, and in those schools that still offer it, marine engineering. At the Naval Academy we have hired two Assistant Professors recently, one in composites and one in hydrodynamic turbulent flow (their specialties). They are both excellent and they are both long-term people on a tenure track, and we expect to get very good service from them. However, the pool they were selected from was very small and very limited. We did well, but I did not have the whole breadth of choices that probably would have been good.

Another thing that the Naval Academy is doing through the Navy is that a permanent military professorship program has been established in which, at the Commander level, we select Navy officers to send back to schools to get PhD’s and then they come back to the Naval Academy to fulfill their time in the military to mandatory retirement, which would be at the 28-year point for Commanders or if they go on to Captain, to the 30-year point. We currently have a student at MIT working on a PhD who is going to come back to the Naval Academy and another one at Monterey, also working on a PhD at the Naval Postgraduate School. We are using those two venues, hiring of young, new people, freshly minted PhD’s, as one source, and then trying to develop within the Navy itself some officers that can come back and teach at the Naval Academy. Nonetheless, I do see it as a major problem.

Edge – What do you think about the future of students coming into naval-related programs, that is naval architecture, naval engineering, marine engineer?

Nehrling – We have a slightly different issue at the Naval Academy. The students come to the Naval Academy and then they select their major. We can make naval architecture fairly attractive. We will graduate 25 later this month, whereas normally, we graduate around 20 each year. We will also graduate about 45 ocean engineers and that is a very typical number. That is about what we can sustain with our staff and faculty. However, I think attracting these students into these engineering majors is becoming quite competitive. Many are leaning toward systems engineering or electrical engineering or aerospace, and it becomes a competitive issue. One of
the things we have done and done fairly well with our experimental facilities is to have some very interesting ongoing research that attracts the students. For instance, this last semester we had some students working on a hydrofoil swath design and also on a submarine with some diver support small submersibles attached to it, looking at the resistance and flow patterns and so forth. That tends to attract the students when they see work like that going on. They become more interested. Anything that is innovative or has pizzazz associated with it will attract the students. However, it is a problem finding students that want to go into the marine industry.

**Edge** – What do you think other academic institutions and organizations could do to help attract more interest in naval engineering, naval architecture, and to basically get more academy students at the Naval Academy?

**Nehrling** – I think the issue is to find students, as was mentioned and alluded this morning. Not that many people know there are naval architects out there, where ships come from – the question that came up this morning. I think for all schools, this is a pipeline. The input to that pipeline has to be kids coming out of high school. At that level, they have to have some idea that there is something out there called naval architecture or naval engineering or ocean engineering – whatever you want to call it – which could be exciting and interesting and could have an interesting future associated with it. If they are aware of that, then they can head in those directions and go to those schools that offer these programs.

**Edge** – How many of the students that are in naval architecture at the Academy, do you think, are staying in the profession?

**Nehrling** – I don’t have any hard figures on that. I would say 15-20%, if I just had to guess. It varies though. My graduates are a little bit unique as with the Coast Guard here. They go into an obligated service of five years and they get training as a Junior Officer plus their technical education as, say, a naval architect. Then their career patterns can go anywhere. We have several different directions. We have students that go into surface warfare, submarines, aviation, Marine Corps, and all of those things. Some of them just go completely out of the industry and go off on a different direction and never return to the naval architecture community. Others have stayed in it, either through their Navy jobs, as we have seen by some of the people who spoke here earlier this morning, and they get out of the Navy and stay in the industry and we have several that are doing that, some in this room. I think they have the credentials to do a lot of things and if the opportunities are there in the marine industry, they will pursue it. If not, they will and do and can go elsewhere.

**Edge** – I turn our attention now to the Merchant Marine Academy. Professor Jose Femenia, could you share with us your perspective of why you think the academies are so important?

**Femenia** – I will be speaking from the point of view of marine engineering, since the Merchant Marine Academy does not offer a degree in naval architecture. We have three separate programs in marine engineering. One program is called marine engineering. It is a non-ABET accredited program. We have a program called marine engineering systems, which is the largest Academy program and is ABET-accredited. We have a relatively new program called marine engineering and shipyard management, which is also ABET-accredited. Our program is very different in that
they are nine academic semester programs and three semesters of co-oping. Our co-oping is essentially going to sea, although with the shipyard management people, they have to spend at least six weeks in the shipyard. Upon graduation, they get the BS degree and they also get a U.S. Coast Guard license in the Merchant Marine and that is a requirement for graduation. Therefore, they all have to be licensed marine engineers.

Why are they so important? Because they are the seed corn for the industry in marine engineering. The academies – and I’m talking about the academies in the generic sense including the six state and regional schools and Kings Point -- put out the bulk of the marine engineers that go into the profession and practice marine engineering. My definition of marine engineering is that segment of the industry that deals primarily with the energy conversion, cargo pumping systems, cargo handling systems aboard the ship. It is the mechanical systems, thermal systems, and the fluid systems aboard the ship.

Whereas most of the Academy graduates go to sea directly upon graduation, after sailing for a couple of years, the majority of them come back and go into the industry, whether it is the shipyard part of the industry or whether it is a supplier as a sales engineer, applications engineer, design engineer, or whether it is a consulting firm. They do remain in the industry.

A significant number also go on to graduate school -- not as many as I would like to see do so -- in the area of engineering. Many of them will go on to graduate school in the to obtain MBA’s, become lawyers -- a lot of them do become lawyers.

Edge – What are the recent trends in enrollment and what do you project it to be for the near future?

Femenia – Our enrollment is pretty steady, although the Academy takes in approximately 275 mid-shipmen every year. Historically, that particular population has gone about 55% engineering and 45% deck. Today, it has flip-flopped. We are getting about 45% engineers and about 55% going the deck route, and that is because some very new, innovative programs have been started. In particular, there is a program called Intermodal Transportation, a very futuristic sounding program, to which many students are attracted. Our population is pretty standard. We graduate about 100 marine engineers per year.

On the other hand, the state schools are having a tough time, and I am taking a little leeway speaking on behalf of the state schools because there is nobody here from the state schools. Having been at one for 31 years, I think I understand their problems. The state schools are in trouble. If you look at the total number of graduates in 1996 and compare them to the total number of graduates in the year 2000, there was about an 18% drop in engineering graduates from those schools. I think this is a trend that is going to continue. The total number of graduates in those schools is approximately 175. That number is somewhat misleading because many of those schools have had to take on related programs in order to stay alive. By related programs, I’m talking about programs that use the same skill sets as marine engineering, but programs that are really focused at other industries. As an example, facilities engineering has become a pretty popular related program at some of the state maritime schools and that is because the kids are getting extremely good job offers upon graduation. They are trained for the
U.S. Coast Guard license, like the other students. They do count in that total pot of marine engineering graduates. But, the fact of the matter is that many of them have no intention of going to sea, and many of them have no intention of going into the marine industry but to other lucrative industries.

Realistically the trend is down and unless we can slow it down, I think you’re going to find many or some of the state schools getting out of the business. I think some of you are aware that SUNY Maritime had to go through a major battle over the last two years because they wanted to make it simply a conventional school within the system and forget about the marine engineering or the marine aspects of the school. In the eyes of many administrators, this little school in the Bronx had already outlived its useful life and they were better off converting the campus to what we used to call our SUNY Bronx rather than SUNY Maritime College. Fortunately, the alumnae stepped in with a major financial commitment and a major political battle, and got it to temporarily back off that particular initiative. I think you’re going to find a lot of the state schools going under that kind of pressure. Schools are a business. If you can’t guarantee throughput, you don’t exist. That is the name of the game. It is a real fight for these state schools to keep their marine programs and keep them healthy.

**Edge** – Let me also ask you to succinctly share with us what you see as the major conflicts, problems, and challenges facing these engineering programs at our national and the state maritime academies.

**Femenia** – Let me start by saying that I think the educational process is very similar to a manufacturing process. The output of the process is really a function of the quality of the raw material and the quality of the massaging that took place in getting the people out. The fact is that in the marine field, we’re not getting the highest or I should say the best prepared candidates around. There are a lot of competing professions out there trying to capture the same individuals that we’re trying to capture. We do not have the flair that the industry should have, and consequently, many of the young people who could go into engineering or into the marine field are opting for what they consider much more futuristic type of professions such as the IT professions, the computer professions, or much more lucrative professions such as Wall Street, business administration type activities. In the eyes of many of them, it is a lot less work and they see the payoffs as being a lot higher; in their eyes, making it the smart decision. The bottom line is that we are competing for those individuals and, in many cases, we’re losing out. I say that in a generic term – not for one school or another school.

The other big issue is upon graduation, many of the graduates coming out of these schools see alternative industries as being industries that have a much brighter future. It was said numerous times this morning that it is an issue of perception. People out there do not know about the industry. People out there in the general public think the industry is part of smokestack America and in their minds they are convinced there are many other ways of becoming professionally successful.

We at Kings Point have undertaken an effort to go out and really put some flashy documentation together. I have left some copies in the back. We spent some money to get these kinds of brochures, and my plans are to send it to all 14,000 high schools in the nation, send them a
couple of copies so that the guidance counselors can see what is out there. Another point is the guidance counselors – I don’t know how many of you have worked with guidance counselors in high schools. Many of these folks have no clue about engineering. Many of them have been pure secondary school educators their entire lives and have gone into guidance counseling. Bottom line is that they do not know engineering, much less marine engineering. You talk about marine engineering and you talk about naval architecture and they haven’t read anything in the papers or magazines about this profession, and if it is not going into the computer business or not going into the financial business, they rule it out as anything worthwhile for young people. It is a major issue we face.

Edge – Let’s now turn to the Coast Guard Academy. Commander Colella, what do you consider to be the real key accomplishments of the Academy and what do you see as some of the problems in the future?

Colella – I think we are, at present, doing a fairly decent job with the quality of our graduates in terms of graduating them from a quality program. Certainly, as has been mentioned, throughput of students is the problem and certainly the field needs our students very badly. There is a shortfall in the number of people that can contribute to the naval engineering program and marine safety fields that really could use an academic background like this. Our main problem is throughput.

There is a very real difference between a cadet or a midshipman and a typical college student. Certainly, it is a four-year program by design, with no options for a fifth or extra semester. We take about 320 students into our program and graduate a little more than half of those who enter (this percentage has increased over the past 20 years). I don’t think that we are necessarily getting the top tier students coming into our program. Certainly, the academies get good students – there is no doubt about that. But, they get surrounded with a lot of other things. A typical cadet day includes 5-6 class meetings, a two-hour training period in the morning, and required sports activity (intercollegiate or intramural) period for two seasons after classes for two or more hours. There is required community service and also a comprehensive summer training program in preparation for serving aboard ship as a junior officer in the Coast Guard. Somewhere in there you have to get an accredited four-year engineering education and it is a difficult package to juggle effectively. That is our dilemma.

In terms of the students, our challenge has been from a variety of different fronts. In some cases, we are finding that the students are ill-prepared from the start. There are a lot of engineering “wannabes” out there. Possibly they are putting engineering on their application form with the thought they will have a better chance of getting into the institution. In any event, we are finding that a lot of students are coming in with, particularly on the math side, with calculus on their transcripts – or what they are calling calculus – and they really don’t have any skills in trigonometry or algebra. It is like putting the roof on the house before we put the framework in place. We find that a lot of them don’t make it (about 50%) to their second year, are changing their major, or being dis-enrolled. We lose them to other majors for a variety of different reasons, not the least of which is the nature of the discipline. In terms of naval architecture and marine engineering, I know we want to beat our chests and say it is difficult, it is tough, it is challenging and that is something we can proud of. On the other hand, it does scare students
away. They see the only lights that are on in our engineering building in the middle of the night are the ones in our labs. The engineering students (as well as others) who are going through the Academy, have a five-year commitment after graduation. They receive the same pay as any junior officer. If they were an engineer, they had little or no discretionary time (or free elective courses) at the Academy. If they were a humanities major, they had very few labs, and less class hours -- i.e. more discretionary time to “enjoy” themselves.

Edge – Once they graduate, can you give us an indication as to how many stay on in the naval architecture and marine engineering field after five years?

Colella – If I were to take the past 10 years, we don’t have much data. We have data for the past four or five years and we are in the 15-20% range that stick around at the 15-year mark. The good news is that more and more of them seem to want to go to graduate school. That doesn’t necessarily mean they want to be in the Coast Guard when they are doing that. What we’re trying to do is make those two things come together.

As I was saying, the nature of the discipline is such that we are a very broad discipline and as a result, you have to work very hard in a lot of different areas and the students get scared away in many cases. Another thing is the nature of the service – I’m sure the Navy is the same way. I like to think the Coast Guard has an unfair advantage over the Navy in that we can throw the humanitarian and the environmental stuff in there and really hang on to some of the things that high school students really react to these days. But, the nature of the service is such that many of the students come through and want to be Coast Guard officers more than they want to have a specific major. They want to be basically true to the mission of the institution, which doesn’t say anything about the program from which they graduate. It is just contributing to the nature of the service in which they are interested. We’re trying to throw on top of that, the real need for technical people.

Edge – I will now turn to Professor Byers from the Naval Postgraduate School, which is educating people who probably are largely experienced and have been out in the field. Can you tell us a little bit more about the differentiation between the Naval Postgraduate School and the other academies?

Byers – The Naval Postgraduate School is a bit of a unique situation. The program is total system engineering and was established about 9-10 years ago when there was a recognition back then that the Navy wasn’t doing a particularly good job of having its HM&E and combat systems people talk to each other. One of the objectives of this program was to facilitate an understanding of what the total system was on junior officers or at least officers at mid-career level, as they moved into more responsible positions, they would bring the systems perspective. The program is not a degree program. We do not grant a degree in a Masters of total ship system engineering. The students get a degree in one of the conventional engineering degree areas – electrical engineering, mechanical, applied physics. They have a specialty in total ship systems engineering and that is a program of eight courses taken over five quarters. It is in addition to their core requirements for whatever their degree program requirements are, and their educational skill requirements which the Navy requires. The point is, the students are highly motivated, they are basically volunteers and they want to do this. The reason they want to do it
is that they see a real pay-off for them in their future careers and future responsibilities in program management within the Navy.

The program is in its 10th year. We have had about 4-15 students per year, depending on the make-up of the group. This year, interestingly, in addition to our U.S. Navy participants, there is a class of 11. We have four international officers involved in the program as well, and that trend is increasing dramatically as word of this program spreads overseas. There is intense interest on the part of the foreign Navys in having their officers participate in this program.

Edge – What is the Naval Postgraduate School planning to do for the future – something different than in the past?

Byers – Well, some of you may be aware last September, we had a new superintendent take over the school, Admiral David Ellison. He has recognized that one of the real growth areas in the Navy as a whole is in the field of systems engineering and systems analysis. Of course, naval architecture is inherently a systems discipline. Looking at the success of the total ship system engineering program over the years at the Postgraduate School, he had the idea to use that as the nucleus for a new organization that he has established called the Institute for Systems Engineering and Analysis. This organization brings together a number of multi-disciplined programs such as total ship system engineering, as well as others outside of the purely marine field that we have had going at the school. This new entity serves as a clearinghouse not only for education, but also for research.

We have already established a Board of Advisors chaired by Admiral McGinn. His job will be to provide input as to possible programs that the students in this institute can work on that are truly multi-disciplined. The first one we are doing this year will be a new, smaller platform for tactical sea-based aviation. It is drawing in not only the total ship system program, but the students in the aviation design program and the systems engineering and integration program as well.

Edge – This morning Admiral Pelaez suggested we consider reducing the number of programs because we are producing more than we need. Do you agree with this suggestion?

Byers – There is a magazine called the Labor Review and it had an article last June about gauging the labor force effects of retiring baby-boomers, which basically built upon some statistics put out by the Bureau of Labor and Statistics. Two specific things in the article drew my attention. They had a table titled, “20 occupations with the greatest percentage of workers aged 45 and older, permanently leaving the occupation, 1998 to 2008”, listing 20 separate occupations. The first one listed was fishers, hunters and trappers – 88.5% were going to leave. The second one listed was water transportation occupations – 76.7% were going to leave. The second table in that article was titled, “Of the approximately 100 occupations with the greater than average number of workers aged 45 and older, 1998 to 2008”, the top one is water transportation occupations – 76.7%. It is quite obvious to me that at least from the seagoing part of it, the number of graduates coming out of the state academies and the federal academy, are not going to be able to keep up with the number of openings that are developing. If you look at the shore-side need for marine engineers, there is no way you’re going to keep up with it.
Edge – Do you think the university research environments are doing enough to provide the replacements for you when you retire or move on?

Byers – No, because I think the universities are, right now, primarily focused on the naval architecture part of the industry. I do not know of any of the university centers that are putting out what I call marine engineers.

Nehrling – The Naval Academy discontinued its marine engineering major effective with the class of 2000. The class that graduated a year ago was the last class of marine engineers that the Naval Academy is going to graduate. That program was eliminated because of lack of student interest. Enrollment became very low over a prolonged period of time and it was deemed not practical to keep the program. That source of marine engineers, and it was a major one over many years, is now gone.

Edge – I would like to ask the other members of our panel if there is anything that we’ve covered so far that you would like to add to or things we haven’t covered that you would like to contribute?

Colella – One thing brought up earlier is a valid point – getting students involved in actual work in shipyards. Because the students of today are very hands-on oriented, that kind of experience turns them on. From my experience, most students would rather be out in a shipyard than sitting at a desk. At the Coast Guard Academy we try to get them involved in internship and field-related activities and we really end up running out of time in the summer to do that. We are really trying to make a push and provide some practical exposure to shipyard-like activities.

Edge – Do you think that is an area where we could have a nexus between the shipbuilding industry and the academic/academy environment by having more internships available, funding more internships on an annual basis?

Colella – I think that would help. The one thing I have found with internships that funding is an absolute necessity. Also, from the academic as well as the industry side we must have someone taking personal ownership over the actual internship, because these things can easily backfire on you. If the student comes back from an internship and doesn’t have a good experience, at least at the Coast Guard Academy, in the next three years the students are going to be affected by it, and I mean really affected, to the point where you will see a movement even if one experience shows up on the radar scope. Taking ownership over these and nurturing the students of today is an important part of it.

Byers – I would like to add something to my remarks earlier about the systems engineering and analysis institute. We are here today obviously to talk about what resources can we marshal to solve the problem that we’re defining in terms of naval engineering education. You recall I mentioned that in the total ship system program, we are having the significantly increased interest by international students in participating in that. The thought is that if we have a problem in this country, or if there is certainly a need in some cases, in our case at the graduate level, to provide some advanced or mid-career level education in naval architecture or related
fields, certainly there is an opportunity here to open the program to increased civilian participation. Now, that has always been the case. In fact, we recently had someone from the Naval Surface Warfare Center go through part of the program at Postgraduate School and get a doctorate. It was not in naval architecture, obviously, but he took advantage of some of the courses there. The point is that the Postgraduate School represents a resource not only for the uniform Navy, but for the civilian Navy as well, if we choose to expand and pursue civilian mid-career education there.
I want to tell you that I had a lonely moment right before lunch. Do you remember when Ed Roland asked all of you who had graduate or undergraduate degrees in marine engineering or naval architecture to stand up – and the whole room stood up? I was over there on the right side sitting by myself. You’re saying, oh she had a lonely moment maybe because she is a woman? That wasn’t it. Maybe because she is a Kings Pointer? That wasn’t it. It was because I am a Deck Officer in a sea of naval architects and marine engineers and I’ve got to tell you it is a lonely, lonely place to be. I appreciate those of you who have been gracious enough to talk to me. I realize it is counter-cultural for all of you – extend your hand and introduce yourself. I also realized if the conversation went on that you may not be too happy to hear from me. I’m the Director of the Information Systems Program at Le Moyne College and RPI, and half of our graduate program is comprised of naval architects and marine engineers who are re-tooling themselves to get out of the industry. (I have asked one of the panelists to watch my back as I leave here so you don’t throw any stones at me.) I’m a guest, as a Deck Officer, and I provide opportunities for those of you who don’t want to be in the maritime industry to be engaged in maritime research. Over half of our funded research is maritime research. While some of you may perceive me as the enemy; trust me, I’m not.

Our first speaker is Gregg Hagedorn, Executive Director of the Integrated Warfare Systems Program at Naval Sea Systems Command. He is a career field manager for engineers, scientists, and mathematicians at NAVSEA.

Gregg Hagedorn, Naval Sea Systems Command

For those who may not be familiar with NAVSEA, it is the Navy organization that buys and maintains ships and the systems on ships. It is a fairly large organization in the Navy – about 46,000 people in a lot of different locations. I point out that I am the Career Field Manager for Engineers, Scientists and Mathematicians because about one-third of our workforce are graduate engineers. We do have some scientists – maybe 10%, and some mathematicians – they are mainly computer scientists – we call them mathematicians because of the personnel system of the government. We employ around 14,500 engineers. You saw a chart that Admiral Yount showed earlier – the pie chart showing different ranges – by my count, that represents two-third of the naval engineering workforce. I’m not sure exactly where it starts and where it ends, but if you read the various studies from the Bureau of Labor Statistics, it gives you numbers that show there are about 25,000 professionals in the naval engineering business. We represent a good piece of that – perhaps over half of that.

Currently, we hire 34% electronic engineers (we call this naval engineering because it goes way beyond the naval architecture and the marine engineering); 25% mechanical engineers; 12% generalists, which means they have reached the point in life where they can do anything; 9% nuclear engineers, mainly in the shipyards; and only 5% of our workforce is naval architects.
Just as an aside on that, the Office of Personnel Management is looking at the naval architecture series and wondering whether it should continue. We were out there trying to talk to them and say that it is, in fact, pretty important. There are about 750 naval architects in the federal government and most are in the Navy. There are some in the Coast Guard and other organizations, but that is the total inventory in the federal government. There are about 140,000 engineers in the federal government, so it represents about .5%. OPM is saying that they look at the overall personnel system for the federal government and wonder whether that is a viable job specialty in the future.

The basic product areas that we look at, and we recently went through this exercise to figure out what kind of folks we should hire in the future. What is core for us? What should we rely on industry for, and where are we going to have to focus on? We came up with nine things. We are kind of gravitating towards that as an organization. This is where we will try to keep some pockets of capability. These include:

- Ship design, construction and repair. We have always relied on industry for ship design, but we still have some role to play in there. But, we still have to have the oversight of construction and we operate four public shipyards who are still in the repair business.

- Ship systems – generally speaking, that is all the machinery, the various auxiliary and main propulsion systems which there is a quite a variety of them. There are some 100,000 makes and models of stuff that we have on the active fleet.

- Surface ship combat systems – the total warfare systems, strategic weapons systems, as in the naval part of that.

- The others are ordnance; undersea command and control systems; undersea weapons and vehicle systems; and warfare analysis and assessment.

These are not small little pockets of two or three people. These are fairly large groups – 1,000 people, 500 people, several thousand people fall into these nine basic categories. We hire from a lot of different schools and because we are in about 30 geographical locations, we tend to hire people who will tend to stay in the area. If you hire somebody from the West Coast and you bring them to the East Coast, a lot of times it doesn’t stick, so you tend to hire locally. Last year we hired about 800 engineers. That just barely replaced the losses we had. We hired 800 and we lost 800. Of the 800, I think 55% were right out of school. By saying right out of school, they were 20-year-olds that may have been in an interim job or off in Europe or something like that. But, they were 20-year-olds. There is another 15% were in the 30’s and 15% in the 40’s and 15% in the 50’s. It worked out that a little bit over half were in their 20’s. Our largest form of attrition has shifted from the classic 30-year retirement to people who leave our service with the Navy to go primarily to other industries. To your point, they come in and they see a better opportunity.

I was asked to maybe hit on our largest challenges. First, and not in any particular order, is to support an increasing ship design workload. It is actually going up. But, we have quite a variety of design teaming environments. They are not very consistent. I’m not saying that acquisition
reform is a bad thing, but it is something we have cope with and it is something that is a little different. What we have tried to do is bring in a wider range of the workforce into the picture with ship design. We have tried to do it all at headquarters, but now we try to spread it out and bring the specialty areas that are at these various locations in to participate primarily with private yards or integration agents.

Another challenge we have is exercising technical authority. This is making sure that the sons and daughters of America are on ships that are relatively safe and we know what we’re doing. However, we have to do it under a variety of service arrangements, everything from the classic government has the entire picture, to where it is relatively contracted out. That is causing us an adjustment – not impossible, but a change.

The third thing that we have to deal with is the support of legacy ships and systems. Once the thrill is gone and it has hit the 25-year mark and there is not a lot of investment in it, but we are going to try to stretch it out. As an example, the FFG-7 class, the Oliver Hazard Perry class, the Navy decided to extend its life by another 15 years. There are new concepts for warfare. There are questions about where defense is going and where warfare is going and trying to look at the Navy after next.

The last thing, which has been discussed, is the electric warship – going from electric drives and integrated propulsion, to the all-electric ship. There is some kind of re-configurable warship that is fairly consistent and something that is quite a bit different from the past. Thank you.

Grabowski – Our second speaker is Jean McKeever who is Associate Administrator for Shipbuilding at the U.S. Maritime Administration. Jean is responsible for the Agency’s Title XI Ship Financing Guarantee Program, as well as tax deferral funds for ship construction. In addition, she oversees MarAd’s naval architecture, marine engineering, production cost review and productivity improvement services. Mrs. McKeever has served in various financial and analytical positions at MarAd, most recently as Deputy Director of the Agency’s Office of Ship Financing. She has also served as the Chief of the Division of Capital Assets Management and Chief of the Division of Subsidy. Ms. McKeever holds a BA from Mt. Holyoke and an MBA from Frostburg State University.

Jean McKeever, Maritime Administration

It is a pleasure to be here today to discuss this increasingly critical and important subject to our industry. What I want to talk with you about is what we at MarAd are doing to try to help in your effort and to point to some of the things we have done in the past with the hopes that we can continue these things in the future and maybe cooperate in more adventures that we decide would be to our mutual advantage.

I think it always helps to begin remarks by making sure everybody in the audience understands your organization’s mission and at MarAd we have a twofold job: The first is to support a shipbuilding industrial base for national security objectives, which of course ties into the naval
aspect. We also are mandated to promote a self-sufficient and internationally competitive commercial shipbuilding industry.

This shows that we need employees who can understand both commercial and military R&D worlds and try to make the two go hand-in-hand. I don’t think it is any secret here that MarAd is far from being a deep pocket in the R&D world. We have no R&D budget to speak of, and many people are consequently skeptical of how much we can contribute to a process such as this. I would like to go over some of the things we have done in the past that, relatively speaking, involved a fairly minimal outlay of dollars, just examples of what can be done if we have the wherewithal.

Over the years, MarAd has championed many industry innovations to improve productivity, to adopt best business practices, and to encourage partnerships. Some of these examples are the development of integrated tugs and barges for ocean transport in partnership with others; self-unloading bulk gear for Great Lakes vessels; double-stack railcars and railcar and barge car floats; and automated engine rooms.

As many of you know, MarAd also hosts the Marine Transportation System’s National Advisory Council. The MTS is an initiative that was begun a couple of years ago and it has become increasingly important and it is very high on Secretary Mineta’s radar screen right now. It is a vehicle that we hope we can all use to further our common interests. The National Advisory Council is a committee that is made up of senior business and association heads in areas ranging all over the waterfront, so to speak, from labor, ports, shippers, ship owners and operators, and other major segments of the marine transportation industry. We have hosted the biennial MTS R&D National Conference, held here at the National Academy of Sciences in November of 1999, with the next one scheduled for November 2001. There are only six subcommittees of the National Advisory Council and one of these deals with information technology and R&D issues. If you follow the MTS, and you really should because as I say it is becoming increasingly more important, you should be aware that funding research for applied technology in ports, shipbuilding, and intermodal terminals is very much on their radar scopes and they are actively looking to promote these things.

We, at MarAd, as most of you also know, have worked closely with the Navy on the Maritech Advanced Shipbuilding Enterprise Program that is a follow-on to the old DARPA Maritech program. Unfortunately, it is drawing to a close. But, over the time we have helped with that program, there have been 40 projects that were valued at $172 million that MarAd was assigned to administer. I would say that most, if not all participants, were very happy with this program. John Welch, who is the Senior Vice President of General Dynamics, expressed his pleasure with the programs and the Sea Powers Committee just six weeks ago noted improvements in manufacturing and technology advances have a direct impact on capability, affordability and productibility.

Several years ago MarAd established a National Maritime Resource and Education Center as the government’s commercial shipbuilding advocate. That helped U.S. shipbuilding and allied industries improve their competitiveness in world markets, and this has been a fairly low-cost
effort as well. We have also led the development effort for standards for vessel-related technical information which was essential in developing an electronic database of ship safety records.

To borrow a military term, we have been at the pointed end of the spear when it comes to doing something about the shortage of marine engineers to the extent we can, keeping in mind our funding limitations which we’re all subject to in different ways. The U.S. Merchant Marine Academy, as you know, is one of only five federal academies and it reports to MarAd’s administrator. The Academy trains young men and women to become officers in the U.S. Merchant Marine and graduates receive U.S. Coast Guard licenses as deck and engineering officers or both, and Bachelor of Science degrees. Graduates are supposed to serve as necessary as reserve officers in the Armed Forces. I think NAVSEA would confirm that Kings Point serves the single largest pool of Naval Research engineering officers for their command.

We have a number of applicants interested in Kings Point, but again, due to funding, we can’t really increase the number that we accept, even if there were to be an upsurge in interest, since tuition, room and board and books are free, and then somebody would have to bear the cost and that is the government.

We support our six maritime academies financially as well, providing student incentive payments and these are at California Maritime, Great Lakes Maritime, Maine Maritime, Mass Maritime, Texas Maritime and New York Maritime. We have worked with the U.S. Transportation Command and academia, together, through CCDOTT, the Center for Commercial Deployment of Transportation Technologies. That is a joint TRANSCOM, MarAd, University of California at Long Beach project. We are working with the Delaware River Port Authority on an agile port study and this is a marine terminal capable of accommodating military surge and sustainment cargoes while minimizing disruption of commercial operations within the terminal.

We are also helping to support a new commercial shipyard at in Philadelphia. We just entered into a loan guarantee commitment to help them build their first containership there, and this is to help them make a go of that new enterprise which involves very advanced engineering techniques.

These things show that MarAd is a serious partner in shipbuilding, but most of what we do is contingent, of course, on adequate funding. If we receive adequate funding and we can continue to work with our partnership with academia and the private industry, I think we can make further strides ahead. Thank you.

Grabowski – The next speaker is Captain Jeff Gamble from the U.S. Coast Guard, who has a B.S. in Ocean Engineering from the Coast Guard Academy, and a Masters in Naval Architecture and Marine Engineering and Mechanical Engineering from the University of Michigan. He has 23+ years of experience in ship maintenance, conversion and repair, and most recently, Jeff oversaw the ship design, construction and delivery efforts of the Coastal Patrol boats at Bollinger Shipyards and the Icebreaker Healig Program at Litton/Avondale Shipyards. He is currently the Chief of Naval Engineering for the Coast Guard.
CAPT Jeff Gamble, United States Coast Guard

I’m here on behalf of my boss, RADM Ronald F. Silva, U.S. Coast Guard, who is the Assistant Commandant for Systems, or more affectionately known as the Chief Engineer of the Coast Guard. RADM Silva regrets that he cannot be here personally to express his thoughts on this serious issue on the future of naval engineering in our country, so he has requested that I speak on his behalf and I’m honored to do so.

As Martha indicated, I’m the current Chief Office of Naval Engineering of the Coast Guard. As such, I have responsibility for the maintenance and repair, programming, planning, budgeting and policy development for some 200+ ships and 1,400+ small boats, with an annual budget that is never enough, with about $1.6 million a year. We also provide human resource management for the 360+ naval engineering officers and over 5,000 naval engineering technicians who jointly provide the support to keep the fleet operating to fulfill our Coast Guard missions such as search and rescue, law enforcement, migrant interdiction, fisheries conservation, environmental protection, aids to navigation and icebreaking, just to name a few. These dedicated Naval Engineers are the ones that deliver the engineering plant operating expertise and maintenance and repair and logistics capability for our Coast Guard fleet in an era of increasingly austere budgets. I might also add, I learned in an offline discussion with CDR Curt Colella, we will be adding another 54 engineering officers in training by the end of this week to the ranks. If you add those in and then subtract off who is going to retire this year, we will still be around the 300-400 range of Naval Engineering officers.

What is our challenge? I wanted to share with you some things many of them previously mentioned. There are some common challenges that we can work on together. My challenge, as the Chief of Naval Engineering, is similar to those already expressed earlier today by many industry and academic counterparts. Quite simply, what it boils down to is how do we attract, mentor and maintain the necessary quantity of those quality Naval Engineers to “get the job done”. Our current status in Coast Guard Naval Engineering is, frankly, alarming. Attrition in our middle grade officer ranks has produced a critical shortage of engineers where we need them most as engineer officers afloat. Also, almost one-third of those Naval Engineering officers occupying Coast Guard engineering program billets are less than fully qualified, given our standard progression of qualifications. Moreover, 43% of our mid- to senior-grade officers in the O-3 to O-5 ranks are now eligible to retire, and a full 57% of them could retire by the year 2004. So, you talk about the graying of a community, we are definitely there.

Even worse, the attrition rate for naval engineering junior officers is higher and has been higher than the rate of other junior officer specialties for the past 10 years. The bottom line is we must do something to stem this outgoing tide of talent.

What are some possible solutions? You’ve heard a number of things today and some of what you’re going to hear is a repeat of those. One possible solution is to expand our view or our definition – which when I wrote this I never knew there would be so much discussion today about the definition of Naval Engineering, so I guess this is particularly appropriate. But, in the Coast Guard, I really think we need to expand our definition of what constitutes Naval Engineering. While this is not necessarily a new concept, especially for our U.S. Navy...
counterparts, the creation of the mechanical engineering major for instance at the Coast Guard Academy approximately 6-7 years ago has made a positive contribution to our overall engineering pool of talent. Likewise, I believe we need to expand and look closely at other areas such as systems, software and human factors engineering as vital components of a more robust Naval Engineering program.

Another potential solution is to continually seek to learn what motivates and what inspires students to want to become naval engineers. Someone earlier commented on two characteristic motivators, peer recognition/visibility and interesting work. We are going to be following up on these for sure in our studies and our evaluation of motivational factors.

Similarly, along those lines, (although there were some viewpoints to the contrary), I think it is still worth looking at the salary aspect. For years, we have paid other professionals within our military communities, such as aviators, extra bonuses for their particular unique professional skills. So, right now our human resource community is working on an initiative for monetary bonuses for our Naval Engineers. Again, the size of these bonuses would be linked to the level of qualification attained, dependent on whether you were an Apprentice, a Journeyman or a Master.

In addition to potential financial incentives, we must be able to communicate to these new engineering recruits that they have a bright future in naval engineering. Again, it gets back to the salesmanship aspect that so many of you articulated so well earlier. How do we communicate why this is such a fun and exciting thing to do, and why would you want to spend a lifetime doing it? These up-and-coming engineers need to know that their potential career path is filled with challenging and exciting possibilities. This is one of the things that I often tell the new folks that come into our office at Naval Engineering at Headquarters -- I challenge them: “I brought you here not to think just about the job you are going to do for me in this tour, but I want you to think about the next job that you’re going to do for the Coast Guard, and then I want you to think about the job you are going to do when you leave the Coast Guard, because I think the Coast Guard and the Navy and other organizations like that are the pipeline for future leaders in the Naval Engineering private sector, be it industry, academia, research, or professional societies.”

For example, the typical career path of today’s Naval Engineer could conceivably entail various careers or portions of a career in industry at shipyards or at naval architectural firms, maybe in academia or research, or other government agencies, or in professional societies such as SNAME or ASNE. As an example, I would also like to take the opportunity to recognize Commander Doug Lane who accompanied me here today, a former Professor in the Naval Architecture and Marine Engineering Department at the Coast Guard Academy and now serving as our Chief of Programs in the Naval Engineering Office.

It is just this type of service – this is the extensive network of Naval Engineering that must combine to support the overall ship design, construction, delivery and sustainment programs that have been such a vital part of our nation’s history. I think all those pieces combine to make the total package. It’s that whole cradle-to-grave approach.
So, what is the way ahead? I think from one standpoint it is the rich heritage of Naval Engineering and American sea power that should spur us all on collectively to assure the vitality of a worthy program. We’ve touched on some of these things today, but just in way of reminiscing, as it were, when you look back at some of the major technology advances in history, you recognize the promise of innovation. From sail to steam to nuclear propulsion plants, from vacuum tubes to microprocessors, from semaphore flags to cell phones, and fossil fuel to fuel cells, clearly the common denominator is innovation which offers the path to a very bright future. Indeed, we can see it all around us in the form of programs such as the Navy’s DD-21 or the Coast Guard’s Integrated DeepWater Systems capabilities replacement programs.

A former Chief of Naval Operations, Admiral Carlisle A. H. Trost, commented on this sentiment by quoting a physicist who worked with superconductors who observed “the challenge is not to do something that everyone has wanted to do, rather….the challenge is to do something that no one has yet imagined”! Indeed, I think this thought serves us well. To achieve this, we need the human capital to make this a reality. To do that, we must team among all the groups here today to carry the torch and light the path for future Naval Engineers to follow. As we do that, we must also continue to deliver the message to Congress and the American people that Sea Power, Naval Engineering and the programs behind it are a large part of what has made and continues to make America great.

Let’s go forth together and usher in the 21st century fleet as Team Naval Engineering. On behalf of Admiral Silva and the Coast Guard, we look forward to working together with you all in the days, weeks, and years ahead to secure the future health and vitality of America’s Naval Engineering core capabilities. Thank you very much.

Grabowski – Our final speaker is Stuart Williams who is the Chief Information Officer in the Office of Finance and Administration, and also the Acquisition Manager in the Information Technology Acquisition Office in the Systems Acquisition Office of the National Oceanic and Atmospheric Administration. Stu is the OFA’s first Chief Information Officer. He also manages two other acquisitions within the System Acquisition Office. These are Information Technology projects and the building of the NOAA Fisheries research vessel. As CIO, he is responsible for two other major functions that serve all of NOAA. These include running the NOAA Information Technology Center and managing the development modifications to the existing legacy software at NOAA. Mr. Williams began his career at NAVSEA. He started as a Design Naval Architect, but quickly moved to managing large ship acquisition projects. His final position at NAVSEA was Deputy Director for all special mission ships. In the mid-80’s, he left government service and was named VP of PBI Corporation. He has a Bachelor of Science in Naval Architecture from the University of Michigan, and a Master of Science in Ship Production Technology from the University of New Castle of Pontine, England, and presently is studying at John Hopkins for a PhD in Information Technology.
Stuart Williams, National Oceanic and Atmospheric Administration

I want to give you a brief taste of what is going on at NOAA because most people don’t know the National Oceanic and Atmospheric Administration and what it does. Then, I will serve as a case study or case point of how varied projects you can get into in naval architecture and marine engineering, and perhaps you can carry that back to some other aspect of your lives.

NOAA is about 12,000 people and is composed of some smaller agencies that were gathered together about 30 years ago – small agencies like the National Weather Service; the National Ocean Service, which does all the bottom charting for the coasts of the U.S. and all their harbors; the Oceanic and Atmospheric Research Group; and the National Marine Fisheries Service (NMFS). What has happened in NOAA is over the course of 30 years, they have built 22 ships. They were all built in the late 60’s and early 70’s by these various organizations and then inherited and put together as a fleet. The fleet is run by the NOAA Corps. What happened about 10 years ago, a major program similar to the Coast Guard initiative was put together with $1.5 billion to rebuild the entire fleet and to buy 22 new ships. I was hired then to help manage that rather major effort. What happened subsequent to that is exactly one new ship was bought by the Navy for us and the other ships disappeared in the Congressional review that took place. I moved into IT.

The National Marine Fisheries Service put a request in for six straight years to get specialized fisheries research ships. If you carry away one thing with you today, we are actually buying a set of four ships. We awarded a contract in early January of this year – acoustically quiet and diesel electric plants, highly isolated. I ran designs for the MCM and the MHC class when I worked at NAVSEA and we have all that kind of quieting and more. We worked with David Taylor to do a hull form that is very good for flow into the propeller. We have almost like a pod on a monohull to get good flow into the propellers. The whole point of that was to not scare fish away. The idea is, and what has happened in the fisheries research world is that you want to use sonar to capture the biomass of the various species of fish. If you can do that accurately enough, the one area that NOAA regulates, which is the fishing industry in the United States, we can potentially allow much more fishing to go on in our coastal waters. We do the entire EZ – the economic zone -- both coasts. We set the fishing quotas every year. It is very contentious. We are in court all the time. NOAA has about 27 lawyers working full-time on nothing but fisheries issues. What we are trying to do with these new ships is to be able to go out and capture the data that are necessary to reset the quotas across all the different classes of fish that are out there.

We have learned an awful lot about fish and the interesting part of that, I think, if you look at the challenges downstream and thinking back into naval architecture and the schools, here is an area where I never expected to get into at all, but because there is a demand, this is a small program by Navy standards, but it is four ships and a quarter of a billion dollars, I think over time there is probably going to be a bigger movement into these environmental areas as global warming takes place and we put more stress on these fisheries and we put more stress on reefs. I think there will be more demand for these kinds of ships and this kind of research. I think over time there actually will be more demand for naval architects that understand a little bit more of the environment and that whole aspect of life on the earth.
I have the impossible task of trying to collate what all of you said today and try to put it within some sort of framework that we can work with. What I will do is propose an outline on how to proceed and how to collate the information. The following slides attempt to illustrate some of the key issues and concerns we have discussed

First, what I would like to say is how we got here. Actually, it started in 1996. We tried this once before. We came to the National Research Council – it was Charlie Stewart and myself, and we said we think there is a little bit of a problem out there in the community. Let me refer to it as the naval engineering community in the broad sense, which is a contraction of naval architecture and marine engineering, in the all-inclusive sense of the word “naval engineering”. At that time, I remember quite clearly Bill Campbell was head of Newport News at the time and he said, you don’t have to worry about it – the market will take care of everything. Well, we are here today again and the topic is pretty close to the same topic.

What happened in the meantime though, at ONR we went through a re-evaluation of our programs and as you and I can guess what happened. We went out to the operating forces and we said: What’s important to you? As you can probably guess, ships are always expected to be there, so ships did not appear to be a high priority item. As a consequence, what happened with our programs internally, HM&E, the infrastructure that supports just about everyone here in the room, did not fare well in that process. Of course, that does not fare well within certain sectors of the Navy as you well know.

In the process, Dr. Saalfeld had set out to say, we’ve got to be careful that we are not throwing things away in the process. How do we sit down and assess what things we should do, because only the Navy will do for itself what the other parts of the industry can’t or won’t do. The first of two national naval responsibilities that are quite clear to understand are ocean acoustics. There are a lot acoustics problems in a lot of agencies that operate in the ocean, but clearly the things that relate to naval warfare are the purview of the Navy.

The second one that is almost obvious is underwater weapons. I don’t believe there is a whole heck of a lot of commercial need for underwater weapons. Perhaps there might be for underwater explosives in certain areas, but not directed for the same reason. It is quite clear and obvious that those are responsibilities of the Navy.

Then we started down a path – we said we should look at hydrodynamics. I countered and I said maybe we should look at structures, and all of a sudden it became obvious that really what we were talking about by proceeding that way wasn’t to just nickel and dime anything to death. So, I said let’s look at it from the all-inclusive point of view from the standpoint of naval engineering and let’s try to go forward with that. Little did I know that when I used that word, I would step off into our communities here, whom I know most of you quite well. But, the antipodes of this spectrum seem to have a great deal of mass on both ends and very little in the middle. I was hung in the middle. From that standpoint, that is why we are here today.
I think one of the prime reasons that we have listened and had comments from everybody today is so that everyone within the community can really see what is driving the issues of everyone else in the community so that when we start going forward and we see the way ahead, and as an approach to solving what we think are the issues, that we have a common set of issues that we’re solving.

I would just like to read to you the mission statement before we get into that and see if we haven’t captured that from a broad point of view. We said that a key national responsibility of the Office of Naval Research is to maintain a robust capability in naval engineering. To meet this responsibility, ONR is committed to a robust science and technology base so that education, research and engineering communities can provide the needed talent, the ideas, products to today’s and tomorrow’s fleet. This planning workshop looks for opportunities to attract people to the community, in the research to support innovation in engineering, to develop advanced naval vehicles, in production to enhance sufficient acquisitions and in the application of commercial approaches. Of course, we wanted to be all-inclusive as we brought you together.

The key aspects that we see as we move ahead, there are fundamentally three components to what I just said. There is people; the knowledge that they have gained and it is important for the future, but we also need to have a basis for which we create innovation to move ahead.

What I heard in terms of people – and I heard this across the board – is that we need students at all levels of education. There is a great need for public awareness, and I probably would have re-ordered these a little bit differently if I had more time.

In the past we have been such a diverse community that it is a little bit like Scottish-English in New York – they can’t really talk to each other. A little bit of that has happened in our community is we become small enough again that we really need to have a common approach. But, it is more than that. It is not only the need for public awareness, but the need for public awareness at all levels. Within our own naval communities, there is a need for that understanding as well as educating the public at-large as well as educating our political and policy makers. There is a need to have a common language.

There is also a key issue across-the-board in terms of people – the need for excitement. I think that is something we need to work on. We all talk about a lot of processes for achieving that, but where is the excitement – where is the beef. Some of us think it is there. We need to create a much larger critical mass so that we can create a reaction that creates the excitement.

There was one thing my friends and colleagues from the universities didn’t talk about but I’ve been hearing this with a lot of deans – and that is the idea that at the PhD level, there needs to be a different type of approach than the single investigator approach. The idea is that many of these projects are very complex projects and require integration of a lot of knowledge, in that the contribution of a person to a team can be as valuable as a single approach. That is not a universally accepted idea, although I heard a number of places that they are beginning to broach the idea because it is not unheard of in physics these days is to see projects that have 30 authors.
I believe that the universities need to have a stable amount of money. That does not necessarily mean they need to have a hand-out. What that means is that they should be working on problems that again are generating enough cash. There has to be enough cash to begin with when we start these programs. But clearly what they are saying is there has to be a view in their market that they can get enough money to sustain their operation, which is exactly the same viewpoint I think that commercial industry has.

It is the mechanism by which we do the research at the university that is important. What we are hearing from the universities is that all of a sudden a significant portion of their money is now coming from non-naval sources and just like the commercial industry here in the room, what I hear is that they will follow that money.

At ONR we are a highly competitive bunch. Within the building we are a highly competitive bunch. I think the point is that we can adopt an attitude in which we are here with the status quo and things will flow that way, or we can adopt an aggressive attitude. We know it is a zero-sum game -- that is an absolute given and even if Congress gives us a small amount of money go to forward, that we think is a small amount of money to what DOD actually needs, it is still going to be a zero-sum game because there is more demand for that money out there than just us. I think what we are trying to do here is to set us up which way we are going to go. We need to be aggressive within our own community. At the moment we are not.

I think what the universities are saying is their time scale for the average life of a professor teaching is a lot longer than the average for what we need as a product. When they look at it from a staffing point of view, then they need to look out further than we do in either government or industry.

MacKinnon – On behalf of the Marine Board, I would really like to thank the participants today – not just the panelists but the audience. I think in terms of good participation, this gets extremely high grades. I think it has exceeded my own personal expectations of what we might do today. I think in my opening remarks I said maybe we would define the envelope of the problem and it won’t be one-dimensional, and I think that is exactly what we’ve done. It has been a very productive day and very enlightening.
LIST OF PARTICIPANTS
Naval Engineering Research and Education Planning Workshop
NAS Building – Washington, D.C.
21 May 2001

Joseph Arcano
Director of Submarine Advanced Development
Naval Sea Systems Command, NAVSEA 05U6
2531 Jefferson Davis Highway
Arlington, VA 22204
T: 202/781-3414
E: arcanojt@navsea.navy.mil

Mark R. Bebar
Naval Sea Systems Command
Code NAVSEA 05D1
Naval Sea Systems Command
2531 Jefferson Davis Highway
Arlington, VA 22242-5160
T: 202/781-3451
E: BebarMR@navsea.navy.mil

John Avis
Kvaerner Masa Marine Inc.
201 Defense Highway, Suite 202
Annapolis, MD 21401
T: 301/970-2226
E: john.avis@masamarine.com

Sharon Beermann-Curtin
Program Officer
ONR 333
Office of Naval Research
Ballston Common Tower 1, Room 507
800 N. Quincy Street
Arlington, VA 22217-660
T: 703/696-0869
F: 703/696-2558
E: beermas@onr.navy.mil

Edward F. Baker, Jr.
Applied Physics Laboratory,
Johns Hopkins University
11100 Johns Hopkins Road
Laurel, MD 20723-6099
T: 240/228-6638
F: 240/228-7993
E: Edward.Baker@jhuapl.edu

Dr. Michael M. Bernitsas
Chair, Department of Naval Architecture & Marine Engineering
University of Michigan
215 NA&ME Bldg.
2600 Draper Road
Ann Arbor, MI 48109-2145
T: 734/764-9317
F: 734/936-8820
E: michaelb@engin.umich.edu

Jack Barney
Director of Marketing
York Marine Systems
PO Box 1592-083G
York, PA 17405
T: 717/771 6393
F: 717/771 7268
E: jack.barney@york.com

David V. Burke
Massachusetts Institute of Technology
77 Massachusetts Ave.
Cambridge, MA 02139-4307
T: 617/258-8764
F: 617/253-8125
E: dvburke@mit.edu

James Baskerville
Chief Engineer of Advanced Technology
Bath Iron Works Corp.
700 Washington St.,
Bath, Maine, 04530-2385
T: 207/442-3613
F: 207/442-3478
E: James.baskerville@biw.com
David Byers
Dept. of Mechanical Engineering
Naval Postgraduate School
Mail Code: ME/CA
One University Circle
Monterey, CA 93943
T: 831/656-2364
E: dwbyers@nps.navy.mil

Dr. Chrys Chryssostomidis
Chairman, Department of Ocean Engineering
Massachusetts Institute of Technology
Building 5, Rm 226
77 Massachusetts Avenue
Cambridge, MA 02139
T: 617/253-7131
F: 617/258-5730
E: chrys@deslab.mit.edu

RADM Jay M. Cohen
Chief of Naval Research
Ballston Common Tower 1, Rm. 907
800 N. Quincy Street
Arlington, VA 22217-660
T: 703/696-4767
F: 703/696-4065
E: cohenj@onr.navy.mil

CDR Kurt J. Colella
U.S. Coast Guard Academy
15 Mohegan Ave.
New London, CT 06320
T: 860/444-8535
F: 860/444-8546
E: kcolella@exmail.uscg.a.edu

Dr. E. William Colglazier
Executive Director
The National Academies
2101 Constitution Ave., NW
Washington, DC 20418
T: 202/334-3000

Tim Colton
Maritime Consultant
124 Iberville Drive
Biloxi, MS 39531-5367
T: 228/374-1258
F: 228/374-4083
E: tim@coltoncompany.com

Dr. Roger Compton
Dean, Webb Institute
Crescent Beach Road
Glen Cove, NY 11542
T: 516/671-2277
E: rcompton@webb-institute.edu

Edward N. Comstock
Principal Assistant, Acquisition, Programming and Budgeting and Principal Assistant, SCN
Chief of Naval Operations Surface Warfare Division
2000 Navy Pentagon
Washington, DC 20350-2000
T: 703/697-5166
E: comstock.edward@hq.navy.mil

Joseph J. Cuneo
Chairman, Marinex International., Inc.
76 S. Orange Ave., Suite 300
S. Orange, NJ 07079
T: 973/275-3862
E: jjc@marinex-international.com

Dr. John C. Daidola
AMSEC LCC, M. Rosenblatt Group
350 Broadway
New York, NY 10013
T: 212/431-6900
F: 516/421-5510

Carol A. Davis
NSRP Crosscut Initiative Team Leader
Department 449,
75 Eastern Point Road, J221-B
Groton, CT 06340
T: 860/433-6266
F: 860/433-5017
E: cddavis@ebmail.gdeb.com
Bahadir Inozu, Chairman
School of Naval Architecture and
Marine Engineering
University of New Orleans
911 Engineering Bldg., Lakefront
New Orleans, LA 70148
T: 504/280-7182
F: 504/280-5542
E: binozu@uno.edu

Robert Johnson, Vice President
SYNTEK
4301 N. Fairfax Drive
Arlington, VA 22203
T: 703/525-3403
F: 703/525-4921
E: rjohnson@syntek.org

Thomas P. Jones
Atlantic Marine Holding Co.
8500 Heckscher Dr.
Jacksonville, FL 32226
T: 904/307-5343
E: tjones2@atlanticmarine.com

Philip B. Kimball, Executive Director
Society of Naval Architects & Marine Engineers
601 Pavonia Avenue
Jersey City, NJ 07306
T: 201/798-2597
F: 201/798-6141
E: Pkmiball@sname.org

Dennis K. Kruse, Executive Director
American Society of Naval Engineers
1452 Duke Street
Alexandria, VA 22314
T: 703/836-6727
E: dkruse@navalengineers.org

Duane Laible, Chairman
Glosten Associates
605 First Avenue, Suite 600
Seattle, WA 98104-2224
T: 206/624-7850
F: 206/682-9117
E: dhlablable@glosten.com

Thomas Lamb
University of Michigan
Transportation Research Institute
Marine Systems 222
Ann Arbor, MI 48109-2145
T: 734/763-7408
F: 734/763-4862
E: Nalamb@umich.edu

Alexander C. Landsburg
Maritime Administration
U.S. Dept. of Transportation
400 – 7th Street, SW - Room 7302
Washington, DC 20590
T: 202/366-1923
F: 202/493-2288
E: alex.landsburg@marad.dot.gov

CDR Doug Lane
Commandant (G-SEN)
U.S. Coast Guard
2100 2nd St S.W.
Washington, D.C. 20593
T: 202/267-1814
E: dlane@comdt.uscg.mil

John Leadmon
Naval Sea Systems Command
SEA 05U
2531 Jefferson Davis Highway
Arlington, VA 22242-5160
T: 202/781-3413
E: leadmonjt@navsea.navy.mil

Dr. Spiro G. Lekoudis
Director, ONR 333
Office of Naval Research
Ballston Common Tower 1, Room 507
800 N. Quincy Street
Arlington, VA 22217-660
T: 703/696-4403
F: 703/696-2558
E: Spiro_Lekoudis@onr.navy.mil

Norman H. Lemley, President
Center for Maritime Leadership, Inc.
955 L’Enfant Plaza, SW, Suite #1400
Washington, D.C. 20024
T: 202/554-8550
F: 202/554-8578
E: mlemley@maritimeleadership.com
RADM Brad Mooney  
2111 Jefferson Davis Highway  
Suite 1009S  
Arlington, VA 22202-3122  
T: 703/415-4535  
F: 703/415-4535  
E: jbradmooney@erols.com

Charles L. Munsch  
Chairman, Engineering Department  
S.U.N.Y. Maritime College  
6 Pennyfield Avenue  
Fort Schuyler, NY 10465  
E: cmunsch@sunymaritime.edu

Dr. Bruce C. Nehrling  
Chair, Dept. of Naval Architecture & Ocean Engineering  
U.S. Naval Academy  
590 Holloway Road  
Annapolis, MD 21402  
T: 410/293-6421  
F: 410/293-2219  
E: bruce@usna.edu

Dr. Wayne L. Neu  
Ocean Engineering Program Coordinator  
Virginia Polytechnic University  
215 Randolph Hall  
Blacksburg, VA 24601  
T: 540/231-6611  
E: neu@vt.edu

Carl H. Oosterman, Program Manager  
New Construction Submarines  
Commander NAVSEA  
Code NAVSEA 08C  
2531 Jefferson Davis Hwy  
Arlington, VA 22242  
T: 202-781-6134  
F: 202-264-8134  
E: oostermanch@navsea.navy.mil

Michael G. Parsons  
University of Michigan  
Department of Naval Architecture and Marine Engineering  
2600 Draper Road  
Ann Arbor, MI 48109  
T: 734/763-3081  
F: 734/936-8820  
E: parsons@umich.edu

CAPT Alan Peek  
Commanding Officer  
Marine Safety Center  
U.S. Coast Guard  
400 - 7th Street, SW  
Washington, DC 20590  
T: 202/366-6484  
E: apeek@msc.uscg.mil

Marc Pelaez, Vice President  
Business Development  
Newport News Shipbuilding  
4101 Washington Ave.  
Newport News, VA 23607  
T: 757/380-4000  
F: 757-688-4222  
E: pelaez_my@nns.com

Scott D. Poelker  
Program Manager  
Advanced Technology Institute  
5300 International Blvd.  
North Charleston, SC 29418  
T: 843/760-3255  
F: 843/760-4098  
E: poelker@aticorp.org

Michael Powell  
Newport News Shipbuilding  
4101 Washington Ave.  
Newport News, VA 23607  
T: 757/380-2000  
F: 757/380-3867  
E: powell_mli@nns.com
William W. Rogalski, Jr.
Northrop Grumman Litton Ingalls
Shipbuilding
Mail Stop M-142
c/o Raytheon Company
7700 Arlington Blvd.
Falls Church, VA 22043
T: 703/560-5000, x 4315
F: 703/208-1284
E: rogalskiwwjr@ingalls.com

Edwin J. Roland, Partner
Elmer-Roland Maritime Consultants
6227 Woods Bridge Way
Houston, TX 77007
T: 713/861-3837
F: 713/861-6564
E: mbr1960@aol.com

Robert C. Staiman
John J. McMullen Associates, Inc.
4300 King Street, Suite 400
Alexandria, VA 22302
T: 703/933-6680
F: 703/933-6822
E: bstaiman@jima.com

Edwin J. Roland, Partner
Elmer-Roland Maritime Consultants
6227 Woods Bridge Way
Houston, TX 77007
T: 713/861-3837
F: 713/861-6564
E: mbr1960@aol.com

RADM David Sargent Jr., USN Ret.
Sr. VP, Defense Sector
Anadac, Inc.
2200 Clarendon Blvd. Suite 900
Arlington, VA 22201
T: 703/741-7090
F: 703/741-7123
E: Sarged@anadac.com

Robert Scott, President
Gibbs & Cox
1504 Kirchner Lane
Gambrills, MD 21054
T: 703/416-3611
F: 703/416-3675
E: rscott@gibbscox.com

Robert C. Staiman
John J. McMullen Associates, Inc.
4300 King Street, Suite 400
Alexandria, VA 22302
T: 703/933-6680
F: 703/933-6822
E: bstaiman@jima.com

David H. Swedin
Engineering Supervisor
Electric Boat Corporation
75 Eastern Point Rd.
Groton, CT 06340
T. 860/433-3755
F: 860/433-8214
E: dswedin@ebmail.gdeb.com

Eric M. Suehrstedt
Director, Production Design
Bath Iron Works Corp., MS4420
700 Washington St.
Bath, ME 04530
T: 207/442-4144
E: Eric.Suehrstedt@biw.com

Richard W Thorpe
Kvaerner Masa Marine
201 Defense Highway, Suite 202
Annapolis, MD 21401
T: 301/970-2226
F: 301/970-2230
E: Rick.Thorpe@masamarine.com

Dr. Kirsi K Tikka
Associate Professor of Naval
Architecture
Webb Institute
Crescent Beach Road
Glen Cove, NY 11542-1398
T: 516/671-2356
F: 516/674-9838
E: ktikka@webb-institute.edu

Dr. Malcolm L. Spaulding
Professor and Chairman
Dept. of Ocean Engineering
University of Rhode Island
215 Sheets Building
Narragansett, RI 02882
T: 401/874-6666
F: 401/874-6837
E: spaulding@oce.uri.edu
Dr. Albert Tucker  
Director, ONR 334  
Office of Naval Research  
Ballston Common Tower 1  
800 N. Quincy Street, Room 528  
Arlington, VA 22217-660  
T: 703/696-4714  
F: 703/696-0308  
E: tuckera@onr.navy.mil

William S. Vorus  
J. Goldman Endowed Chair and Professor  
School of Naval Architecture and Marine Engineering  
University of New Orleans  
New Orleans, LA 70148  
T: 504/280-7181  
F: 504/280-5542  
E: wvorus@uno.edu

Wade Webster  
Naval Sea Systems Command  
2531 Jefferson Davis Highway  
Arlington, VA 22242-5160  
T: 202/781-3756  
E: websterwa@navsea.navy.mil

Stuart Williams  
National Oceanic & Atmospheric Administration  
System Acquisition Office  
1315 East West Highway  
Room 10452/SSMC3  
Silver Spring, MD 20910  
T: 301/713-3370 x103  
F: 301/713-0086  
E: stu.williams@noaa.gov

Dr. Ronald W. Yeung  
Professor of Hydromechanics & Ocean Engineering  
Department of Mechanical Engineering & Ocean Engineering Graduate Group  
6135 Etcheverry Hall  
University of California at Berkeley  
Berkeley, CA 94720-1740  
T: 510/642-8347  
F: 510/642-5539  
E: rwyeung@socrates.berkeley.edu

RADM George R. Yount  
Deputy Commander  
Integrated Warfare Systems  
Naval Sea Systems Command (SEA 05)  
2531 Jefferson Davis Highway  
Arlington, VA 22242-5160  
T: 202/781-1710  
E: yountgr@navsea.navy.mil

NRC STAFF:  
Joedy Cambridge, Principal Staff Officer  
Marine Board/TRB  
T: 202/334-2167  
F: 202/334-2030  
E: jcambrid@nas.edu

Susan Garbini, Senior Staff Officer  
Marine Board/TRB  
T: 202/334-3134  
F: 202/334-3532  
E: sgarbini@nas.edu

Stephen R. Godwin, Director  
Studies and Information Services  
Transportation Research Board  
T: 202/334-3261  
F: 202/334-2527  
E: sgodwin@nas.edu

Peter Johnson, Consultant  
Marine Board/TRB  
T: 202/333-0798  
F: 202/333-2691  
E: petejohnson@starpower.net

Beverly Huey, Senior Staff Officer  
Transportation Research Board  
T: 202/334-3307  
E: bhuey@nas.edu

Ron Taylor, Director  
Naval Studies Board  
T: 202/334-3523  
F: 202/334-3695  
E: Rltaylor@nas.edu