Rapid Response Shipbuilding Study Prepared In Anticipation of Quadrennial Defense Review Requirements

October 2001

Prepared by
Under Secretary of Defense for Acquisition, Technology and Logistics

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INTRODUCTION

This reports a study conducted at the behest of USD(AT&L) for the purpose of developing information needed to formulate recommendations to the QDR concerning Navy-related matters. Like the study itself, this document is composed of three parts

a **THE NAVY'S TASKS**
- The demands made of the Navy now and in the future, the Navy's strengths, its forthcoming challenges

b. **FLEET SIZE OPTIONS**
- The size of the fleet that will result year by year from now until 2030 under several assumptions

c **TRANSFORMATION OF THE FLEET**
- Need for at-sea tests, simulations, wargames to illuminate future technological needs, and to furnish insights into mixes and uses of ships

1 THE NAVY'S TASKS

The Navy's core value to the Nation is that it offers unhindered access to wherever the action is -- about 75% of the world's population lives and works within 50 miles of a coastline. The Navy's visible combat-credible presence reassures our friends and allies, dissuades potential adversaries, and deters threats The Navy continues to be responsible for ensuring freedom of the seas for both commercial and military use and, conversely, denying that use to adversaries by blockading or quarantining

The recent developments in international affairs have added new responsibilities
- Shore bombardment
- Delivery of land forces (gaining access across a defended beach)
- Support of land forces (striking mobile targets, furnishing area defense)
- Theater ballistic missile defense
- US coastal defense

And the fresh geopolitical emphasis on the Pacific Rim imposes a need for revolutionarily higher ship speeds and ranges -- the Army's forward basing and prepositioning can't be reduced otherwise

The Navy brings impressive inherent strengths to these tasks·
- It is dominant in all areas of naval warfare
  - In a degree that by itself deters the development of competitors
- Centuries-old precedent legitimizes its forward presence as non-provocative
  - Operations at sea are not hobbled by host country constraints
- Its on-scene endurance is essentially unlimited

There are new challenges to accompany the new responsibilities

- There is a heightened risk of loss
  - Threat development cycles are short compared with ship life times
  - Modern sensors can penetrate the cloak previously offered by the ocean's vastness
  - The range and the lethality of modern shore-defense weapons have both increased
  - New forms of weaponry have to be contended with – Info., Bio , Chem
  - Asymmetric warfare (small boat swarms) is a fertile field for adversaries
- Locating land-based targets is difficult
  - Anti-ship weapons can be hidden in hospitals, schools, places of worship
  - Recognition of mobile targets is imperfect
- Satisfying the need for greater speed and range requires fundamental break-throughs

Finally, the high cost of ships will be felt very strongly when the currently scheduled retirements balloon in 2015 – 2020

2 FLEET SIZE OPTIONS (See Appendix A)

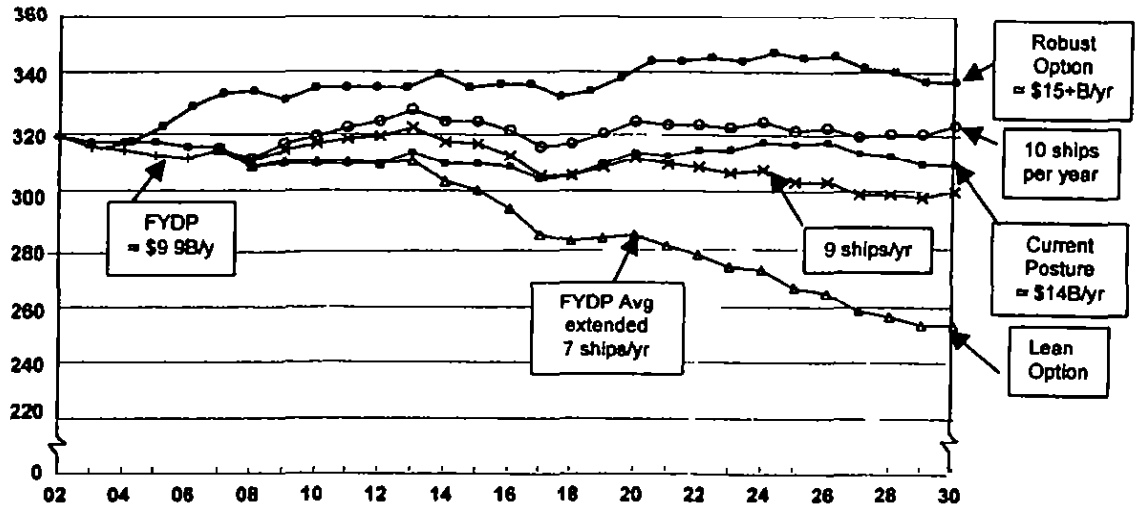
While the Navy's utility cannot be gauged by simply counting ships, it's necessary to do so, and it's a good place to start. Capabilities – the true gauge – are taken up in Section 3. We have calculated the number of ships that would be in service each year from now until 2030 under three different investment options, but assuming 12 aircraft carriers throughout:

- **LEAN FLEET:**
  This option assumes SCN funding will remain relatively constant at the current FYDP average of $9-10 billion per year which supports the acquisition, on the average, of 7 ships per year. This is not sufficient to maintain the current posture, and by 2030 will result in a fleet size of just 258 ships

- **CURRENT POSTURE**
  This option is consistent with the 30-year plan that was submitted to Congress in June 2000. As its name implies, it acts to maintain the current fleet size; doing that requires that funding be increased to $12-13 billion per year within the FYDP, and to $14 billion post FYDP

- **ROBUST FLEET**
  This option results in a 340-ship fleet. It requires an increase in SCN funding of $1-2 billion above the current requirement, and produces about 11 ships per year. USD(AT&L) recommended this option to QDR

The results are shown plotted in the following graph Curves for construction rates of 9 and 10 ships per year are included for reference purposes



3 TRANSFORMATION OF THE FLEET

It's not just the number of ships, it's the sum of their capabilities that counts Our attention in this section is directed to what has to be done to make our ships smaller, faster, better, and safer.

There are already underway a number of thrusts that have potentially great impacts.

- UUVs and UAVs will extend the ships' safe operating envelopes UAVs will get greater ranges, and the risk of collateral damage will be reduced, by exploiting precision guidance to reduce the warhead weight. UAVs can be catapult-launched, removing the need for takeoff fuel weight and getting rid of launch signatures
- Automation will enable reductions in crew size
- Electric drive will enable the management of energy usage
- Networking will increase the effectiveness of dispersed forces
- The reduction of wave and friction drags will confer both higher speed and longer legs

At-sea experimentation is at the threshold of developing new CONOPS, tactics, and doctrines, but fulfilling its promises will require significant investments in both dollars and time A HASC mark provides $49M to ONR in FY02, and CNO plans to fund ONR $100M in FY03 It may require as much as ten to fifteen years to accomplish what has to be done for surface ships, but a shorter time may be possible in the case of submarines by working with the *Virginia* class SSN and with the new SSGN

The goals –visions – for surface ships include the following

- Increased stealth
  - Reduction of all detectable signatures – RADAR, SONAR, THERMAL
- New warship hullforms and sizes

- High Speed Sealift with trans-Pacific range capability
    - Essential to reducing (eliminating?) forward basing and prepositioning
    - Requires fundamental advances in battling friction drag
- A solution to offloading in "austere" circumstances
    - We can't assume the availability of a developed port
    - "In stream" (onto small craft) is too long and too weather-dependent
    - Causeway construction is too long and too weather-dependent
    - Is beaching viable?

Submarines – our prime stealthy platforms – need new ordnance, new decision-support tools, and new CONOPS to perform in littoral warfare These needs and their fulfillment were identified by the DSB panel on "Submarines of the Future" and its follow-on DARPA-Navy project "Payloads and Sensors" These changes can and should be implemented now on *Virginia* and the new SSGN

Our sensor capabilities can be improved in several ways·

- By implementing COTS across the board to reduce costs and improve flexibility
- By networking into a distributed combat system
- By making interoperability universal and user-friendly
- By getting larger acoustic apertures (both shipborne and deployed)

Our ordnance capabilities can be enhanced by

- Exploiting PGM to reduce the warhead weight (required weight ~ CEP cubed)
- Using ship's power for launch (catapults) to remove takeoff fuel load
- Developing means of reloading at sea
- Developing means of making ***stealthy*** multiple launches
- Solving the targeting enigmas
    - Mobile targets (exploit work on cognitive artificial intelligence?)
    - Targets hidden in safe havens (HUMINT? Other agencies?)
- Gaining vehicle commonality
    - What functions can be combined in one unmanned vehicle?

(Surveillance? Reconnaissance? Classification? Localization? Destruction?)

We've discovered that a substantial effort is needed to clarify several of these areas, and the following actions have been taken

- <u>At-sea</u> <u>experimentation,</u> <u>simulation,</u> <u>and</u> <u>wargaming</u> (See Appendix B)

  There has been much discussion about the use of small, stealthy, fast, modular, lethal ships in the execution of littoral warfare -- particularly in the first phases of engagement prior to the arrival of the main combatants and battle group However, the discussions have been primarily theoretical and inevitably result in (a) identification of the lack of a concrete requirement, which cannot be established because we don't have real world data of what is possible (or needed), and (b) recognition that while currently available technology is limiting our capabilities, a definition of what tech-

nologies to pursue is elusive because we don't have a requirement to help prioritize our goals.

USD(AT&L) has directed the Secretary of the Navy to develop a plan that will lay the course for at-sea experimentation, simulation and warfighting The goal is to identify requirements and capabilities currently available as well as those needed for the future, and technologies which need to be demonstrated to support those requirements This may require building or chartering ships of appropriate size and capabilities from our industry or allies – a process that has already started for intra-theater sealift, but needs to be expanded to yield desired results quickly.

This is a long term effort with potentially a major effect on Navy CONOPS, tactics and doctrine. It may well affect the way our Navy carries out its missions in the future. The experimental work will probably take several years (a definitive plan is expected in a few months) AT&L will remain involved by annually reviewing the progress, the impact on the fleet, and each year's proposed shipbuilding plan Appendix B contains a copy of the memorandum to the Secretary of the Navy

- A review of aircraft carrier utilization in the future (See Appendix C)

Our carrier battlegroups (CVBGs) have been the mainstay of our forward presence and our warfighting capability. (A typical CVBG is composed of the carrier plus 3 AEGIS ships, 4 VLS (Tomahawk) ships, 2 SSNs (one with VLS), and one multiple-purpose AOE. The seven surface combatants are expected to have 10 LAMPS between them. These battlegroups represent a major investment concentrated in a small number of ships As already noted, our force structure analysis assumed 12 carriers throughout Nonetheless, it's clear that there will be major impacts on carrier usage from technological and geopolitical developments already visible such as littoral warfare, anti-access defenses built around hidden missiles, unmanned aircraft, high-speed torpedoes. In response to a request from USD(AT&L), the Defense Science Board has formed a task force to review this subject. It has already begun its work and its report is expected in late Spring 2002 Its terms of reference are reproduced in Appendix C.

- A review of the effectiveness of alternative ship mixes (See Appendix D)

During our force structure analysis, we debated the use of smaller platforms to carry out the forward presence mission without compromising the Navy's warfighting capabilities Doing so would increase the number of platforms at relatively small cost This concept is not new, it hasn't been found viable because the Navy has traditionally had to deal with highly capable threats and has had to rely on large sensors and weapon systems to do so However, net-centric warfare in the littorals may represent a paradigm change Hence, USD(AT&L) has tasked the Institute of Defense Analyses to review the applicability of alternative mixes of combatants for future missions The mix will include the current and projected major combatants plus vessels of new and novel designs that are fully mission-capable and, hopefully, smaller and less expensive The study started in September 2001 and we expect to have preliminary

results in time for the submission of next year's budget Appendix D is an excerpt from the task order.

- Initiation of a very high-speed ship research program (See Appendix E)

The QDR's re-balanced priorities and increased emphasis on the Pacific (with its very great distances) constitute new requirements on our military. The Army has indicated its desire to be anywhere it's needed and ready to fight within 96 hours The majority of the Army's equipment has to be transported by ship, and it is therefore necessary that very high-speed sealift be developed To meet the Army's proposed timeline, speeds as high as 100 knots, sustained over Pacific distances, must become available to ships of about 10,00 tons.

Further, such efficient (economical) high speed offers the Navy options it has not had and may therefore be a key enabler of an alternative fleet mix. Finally, the at-sea demonstrations may support existing analytic findings that high speed is a key element of the effectiveness of small ships engaged in net-centric littoral warfare.

Our FY 02 budget includes $4M to start a research program at ONR and our universities It will provide the necessary data and capabilities to design very high-speed ships In FY 03 we plan to request $10M to continue this effort which will be blended into ONR's ongoing efforts. Should this concept prove viable in the Navy's experimentation efforts, an appropriate transition plan will be developed to bring this technology to the SCN arena Appendix E contains a copy of the funding requirement document

APPENDIX A

FLEET SIZE OPTIONS

The analysis has considered only one Navy mission – presence,because doing so is not restrictive in that our ships have traditionally been designed for warfighting and, thus, satisfying the numerically greater need for presence means that the fleet's combat capabilities will be abundantly met.

We found ourselves challenged by the increased emphasis being placed on the Pacific, whose great distances mean that either

- more ships are needed to provide the required presence around the rim, or
- the extra time needed for transit must be subtracted from the time on-scene, or
- new technology (e g , high speed sealift) is needed to maintain the status quo.

That dilemma is a special case of the general need to measure capabilities (and encourage their development), not just to count ships. Its recognition has led to the actions described in Appendices C-E However, even if those actions should all bear fruit, there will remain the problem of developing metrics for evaluating "presence".

We have, however, ensured the availability of the right kinds of hulls. In particular, we have maintained 12 carriers in all options. Even though missions, threats, and technologies are all changing, we believe that the rate of change is not sufficient to affect the desirability of retaining 12 carriers through the QDR time frame.

The anticipated changes in missions do result in a need for change in the special case of amphibious warfare In this area we are starting from a deficit in that, while we have a requirement for 3.0 Marine Expeditionary Brigade (MEB) lift, we have only been able to fund 2.5 MEB. For this reason, in the robust option, we have incorporated enough amphibious ships to meet the USMC's lift requirement of 3 0 MEB.

Missile Defense is a new thrust area of importance to the Department. To support this new Navy mission, we included in the robust option more ships that can provide missile defense capability

We assumed the usual rotation factors for ships and again recognized the importance of distance This led to considering forward basing and we looked into placing carriers or surface combatants in Guam We rejected the idea for carriers because it proved to be very expensive, but it may still be an option worth pursuing for surface combatants with missile defense capabilities.

We were tempted by the possibilities of increasing the numbers of hulls by relying on smaller, cheaper, less-capable ships We rejected this approach, for now, because of the lack of effectiveness data, and we have started the process of studying options regarding the possible use of alternative mixes of ships in the future Navy which may contain smaller ships designed to be highly capable for their missions in a netcentric environment (See Appendix D)

The many industrial base issues pertaining to shipbuilding are outside the scope of this work; however, we reviewed briefly the effect of our options on the current shipbuilding industrial base In design and production we currently have an over-capacity within the shipyards, so the issue is how to maintain the yards

- The "lean" option results in serious negative impact to the industrial base, and would likely force alterations in the industrial base structure.
- The "current" option is marginal, and has some recognized problems, especially in maintaining the surface combatant industrial base from FY04 through FY07, during the transition from DDG 51.
- The "robust" option avoids any harm to the surface combatant industrial base issue identified above
- In no case do we end up with a fully utilized shipbuilding industrial base

APPENDIX B

AT-SEA EXPERIMENTATION, SIMULATION, AND WARGAMING

THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

ACQUISITION,
TECHNOLOGY
AND LOGISTICS

25 SEP 2001

MEMORANDUM FOR THE SECRETARY OF THE NAVY

SUBJECT: Guidance on Further Navy Transformation

Working within the Quadrennial Defense Review process, our staffs have identified several options for a fleet size that would achieve various capabilities in the future.

The first option would call for a "260 Ship Navy". This is what we will achieve by 2025 if we allow the shipbuilding to continue at its current rate. The second option calls for a "316 Ship Navy", roughly sustaining the current size The third option calls for a "340 Ship Navy", permitting us to increase the SSN force, meet the Marine Corps needs of 3 MEB's, convert four tridents to SSGNs, increasing surface combatants, and providing a Theater Missile Defense capability. All options retain 12 carriers.

I personally prefer option 3, and suggest this "340 Ship Navy" would be a good goal for the DOD However, this level may not be sufficient as we look to the challenges of the future.

The fact that three-quarters of humanity lives within fifty miles of the sea ensures a pre-eminent role for the Navy However, filling that role may require a significantly different composition of the fleet, as we focus increasingly on the Pacific and as shore defenses become more effective The lead-time for new platforms is such that preparations must begin now with technological and operational investigations of the issues involved in

a Gaining access to a defended littoral

b Very-high-speed, long-range transport

c Offloading of personnel and materiel at undeveloped sites

d Support of the land battle

I would like to request that our staffs work together to develop a comprehensive concept-exploration program of mutually supporting technological development, at-sea experimentation, wargaming, and simulation The goal is to identify operational concepts, ship types, technologies, CONOPS, tactics, and doctrine for a future where the focus will be on littoral operations in an anti-access environment.

While existing submarine programs can provide appropriate experimentation platforms, surface ship demonstrations will probably require building prototypes and possibly chartering vessels to assist in reaching the goal of smaller, fast, netted, stealthy, lethal, and modular platforms. The attachment provides additional ideas on some components of such a transformation.

I am open to suggestions on how you would like to proceed. Dr. Paris Genalis, Deputy Director for Naval Warfare, is my point of contact, his number is 697-2205.

E C Aldridge, Jr.

Attachment:
As stated

COMPONENTS OF THE PLAN FOR FLEET TRANSFORMATION

The following is a partial list of concepts that need to be explored in the formulation of a plan and its implementation to develop a Navy fleet appropriate to its future roles and missions

Transformational concepts for submarines were identified by the Defense Science Board and explored by a Navy/DARPA study on payloads and sensors The Virginia class of submarines and the ballistic missile submarines being converted to a cruise missile configuration provide excellent platforms for the application of these concepts The Navy should not wait for the weapons and sensors packages to be perfected. Rather, the platforms should be made available for current systems and provide the flexibility to accommodate future, more advanced, unmanned undersea and aerial vehicles, as well as weapons of smaller size and sensors.

The Defense Science Board was recently tasked to explore options for the transformation of aircraft carriers Although the analysis will not be completed for several months, the recommendations of the task force will provide additional input to the creation of the vision for transformation and possibly influence the experimentation plan.

Consistent with our increased emphasis on the Pacific Ocean, the surface ships of the future need to provide break-through capabilities simultaneously in speed and endurance. Advanced technologies, some demonstrated by other nations, show promise for efficient, high-speed propulsion that makes it possible to augment our presence and to develop options for hulls suitable to anti-access operational needs Further, it is a Navy responsibility to provide the sealift required to meet the Army's goal to be anywhere in the world in 96 hours, ready to fight. Overseas bases are viable but not always available, and prepositioning is always expensive Thus the Army's goal can best be supported by very-high-speed, large ships with long endurance A major part of fast sealift is the off-loading of these cargo ships quickly in less-developed harbors and "in the stream" in rough weather

The Navy needs to continue its efforts in increasing connectivity, signature reduction, and integrated power systems Even as we demand more connectivity that will support net-centric concepts, all signatures must be reduced to survive in an anti-access littoral warfare environment Integrated power systems, using electric propulsion, will provide opportunities for power management and efficient energy use for purposes other than propulsion, such as hotel loads combat systems, and non-explosive weapons launch

Netting of sensors is vital to achieve many of the proposed operational concepts, and much development and experimentation is needed to fully explore their potential Commercial systems (hardware and software) and techniques (use of middleware to decouple software from hardware) must be harnessed to support a large increase in the pace of technology insertion and upgrade Multi-function apertures need to be developed, both to exploit the spectrum better and to support signature reduction The size of acoustic apertures needs to be increased, possibly on smaller platforms Interoperability needs to be ubiquitous and user friendly

To increase the offensive payload of both submarines and surface ships, weapons need to be made smaller, while increasing their lethality, by use of precision guidance This will increase the number of weapons per platform and reduce possible collateral damage, but will also put additional stress on targeting. We need to explore both technology and operational concepts of targeting anti-ship weapons possibly hidden in safe havens such as hospitals, schools, and places of worship.

As the process of analysis and experimentation proceeds, it is likely that concepts will be refined, new ones will emerge, and some will be discarded.

APPENDIX C

AIRCRAFT CARRIERS OF THE FUTURE

THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

ACQUISITION,
TECHNOLOGY
AND LOGISTICS

SEP 6 2001

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Terms of reference—Defense Science Board Task Force on Aircraft Carriers of the Future

You are requested to establish a Defense Science Board (DSB) Task Force to assess how aircraft carriers should serve the nation's defense needs in the 21st century and beyond.

The U S. is confronted by several actual and potential widely distributed regional threats Further, the 2001 Quadrennial Defense Review (QDR) increased our focus on the Pacific Ocean while maintaining our posture on other parts of the globe. This has reinforced the need to implement the shift in the Navy's focus from open water to littoral regions. The Task Force should concentrate on the increased need to fulfill the presence and warfighting mission that aircraft carriers perform The carrier battle group has been the mainstay of our combat-credible forward presence and the Task Force should examine its applicability and potential for transformation in the future.

There continues to be a strong movement toward "jointness" among the armed services, as urged by the Goldwater-Nichols legislation, and exemplified by the call for seamless integration made by the Chairman of the Joint Chiefs of Staff in *Joint Vision 2020* The Task Force should explore the aircraft carrier's contribution to joint operations in the littoral.

While significant resources are being expended in the evolution of aircraft carriers to improve performance and life cycle cost, it is not expected that there will be sufficient funds to expand the carrier fleet significantly The Task Force should examine cost/capability tradeoffs in considering the design of carriers appropriate to the future environments in which naval warfare may occur. In exploring all of these issues, the Task Force should examine the broadest range of alternatives and be guided by the following questions:

- What is the naval environment to be expected for the next 20 – 50 years?
- What is the role of the Navy in the next 20 – 50 years?
- What is the role of the carrier and the carrier battle group in a joint environment in which technology has progressed (and been transferred) at the appropriate pace for both the US and its potential adversaries? In particular, how does the existence of Unmanned Combat Air Vehicles affect the role of the carrier and the battle group?
- How should the carrier evolve or be transformed to best meet the mission requirements in the joint environment described above?
- How might the role change for radically different aircraft carriers (and carrier battle groups, if still needed) and what might their characteristics be to effect this change?

- What are the technology improvement barriers that need to be overcome for very significant improvement of the ability of the carrier to execute its missions?

The Task Force should report its findings by the end of March 2002

The Under Secretary of Defense (Acquisition, Technology, and Logistics) and the Director, Strategic and Tactical Systems will co-sponsor this Task Force and provide funding and other support as may be necessary Dr William Howard will serve as the Task Force Chairman. ADM Donald Pilling, USN (ret) will serve as vice chairman. Dr Paris Genalis, Deputy Director, OUSD(AT&L) Office of Naval Warfare, will serve as the Executive Secretary and CDR Brian Hughes, USN, will serve as the Defense Science Board Secretariat representative

The Task Force shall have access to the classified information needed to develop its assessment and recommendations

The Task Force will be operated in accordance with the provisions of P.L. 92-463, the "Federal Advisory Committee Act," and DOD Directive 5105 4, the "DoD Federal Advisory Committee Management Program," It is not anticipated that this Task Force will need to go into any "particular matters" within the meaning of Section 208 of Title 18, U S Code, nor will it cause any member to be placed in the position of acting as a procurement official.

E. C. Aldridge, Jr.

APPENDIX D

ALTERNATIVE SHIP MIXES

OBJECTIVE.

The objective of this study is to assess the effectiveness and cost of alternative mixes of naval surface combatant forces in the 2010 to 2020 time periods The alternatives will include the Navy's planned mix of surface combatants as well as forces in which these ships, at either currently planned or reduced force levels, are teamed with a force of smaller, lower cost combatants Effectiveness will be measured for both combat and presence missions for a wide range of scenario conditions and threats

STATEMENT OF WORK

To accomplish this objective, the study will undertake the following tasks

a In concert with the study sponsor, identify a range of strategic and operational scenarios in which naval forces might be employed in the 2010 to 2020 time periods To the extent possible, these scenarios should encompass a broad range of strategic and operational situations, geographic settings, and potential threat capabilities For each of these scenarios, identify the full range of missions in which Navy surface ships might be employed and the threats that they might be expected to confront

b. In concert with the study sponsor, identify a range of smaller, lower cost surface combatants that could be used as a component of future Naval surface combatant forces Based on a review of concepts or designs developed by the US Navy or by US or foreign shipyards, identify the principal physical and performance characteristics of these ships. Key characteristics of interest include displacement, speed, maneuverability, fuel capacity and range, available sensors (including radar, sonar, and infrared systems), weapon loadout (including antiaircraft, antiship, and land attack weapons), mine countermeasure capabilities, ship signatures (radar, infrared, visual), self defense countermeasure systems and other survivability features, capability to accommodate network-centric force employment concepts, and required crew size In addition, the study should identify the potential benefits and likely availability of advanced technologies that could reasonably be applied to these smaller ships or to their weapon or sensor payloads Based on discussions with appropriate Navy commands and agencies, identify suitable employment concepts for each of these ship concepts

c In concert with the study sponsor, use the ship designs developed in (b) above to construct a range of alternative surface ship mixes for each time period of interest that combine the smaller, lower cost surface combatants with existing and planned surface combatant forces These alternatives should include as a baseline the planned mix of surface combatants in each time period of interest (i e , the planned inventory of DDG-51s, CG-52s, DD-21s, DD-963s, and FFG-7s) Based on discussions with appropriate Navy commands and agencies, identify suitable employment concepts for each of the alternative surface combatant mixes to be considered in the assessment These concepts should include options for employing the various components of the force separately or as a mixed combination

d Using appropriate naval engagement models and measures of effectiveness, assess the combat effectiveness of the alternative surface combatant mixes in representative engagements with hostile surface ships, submarines, aircraft, naval mines, theater ballistic missiles, and land targets. These assessments should take into account the network centric capabilities of the alternative ship concepts as well as those of the existing and planned combatants with which they are teamed and any other force components that might provide support.

e By combining the naval engagements into an overall naval campaign, estimate the effectiveness of the alternative naval surface combatant forces developed in (c) above in each of the scenario or conflict situations identified in (a) above.

f. Assess the effectiveness of the alternative surface combatant ship mixes in the presence mission using appropriate measures of effectiveness, including the traditional measure of ship-days as well as measures that take into account the combat capabilities provided by the alternative forces.

g. Estimate the costs associated with development, procurement, and operation of the alternative ship concepts identified in (b) above as well those associated with procurement and operation of the Navy's current surface combatants Cost estimates for new ships should take account of new ship design and construction processes to the extent that these are applicable. Using these ship-specific costs, estimate the costs of the alternative ship mixes that combine the smaller, lower cost ships with current and planned surface combatants such as DDG-51, CG-52, and DD-21 class ships.

h Using the force cost estimates developed in (g) above and the force effectiveness estimates developed in (e) above for the presence mission and in (f) above for combat missions, assess the relative cost effectiveness of the alternative forces Based on these assessments, identify the scenario and threat conditions where each alternative might best be employed. Force flexibility to accommodate a variety of strategic and operational conditions and a range of threat capabilities should be considered as part of this overall assessment

i The sponsor will facilitate timely access to any special intelligence and special access program/special access required (SAP/SAR) material required by IDA to complete the work specified in this task order Storage, processing and generation of data requiring special handling will be granted to IDA subject to the security rules and guidelines provided by the sponsor and the controlling program offices.

j The sponsor will assist in coordinating any necessary meetings and briefings, arranging travel to Government and contractor facilities, and help in identifying and providing data required to perform the study

APPENDIX E

FUNDING REQUIREMENTS FOR HIGH SPEED SHIP RESEARCH

FY03-07 S&T Unfunded Requirement Issue Paper

1 **PE 63114N** Power Projection Advanced technologies

2 **Technical goal**: Doubling or tripling the speed of ships

3 **Operational goal**: Primary. Rapid transport of US land forces (Army and/or USMC) over great distances. Secondary: Supports Navy surface combatant transformation.

4 **Nature of the technology**:

a. It is a new initiative -- the refurbishment of a test facility needed to validate drag reduction techniques at high speed and over large surfaces which have been demonstrated only in laboratories at low speeds and small surfaces. It is a necessary step toward meeting the Department's littoral warfare goals. The need for this work was endorsed by the McCarthy panel, supported by the QDR and cited in the DPG.

	Yes	No
b. paying existing unfunded requirements,	☒	☐
c. paying overruns on programs in existence over four years,	☐	☒
d. paying laboratory people or infrastructure,	☐	☒
e. funding programs previously in other budget activities outside of 1-3,	☐	☒
f. performing upgrades to acquisition programs or those in production,	☐	☒
g. upgrading programs no longer in production, etc.	☐	☒

5. This technology complements the family of technology efforts concerned with ship design.

6. This is a FY03 continuation of a $4M FY02 line item.
HASC staff has been very supportive of concept.
There are no known risks

7. **Out year requirements**

	FY03	FY04	FY05	FY06	FY07	Total
Funded	0	0	0	0	0	0
Unfunded	$10M	$5M	$3M	$1M	0	$19M

a These were not budgeted before because the operational need for high speed hadn't been perceived

b. The US history in this field contains only laboratory measurements, nothing full-scale, but the laboratory results are encouraging. There have been successful large-scale tests performed in Russia, although no ocean-going implementations are known

c. The goals of this work have been discussed with and endorsed by Messrs McCarthy and Aldridge