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The U.S. Government's Decision on the Fate of Newport News: Unprecedented Merger to Monopoly, Cost Savings Without Reduced Competition, or the Status Quo

Discussion Materials Regarding Alternative Outcomes in the Proposed Acquisitions of Newport News Shipbuilding for the Consideration of the

U.S. Department of Defense

and

U.S. Department of Justice

August 3, 2001

Prepared and Submitted on Behalf of
Northrop Grumman Corporation

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TAB A

Alternative Outcomes of the Government's Consideration of the Possible Acquisition of Newport News Shipbuilding

The government deliberations regarding the possible acquisition of Newport News (NNS) by either General Dynamics (GD) or Northrop Grumman (NOC) could result in following the broad outcomes:

1. Deny Both — The acquisition of NNS denied to both GD or NOC;
2. Allow GD — Allow GD but not NOC to pursue the acquisition;
3. Allow Both — Both GD and NOC are allowed to pursue the acquisition;
4. Allow NOC — Allow NOC but not GD to pursue the acquisition.

Each of these outcomes has a set of consequences.

Outcome 1. (Deny Both)

This outcome, which maintains the status quo in the Navy shipbuilding industrial base, would support competition for future nuclear and non-nuclear ship programs by accommodating multiple teaming alignment possibilities.

This outcome would forego, at least in the short term, the expected cost savings that would arise from the acquisition of NNS by either GD or NOC.

Moreover, if the government denies the acquisition to either company it is probable that the issue of the sale of NNS will be raised again at some future date. Capital markets-driven financial considerations are likely to continue to make NNS a candidate for acquisition. Additionally, there are continuing affordability pressures which are likely to make a combination with another shipbuilding contractor attractive to NNS's customer, the U.S. Navy. It is not only possible, but even probable, that these factors would, at some future time, outweigh the considerations that led to a decision by deny the acquisition to either company at this juncture.

There would also exist a distinct possibility that a third party would arise as an acquirer of NNS. If NNS were to be acquired by such a non-strategic (i.e. a firm not in the shipbuilding business) buyer there would be a far smaller cost savings potential. There would also exist the potential that a buyer without a strategic interest in defense (i.e. one not in the ship building or defense business) may seek to acquire NNS again with minimal cost savings potential. Furthermore, a non strategic buyer would be looking for an exit strategy which would at some future time result in NNS being, once again, on the market. Finally, it is unlikely that future consolidation options for NNS, whether it remains as a standalone company or is acquired (temporarily) by a non

strategic buyer, would be materially different than those currently under consideration.

Outcome 2. (Allow only GD)

This outcome seems difficult to rationalize. Its basis could only result from the perception on the part of the government that the cost savings which would accrue to the customer from a GD acquisition would be sufficiently larger than those derived from a NOC acquisition and that this cost-driven consideration would overcome the substantial benefits arising from continued competition between the businesses of NNS and GD because the monopoly created in this circumstance would in all likelihood be permanent and irreversible. The barriers to entry or reentry in terms of costs, regulatory hurdles, engineering and technical expertise, infrastructure and time are such that it is remote that a new competitor could ever emerge in domestic nuclear ship building.

It has been argued that the existing teaming agreement between NNS and GD for the Virginia Class submarine demonstrates that there would be no competitive consequence arising from allowing a monopolistic combination of GD and NNS. There are several reasons why this is not at all the case:

- GD and NNS, under or despite the teaming agreement, remain potential competitors on future procurements of Virginia Class submarines;
- GD and NNS would be competitors on future Navy ship classes;
- Even with the teaming relationship in place, the customer has the ability to continue to establish and manage the performance incentives for each the contractor by shifting work share between the parties;
- GD and NNS are competitors for ongoing contract awards pursuant to the Technology Insertion Program for modernization of the Virginia Class submarines.

In summary, it is clear that allowing a merger between GD and NNS would effectively eliminate the benefits arising from the current competition between the parties.

If such a monopolistic combination is allowed, however, some of the consequences are easy to predict. Under this circumstance, GD would have a dominant advantage in all of the competitive dimensions of Navy shipbuilding:

- Mass - GD would command a substantial majority of future Navy shipbuilding revenues, a large fraction of which will be either sole-source or directed procurement;
- Capability - GD would have a potentially overwhelming advantage in terms of organic engineering, technical and manufacturing capability;
- R&D - Again, GD would enjoy an enormous advantage both in terms of knowledge and capability arising out of very substantial past R&D efforts and in terms of continuing Government-funded R&D activities. The resulting disparity between GD and other shipbuilders in engineering capability and in-house

knowledge of past and ongoing R&D activities will have an immediate and increasing effect of eliminating future competition for nuclear (de facto) and, importantly now, non-nuclear Navy ship design and development.

It is very likely that a number of technologies, largely the result of past

and current R&D activities performed by NNS and GD, will be critical in future Navy ships. Of particular significance in the design of future Navy surface ships will be technologies related to integrated power systems (including electric drive), advanced propulsors, advanced hydrodynamics, computational fluid dynamic analysis in the areas of induced cavitation, detectable wake effects and turbulent flow phenomena, acoustic phenomenology and thermal signature analysis. As future surface combatants are able to realize a substantial reduction in radar detectability, the application of these technologies to surface ships will become increasingly important to providing the requisite degree of stealth since all signatures will need to be balanced.

Clearly if GD were to acquire NNS it would have an overwhelming advantage in these and other technologies critical to future surface ship designs. It is important to note that simple access to developed R&D data will not be sufficient to offset this advantage - it is the know how which is acquired in the development of technologies that creates the ability to effectively incorporate the R&D results in new designs. Access without the underlying experience and know how is not a substitute for direct participation.

While this situation is clearly a significant competitive concern to NOC, the more serious result would be the adverse effect the combination of GD and NNS would have on the competition for new ideas. Competition has been the engine for innovation and it has provided the U.S. with its technological edge in weapon systems. If the competitive environment is eliminated, GD will have a subtle but significant motivation to maintain existing technologies in favor of assuming the financial risks and uncertainties associated with the development and incorporation of new technologies. Quite apart from the increased costs and developmental risks, one needs to acknowledge that the largest margins are typically obtained during mature production.

Finally, but equally importantly from an overall policy perspective, the industrial policy ramifications of a government decision to allow Outcome 2 (and its equivalent Outcome 3 below) are enormous and reach far beyond the customer considerations of anti-competitive behavior. Allowing Outcome 2 may also signal a shift in policy insofar as the government will have explicitly approved a merger to monopoly in an industry important to national defense. This could have significant and immediate implications in light of the fact that the consolidation of the U.S. defense industry will continue through ongoing mergers and acquisitions. The Government's ability to distinguish this precedent from other proposed transactions (which will also argue efficiencies as a substitute for the benefits of competition) will be severely questioned.

Outcome 3. (Allow Both)

This result would have the same net result as Outcome 2 (Allow only GD). This is a simple consequence of the likely response of the capital markets to the transaction. The capital markets will clearly support the GD transaction in favor of a NOC transaction. GD would be perceived as able, at some future time, to command monopoly rents and, as a result, be able to generate extraordinary financial returns that would not correspondingly accrue to NOC. Therefore, participating in an auction with GD for the acquisition of NNS is not a remedy that would be in NOC's interest.

Outcome 4. (Allow only NOC)

This outcome would produce a consolidated and robust industrial base for Navy shipbuilding characterized by overall balance and the establishment of a strong basis for continuing competition in all segments, excluding, of course, the already existing single source for nuclear powered aircraft carriers. The availability of NNS's engineering talent and applicable R&D derived technology to augment NOC's existing and future non-nuclear ship business will benefit NOC

by strengthening a key segment of its defense business. The result will be an environment in which both competitors will have a strong ongoing business base and the Navy customer will benefit from the substantial cost savings to be derived from the combination of NNS and NOC. The Navy customer would continue to be the beneficiary of the ongoing competition both in terms of ship system costs and the substantial positive effect competition will have on technological innovation.

It has been suggested that a NOC acquisition of NNS would create new single source for "large deck" Navy ships. This concern arises out of an attempt to combine two segments, nuclear powered aircraft carriers and aviation capable assault ships, which have hitherto not been considered as a single market. While it is clear that NNS has the manufacturing assets capable of building assault ships, GD's NASSCO yard also has the requisite capabilities to be a competitor in this class. Clearly without the acquisition of NNS, NOC would have no ability to compete for nuclear powered aircraft carrier contracts. On the other hand, GD already has the ability to compete as a supplier of assault ships both in terms of shipyard assets (NASSCO) and the technical capacity implicit in the augmentation of its NASSCO capability with the considerable engineering expertise resident at Bath Iron Works.

A concurrent and integrated design approach, incorporating all aspects of the hull, combat systems, propulsion and power system design, auxiliary systems design, electronic systems and weapon system design is required since all of these elements interact and affect the over all platform signature and hence its survivability and mission effectiveness. NOC understands this process and is excited by the potential of applying its considerable expertise to meet the U.S. Navy's future requirements.

This innovative application of a wide range of technologies to the design of future surface combatants and amphibious ships holds the promise of providing significant enhancement to survivability and weapon system effectiveness. The full realization of this potential will require significantly increased levels of integration and concurrency in

all aspects of the ship/weapon system design and development. NOC has considerable and significant experience in weapon system design requiring this kind of highly integrated approach - often performed in geographically dispersed locations.

The opportunity to deploy this expertise in a new arena is a critical element of NOC's strategic interest in its recent acquisition of Litton and is fundamental to its interest in the acquisition of NNS.

NOC cannot, however, begin to realize this objective if it is denied the R&D base and engineering talent to address the full breath of applicable technologies. If GD is allowed to acquire NNS, it would command an over whelming position in several critical technologies and would attract a dominant share of the R&D funding required for this kind of integrated systems design approach. This disparity would practically render the smaller player (in this case NOC) ineffective in the short run and marginal in the medium run. If, however, NOC acquires NNS, a healthy and robust shipbuilding environment would be established in which competition between GD and NOC would assure that the best and most innovative design approaches might be available to meet present and future Navy requirements.

TAB B

THE U.S. GOVERNMENT'S DECISION ON THE FATE OF NEWPORT NEWS:
UNPRECEDENTED MERGER TO MONOPOLY (GD), COST SAVINGS WITHOUT

REDUCED COMPETITION (NOC), OR THE STATUS QUO

In considering the competing offers of Northrop Grumman ("NOC") and General Dynamics ("GD") for Newport News Shipbuilding ("NNS"), the United States Government (the Department of Defense and the Department of Justice) has essentially three options.

- First, the Government can move to block both acquisitions and preserve the status quo. While this option has the laudable result of preserving competition in nuclear submarine R&D and construction, it would do nothing to reduce the high cost and inefficiency that currently characterizes NNS. Moreover, it would leave in place the existing imbalance in the Navy's shipbuilding and engineering base. Currently, there is only one shipbuilder, GD, with the design and construction capability necessary for the full range of ships (except nuclear-powered carriers) that the Navy requires now and in the foreseeable future.

- Second, the Government can block GD's offer and approve that of NOC. That option will also preserve competition in nuclear submarine design and construction. But, unlike merely preserving the status quo, this second option will enable NOC to realize savings that NOC estimates (though it has been unable to validate the estimate because NNS continues to deny NOC the ability to conduct due diligence) to be in the range of $1.9 billion to $2.6 billion over ten years. (That range is equivalent to the cost-savings GD claims that its acquisition of NNS will achieve.) Moreover, unlike the other options, an acquisition by NOC of NNS will create competitive balance in shipbuilding because the combined NOC/NNS will achieve the scale and scope currently enjoyed by GD alone.

- Third, the Government can allow GD to acquire NNS./1/ This option is clearly the worst. Not only does this option eliminate current and future competition for the design and construction of nuclear submarines, but it also further exacerbates the current competitive imbalance in the Navy's shipbuilding and engineering base. After such a merger, a combined GD/NNS would have a stranglehold on subsurface technology and engineering that is becoming increasingly critical in the design and construction of surface ships. In

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/1/ This would be the likely result if the Government approves the GD deal, regardless of whether the Government also approves a NOC acquisition. Because NNS has cooperated with GD and provided the company with the opportunity to perform due diligence, GD can close its offer quickly. Moreover, because of the anticompetitive profits that GD can anticipate from the elimination of competition in submarine design and construction as well as from the weakening of NOC in surface ship design and construction, GD will always be able to outbid NOC, which must rely exclusively on cost-savings from an acquisition of NNS to generate value.

addition, in the absence of shutting down the submarine shipyard at either GD's Electric Boat or NNS (which GD has consistently stated that it will not do and which it probably cannot do for political and strategic reasons), there are virtually no unique cost-savings GD can achieve by acquiring NNS that NOC cannot achieve if it acquires NNS. (Moreover, NOC believes that, applying its experience in the aerospace industry, it can work with GD after a NOC/NNS merger to achieve significant nuclear shipyard consolidation through specialization if that is requested by the Navy.) In short, a GD/NNS combination will achieve

few if any unique, merger-specific cost-savings, and those paltry savings would be swamped by the economic and strategic costs of allowing a merger to monopoly in submarine design and construction.

The remainder of this white paper examines the cost of this third option. It explains how, particularly in light of the NOC option that carries none of the anticompetitive costs and achieves virtually all of the cost-savings benefits of a GD/NNS merger, approval of a GD/NNS merger would contravene well-established legal precedent and stand in stark contrast to this Administration's commitment to free-market capitalism. It is highly unlikely that efficiencies of any magnitude would be sufficient to defend a merger to monopoly. Given that there are virtually no "merger specific" efficiencies (i.e., cost-savings that can be achieved uniquely) likely to be realized by a GD/NNS combination, the legal precedents indicate that the proposed cost-savings from a GD/NNS merger would not be sufficient to justify even a merger that fell far short of monopoly. Moreover, if the government were to allow a GD/NNS merger, it would be the first time a merger to monopoly was approved in the defense industry and would set an ominous precedent for relying on bureaucratic oversight, as opposed to competition, to constrain procurement costs.

Mergers to Monopoly Have Long Been Illegal

The Sherman Act, enacted in 1890, is this country's original and core antitrust law and is a bulwark of this nation's commitment to free-market competition. Section 2 of the statute prohibits monopolization and attempts to monopolize. Central to the law is the notion that monopolies are bad. As the Supreme Court stated in its landmark decision in Standard Oil Co. v. United States "[t]he evils which led to the outcry against monopolies . . . may be thus summarily stated: (1) The power which the monopoly gave to the one who enjoyed it, to fix the price and thereby injure the public; (2) The power which it engendered of enabling a limitation of production; and (3) The danger of deterioration in quality of the monopolized article which it was deemed was the inevitable result of monopolistic control over its production and sale."/2/ In its decision, the Supreme Court condemned, among other things, Standard Oil's creation of a monopoly through acquisitions.

/2/ 221 U.S. 1, 52 (1911).

Mergers to monopoly have been virtually per se unlawful for the past century. Indeed, shortly after the Supreme Court's decision in Standard Oil, Congress showed that its concern with mergers to monopoly was so strong that it supplemented the antitrust laws to prevent mergers before they reached monopoly proportions. That law, section 7 of the Clayton Act (passed in 1914 and amended in 1950), prohibits mergers which "may tend to create a monopoly" and today serves as the principal statute governing mergers and acquisitions.

The aversion of the courts and the antitrust enforcement agencies to mergers to monopoly extends to the defense industry. In the only reported defense industry case involving a proposed merger to monopoly, the court granted the FTC an injunction blocking the transaction./3/ As the court stated, "the resulting entity would have a complete monopoly over the relevant domestic market. . . . This showing, in itself, is adequate for the [Government] to demonstrate a substantial likelihood that the merger will `substantially . . .

lessen competition or . . . tend to create a monopoly,' as prohibited by (S) 7 of the Clayton Act."/4/ Indeed, despite the significant consolidation of the defense industry over the last decade, the Government has never approved a merger to monopoly among defense contractors. It would truly be unprecedented -- and odd, given the likely increased demands on the defense industry in the near future -- for the Government to begin approving mergers to monopoly now./5/

The law's hostility toward mergers to monopoly is so clear that for over a century this country's courts have rarely been confronted with such mergers, and this country's economy has even more rarely been forced to contend with their debilitating costs. The rare exceptions prove the rule. In the 1920s and 1930s, when this country's experience with the antitrust laws was limited and its understanding and commitment to free-market competition was not as strong as today, a few mergers to monopoly did avoid condemnation. Perhaps the most famous was the merger that created the US Steel monopoly in the early part of the century. Although the courts dismissed the DoJ's attempt to break up that monopoly, analysis by economists has shown that

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/3/ FTC v. Alliant Techsystems, Inc., 808 F. Supp. 9 (D.D.C. 1992)(enjoining the proposed merger of the ordinance businesses of Olin and Alliant, which involved the special circumstance of an imminent "winner-take-all" competition that would have resulted in a single supplier to the military).

/4/ Id. at 12.

/5/ Under various force structure alternatives currently under consideration, the optimal attack submarine fleet ranges between 50 and 62 vessels. See, e.g., Defense Budget Presentation for Fiscal Year 2002, presented in part by Dr. Dov Zakheim, Under Secretary of Defense (Comptroller) (June 27, 2001), available at www.defenselink.com (calling for a force objective of 53 attack submarines). To meet this demand build rates would have to increase, in some cases dramatically, over the current procurement level of one per year, which will allow the introduction of competitive bidding once the four ships covered by the teaming agreement are completed. See Implications of Alternatives on the Naval Shipbuilding Industry, at Tab __. For example, build rates would have to increase immediately to 2/year and by 2010 to 3/year -- a level that would easily accommodate two shipyards -- if the force structure required the addition of merely 3 more subs in the fleet (over the currently-budgeted fleet of 53).

the cost to the country was substantial. According to one recent economic analysis, the US Steel merger resulted in the price of steel being 20 to 40 percent higher than it would have been had the courts broken up the monopoly./6/

Today, the only mergers to monopoly that have any chance of approval are those subject to review by a regulatory agency that has the power to ignore the antitrust laws. The most prominent recent example is the merger of the Union Pacific and Southern Pacific railroads. That merger, which was approved in the mid-1990s by the Service Transportation Board over the vigorous opposition of the DoJ, reduced from two to one the number of rail alternatives for certain shippers. The merger was an unmitigated disaster for shippers, resulting in service disruptions and numerous lawsuits that continue to this day./7/ Moreover, shippers that lost the benefit of competing rail service were forced to pay rates that were 15% to 40% higher than those with an alternative supplier./8/ The economic impact of the merger was so devastating that the Surface Transportation Board was forced to declare a moratorium on further rail

mergers./9/

Both economic theory as well as experience underlies this country's long-standing aversion to mergers to monopoly, and, not surprisingly, there is strong bipartisan support for the rule against mergers to monopoly. As the conservative antitrust scholar, former Judge Robert Bork has written, "[w]hen companies . . . merge to create a complete monopoly . . . [t]he law is justified in striking down such a merger on the theory that restriction of output is certain and an offsetting increase in efficiency . . . is not."/10/ And as recently as the end of July, the current Administration reaffirmed the DoJ's opposition to mergers to monopoly by announcing its intention to block United Airlines' proposed acquisition of US Airways. Though the two airlines fly thousands of non-stop routes, the Department based its opposition in large part on the fact that, according to DoJ's press release, the merged airline would have "a monopoly or duopoly on nonstop service on over 30 routes."/11/ Attorney General Ashcroft stated, "While mergers can further competition, this one does not. If this acquisition were allowed to proceed, millions of

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/6/ George L. Mullin et al., "The Competitive Effects of Mergers: Stock Market Evidence from the U.S. Steel Dissolution Suit," 26 RAND Journal of Economics 314 (1995).

/7/ Brian O'Reilly, "The Wreck of the Union Pacific," FORTUNE (March 30, 1998) ("A pair of University of Northern Texas economists estimate that UP-SP snafus have already cost U.S. companies $2 billion.").

/8/ Id. ("Several plastics executives said captive shippers can expect to pay 15% to 40% more for rail freight than those with alternatives.")

/9/ See Public Views on Major Rail Consolidations, STB Ex Parte No. 582 (March 16, 2000).

/10/ Robert H. Bork, The Antitrust Paradox, at 219 (1978).

/11/ Department of Justice and Several States Will Sue to Stop United Airlines from Acquiring US Airways, DOJ Press Release (July 29, 2001), available at http://www.usdoj.gov/atr/public/press.releases/2001/8701.htm.

consumers --business, government and families -- would have little choice but to pay higher fares and accept lower quality air service."/12/

Even the Most Extraordinary Efficiencies May Not Save a Merger to Monopoly

Though efficiencies today are relevant to merger analysis, in the modern history of antitrust, efficiencies have never saved a merger to monopoly. Indeed, the law requires merging parties to establish substantial, concrete, and merger-specific efficiencies to justify anticompetitive mergers that fall far short of a merger to monopoly./13/

In 1997, the DoJ and the FTC formally amended their Merger Guidelines to set out a framework for analyzing efficiencies. According to the Guidelines, the agencies will consider only "merger-specific" efficiencies -- that is, the agencies will only credit those efficiencies that can be accomplished uniquely by the proposed merger and that likely cannot be achieved by some less anticompetitive means. The Guidelines also require the merging companies to substantiate the efficiencies and the likelihood that they will be achieved.

The Guidelines also indicate that the level of merger-specific efficiencies that the merging parties must substantiate increases with the potential anticompetitive costs of the merger. Notably, the Guidelines state that "[e]fficiencies almost never justify a merger to monopoly or near-monopoly."/14/

Earlier this year, in FTC v. H.J. Heinz, the Court of Appeals for the D.C. Circuit, probably the most distinguished of the federal circuits, indicated just how difficult it is for parties to a merger that substantially increases market concentration to prove that efficiencies offset the merger's likely anticompetitive effects. In Heinz, the two smaller manufacturers of processed baby food proposed to merge and argued that the resulting efficiencies would enable the combined firm to realize substantial cost savings (including, among other things, closing an older plant and consolidating production in the more efficient facility) and thereby compete more effectively with the market leader Gerber. The district court agreed, but the Court of Appeals reversed, holding that the lower court had erred in several respects, including its application of the efficiencies defense. The appellate court held the trial court had failed adequately to explain

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/12/ Id.

/13/ The courts have only recently recognized any efficiencies defense. In the 1960s for example, the Supreme Court in FTC v. Procter & Gamble Co., stated that "possible economies cannot be used as a defense to illegality in section 7 merger cases." 386 U.S. 568, 579 (1967). Although the Supreme Court has never expressly held to the contrary, over the last ten to fifteen years the federal antitrust agencies and the lower courts have begun to consider the prospect of merger-specific efficiencies in adjudicating merger cases. See, e.g., FTC v. H.J. Heinz Co., 246 F.3d 708 (D.C. Cir. 2001); FTC v.University Health, 938 F.2d 1206 (11th Cir. 1991); FTC v. Staples, Inc., 970 F. Supp. 1066 (1997); FTC v. Cardinal Health, Inc., 12 F. Supp.2d 34 (D.D.C. 1998).

/14/ Merger Guidelines (S) 4 (emphasis added).

why the proffered efficiencies could not be achieved in the absence of the proposed merger. Moreover, because the combination would create a virtual duopoly (far short of a monopoly), the court stated that "the high market concentration levels present in this case require, in rebuttal, proof of extraordinary efficiencies."/15/ Despite very substantial cost-savings, the court found that the defendants had failed to meet this requirement.

/15/ 246 F.3d at 720 (emphasis added).

A Merger of GD and NNS Would Create a Nuclear Submarine Monopoly

As antitrust merger analyses go, determining that a merger of GD and NNS would create a monopoly is simple and straightforward. GD and NNS are the only

two shipbuilders currently engaged in (or capable of being engaged in) the production of nuclear submarines./16/

Perhaps even more disconcerting than the potential submarine construction monopoly, the proposed GD/NNS merger would create a monopoly in research and design relating to nuclear submarines. In light of the prohibitive cost of new entry (discussed below), the notion that any shipyard that does not currently have the capability of building nuclear submarines would or even could successfully perform state-of-the-art R&D or design work for subsurface ships is ludicrous. Without the expertise that comes from employing a workforce experienced in the construction of nuclear submarines and without the prospect of being able to implement the fruits of successful efforts, a non-nuclear shipyard has no incentive or ability to perform nuclear submarine R&D and design work.

By creating such a monopoly in the construction and design of nuclear submarines, a merger of GD and NNS would also over the long run reduce, if not destroy, competition for the design and construction of conventionally powered surface ships./17/ Future generations of surface ships will increasingly rely on the technologies developed for subsurface ships. Currently, as reflected in the competition for the DD21, NOC, which does not participate in the design or build of nuclear submarines, is at a real competitive disadvantage to GD, which does. In the absence of a GD/NNS merger, it is at least theoretically possible for NOC to team with NNS, which does not compete to supply surface ships, in order to obtain access to critical subsurface technologies./18/ Of course, a merger of NOC and NNS would convert this theoretical possibility into an actual reality by bringing NNS's subsurface capabilities within NOC, making a transfer of those technologies to NOC's surface platforms much easier and more efficient. Teaming is not an efficient substitute for vertical integration. Foreclosed from access to these critical technologies if a GD/NNS merger is allowed to proceed, NOC will see its competitive prowess in the area of surface ships wither and NOC will fall farther and farther behind the GD/NNS juggernaut./19/

/16/ While NOC's Ingalls shipyard produced twelve nuclear attack submarines between 1958 and 1974, its capacity for producing nuclear submarines has long since disappeared.

/17/ NNS, of course, already has a monopoly in the design and construction of nuclear aircraft carriers.

/18/ Because of the higher cost structure of its nuclear shipyard, NNS is not a realistic potential competitor with respect to conventionally powered surface ships.

/19/ According to a recent CRS report, a combined GD/NNS would employ over 80% of all in-house designers and engineers working on Navy vessels and over 95% of Navy research and development funds. Ronald

Footnote continued

The prospect of new entry into submarine design and construction would pose no constraint on the monopoly that would be created by merging GD and NNS. The Merger Guidelines consider the threat of new entry to be relevant when entry by new firms will be timely, likely and sufficient to constrain a "small but significant and nontransitory increase in price" after the merger. Because the possibility of entry into submarine construction is so remote, it is hard to

estimate how much time and investment would be required to enter the business, though it would surely take at least five years and cost many hundreds of millions, if not billions, of dollars to obtain the capacity to design and build nuclear submarines./20/ A 1994 RAND analysis, for example, estimated the cost of restarting a "smartly" shut down nuclear submarine shipyard to be as much as $2 billion, certainly far less than the cost of creating such shipyard capability from scratch./21/ Interestingly, according to the analysis, the most time-consuming and expensive part of restarting such a shipyard would be assembling the requisite skilled workforce. The RAND study confirms the recent observation of a high ranking antitrust official at DoJ: "weapon programs can span decades, and once capability is lost it is incredibly difficult and slow to recreate it."/22/

The Cost of a GD/NNS Monopoly Would Be Dramatic

A merger to monopoly in the area of submarines would impose a high cost in an area that is critical to this nation's national security. As a distinguished panel analyzing general consolidation of this nation's defense industry noted, "[a] merger that reduces the number of firms capable of developing a suitable design for a new weapons system may lead to higher prices, lower quality products, reduced advances in technology, and a reduction in the number, variety, or quality of the proposals submitted to DOD."/23/ The notion that the Navy can manage the costs of monopoly is flatly inconsistent with the myriad of studies of the military's procurement experience with and without competition. "DOD's experience, Congressional findings, the opinion of industry, and a large body of literature lead to the conclusion that DOD's

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Footnote continued from previous page

O'Rourke, Navy Shipbuilding: Proposed Mergers Involving Newport News Shipbuilding -- Issues for Congress, CRS Report for Congress (May 22, 2001).

/20/ In addition to the difficulty of assembling a capable skilled workforce and constructing the necessary infrastructure, the need to obtain the necessary permits to develop nuclear capability is a significant barrier to entry.

/21/ See Birkler et al., The U.S. Submarine Production Base, at xix (RAND 1994).

/22/ Constance K. Robinson, Leap-Frog and Other Forms of Innovation, Address before the American Bar Association (June 10, 1999).

/23/ Report of the Defense Science Board Task Force on Antitrust Aspects of Defense Industry Consolidation (April 1994) ("DSB Report"), at 27.

regulatory and auditing procedures are not a substitute for competition in assuring the best mix of price and quality."/24/ One would have thought that the dismal experience of the Navy in trying to control the costs of nuclear aircraft carriers -- a NNS monopoly that arose naturally as opposed to being created by a merger -- would be proof enough of the intolerable costs of monopoly.

The case of F-15 engines provides an illustrative proxy for the costs of merger to monopoly./25/ In the late 1960s, Pratt-Whitney and GE competed to develop the next generation engine to be used on the F-15 fighter. After the initial competition, the Air Force selected Pratt-Whitney as the sole source. After a series of cost overruns, reliability problems and other performance issues with Pratt-Whitney, the Air Force was willing to listen when GE approached with an alternative engine design (which it had developed at its own

expense). The Air Force held another competition, ultimately selected the GE product and claims to have saved upwards of $2.5 billion over the 20-year life of the procurement, all the while receiving "vastly improved engines, significantly enhanced warranties, and an enlarged industrial base." Without the presence of a second viable competitor, the Air Force would have had no option but to overpay for an unreliable and under-performing product.

In the case of nuclear submarines, the costs that will result from the elimination of competing shipyards are also not wholly speculative. In fact, the presence of competing nuclear submarine shipyards has in the past directly saved the Navy money, specifically in connection with the Trident submarine program. Without even having to solicit competitive bids for the program to develop the Trident submarine, the Navy was able to extract substantial cost reductions from GD by threatening to shift work to NNS./26/ The threat was taken seriously because the Navy had previously shifted work on the Los Angeles class from GD to NNS because of performance issues at GD./27/

Though the costs of a submarine monopoly will be substantial, they are hard to project with any precision. The various studies of the absence of competition in various military procurements place the cost of monopoly from as low as 10 percent to as high as 50 percent or

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/24/ DSB Report at 27. See also FTC v. Alliant Techsystems Inc., 808 F. Supp. 9, 16(D.D.C. 1992) ("There is persuasive opinion in the record that Army oversight, while effective, is an imperfect substitute for the action of the competitive marketplace.").

/25/ See The Engine Wars: Implications for Naval Shipbuilding, at Tab __. The F-15 example was the subject of The Great Engine Wars, a book written by David M. Kennedy and commissioned by Robert Murray of the John F. Kennedy School of Government at Harvard University.

/26/ See Appeal of General Dynamics, Electric Boat Division, 83-2 B.C.A. (CCH) (P) 16,907 (findings of fact discussing contract negotiations on the Trident development program).

/27/ Id.

more./28/ As former Under Secretary of Defense for Acquisition and Technology, Jacques Gansler, stated recently, "all the empirical data there shows that the competition tends to improve the performance at an average cost reduction of around 30 percent, sometimes up to 50 percent."/29/ Even ignoring GD's obligation to establish that the efficiencies it will gain from its acquisition of NNS are "merger-specific" as discussed below, the cost savings that GD projects from its merger with NNS come nowhere close to covering the additional cost to the Government from the loss of competition.

As substantial as the direct cost increases to DOD are likely to be, the loss of competition for R&D and design may represent the greatest threat of a GD/NNS merger. It is obviously hard to value the loss of the "idea" that would lead to superior military capability. As Defense Science Board's report noted, "Competition in the defense industry generally has quality and technology components that may be as important or more important than competition on price."/30/ There is strong support in the literature for the notion that monopolies invest in less research and development than is socially desirable,

and that rivalry stimulates the innovative process./31/ As two knowledgeable observers of the defense industry have written:

> Cost and price effects strike us as secondary to design innovation as the most important reason for preserving contractor rivalries. Competition's greatest benefit in weapons acquisition arguably is its power to spur firms to devise ingenious approaches for fulfilling DoD's mission requirements. The main potential hazard of mergers is the danger that technological competition will diminish, and that specific technologies may become entrenched as the one or two remaining suppliers freeze out innovative design approaches that threaten their vested interests or defy conventional wisdom. Preserving rival design centers can counteract lethargy, myopia, or error -- an important safeguard where national defense policy rests heavily on exploiting superior technology. Weapons

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/28/ See generally Washington, A Review of the Literature: Competition Versus Sole-Source Procurements, ACQUISITION REVIEW QUARTERLY, Spring 1997.

/29/ Remarks of J. Gansler on panel discussion, "Are We Buying the Right Weapons in the Best Way? The Pentagon's Weapons Buying Systems: Lessons Learned" (Washington, D.C. April 3, 2001).

/30/ DSB Report, at 27. See also Robert Kramer, Antitrust Considerations in International Defense Mergers, Address before the American Institute of Aeronautics and Astronautics (May 4, 1999) ("As important as price competition is to [DoJ], a second major and possibly even greater concern is maintaining competition for innovation.").

/31/ See, e.g., Yao and DeSanti, Antitrust Analysis of Defense Industry Mergers, Public Contract Law Journal, vol. 23, no. 3 (1994).

> acquisition experience suggests that rivalry for new design and development awards can be acute even when a market segment contains only two firms./32/

A GD/NNS combination would combine the only two technologically capable firms with incentives to perform submarine R&D.

The Current Teaming Agreement Between NNS and GD Provides No Excuse

GD apparently believes that the Government should simply blink at these daunting monopoly costs because GD's teaming agreement with NNS on Virginia-class submarines has already eliminated competition between the shipyards. For GD now to cite its teaming agreement with NNS -- which was sold to DoD and Congress on the ground that the teaming agreement would preserve two independently owned shipyards capable of producing nuclear submarines -- as a reason for permanently extinguishing any possibility of competition on submarines is cynical to say the least. Moreover, an attempt to equate a temporary teaming agreement between two independent shipyards with a permanent merger to monopoly defies logic. Under a teaming agreement, the parties or the Government always have the option to restore actual competition by ending the agreement; once a merger occurs, competition can only be restored by the forced divestiture of a nuclear-capable shipyard (a result that could conceivably be achieved only after years of costly litigation) or by the de novo entry of a new shipyard (a prospect that, as explained above, is not realistic).

Even assuming the teaming agreement remains in force, the proposed

merger to monopoly between GD and NNS still imposes significant costs.

- First, under the terms of the teaming agreement, GD and NNS remain potential competitors for future procurements of Virginia-class submarines because the teaming agreement covers only the first four subs. Moreover, GD and NNS continue as competitors to design and build future generations of nuclear submarines.

- Second, the teaming agreement still allows for R&D competition. DoD can reward an innovative shipyard with additional funding to develop a promising concept into an actual piece of equipment that can be incorporated into future submarines.

- Third, even with the teaming agreement, the option remains for DoD to reallocate the division of work between the shipyards in order to provide incentives and rewards for GD and NNS to remain efficient and innovative.

/32/ Kovacic and Smallwood, Competition Policy, Rivalries, and Defense Industry Consolidation, JOURNAL OF ECONOMIC PERSPECTIVES, vol. 8, no. 4, Fall 1994 (citations omitted).

- Fourth, the existence of two independent shipyards allows DoD to benchmark costs and provides some measure of the relative cost-effectiveness of the two shipyards. Such benchmarking by DoD would become much more difficult (if not impossible) if the yards were under common ownership.

GD's Projected Cost-Savings Do Not Justify a Merger to Monopoly

GD has publicly stated that it expects its acquisition of NNS to generate about $2 billion in cost savings to the Government over ten years. Even assuming that those cost-savings are credible and that sound antitrust policy would give GD full credit for all those projected savings, savings of that magnitude would not outweigh the substantial costs entailed by extinguishing all prospects for competition on submarines now and forever more. The claimed efficiencies of $2 billion over ten years equates to a mere 3.7% of the annual revenues of a combined GD/NNS. Even this generous assumption on efficiencies amounts to a small fraction of the costs to be expected from a monopoly. As mentioned earlier, monopoly can result in price increases of thirty percent and more, and an even greater loss from a reduction in the generation of new ideas.

However, as the earlier discussion of the relevance of efficiencies to merger analysis indicated, the antitrust laws do not call for a balancing of all the savings GD projects against the costs of monopoly. Rather, only those cost-savings that are "merger-specific" -- that is, that cannot be achieved through some less anticompetitive means -- should be considered as an offset against the costs of monopoly. In other words, if the Government can realize most, if not all, of those cost savings without a merger to monopoly, then those savings cannot justify the merger. And, since NOC believes that, by acquiring NNS, it should be able to achieve cost savings in the range of $1.9 billion to $2.6 billion over ten years without any loss of competition, there appear to be virtually no merger-specific cost-savings that a GD acquisition of NNS will achieve.

In Contrast to GD/NNS, NOC's Acquisition of NNS Would Not Reduce Competition

Because NOC and NNS compete for no military procurement and have complementary capabilities, NOC's acquisition of NNS poses no threat of a loss of competition. NOC's shipyards, Ingalls and Avondale, produce conventionally powered surface ships, while NNS produces nuclear submarines and nuclear aircraft carriers. Similarly, to the extent each possesses shipbuilding or design expertise, those capabilities do not overlap. Most importantly, as explained above, NOC is not a potential competitor in the design or production of nuclear submarines (or, for that matter, nuclear aircraft carriers)./33/

/33/ While NOC does provide certain subsystems that are incorporated in submarines and does possess certain technologies that have application with respect to submarines, those vertical relationships between NNS and NOC pose no threat to competition. First, in connection with its acquisition of Litton, NOC made commitments to the Navy to ensure that the Navy will have the benefit of open competition on procurement of subsystems and

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NNS is also not a significant potential competitor on any of the platforms on which NOC currently competes. Because of the high costs inherent in NNS's shipyard because of its nuclear capability, NNS cannot compete effectively for the conventionally powered surface ships that are NOC's current focus. This is equally true for conventionally powered, large-deck aviation-capable ships, like LHD craft./34/ While NNS's experience designing and building nuclear carriers certainly gives it most (though not all) of the know-how to build large deck amphibious assault ships, its cost-structure is prohibitive. The real potential competitive threat to NOC comes from GD. GD's NASSCO shipyard in San Diego is physically capable of producing large deck ships, while GD's experience in making LPD-17 ships at Bath Iron Works gives it the design and integration capability to produce such large deck aircraft-capable ships./35/ In addition, by using NASSCO, GD can avoid the high overhead inherent in a nuclear-capable shipyard (like that of NNS).

In fact, not only does a NOC/NNS merger not pose any risk of reducing competition, such a merger actually holds the promise of increasing competition. Currently, NOC and NNS represent two different halfs of the total shipbuilding equation (respectively, conventionally-powered surface ships, on the one hand, and nuclear powered sub-surface and surface ships on the other). GD represents the only complete shipbuilder capable of making all types of ships (with the exception of nuclear carriers, which have long been a monopoly). Unlike a GD/NNS merger, which would give the merged company a tremendously disproportionate share of engineering talent and technological capability, a NOC/NNS merger would achieve a roughly equivalent distribution of talent and capabilities between the surviving two shipbuilders./36/ That rough equivalency should increase the vigor of future competitions between GD and a merged NOC/NNS.

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systems integration. See Letter from Albert F. Myers to David R. Oliver dated March 13, 2001. Second, after a merger of NNS and NOC, GD will still be able to turn to Lockheed and Raytheon, among others, to obtain the systems and technologies that NOC possesses.

/34/ It has been suggested that NOC and NNS would be competitors should the

Navy ever decide to procure smaller, conventionally powered aircraft carriers. Though the possibility of procuring such ships has been much discussed over a number of years, no such procurements seem likely in the foreseeable future. Moreover, if there were such a program in the future, GD through its NASSCO shipyard (complemented by the engineering and manufacturing expertise developed at Bath Iron Works) would likely be a more serious competitor than NNS because of NNS's cost disadvantage.

/35/ NASSCO, which is now owned by GD, has competed for this type of vessel in the past, as it submitted bids for LHD 2 through 4.

/36/ See note 19 above. If NOC acquired NNS, NOC/NNS would employ approximately 56% of in-house engineers, while GD would maintain its 44% of engineers.

A NOC/NNS Merger Should Achieve Virtually All of the Projected GD/NNS Cost-Savings

Because NNS has thus far refused to allow NOC to perform due diligence, NOC has not yet been able directly to calculate and verify the cost savings that it could achieve through an acquisition of NNS. However, at least conceptually, it should be able to achieve most of the savings projected by GD. For example, a substantial portion of GD's projected savings come in the area of procurement and overhead savings. NOC should be able to match most of those savings. In fact, there are some efficiencies that a NOC/NNS can achieve that a GD/NNS could not realize. For example, the efficiencies associated with combining NNS's subsurface technologies and capabilities with NOC's surface capabilities and technologies would not be matched by a GD/NNS combination -- GD already has access to all the capabilities and technologies that NNS has. In addition, GD does not have the experience or capability to match NOC's proven ability to achieve cost-savings through the LEAN initiative that it has developed on the aerospace side of the house and is beginning to realize on the shipbuilding side. The $1.9 billion to $2.6 billion over ten years that NOC parametrically projects to achieve by acquiring NNS is at least equal to the savings that GD projects to achieve from its proposed acquisition of NNS.

The only arguable unique cost-savings that a GD/NNS merger could achieve is the closing of either NNS's or Electric Boat's shipyard and consolidating all submarine production in a single yard. However, GD has publicly stated that it does not intend to close either one of the yards after the acquisition, and GD has pledged to maintain the respective skilled workforces for a period of time. Closing one of the two shipyards is probably neither politically nor strategically feasible. Moreover, should the Navy's rate of procurement of submarines increase (as seems likely), more than one yard will likely be required./37/ Finally, although a NOC acquisition of NNS would ensure that NNS's shipyard remains open, NOC's experience in limiting infrastructure costs through specialization in the aerospace sector holds the promise of generating some consolidation savings even as the two shipyards remain open and competition between them remains viable.

Only a NOC/NNS Merger Achieves Cost-Savings and Preserves Competition

Under established principles of antitrust law, the Government can legitimately consider only the merger-specific cost-savings from a GD/NNS merger. Those savings pale in comparison to the overwhelming costs that a GD/NNS merger to monopoly would impose on its customer, the U.S. Government. By contrast, the option of a NOC/NNS merger is a classic case of allowing the Government "to have its cake [substantial cost savings] and eat it too [by preserving submarine competition]," while under the status quo there will simply

be no cake.

/37/ See note 5 above.

The choice is clear and simple. It would be ironic if this Administration, which came to office in part by professing its intention to rely on the marketplace rather than bureaucracy in economic affairs, became the first to approve a naked merger to monopoly on the ground that the bureaucracy can effectively manage a newly created monopoly.

TAB C1

Proposed Acquisition of Newport News by General Dynamics Will Reduce Competition in Research and Development for Surface Ships and Submarines

This white paper explains why the acquisition of Newport News Shipbuilding ("NNS") by General Dynamics Corporation ("GD") would reduce competition in research and development in the surface ship and submarine industries. This issue is of particular concern to Northrop Grumman Corporation ("NOC") because research and development is critical to the design of advanced combat and ship systems.

As discussed in more detail below, surface ships and submarines are becoming more reliant on advanced technology. Much of this technology, including that which is used on surface ships, is being developed in conjunction with the submarine program. If GD acquires NNS, NOC's ability to obtain the necessary engineering data and engineering expertise, as well as to utilize it in ship design, would be greatly reduced. At the very least, the likelihood of NOC teaming with NNS would be much lower. NOC believes that over time its ability to compete for engineering, design and construction of surface ships will be seriously harmed if it cannot access submarine-developed advanced technology. NOC believes any "horizontal" firewall between the research and development divisions of GD and NNS would not be effective or efficient.

Advanced ship systems technology is becoming an increasingly important part of

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ship development

Over the last fifty years, advanced technology has become an increasingly important part of ship development, both for the combat systems (e.g., fire control, radar, missiles) and ship systems (e.g., hull design, propulsion). Missiles with computer and radar tracking have replaced optical-sighted guns as the principal anti-air weapon on surface ships. Ship systems are also more complex. Propulsion systems for US Navy surface combatants, for example, have evolved from large, labor intensive steam and diesel engines to compact, low maintenance gas turbines that burn jet fuel.

The move towards greater technological complexity has continued with the Navy's next planned surface combatant, the DD 21, which is expected to be deployed in littoral (i.e., coastal) operations in support of Marine

Expeditionary Forces. This ship's Operational Requirement Document calls for unparalleled technological advances in both the combat systems and ship systems. One new system, electric drive, was described in a CRS report to Congress in the following terms:

> The Navy's decision to use electric-drive propulsion technology represents a technological shift for the Navy arguably comparable in significance to the Navy's shift from

> sail to steam power in the latter 1800s or the Navy's development of nuclear propulsion in the 1950s./1/

The change in administration does not appear to have affected the continuing trend towards greater technological sophistication. The Bush Administration has called for a "leap ahead" in weapons systems./2/ Testimony by Secretary of Defense Donald Rumsfeld before the Congressional Armed Services Committee has echoed the need for the United States to prepare itself technologically./3/

The ongoing emphasis on technology in ship systems and weaponry means that future ship building will continue to require access to innovative technology and engineering to remain competitive.

Advanced ship systems technology is often developed through the submarine program. The trend is towards greater use of submarine-developed advanced technology on surface ships.

The type of technology being developed depends, at least in part, on the nature of the perceived threat to the country. In the last decade there has been a renewed emphasis in the littoral battleground./4/ Because littoral operations often take place in

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/1/ Congressional Research Service, "Electric-Drive Propulsion for U.S. Navy Ships: Background and Issues for Congress", July 31, 2000, at 1.

/2/ Merle D. Kellerhals, Jr., "Bush Seeks $310,500 million for FY 2002 Defense Spending", www.eucom.mil, 28 February 2001 ("The research and development spending will focus on leap-ahead technologies for new weapons and intelligence systems; improvements to the laboratory and test range infrastructure; technologies aimed at reducing the costs of weapons and intelligence systems; efforts that are focused on countering unconventional threats to national security; and funding to continue development of a missile defense program.") (emphasis added).

/3/ Donald Rumsfeld, Secretary of Defense, testifying before the Senate Armed Services Committee, June 21, 2001, at 7 ("Nations are arming themselves with a variety of advanced technology systems, from quiet submarines armed with high-speed torpedoes, and cruise missiles to air

defense radars to satellite jamming capabilities.").

/4/ Aerospace Daily, "Navy, Marines push new technologies for littoral operations," February 22, 2000; Bryan Bender, "A sea change in ship size," Jane's Defense Weekly, April 19, 2000 ("The US Navy's transformation from a `blue water' force to one increasingly operating in the littorals has put the focus primarily on equipping the surface fleet with new information technologies, air- and sea-launched weapons and other next generation components."); Rear Admiral Jay Cohen, Before Senate Armed Services Committee, Subcommittee on Emerging Threats and Capabilities, June 5, 2001 at 2 (referring to littoral antisubmarine warfare). See also, Office of

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shallow waters with restricted maneuvering room, a maximum amount of stealth is required. Since submarines, by their very nature, are weapons of stealth, companies with submarine expertise have a distinct advantage in the development of this technology.

In the 1990s, the USS Arleigh Burke was designed to meet this greater need for stealth in a littoral environment. Not only was the radar cross section/5/ slashed to resemble a tuna boat but the ship's hull design included sound isolation devices as well as hardened and ground reduction gears to reduce the acoustic signature./6/

More recently, the Navy decided that its next planned surface combatant, DD 21, would also use several critical submarine-derived technologies:

- Hydro-acoustic analysis for propellers and hydrodynamic flow (i.e., the study of objects in water to minimize flow separation and noise);
- propulsor design including flow into and out of the propulsor (i.e., to control flow and noise);
- machinery quieting and isolation including analysis methods and rafting (i.e., the ability to isolate and reduce structural noise); and
- electric drive propulsion (i.e., the transmission of power from the engines to propulsion and non-propulsion systems, which can increase the stealthiness of ships)./7/

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Naval Research website listing littoral anti-submarine warfare as an important future naval capability.

/5/ Radar cross section refers to the reflectivity of an object expressed in square meters or decibels.

/6/ See DDG 51 Top Level Requirements, OPNAV Inst. S9010, Ser.N865G/6615, dated March 22, 1993.

/7/ CRS Electric Drive Report, supra note 1, at 58 (the potential for electric

drive to increase "submarine quieting" has led the Navy to consider installing it on Virginia Class Submarines. By developing a common system for both submarine and surface vessels, the Navy hopes to reduce the engineering and research and development costs) (citing testimony of Rear Admiral

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Most of the technologies being developed for the DD 21 directly or indirectly affect acoustic signature. The emphasis on controlling or reducing the DD 21's acoustic signature, which is to be similar to the Los Angeles Class submarines, is a clear advantage for submarine manufacturers. Companies whose experience is with surface ships lack that expertise and, for reasons discussed more fully below, are not able to easily acquire it.

Merger of GD and NNS would lead to a single source for much advanced ship systems technology

As described above, many of the advanced ship systems are being developed either in, or in conjunction with, the submarine program. The result is that GD and NNS, as the only two submarine new construction shipyards, hold a vast amount of the Navy's high tech expertise./8/

Each company has a large engineering staff devoted exclusively to submarine and ship systems. Combined, they would have about 80% of in-house engineering talent working on ship systems./9/ The concentration of high tech expertise in GD and NNS is reflected in the percentage, perhaps over 95%, of the Navy research and development budget going to these companies./10/ This figure might even increase if the Navy were to implement submarine-designed proposals derived from the Navy/Defense Advanced Projects Research Agency submarine payloads project./11/ As pointed out in a CRS Report on the proposed merger of GD and NNS, this concentration of engineers is important because:

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J. P. Davis and Rear Admiral Malcom I. Fages to the Military Procurement Subcommittee of the House Armed Services Committee, June 27, 2000).

/8/ Congressional Research Service, "Navy Shipbuilding: Proposed Mergers Involving Newport News Shipbuilding - Issues for Congress," at 17, May 22, 2001 ("staffs at [Electric Boat] and [Newport News] are the only two among the six yards that have extensive experience and resources in the design and engineering of submarines and nuclear-powered ships.").

/9/ Id. at 24.

/10/ Id. at 18 (quoting former Secretary of Defense Cohen expressing his opposition to the 1999 attempt by General Dynamics to acquire Newport News). The 95% figure may actually be an overstatement but it is, in any case, a substantial percentage.

/11/ Id. at 27. The DARPA project was designed to increase the number and variety of weapons and sensors on Navy attack submarines.

designers and engineers can create new designs and develop new technologies that can be sources of competitive advantage to a ship building organization when the organization incorporates the new designs and technologies into bids for future Navy ship acquisitions./12/

The expertise of GD and NNS is particularly apparent in relation to two important systems referred to above: acoustics and electric drive. Both companies have unique acoustic engineering expertise as a result of the Navy's research and development funding and their engineering, design and construction of Los Angeles (SSN 688) and later submarine classes. GD and NNS were also "the only two firms of any kind that mounted efforts to propose designs for fully integrated electric-drive/integrated power systems (as opposed to specific components of such a system) ..." for the DD-21, a non-nuclear surface ship./13/

NOC cannot obtain this technology from GD, NNS, or the Navy

Information concerning advanced ship and weapons systems is rightly treated as very sensitive. Much of the data is classified and, even where it is not, often contains proprietary information./14/ Companies have little incentive to provide such data to competitors. Even the Navy, as a neutral repository of such information, has been unwilling to release it. In the context of the DD 21 project, NOC (and previously Litton Ship Systems) has spent over a year trying to gain access to certain submarine related information held by the Navy. Even though several Navy officials have acknowledged NOC's need for the data, nothing has been provided to NOC as yet./15/

The proposed acquisition of NNS by GD will only exacerbate the situation by eliminating the potential for teaming arrangements between NOC and NNS. The NOC DD 21 Gold Team (led by subsidiary Ingalls Shipbuilding) hired NNS as its subcontractor for electric drive because it was the only way to gain access to required

/12/ Id. at 16.

/13/ Id. at 26.

/14/ The Chief of Naval Operations security instructions limit the transfer of classified or sensitive data.

/15/ NOC is willing to make available a list of its ongoing efforts to obtain this information over the past year. The list includes only those contacts for which NOC has written corroboration. It does not include the many telephone calls that were made during this time frame.

technology and engineering expertise. If the proposed merger between GD and NNS had already been approved, it is unlikely that NOC could have competed for the project. It would also have crippled the Navy's efforts to have competing teams on the DD 21 project.

Although advanced ship systems technology is usually developed through funding

by the Navy, mere access to these funds would not allow NOC or anyone else, other than GD and NNS, to compete in research and development

Access to Navy funding is critical for firms undertaking advanced technology research and development because of the enormous costs and risks involved./16/ However, merely providing Navy funds would not allow NOC to undertake the development of such technology. In order to develop the relevant engineering expertise, NOC needs not only engineers but also engineers with substantial experience. Understanding the theoretical parameters of propulsion, for example, is not a substitute for first-hand experience with the actual systems.

It would not be practical for NOC to hire, assuming it could do so, a sufficient number of experienced engineers from NNS or GD. It would require a very large upfront investment in personnel before there was any actual work for them to do. NOC would have to continue to pay these engineers in the hope that, some day, the company might win a Navy contract in which the research and development would have a practical application./17/ Since it takes several years between an Operational Requirements Document and an actual contract award, the investment, when compounded by the risk of not being successful, is staggering./18/

As a practical matter, it would also be difficult to lure engineers away from GD/NNS without any actual ongoing Navy research and development contracts. The

/16/ Defense Science Board Task Force (Department of Defense), "Vertical Integration and Supplier Decisions," May 1997, at 38 ("Whether a prime or supplier is likely to become competitive in a new technology is, in part, based on receiving DoD science and technology (S&T) funding."). The risk is exacerbated by the lack of certainty concerning the actual application of the research. The Navy might not ultimately use the research or Congress might withdraw funding for a particular project.

/17/ Even if the Navy were willing to guarantee an allocation of research and development funds the risk would be reduced but not eliminated.

/18/ In the case of the DD 21, the ORD was approved in November of 1997. The contract award is expected in December of 2001.

best engineers would want a stimulating work environment as well as the job security that comes from a company that successfully bids on important projects. NOC, at least in the short term, would have difficulty satisfying either requirement. It would also be difficult for NOC to compete using outside designers and engineers. In-house designers and engineers at GD/NNS are more effective because they work across a range of projects, allowing them greater access to their company's sensitive information and technology.

Even if NOC were to obtain the necessary engineering expertise, it would be at a cost disadvantage relative to GD/NNS because the latter entity could spread its research and development expenses over the production of both surface ships and submarines. The huge costs involved in entering into the

production of nuclear submarines would, of course, prevent NOC from doing the same.

Absent the ability to develop this expertise, NOC must either team with NNS, as it has done in the past, or merge with NNS. A merger between GD and NNS would eliminate the former option because of the platform competition between GD and NOC for surface ships.

Without two sources for this advanced technology, innovation competition will be stifled

It is well understood that firms compete not only on price but also in terms of innovation. Innovation has become a particularly important source of competition over the last 20 years in several industries, including defense. In fact, innovation competition may be of greater significance in the long term than price competition./19/ For example, innovation competition is responsible for the explosive growth and change in the telecommunications industry, leading to the creation or enhancement of such products as cellular phones and Internet services. The stifling of innovation was also a central issue in the Justice Department's case against Microsoft Corporation./20/

/19/ Constance K. Robinson, "Leap-Frog and other Forms of Innovation," June 10, 1999, at 1 ("Curtailing innovation through mergers may have serious anticompetitive consequences to consumers over the long run, and may be even more damaging to them than a price increase or quality decrease."); Robert Kramer, "Antitrust Considerations in International Defense Mergers," at 3, May 4, 1999.

/20/ US v. Microsoft, 65 F. Supp 2d 1, 103 (1999) ("Microsoft's past success in hurting such companies and stifling innovation deters investment in technologies and businesses that exhibit the potential to threaten Microsoft. The ultimate result is that some innovations that would truly benefit consumers never occur for the sole reason that they do not coincide with Microsoft's self-interest.").

Innovation competition is particularly important in the defense industry given the security provided by maintaining a technological lead over other nations./21/ Indeed, it was the critical importance of innovation competition that led the former Secretary of Defense to reject the previous proposal of GD to buy NNS. The Department of Defense announcement specifically noted a concern that "[i]f the two companies were to merge, there would be a concentration of ... engineering talent and of the technology advances from Navy-funded research and development."/22/

Consequently, combining the research and development of GD and NNS, the primary developers of advanced ship technology, will not encourage the level of innovation that the Navy and the Defense Department expect and require for their projects.

Firewalls between the research and development teams of GD and NNS would not be

effective

Firewalls are designed to prevent the transfer of sensitive information, such as proprietary or non-public technical and price data, between divisions or subsidiaries of the same company. Firewalls are often an effective remedy in vertical mergers where a company is acquiring a supplier or distributor. For example, a company that merges with one of its suppliers might obtain competitively sensitive information about unaffiliated suppliers by virtue of its relationship. Firewalls can prevent the disclosure of that information to the company's affiliate.

However, firewalls are apt to be less effective in a horizontal context, where two divisions are competing with one another and reporting to the same executive./23/ First, an executive has a fiduciary duty to maximize overall revenue. Having two

/21/ Kramer, supra note 19 at 3 ("when our defense strategy depends on maintaining a technological lead over possible adversaries ... reduction in the pace of innovation can have life-and-death implications.").

/22/ News Release, Department of Defense, "Secretary Cohen Announces Decision on General Dynamics and Newport News Shipbuilding Merger Proposal," at 2, April 14, 1999.

/23/ Firewalls have been used to deal with horizontal issues in only very limited circumstances. In the defense industry, such firewalls have been used where the merging companies already have competing teams in place and the contract is near to being awarded.

divisions competing against one another as well as duplicating certain costs would not allow the executive to satisfactorily discharge that duty. Second, one of the benefits of mergers is the potential for efficiencies. By maintaining such an artificial separation, the transaction would lose some of those direct benefits.

Conclusion

GD and NNS, because of their unique Navy submarine engineering and construction contracts, have a significant advantage in key submarine derived technologies and engineering. Future Navy ship programs will, of necessity, rely on this technology and innovation. Should the proposed acquisition be approved all submarine derived technology and engineering will be resident in a single corporation. NOC will not have access to this information, which would have a deleterious effect on its ability to compete in the production of surface ships. Conversely, the NOC/NNS transaction would provide two capable sources of submarine related technology for the Navy and the private sector, resulting in a healthier industrial base.

The Engine Wars: Implications for Naval Shipbuilding

The purpose of this paper is to describe the effects of creating a sole supplier in the defense industry by drawing on the U.S. Air Force's experience in creating a sole supplier -- Pratt Whitney -- for F-15 engines. The thesis of the paper is that if nuclear shipbuilding were to become a monopoly business, the Navy (like the U.S. Air Force) would be unable to ameliorate monopoly-induced inefficiencies. More importantly, unlike the jet engines example, the DOD would be severely constrained in its ability to induce viable competition due to the significant entry barriers present in the nuclear shipbuilding industry. One-time, short-run gains from creating a sole supplier in this industry are likely to be overwhelmed by the long-run costs of implanting a monopoly-induced, sub-optimal incentive structure in nuclear shipbuilding.

The paper's approach to proving this thesis is as follows. The first section provides a brief overview of the dynamics in the market for jet engines during the early 1980s. The goal of this section is to provide a historical perspective on how the incentives provided by a particular market structure can affect every customary measure of performance--cost, quality (including schedule adherence), and R&D or innovation--undertaken by a defense contractor. The paper's second section evaluates how key insights from such an experiment are applicable to the nuclear shipbuilding industry.

Section I. Sole-Sourcing Jet Engines: A Case Study/1/

In the late 1960s the Air Force conceived of the F-15, a premier performance plane to be powered by engines with a thrust-to-weight ratios of 10:1. This engineering requirement would prove a daunting challenge for the two viable engine producers, Pratt and Whitney and General Electric, whose previous offerings had clustered around thrust-to-weight ratios of 5:1. The Air Force decided to sole-source these engines (designated F100s) from Pratt and Whitney (PW) on the basis of a 50-hour qualification test in which the PW engine seemed more promising than the General Electric (GE) prototype. However, turning PW's test model into a full-scale development project proved more difficult than had been expected. So much redesigning, readjusting, and fine-tuning were required for the model to pass concurrent tests that the final engine deviated substantially from the prototype. Additionally, the thrust-to-weight ratio slipped to 8:1. Yet, in one key sense the Air Force got what it wanted--a plane promising unprecedented performance.

However, the Air Force soon realized that performance per se was not enough; the full potential of F-15s could only be realized if they proved durable. Yet durability was not what the Air Force had originally contracted for in making a sole-source contract with PW for an engine

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/1/ The Great Engine Wars, written by David M. Kennedy and commissioned by Robert Murray, John F. Kennedy School of Government, Harvard University, Report No. C16-85-629, 1985.

optimized for unprecedented performance. The F100s demanded extraordinary upkeep. Likened to a stable of racehorses, these engines required continuous tuning, parts replacement, maintenance, and troubleshooting. Eventually, necessary (and unanticipated) modifications overwhelmed the Air Force's repair and maintenance facilities. The life-cycle price tag on the F100 engines increased substantially.

PW met each new problem with the assurance that the crisis at hand would be

the last one the engine would experience, but this proved an elusive goal. For example, the engine's power allowed pilots to fly at less than full throttle, which caused the engine's turbines to break more frequently than expected. The absence of extensive performance data on this new engine also made it more difficult to predict how often the turbines would break or whether the problem would get worse with age. More alarming still, as more pilots flew more missions, it became clear that the engine could lose power without warning under certain circumstances, and sometimes even destroy itself under others. To complicate matters, two of PW's vendors that were critical to the F100 experienced workforce strikes simultaneously, leaving PW without replacement parts, and forcing it to cease production temporarily in 1979. The Air Force was constantly a step behind in repairs, spare parts, and qualified personnel for the F100. By the end of 1979, for instance, the Air Force had over 40 F-15s standing inoperable for lack of operating engines.

While the Air Force was wrestling with PW's F100, GE had assembled a test engine at its own expense. Combining characteristics of the engine GE had developed for the B-1 bomber and a new commercial engine, CFM-56, the so-called F101X impressed the Air Force enough that it decided to fund the prototype's initial production. Air Force officials contend that they decided to fund a transition of the F-101X from its test phase into initial production as a tactic to shock PW into improving its own cost-effectiveness and customer service, which had markedly deteriorated since the F100's inception.

In the event, GE further impressed the Air Force by preparing an upgraded model of the F101X that boasted more power than PW's F100 and substantially less wear. The Air Force decided to see what it could gain from competition, and in mid-1981 issued a Request For Information (RFI) to both PW and GE, soliciting detailed data on each firm's product pricing, reliability, performance, delivery rate, spare parts, and warranties. Because GE's response to the RFI had promised good prices on a reliable engine with spare parts and buyer-friendly warranties, the Air Force stepped up its interest in the F-101X, and approved the engine for full-scale engineering development (an acquisition milestone today called engineering and manufacturing development).

Nonetheless, the prospects of ever using this alternative engine seemed at best marginal, and the Air Force, in the beginning, remained skeptical about committing resources to GE's F-101X demonstrator program. Officials concluded that it would be virtually impossible to insert

an F-101X into an F-15 or F-16. The costs and difficulties of establishing another contractor and another full support service network for the F-101X seemed insurmountable. Further, fresh in the Air Force's memory was the testing and repair cycle it had undergone to get the F100 serviceworthy. Compounding all such skepticism was PW's strong desire to remain a sole supplier and the influence it wielded in Congress and the Pentagon attempting to secure that privileged position. PW saw the competition as a bluff, and maintained that the deciding factor in engine selection would continue to be thrust-to-weight ratio. As a result, PW played down the Air Force's new demands for durability. However, the prospects for the F101X improved significantly when the Navy, in the market at the same time to procure an alternative for its disappointing F-14 engine, indicated a willingness to bear some of the costs of turning GE's demonstrator prototype into a full-fledged fighter engine.

The transition from fostering viable competition to actually procuring a competitive product was not easy. PW realized that the competition it had so confidently dismissed was beginning to threaten its comfortable F100 niche. Consequently, PW attempted to forestall the competition, offered significant

price reductions on its new engines, as well as a host of fringe benefits that would extend to models already in the field. PW also encouraged congressional intervention to stop the Air Force from introducing competition for the engines on its two high-performance aircraft. The Air Force viewed these concessions as PW's attempts to remain a sole-provider for the F100 engines. They declined PW's proposal, and congressional pressure on the Secretary of the Air Force only emboldened his commitment to pursue a competitive procurement. The GE effort to move the F101X into production was showing dramatic results. The F-101X had begun to deliver everything the Air Force wanted: a stall-free engine, immune to throttle-provoked misbehavior and packing more power than the existing F100s. The Air Force now was in a position to test the ultimate gains from inducing competition, and asked both companies for complete details about engine price, reliability, performance, delivery rate, and, most importantly, price schedules on spare parts and warranties.

PW and GE submitted their "best and final" offers to the Air Force in November 1982. The competition had been more effective than anticipated: both contractors offered engines promising twice the life span of previous models and a higher degree of durability, all priced substantially lower than the Air Force expected. Moreoever, GE offered more attractive agreements on both spare parts provisions and warranty offers, a key feature of the acquisition in the light of how logistical costs began to overwhelm the Air Force's introduction of the first F100s. The company also agreed to provide dual sourcing for any part the Air Force specified and to help locate alternate vendors if necessary. GE's warranty was a flat 5% of the engines' price, regardless of the proportion of the contract GE eventually won. PW's offer, on the other hand, gamed the warranty provision by adjusting its cost in proportion to the share of the total quantity of engines it would receive. PW's warranty started at 5% of the engines' price for a contract granting PW 100% of engines. It then increased the price of the warranty up to 33 percent of the engines' price for a contract granting PW only 25% of the total.

The Air Force was unwilling to commit to a long-term procurement contract on the basis of the GE bid and decided instead on a one-year award, intending to buy 120 F-110s (the redesignated F101X) and 40 PW F100s. Additionally, the F-110s were chosen for the F-16 aircraft, of which the Air Force planned to purchase over 1,000, while PW's award was for the F-15, with only hundreds more slated for production.

The "Great Engine War," as it has been dubbed represents how competition, or its absence, affects the relationship between the government-customer and its contractors. The Air Force claims the engine war saved it more than $2.5 billion over 20 years. More importantly, the Air Force believes that it received "vastly improved engines, significantly enhanced warranties, and an enlarged industrial base." The New York Times, in commentary on the engine's acquisition strategy, praised the Pentagon, saying that if other services followed its dual-competition standard, it "would vastly improve the quality of every weapon on the Pentagon's long shopping list. Besides that, it would cut defense costs dramatically."/2/

Section II. The Lessons of Sole-Sourcing: Jet Engines to Nuclear Shipbuilding

The "Great Engine War" of the 1980s, described above, has important implications for the current proposal to create a monopolist in the nuclear shipbuilding industry. Restoring efficiency in such a market structure requires that procurement practices be designed to induce a monopolist to act in ways that run counter to its self-interest. The jet engine experience highlights the fact that it is very difficult to ameliorate the customary market distortions

associated with the operation of a monopolist. These monopoly-induced distortions are summarized below:

Sole-sourcing is inefficient in a dynamic market environment. High initial costs, technical riskiness, and long developmental times are hallmarks of any major military procurement. Any procurement, especially the product offered by a nuclear shipbuilder, will entail a "technological evolution." The jet engine experience highlights the fact that it is very expensive to buy flexibility (design changes, customer service, etc.) from a monopolist in a constantly evolving environment.

The Air Force's relation with PW suffered markedly when it needed technical support in getting the F100 engines serviceworthy. Lt. Col. William Eddy, working for the Air Force Command System at the time noted, "They didn't want to do what we wanted them to do."/3/ Gen. Alton Slay (who was responsible for all aspects of the F-15 program), publicly airing his views on contracting problems with PW, told Dun's Business Monthly that when he went to

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/2/ Ibid, p.26.

/3/ Ibid, p.4.

meet PW, he met "with their lawyers, not their managers."/4/ PW's lawyers were quick to point out that such interactions are hallmarks of contracting any complex defense procurement with the government. In their view, "Once you qualify an engine through testing, (and it's accepted by the government), it becomes frozen in design. You cannot change anything - you can't change a washer without formal processing and approval of funding if necessary, or price adjustment, if necessary."/5/

Loss of competitive alternative due to sole-sourcing can be very expensive. Since it is not possible to write a contract covering all future contingencies, efficient contracting requires that the government maintain some satisfactory alternative over the procurement process. The Air Force gained from dual sourcing in jet engine procurement because GE (despite loosing to the F100) had remained a viable manufacturer of jet engines. It was possible for GE to build a demonstration engine at its own expense because it could appropriate major subsystems from the engines it was already building for the B-1 bomber and the F-18. Monopolization of nuclear shipbuilding will foreclose all such opportunities for competitive procurements. Investments and technical know-how required to credibly threaten an incumbent in this industry are simply too large to impose any cost discipline.

Gary Hansmen (Aeronautical Systems Divisions (ASD) contract officer, who negotiated several F100 buys), commenting on the lack of satisfactory competitive alternative to sole-sourcing from PW, noted that, "In any sole-source negotiating situation, all they have to do is wait you out. You can't wait for ever; you need that product."/6/ While pointing to PW's proclivity for taking maximum possible advantage of its sole- sourcing situation, Hansmen noted, "They were willing to give us anything we wanted. It was just a question of whether there was enough money in the budget."/7/ Under these condition the impact of credible dual sourcing was dramatic. As the GE engine became a viable competitor, PW offered the Air Force a package deal on its engines that could eventually save the Air Force $3 billion. PW's offer was not accepted. While the dramatic cost reduction was impressive, PW's package had work provisions the Air Force did not ask for or want. More importantly PW's offer raised expectations

that even the current deal could be bettered as dual sourcing took roots in this industry. Gary Hansmen, who was on the source selection team felt the contract would "effectively wipe out the competition and sew up the business for five years."/8/

Competitive remedies to sole-sourcing may be difficult. Encouraging competition to remedy monopoly-induced market distortions usually requires funding a competing product in its developmental stages. In light of high costs of funding development efforts, the benefits of

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/4/ Ibid, p.4.

/5/ Ibid, p.4.

/6/ Ibid, p.16.

/7/ Ibid, p16.

/8/ Ibid, p.13.

competition are often too uncertain to validate the significant investments required to support two plausible suppliers. Further, current procurement practices, at least in theory, are supposed to result in the best possible value from the defense contractor. As such, supporting competition often requires arguing for unknown benefitsa position that is often very difficult to quantify and defend. This problem is particularly acute in nuclear shipbuilding because the investments and technical know-how required to enter this industry is quite large and complex. Adding to such budgetary and technological hurdles, the prospect of introducing a competing product is often met with skepticism from within the armed forces because of the logistical complications (repair, maintenance, stocking new parts, etc.) and the associated pains of learning to make the new product service-worthy. The systemic inertia induced by using a known complicated system (albeit a cost-inefficient one) in nuclear propulsion could make the introduction of a new, competing system unattractive even if it promised superior value. This situation is further complicated by the incumbent's desire to remain a monopolist and the political influence an incumbent may exercise over the whole process of initiating competition. Fortunately in the nuclear shipbuilding industry, under current procurement system (for example, teaming arrangements between General Dynamics and Newport News to build nuclear submarines), the cost of maintaining a dual source is quite low. Monopolization of the nuclear shipbuilding industry will significantly increase the cost of any remedy i.e. ushering dual sourcing when needed. Any measure of gains from monopolization must take into account the forgone opportunity cost of abandoning the current dual source system.

The Air Force's experience in getting GE's F-101X service-ready illustrates each of the above hurdles. While the Air Force was clearly impressed with GE's demonstrator engine, the difficulties involved with establishing a new full support and service network around another engine seemed insurmountable. Major Tack Nix, who initially reviewed the demonstrator engine said, "I consider it strictly a textbook exercise; I said this was going to be a great demonstrator."/9/ Then there was the issue of funding a demonstrator program. It was fortuitous that the Navy at that time was willing to fund such a program, and that the Air force could influence Congress to shift some of the Navy's funds to that project. The PW lobby did not hesitate to point out the potential logistical, support, and maintenance problems that would attend introducing a

new engine. Fortunately for GE, and in the long run for the government, embarrassing the Air Force officials backfired.

Regulating a sole supplier is often quite ineffective. Key to effective regulation is accurate information about cost of production. It is often impossible to collect the information required to incentivize a monopolist to be cost-effective and innovative in an environment where the product is constantly evolving. In the absence of any benchmark for what "value" is --cost, quality (including schedule adherence), and innovation--, it is very difficult for a regulator to ensure the best possible "deal" from a defense contractor. Creating a sole supplier in nuclear

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/9/ Ibid, p.8.

shipbuilding will leave to the Navy the unenviable task of guessing the best value for any procurement. Estimating best value is often difficult even if the contractor reports true operational logistics and cost of production. Ultimately, from society's perspective, the real question is not how good a current contract is but how good it can be. The life cycle costs (including parts and warranties) of jet engines, after competitive bids were submitted by PW and GE, were substantially lower than any Air Force estimate. This is not surprising, because without a competitive process the Air Force was in no position to determine what true costs would be. Fixed-price (or price-cap) contracts designed to acquire a product at the lowest price are usually ineffective (especially when it comes to the quality and technical innovativeness of a product) when the exact specification of the product is unknown at the time of contracting. The Navy will have no credible benchmarks for accessing value if it chooses to contract with a sole supplier for its nuclear shipbuilding program.

The Air Force's initial experience in contracting with PW for jet engines and its eventual savings from encouraging competitive bids provide a good example of the drawbacks involved with sole-source contracting. The keys to cost-cutting on engine procurement were provisions dealing with spare parts and warranties. Procuring spare parts at best prices required data on dimensions, tolerances, material performance characteristics, and the manufacturing process involved. As a sole supplier, PW could extract not only top dollar for this information but was able to retain significant control over the supply of these parts. According to The Wall Street Journal, although PW produced only 20% of its own spare parts, the Air Force acquired almost 80% of these parts from PW, which benefited handsomely from handling and management fees./10/ As a sole supplier, PW also exercised considerable leverage on warranty contracts. Since problems with the engines and the associated damages could not be anticipated, it was almost impossible for the Air Force to share the costs of major engine problems. The severity of this problem can be seen by the cost of warranty coverage. PW had charged the Air Force $53 million for warranty coverage on roughly $130 million worth of engines. Competition in engine production dramatically reduced the informational bottlenecks regarding pricing for both spare parts and warranties. As a part of its RFP, the Air Force required both manufacturers to divulge "Level II" procurement data, i.e., everything necessary to enable another manufacturer to reproduce the part in question. Both manufacturers eventually also settled for a flat warranty price of 5% of the engine prices.

Summary

It has been the purpose of this paper to highlight the distorted economics

of a sole supplier in the jet engines industry and draw inferences for monopolistic control of nuclear shipbuilding industry. The results of this analysis suggest three concluding observations.

/10/ Ibid, p.17.

First, if the nuclear shipbuilding industry is monopolized, all direct benchmarks for evaluating cost-effectiveness and innovativeness in this industry will be lost. Economic theory clearly points to loss in dynamic efficiency if an industry is monopolized. In fact the Air Forces' experience with PW in the late 70's provides a good example of how distorted incentives, over time, can reduce the will to innovate and discipline costs. The static, one-time gains that may be realized by a monopolist are always more visible, but the Air Force's experience indicates that the eventual losses from long-term inefficiency may be quite large and significant.

Second, once monopolized, an industry will require regulation to ameliorate some of the monopoly-induced distortion, and this regulatory process tends to prove very burdensome. This industry will produce the most technologically advanced products whose exact specification cannot be predetermined. Informational requirements for efficient contracting under such a continually changing environment is quite imposing. However flexibility in product design is key to keeping pace with the current transformation of military forces. Economic theory strongly suggests the government ability to design effective procurement contracts that foster innovation and cost-effective production is quite limited.

Finally, The Air Forces experience highlights the difficulties associated with fostering competition, once an industry is monopolized. Competition for nuclear-powered ships after General Dynamics were to acquire Newport News Shipbuilding is almost certainly not viable. While low levels of procurement today for nuclear submarines may not present opportunities for vigorous competition, maintaining the independence of the two shipbuilders at least allows for some way of benchmarking costs, quality, and innovativeness. More importantly, maintaining two independent sources allows the possibility that credible competitive forces can be unleashed if procurement needs change. Maintaining an industrial base where some form of competition is possible is the only way to ensure long-term value for the government's investment in nuclear shipbuilding and undersea warfare.

TAB C3

Implications of Alternative Forces on the Naval Shipbuilding Industry

The purpose of this paper is to elaborate the implications of alternative future force structures on shipbuilding revenue shares and submarine procurement rates. At its most basic, the paper describes a forward-looking perspective on the shares of revenue that would result from the acquisition of Newport News Shipbuilding by General Dynamics or Northrop Grumman, figures that have been widely discussed as a part of even the public commentary about these two competing merger proposals./1/ The significance of these revenue-concentration calculations is that they form one of the more straightforward indicators of the very different market structures for shipbuilding that would result from the two

proposals. The paper's deeper insight, however, concerns the sensitivity of submarine procurement rates to alternative force structures. The key point of this analysis is that even for an objective as low as 50 SSNs, 3 new ships per year would have to be authorized, beginning in the relatively near future. As demonstrated in the acquisition strategies associated with the procurement of surface combatants and logistics ships, a procurement requirement calling for two or three ships per year of the same class has tended to warrant a competitive allocation of awards among at least two different firms.

The thesis of the paper is that the outcomes of the Department of Defense's (DoD's) ongoing review of strategy and force structure are critical to a proper evaluation of the antitrust considerations relevant to the two proposals to acquire Newport News. Moreover, two implications of those outcomes would be to skew toward 80 percent the share of revenue that might accrue to a General Dynamics-Newport News combination and to increase the build-rate of attack submarines to at least three per year.

The paper approaches its proof of this thesis on the following course. First, it describes the nominal force structure of planned Navy ships and two alternative future forces drawn from the emerging results of the DoD's strategy review. Next it calculates the annual, steady-state acquisition funding required to sustain these three ship-forces and makes an illustrative allocation of that funding among the six shipyards owned by Newport News, General Dynamics, and Northrop Grumman. From that allocation, the analysis describes how future revenues might be shared between General Dynamics and Northrop Grumman under each company's merger proposal. Finally, the paper explores the implications of the alternative force levels for the required procurement of attack submarines. The results of this exploration depict how the build-rate for these submarines would have to increase to support the levels of attack submarines postulated in the three force structure alternatives used to calculate revenue shares.

/1/ Most notably in CRS Report RL 3096, Navy Shipbuilding: Proposed Mergers Involving Newport News Shipbuilding - Issues for Congress, by Ronald O'Rourke, May 2001, which indicates a 70:30 ratio of revenue between the General Dynamics-Newport News combination and Northrop Grumman, based on shipbuilding programs experienced in the 1990s.

Section I: Alternative Navy force structure objectives

The baseline force structure objective considered in this analysis is displayed in the table below. It can be thought of as the nominal "300-ship" fleet that emerged from the DoD's 1997 Quadrennial Defense Review. That force consists of 12 aircraft carriers, 36 amphibious ships, 14 ballistic missile submarines, 50 attack submarines,/2/ and 116 surface combatants, rounded out by 70-odd logistics, mine warfare, command, and support ships./3/ Based on the indicated replacement costs and life of these ships, the total annual funding required to sustain this force is about $10 billion./4/

	Baseline Fleet/5/		
Ship type	Number of ships	Replacement cost (B)/6/	Exp (Yea

A/C carriers	12	5.2
Big-deck amphibs	12	1.4
Other amphibs	24	0.6
SSBNs	14	2.4
SSNs	50	1.8
Destroyers	89	1.0
Cruisers	27	1.2
CLF ships	30	0.3
Mine warfare	16	0.2
Command	4	0.7
Support	22	0.2
TOTAL	300	

/2/ It should be noted that the DoD's amended budget submission for fiscal year 2002 already has increased the force objective for attack submarines from 50 to 53. See June 27, 2001 Defense Budget Presentation for fiscal year 2002, presented in part by Dr. Dov Zakheim, Under Secretary of Defense (Comptroller). Transcript available at www.defenselink.com.

/3/ Note that "today's" fleet consists of slightly more than 300 ships. For example it includes 18 SSBNs, four of which are scheduled to be retired because of treaty agreements, plus several older attack submarines and surface ships that are rapidly approaching the end of their service lives.

/4/ The approach adopted here is a steady-state-type analysis, which begins with a target force structure of naval ships, described in numbers and types of ships. It estimates unit replacement (i.e., construction) costs from current and historical budget data (expressed in billions of budget year 2000 dollars). It estimates the expected useful lives of the different types of ships from publicly available data on commissioning and retirement dates. The calculation of steady-state funding is the annual cost, by ship-type, necessary to sustain the targeted force structure. For example, 15 ships of a given type in the fleet, whose unit replacement cost and useful lives are $0.6 billion and 30 years, respectively, require annual, steady-state funding of $0.3 billion ((15 x $0.6)/30 = $0.3).

/5/ This fleet composition is based on information published by the American Shipbuilding Association and is located at www.americanshipbuilders.com.

/6/ Replacement cost estimates are in billions of budget year 2000 dollars. They are based on extrapolations from current and historical budget data, located at the Navy budget link available through www.defenselink.mil.

/7/ The expected useful lives are in years, estimated from publicly available commissioning and retirement dates in Jane's Fighting Ships 2000-2001 Yearbook.

The second and third force-objective alternatives were motivated by a recent presentation about the results of Secretary of Defense Rumsfeld's study of how conventional forces relate to the emerging strategy of military transformation./8/ The one new shipbuilding investment program that the study found attractive was the Virginia-class SSN. Mine warfare, fast sealift concepts, and conversions of strategic ballistic missile submarines (SSBNs) to a

configuration suited to the launch of guided, conventional missiles (SSGNs) also were seen as attractive research and development initiatives. The presentation also favored the Burke-class guided missile destroyer (DDG-51), but noted that that program is nearing the end of its planned procurements. Conversely, the study appears to give less support to the emerging DD-21 surface combatant program, new aircraft carriers, and amphibious ships. Accordingly, the force alternatives posited here simply put more emphasis on ship-types endorsed in the study and less on other types of ships.

The first alternative, characterized in the table below as the Transformation fleet, maintains the overall force at 300 ships but changes the composition of ships in the fleet in accordance with the indications emerging from the DoD's strategy review. It increases the total number of submarines (raising to 62 the number of attack submarines and adding 4 SSGN's), mine warfare and support ships, while modestly reducing the numbers of aircraft carriers, amphibious ships, and combat logistics ships in the fleet.

	Transformation Fleet		
Ship type	Number of ships	Replacement cost (B)	Exp (
A/C carriers	9	5.2	
Big-deck amphibs	10	1.4	
Other amphibs	20	0.6	
SSBNs	14	2.4	
SSGNs	4	1.5	
SSNs	62	1.8	
Destroyers	79	1	
Cruisers	27	1.2	
CLF ships	27	0.3	
Mine warfare	18	0.2	
Command	4	0.7	
Support	26	0.2	
TOTAL	300		

The second alternative force objective, shown in the table below, scales back the total number of ships to a level more consistent with a constrained funding environment. It then also adjusts the composition of that force in directions consistent with the emerging review of strategy. The resulting force, totaling about 249 ships, would increase to 56 the absolute number of attack submarines in the force, add four SSGNs, and make one-third reductions to the numbers of surface combatants and combat logistics ships,

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/8/ Briefing of the Rumsfeld study of conventional forces was given by the study group's leader, David C. Gompert, on June 22, 2001. A transcript is available at http://www.defenselink.mil.

while reducing the remaining force elements in rough proportion to the overall reduction in the fleet.

	Constrained Fleet		
Ship type	Number of ships	Replacement cost (B)	Exp (
A/C carriers	9	5.2	
Big-deck amphibs	9	1.4	
Other amphibs	18	0.6	
SSBNs	14	2.4	
SSGNs	4	1.5	
SSNs	56	1.8	
Destroyers	60	1.0	
Cruisers	20	1.2	
CLF ships	20	0.3	
Mine warfare	14	0.2	
Command	3	0.7	
Support	22	0.2	
TOTAL	249		

Section II: Future revenue shares

Based on these three alternative force structures and the estimates of annual funding associated with each class of ships, the analysis next makes an allocation of funding to different shipyards, as indicated in the three tables at Attachment 1. In an effort to minimize the amount of judgment necessary to determine this allocation, the approach adhered to current policies and practices as closely as possible. Newport News remains the sole builder of nuclear aircraft carriers, and Northrop Grumman's Ingalls Shipbuilding continues as the only builder of build large-deck amphibious assault ships./9/ Funding for the other types of ships was allocated to competing yards in essentially the same proportions as experienced in the 1990s. In addition, the funding necessary to refuel nuclear-powered ships that remain in the force structure is included, allocated between Newport News and General Dynamics as it has been distributed to them in the past.

The two tables below show the effects of these allocations on how total shipbuilding revenue would be shared between General Dynamics and Northrop Grumman under the two merger proposals now under consideration. The first table depicts, for each merger proposal and alternative force structure, the revenue shares in absolute dollars, as well as the revenue at the individual shipyards constituting each firm's total. The figures indicate that if General Dynamics were to acquire Newport News Shipbuilding, its total shipbuilding revenues would range from a low of $7.48 billion per year under the Constrained fleet alternative to a high of $8.37 billion per year under the

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/9/ This is not to say that Ingalls is the only yard capable of building these ships. For example, the National Steel and Shipbuilding Co. (NASSCO), which is owned by General Dynamics, submitted bids to build the second, third, and fourth ships of the LHD-1 class (large deck) amphibious ship.

Transformation fleet alternative. If Northrop Grumman were to acquire Newport News, its total shipbuilding revenue would range from a low of $5.01 billion per year under the Constrained fleet alternative to a high of $5.99 billion under the Baseline fleet scenario.

	Baseline Fleet	Transformation Fleet	
	Funding(B)	Funding(B)	
Avondale	0.48	0.45	
Ingalls	2.15	1.94	
NNS	3.35	3.32	
BIW	1.85	1.69	
EB	2.44	3.03	
NASSCO	0.32	0.33	
Total	10.61	10.76	
GD acquires NNS			
GD & NNS	7.97	8.37	
NOC	2.64	2.39	
NOC acquires NNS			
GD	4.62	5.05	
NOC & NNS	5.99	5.71	

The second table translates these absolute figures into a series of ratios expressed as General Dynamics' share: Northrop Grumman's share.

	Ratios of GD:NOC revenues		
	Baseline Fleet	Transformation Fleet	Constraine
GD acquires NNS	75:25	78:22	80:20
NOC acquires NNS	44:56	47:53	47:53

The ratios suggest the following observations. First, relative to current revenue shares resulting from General Dynamics' acquisition of Newport News (i.e., 70:30),/10/ each alternative force structure would increase General Dynamics' revenue dominance resulting from combining the two nuclear-capable shipbuilders. Under the Constrained fleet alternative, the spread of the ratio grows to 80:20. It would appear that the growth in submarine construction under all three alternatives, concentrated at two General Dynamics yards, overtakes any offsetting reductions in other classes of ships (e.g., aircraft carriers), to the increasing advantage of the combined General Dynamics-Newport News firm. Second, relative to the current revenue shares resulting from

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/10/ CRS Report RL 3096, Navy Shipbuilding: Proposed Mergers Involving Newport News Shipbuilding - Issues for Congress, by Ronald O'Rourke, May 2001, p. 24

Northrop Grumman's acquisition Newport News (i.e. 42:58),/11/ the spread of the ratio narrows under all three force alternatives toward 50:50. Moreover, the calculations suggest that the kinds of variations to the Baseline fleet indicated by the emerging results of the DoD's strategy review would actually narrow the spread of the ratio in General Dynamics' favor. This result appears to arise from the fact that reductions to the procurement of aircraft carriers and amphibious ships adversely affect the Northrop Grumman-Newport News revenue totals more than the increases to submarine construction shared with General Dynamics/Electric Boat help it. Finally, it is worth observing that the ratios associated with Northrop Grumman's acquisition of Newport News are not sensitive to even broad changes to acquisition plans. While the robustness of this point may extend only to variations of the force centered mostly on changes to the levels of attack submarines, it also follows logically from an industrial structure characterized by two matched firms, each with shipbuilding capabilities spanning the full breadth of platforms and propulsion types.

Section III: Attack submarine procurement rates

The first purpose of this paper has been to describe the implications on revenue shares of alternative ship-force levels in the future. But these same alternative force levels have equally important implications for acquisition planning. The Navy's existing acquisition program envisions acquiring one submarine each year into the future, a rate that may be too small to motivate a robust competition between General Dynamics and Newport News Shipbuilding for the award of each ship. However, one-per-year is also a rate insufficient to sustain even a 50-ship fleet, let alone still larger force levels that are both the express/12/ and implied results of the DoD's ongoing strategy review. In fact, the procurement rate turns out to be very sensitive to even modest increases to the size of the submarine force structure objective.

For example, and as illustrated in the table below, sustaining the force of 53 submarines now planned in the fiscal year 2002 defense budget request would require ramping up production of attack submarines to three per year at the point around 2009 when large numbers of Los Angeles-class ships in the legacy force begin reaching the end of their service lives. Reaching and sustaining a force objective of 56 attack submarines, as posited in the Constrained force alternative would require ramping up to 2 per year immediately and then 3 per year beginning in 2010. The still larger force objective of 62 posited in the Transformation force alternative would require ramping up to 3 per year immediately.

/11/ O'Rourke, p. 29

/12/ See June 27, 2001 Defense Budget Presentation for fiscal year 2002, presented in part by Dr. Dov Zakheim, Under Secretary of Defense (Comptroller). Transcript available at www.defenselink.com.

SSN Force Levels Under Alternative Acquisition Profiles/13/

Fiscal year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	20
SSN-21 and earlier classes	50	50	50	49	49	48	48	45	45	45	43	41	
VA-class, '98 thru '02		1	2	2	3	4	4	4	4	4	4	4	
Legacy Force	50	51	52	51	52	52	52	49	49	49	47	45	
FY 2002 Budget Force													
Ships authorized	1	1	1	1	1	1	3	3	3	3	3	3	
Cumulative additions to force							1	2	3	4	5	6	
Total SSN's in fleet							53	51	52	53	52	51	
Transformation Force													
Ships authorized	3	3	3	3	3	3	3	3	3	3	3	3	
Cumulative additions to force							3	6	9	12	15	18	
Total SSN's in fleet							55	55	58	61	62	63	
Constrained Force													
Ships authorized	2	2	2	2	2	2	3	3	3	3	3	3	
Cumulative additions to force							2	4	6	8	10	12	
Total SSN's in fleet							54	53	55	57	57	57	

Summary

Much of the public commentary about the two competing proposals to acquire Newport News Shipbuilding has centered on calculations of static, historical revenue shares and acquisition plans. For example, based on shipbuilding revenues over several of the past years, it is said that General Dynamics' acquisition of Newport News would concentrate 70 percent of shipbuilding monies in that combined firm. It is also widely observed that the acquisition program for attack submarines over the past several years has called for the construction of one or fewer submarines each year, a level at which the putative economies of concentration might well exceed the expected value to the Navy of having two, independent shipyards to compete for these awards. However, more important to an assessment of the antitrust considerations about the two proposals is a dynamic perspective of how revenues and acquisition plans may change in response to the fundamental reconsideration of military strategy and force structure that began at the advent of the new Administration in January. It has been the purpose of this paper to develop this more dynamic perspective on the naval shipbuilding industry. The paper has constructed three plausible (if not probable) ship-force structures and then worked out the implications of those alternative forces on, first, the revenues likely to accrue to each shipyard and, second, the acquisition plans for attack submarines.

/13/ These calculations assume a six-year construction lead time. They also assume that the SSN build program is fixed until FY 2003.

The analysis turns up two important conclusions. First, with respect to revenues, it shows that under a broad range of the likely future ship-forces, Northrop Grumman's acquisition of Newport News would result in an allocation of revenues between the two remaining shipbuilding firms that is roughly even and stable. While revenue is only one of many attributes that might speak to the viability of a healthy, competitive industrial base for ships into the future, it is nevertheless a prime indicator. By contrast, General Dynamics' acquisition of Newport News would tend to skew the distribution of revenues toward an 80 percent concentration in the nuclear-capable firms that might undermine the competitive health of the overall sector. The second key conclusion of the analysis is that the procurement rate is extremely sensitive to increases in the objective force levels of submarines. No force of submarines that is likely to emerge from the DoD's strategy and force structure could be achieved and sustained without a procurement rate of three ships per year after 2009. Any submarine force level above the 53 now planned will require at least 2 per year beginning in 2003. And force levels above 60 cannot be achieved before 2012 without increasing the procurement rate above 3 per year immediately. Whereas the viability of competition for awards of one submarine per year or fewer may be questioned, the Navy's current acquisition strategies for surface combatants and logistics ships would suggest that programs requiring 2 or 3 ships per year warrant a competitive award between at least two, independent firms.

ATTACHMENT 1

Estimated Steady-State Funding Distribution

(Billions of BY 2000 Dollars)

Baseline Fleet

Ship type	Annual cost (B)	Avondale	Ingalls	NNS	BIW	EB	NASSC
A/C carriers	1.25			1.25			
Big-deck amphibs	0.42		0.42				
Other amphibs	0.36	0.24			0.12		
SSBN	0.84					0.84	
SSN	3.00			1.50		1.50	
Destroyers	2.54		1.27		1.27		
Cruisers	0.93		0.46		0.46		
CLF ships	0.26	0.13					0.13
Mine warfare	0.11	0.05					0.05
Command	0.08						0.08
Support	0.13	0.06					0.06
Carrier refueling	0.50			0.50			
SSBN/SSN refueling	0.20			0.10		0.10	
TOTAL	10.61	0.48	2.15	3.35	1.85	2.44	0.32

Transformation Fleet

Ship type	Annual cost (B)	Avondale	Ingalls	NNS	BIW	EB	NASSC
A/C carriers	0.94			0.94			

Big-deck amphibs	0.35		0.35				
Other amphibs	0.30	0.20			0.10		
SSBN	0.84					0.84	
SSGN	0.20					0.20	
SSN	3.72			1.86		1.86	
Destroyers	2.26		1.13		1.13		
Cruisers	0.93		0.46		0.46		
CLF ships	0.23	0.12					0.12
Mine warfare	0.12	0.06					0.06
Command	0.08						0.08
Support	0.15	0.07					0.07
Carrier refueling	0.40			0.40			
SSBN/SSGN/SSN refueling	0.25			0.13		0.13	
TOTAL	10.76	0.45	1.94	3.32	1.69	3.03	0.33

Constrained Fleet

Ship type	Annual cost (B)	Avondale	Ingalls	NNS	BIW	EB	NASSC
A/C carriers	0.94			0.94			
Big-deck amphibs	0.32		0.32				
Other amphibs	0.27	0.18			0.09		
SSBN	0.84					0.84	
SSGN	0.20					0.20	
SSN	3.36			1.68		1.68	
Destroyers	1.71		0.86		0.86		
Cruisers	0.69		0.34		0.34		
CLF ships	0.17	0.09					0.09
Mine warfare	0.09	0.05					0.05
Command	0.06						0.06
Support	0.13	0.06					0.06
Carrier refueling	0.40			0.40			
SSBN/SSGN/SSN refueling	0.20			0.10		0.10	
TOTAL	9.37	0.38	1.52	3.12	1.29	2.82	0.26

TAB C4

Economic Incentives in the Naval Shipbuilding Industry

The purpose of this paper is to explain the economic incentives of shipbuilding firms under different market structures and the consequences of those incentives for the Department of Defense's (DoD's) interest in having access to efficient industrial resources for this crucial defense industry. Efficiency, as used in the context of this paper, is intended to relate all the attributes of "value" that are the customary measures of a defense contractor's performance--cost, quality (including schedule adherence), and innovation. The paper proceeds on the premise that a proper understanding of the economic incentives operating in these alternative market structures provides the strongest basis for predicting how well and how likely the DoD is to realize value from the shipbuilding assets available to it in the future. That is to say, underlying economic incentives are assumed to be a powerful, if not decisive, determinant of future market outcomes.

The thesis of the paper is that, among the three alternative market structures presently under consideration, that structure which joins Newport News Shipbuilding with the shipbuilding assets of the Northrop Grumman Corporation will generate economic incentives across the industry that are most consonant with the DoD's interest in achieving the greatest value from its acquisition of ships. The key insight of this analysis is not that General Dynamics' acquisition of Newport News will distort the performance of the market to accommodate a monopolist's customary incentives--which is manifest. Instead, the key insight of the analysis is that only Northrop Grumman's acquisition of Newport News holds the promise of correcting existing distortions that arise from the inefficiencies inherent in both the industrial structures associated with the status quo and with General Dynamics' acquisition of Newport News.

The paper's approach to proving this thesis proceeds as follows. In its first section, the paper briefly recounts the economic theory of a monopolist's incentives relative to those of a firm facing competition (or at least the threat of entry) in a given market. The simple point of this section is to delineate the customary market distortions associated with monopoly and introduce the concepts of efficiency typically used by economists and public policy analysts to assess alternative market structures. The second section of the paper evaluates the economic incentives of shipbuilding firms in three different market structures:

1. The status quo, in which the shipbuilding assets of Newport News, General Dynamics, and Northrop Grumman remain independent of one another.

2. A dominant-firm market structure resulting from the acquisition of Newport News by General Dynamics.

3. A market structure of equally-matched shipbuilding rivals that would result from the acquisition of Newport News by Northrop Grumman.

Section I. Market distortions of monopoly

The economic theory of how monopoly power may distort economic incentives of a firm is well established. Under competition, suppliers have strong incentives to offer their customers the goods and services they want at prices that just cover the costs of providing the features and quality the customers are willing to pay for--the economic recipe for efficiency. Monopoly, on the other hand, diminishes and distorts these incentives to efficient production. The best known of these distortions concerns a monopolist's incentive to charge prices above marginal costs. However, this is only the most obvious distortion and the one with the least immediate application to a naval shipbuilding industry subject to a monopsonist's detailed oversight of costs. More importantly, over time the dynamic effects of a monopolist's incentive structure also distort conduct away from an efficient allocation of resources in ways less directly amenable to regulatory controls. The classic formulations of both these static and dynamic monopolistic effects are as follows:

. Dead-weight loss to customers' welfare./1/ The key to an efficient allocation of resources under a competitive environment is the observation that in the long run the value to buyers of the last unit of output is exactly the same as the market value of resources required in producing it. In contrast, a single-product, profit-maximizing monopolist generally has the incentive to set prices higher than the cost of producing an additional unit, and so produces too little of the good compared to what consumers would otherwise have demanded. Under such a pricing strategy the aggregate economic loss is greater than the monopolist's gains, creating a "dead-weight loss" to

aggregate welfare.

. Wasteful rent-seeking activity./2/ The ability to charge higher prices not only increases a monopolist's profit at the expense of total welfare, it also encourages a monopolist to expend some of its extra profits derived from having market power to maintain the status quo. This expenditure of resources to attain and sustain monopoly is called rent-seeking behavior. Advertising, political lobbying, and the erection of barriers to entry can be examples of so-called rent-seeking behavior./3/

. Low "technical" efficiency./4/ Monopoly power in a dynamic context can also have perverse effects on incentives to reduce costs ("X-inefficiency," as it has been dubbed in economic theory). Outside a competitive environment, there is limited ability to understand the technological environment and its possibilities for productivity. Under

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/1/ See D.W. Carlton and J.M. Perloff, Modern Industrial Organization, 2nd Edition (Boston: Harper Collins, 1994), chapter 5.

/2/ See J. Tirole, The Theory of Industrial Organization (Boston: The MIT Press, 1988), pp. 75-76.

/3/ Political lobbying, for example, is a particularly good example for rent seeking. See, Mintz, J., "Utilities Secretly Lobbied Congress; Electric Firms Gave Millions to Left and Right to Halt Deregulation," in A-section, page A01, The Washington Post, May. 11, 2000, for an example of how certain regulated utility companies "spent $17 million over the [last] 3 1/2 years . . . to bottle up legislation" in Congress that would have challenged their franchise.

/4/ Tirole, pp.75-76.

such a circumstance, it is quite likely that a monopolist will not achieve cost-minimizing production. Without external benchmarks of performance, it is difficult for both customers and the monopolist itself to gauge internal efficiency.

. Low incentives to innovate and maintain quality./5/ There is strong support in the economics literature for the notion that monopolies have lower incentives to innovate than firms participating in more competitive markets, in which rivalry stimulates the innovative process. For example, monopolies may invest less in research and development than is socially desirable. More generally, the emergence of a sole supplier naturally dampens the incentives to enhancing quality that arise from a firm's desire to ensure repeat purchases and avert losing sales to rivals. Indeed, with respect to the U.S. aerospace industry in particular, there is historical evidence indicating that the industry became technologically more progressive as the Federal government exposed industry members to more robust competition./6/

Section II. Economic incentives under alternative shipbuilding market structures

This section of the paper evaluates the relative efficiency of three possible market structures in the shipbuilding industry --the status quo, a dominant-firm structure, and an equally-matched-rivals structure. The relative efficiency of these alternative market structures is shown to be a function of the economic incentives of the resulting firms to allocate resources, minimize costs, and innovate. In particular, the different structures are distinguished by the extent to which each promotes the dissemination of key shipbuilding

resources--tools and technology, in particular; disciplines the costs of operating nuclear shipyards; and advances the prospect for continuing innovations in naval shipbuilding.

1. Status quo structure

Under the current industrial structure, there are two principal defects in the economic incentives to generate value for the DoD. First, as surface ships have become increasingly complex in response to mission requirements calling for applications of key nuclear submarine-derived technologies, the two shipbuilding firms which have been the recipients of the Navy's vast investment in nuclear propulsion and undersea warfare have an incentive to withhold the dissemination of key technological resources from other actual and potential competitors. Second, the status quo results in weak cost discipline in the construction of both submarines and, especially, aircraft carriers.

Structural bottlenecks in technology dissemination. The current market structure restricts competition in surface shipbuilding because competitors in this market do not have equal access to the tools and technologies developed from the Navy's many years of investment in nuclear propulsion and undersea warfare. Moreover, there are strong indications, consistent with the nuclear shipyards' economic incentives, that the

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/5/ Tirole, p. 115.

/6/ Stekler, H.O., "Technological Progress in the Aerospace Industry," Journal of Industrial Economics 15 (3) (July 1967): 226-36.

prevailing allocation of these technological resources is less than efficient. For example, the system specifications for the next-generation surface combatant, the Zumwalt-class of destroyers (DD 21), require an acoustic signature similar to the Los Angeles-class submarines (SSN 688)./7/ Other complex technologies and innovations associated with submarines that now have direct application to the design of future surface ships include those relating to hull coating, propeller and turbulent boundary layer noise, and machinery noise control and transmission paths./8/

The Navy's intention to develop a common electric drive propulsion and power distribution system for submarines and surface ships underscores the reliance of future surface ships on technologies fostered until recently only at the nuclear shipyards./9/ In principle--and the Navy's best interest--Ingalls should enjoy efficient access to these sorts of technologies. Northrop Grumman should be able to secure access to these technologies either from the Navy itself, which owns intellectual property rights to them and has an incentive to facilitate robust competition, or from Newport News, which is the only nuclear-shipbuilding competitor to General Dynamics, the other shipyard with ready-access to these tools and technologies. However, in practice, Northrop Grumman's access to these tools and technologies reflects the distorted incentives at play in the existing market structure, placing it at a competitive disadvantage.

For example, to develop its concept for electric drive in the design of the DD-21, Northrop Grumman's team did indeed subcontract to Newport News. But Newport News and Northrop Grumman do not share mutual incentives for a full transfer of technology and know-how. While collaborating with Northrop Grumman on electric drive, Newport News is also a potential competitor of Northrop Grumman's for other surface ships and for the overall integration of weapons systems on complex ships./10/ Ingalls' only other alternative is to acquire this

kind of know-how from the customer, the Naval Sea Systems Command (NAVSEA). But here too the presumptive incentives of the Navy to share technology that would enhance competition and innovation are stunted. Advanced technologies developed in pursuit of nuclear propulsion and undersea warfare are complex and shrouded in extreme national security secrecy. As a result, Ingalls must access these technologies through NAVSEA without the benefit of having a comprehensive knowledge of the range of possibilities that may comprise a catalogue of the relevant technologies. Moreover, Ingalls' experience in the DD-21 program suggests that the Navy itself has not yet developed a process for brokering these technologies to the non-nuclear shipbuilders in a way that is responsive to the competitive demands of a fast-paced development program. For example, Ingalls was forced to develop signature-related calculations without the benefit of Navy-funded, submarine-derived know-how for which it has requested data./11/ At the very least, it can be said that NAVSEA's process

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/7/ Northrop Grumman, DoD/DoJ Briefing, June 6, 2001, p. 7.

/8/ Northrop Grumman, DoD/DoJ Briefing, June 6, 2001, pp. 5; cf. O'Rourke, ibid., pp. 25-26.

/9/ Northrop Grumman, DoD/DoJ Briefing, June 6, 2001, p. 7.

/10/ Newport News claims to be "the only shipyard with both the physical capacity and the technical capability to design, integrate, build, repair, overhaul, refuel, and deactivate every type of ship in the U.S. Navy fleet." See Loren Thompson, "US Shipbuilders: The Tide Begins to Turn," Sea Power Magazine, April 1999.

/11/ Northrop Grumman, DoD/DoJ Briefing, June 6, 2001, p. 6.

for reviewing requests for access to technology, data, and know-how is problematic and no doubt complicated by NAVSEA's own internal barriers and rivalries.

Weak cost discipline at Newport News. The current market structure also provides limited incentives for the nuclear shipbuilders to develop and implement business practices that would lower costs. The public record is replete with indications that the cost-structure of the Newport News shipyard exceeds the DoD's contractual expectations and needs./12/ In fact, the cost overruns at Newport News have been so alarming that the Pentagon hired the consultancy Bain & Co. to recommend new ways to control costs at that yard (an initiative also indicative of the challenge DoD faces in properly regulating the franchise it has granted Newport News)./13/ It has been estimated that the Ronald Reagan carrier being built at the facility is running about $89 million over budget./14/ Cost overruns on refueling the USS Nimitz aircraft carrier have been estimated at $200 million./15/ These cost overruns may well relate to the lower incentives to technical efficiency that result from Newport News' lack of rivals for the production and refueling of nuclear powered aircraft carriers.

But they may equally reflect certain rent-seeking behavior on the part of Newport News that inflates the overhead costs charged against the government's cost of the aircraft carrier. For example, in 1998, Newport News, with great fanfare and assistance from the Virginia state government, established the "Virginia Advanced Shipbuilding and Carrier Integration Center," a systems integration facility intended to help Newport News retain prime contracting authority over future aircraft carriers against the threat to its incumbency arising from non-shipbuilding systems integrators, like Lockheed Martin and

Raytheon./16/ Not only does this initiative reflect an intensive political lobbying effort by Newport News, it also is likely to add excess operating costs to the overhead charged against existing Navy contracts.

/12/ Squeo, A. M., "Newport News Draws Fire Over Cost Cutting Efforts - navy Officials Say Company's Status as Sole Builder of Aircraft Carriers is the Problem", in Corporate Focus, Wall Street Journal, Jan.23, 2001. Addressing his dissatisfaction with the progress NNS had made toward reducing costs on the aircraft carrier program, former Navy Secretary Richard Danzig said in this article, " [Newport News] only achieved half of what they promised . . . ."

/13/ Ibid.

/14/ See David Lerman, "NNS On Target With Cost-Cutting Navy Confirms Shipyard's Planned Saving by 2003," Daily Press, Feb. 1, 2001, p. A1.

/15/ See Michael Fabey, "Nimitz Cost One Slippery Number Carrier's Refueling Almost Complete.", Daily Press, Jan. 10, 2001, p. A1.

/16/ See Jerri Fuller Dickseski, "Governor Gilmore Signs Bill Establishing Carrier Integration Center During Ceremony At Newport News shipbuilding," Newport News, Jan. 19, 1998, Press Release.
John L. "Jack" Roper IV, executive vice president-operations at Norshipco, commenting on the use of public money in funding the "Virginia Advanced Shipbuilding and Carrier Integration Center" noted "But it definitely begs the question: Is there only one shipyard in the industry that merits state money?", See Whitt, T., and C. Dinsmore, "Should The State Give Shipbuilder A tax Break", The Virginian-Pilot, Feb. 9, 1998, p. A1.

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2. Dominant-firm structure: General Dynamics Acquires Newport News Shipbuilding

Under the industrial structure resulting from an acquisition of Newport News by General Dynamics, all four of the market distortions associated with monopoly are likely to diminish the value the DoD can achieve from the shipbuilding resources available to it. Nuclear ships of both types will tend to cost more, stray from planned schedules, and fail to achieve the full range of technological advances that are technically available under a more competitive industrial structure. But among these four distortions, diminished incentives to achieve efficiency and pursue innovation are those most threatening to the DoD's interests.

Loss of leverage in disciplining costs of nuclear shipbuilding. The merger of General Dynamics and Newport News Shipbuilding would create a sole supplier for nuclear-powered ships. Facing such monopoly power, the DoD would lose leverage over cost-discipline that it could derive from a market structure allowing at least some rivalry in the production of nuclear ships. Economic theory suggests strongly that the DoD will pay more for nuclear-powered ships in the long run. This disparity may well encourage a search for more cost-effective weapon systems that the DoD can use as substitutes to achieve the military missions that aircraft carriers and submarines perform. Long-range bomber aircraft and missile-laden surface ships have been suggested, for example, as substitutes for some of the precision-strike missions of aircraft carriers and submarines./17/ However, in the short-run, there are only inferior substitutes for the full range of missions aircraft carriers perform and possibly no substitutes for the core undersea warfare missions of submarines.

The merger would eliminate any leverage the Navy has had up to this point

in contract negotiations over nuclear submarines. Notwithstanding that the two shipyards today are teamed to produce the first four Virginia-class attack submarines, the DoD still derives significant leverage from the possibility of competitive awards in the future or if one or the other of the yards should fail to adhere to its part in the teaming arrangement. In fact, rather than dampening the economic incentives to efficiency, the teaming arrangement itself has created a regulatory regime of discipline and scrutiny that may actually enhance the government's insight into costs and the credibility of rivalry on future awards that disciplines the two firms' performance. However, the incentives embodied in the teaming agreement would dissolve with the elimination of rivalry that would result from the merger. The point is that even in the absence of nominal "competition" for nuclear ships, the Navy derives leverage to discipline costs and performance from the threat of rivalry which the teaming arrangement promotes.

It is a point well illustrated in the history of the sole-source Trident submarine program. Struggling to motivate General Dynamics to contain costs and meet performance objectives, the Navy undertook to facilitate Newport News' ability to compete for award of the ships./18/ In a subsequent review of an award of the Trident ship

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/17/ See Dr. Paul Kaminski, et al., DOD News Briefing, May 18 1998

/18/ In 1986, Rear Adm. Stuart F. Platt, the Navy's Competitive Advocate General, said of the Navy's decision to offer Trident inspection and repair contract to Newport News, "It's a first step toward

Footnote continued

to General Dynamics, the Armed Services Board of Contract Appeals (ASBCA) found that General Dynamics was motivated to reduce costs by a belief that the Navy otherwise would make the award to Newport News./19/ General Dynamics found this threat credible at least in part because it previously had lost work to Newport News on the Los Angeles-class submarine program over the Navy's dissatisfaction with its performance./20/ The combination of General Dynamics with Newport News would eliminate these possibilities for motivating efficiency, since the Navy would have no credible alternative to General Dynamics for submarine procurement.

Reduced incentives for technology insertion and innovation. Economic principles also indicate that the combined entity would have markedly lower incentives to pursue and achieve innovations in naval nuclear propulsion and undersea warfare. This is a particularly threatening prospect in consideration of the high priority the Navy places on advancements in undersea warfare.

For example, the acquisition plans for the Virginia-class of submarines envisions an evolving design that can accommodate the insertion of new technologies with each new ship that is authorized./21/ Accordingly, the Navy has maintained a very active program of research and development in these areas for which General Dynamics/Electric Boat and Newport News compete vigorously for contract awards and, as importantly, pride of achievement. In fact, it was a matter of special congressional interest at the time the Navy was putting in place the teaming arrangement for construction of the Virginia-class ships whether the collaboration would have any adverse effects on the competitive friction between the two yards that had produced so many astounding technological achievements over the years. The Navy acknowledged the importance

of this friction and made assurances that it would prevent the teaming agreement from mitigating competition for technology developments./22/

Moreover, the advance of a keystone technology in the future of naval shipbuilding,/23/ electric drive, may well be at risk from the combination of General Dynamics and Newport News. General Dynamics and Newport News are the only two firms now capable in the full range of technologies necessary to develop the application of this technology to Navy ships./24/Not only will the combination of these two firms stall

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Footnote continued from previous page

competition. (This) work would provide Newport News the experience so they could submit credible bids on construction." See C.R. Herron. and M. Wright, "Competition for the Trident Sub?", The New York Times, January 12, 1986, p.4, Column 2.

/19/ Northrop Grumman, DoD/DoJ Briefing, June 6, 2001, p. 33.

/20/ ibd.

/21/ See Fiscal year 2001 Budget Request (http://164.224.25.45/fy2001), Dept of Navy, Exhibit R-2, RDT&E Budget Item Justification, and February 2000.

/22/ See, Military Procurement Subcommittee, Hearing on the New Attack Submarine Program, March 18, 1997.

/23/ Richard Danzig, former Navy secretary, likened the change to integrated power to that "from sail to steam or from propeller to jet engines or to nuclear power." See, Navy Office of Information, "Navy Selects Integrated Power Systems and Electric Drive for DD 21", January 6, 2000.

/24/ See Ronald O'Rourke. "Navy Shipbuilding: Proposed Mergers Involving Newport News Shipbuilding: Issues for Congress," CRS Report for Congress, RL30969, May 22, 2001, p. 26.

the competitive engine of innovation among engineers working to advance electric drive technology; economic theory also suggests that General Dynamics, without fear of competition in the development of electric drive, may slow that technology's introduction onto ships in order to extend the production of older-generation ships on which its immediate returns are greater./25/ The successful introduction of the DD-21, with electric drive, would hasten the end of production on the DDG-51 class of ships, an established program on which General Dynamics' Bath Iron Works shipyard now enjoys almost risk-free returns. Faced with a competitor in the development of electric drive, General Dynamics could not afford to delay its advancement of the technology for fear of losing the lead over this keystone technology to a rival. But enjoying dominance over the development of electric drive, General Dynamics' incentives to promote both advancement of the new propulsion system and the new class of ships on which it would be employed are conflicted.

3. Equally-matched: Northrop Grumman acquires Newport News Shipbuilding

The industrial structure resulting from Northrop Grumman's acquisition of Newport News promotes a superior set of economic incentives to efficient naval shipbuilding. It rectifies each of the distortions in the incentives at play

under the status quo and averts those that would result from monopoly ownership of the nuclear shipbuilding yards:

- Bottlenecks impeding a more efficient application to surface ships of the tools and technologies developed in the nuclear shipbuilding programs would be replaced by Northrop Grumman's immediate access to the assets and know-how of Newport News.

- Cost discipline over Newport News' performance on the aircraft carrier program would be strengthened by the Navy's leverage over non-nuclear shipbuilding programs for which Northrop Grumman competes/26/ and by Northrop Grumman's familiarity with the construction of large-deck amphibious ships.

Footnote continued from previous page

Ronald O'Rourke, "Navy Zumwalt (DD-21) Class Destroyer Program: Background and Issues for Congress", CRS Report for Congress RS20698, Updated March 13, 2001, p. 4-5; Otto Kreisher, "Influencing Events Ashore," Navy League of the United States.

/25/ For a discussion of economic incentives created by procurement practices, see Rogerson, W., "Incentive Models Of The Defense Procurement Process," in Defense Handbook of Defense Economics, edited by Hartley, K., and T. Sandler, (1995), Elsevier, P.311-346.

/26/ A shipbuilder with market power in one market will have incentives to reduce costs in that market, if such cost overruns are perceived as structural inefficiencies and affect future contracts in other markets where there is credible competition. Current Federal Acquisition Regulation (FAR) allows the Navy to consider past performance and, more importantly, lets the Navy define "the approach for evaluating past performance" in assessing any source selection (see Federal Acquisition Regulation subpart 15.305). The Navy's ability to enforce cost-cutting measures increases to the extent cost overruns in one market can be tied to procurement standards in another market in which shipbuilders operate.

- Cost discipline on nuclear submarines would be improved by the reinforcement of rivalry between General Dynamics/Electric Boat and Newport News and by Northrop Grumman's opportunities to streamline overhead at Newport News.

- Competition for technology insertion and innovation would be enhanced by the maintenance of rivalry between the two firms' nuclear shipbuilding engineering teams and by Northrop Grumman's advanced technology and systems integration capabilities.

Summary

It has been the purpose of this paper to explain the economic incentives of shipbuilding firms under the different market structures implied by the proposals now under consideration for the acquisition of Newport News Shipbuilding. Much of the public commentary about the government's review of these proposals has tended to focus on static or even historical features of the market structure for shipbuilding, without regard to the dynamic, long-term consequences of underlying economic incentives./27/ Yet, there are strong indications from economic theory about the incentives likely to animate firm performance in the different market structures that would result from an acquisition of Newport News. The success of General Dynamics' bid to acquire Newport News would concentrate in one firm all the private nuclear shipbuilding

assets available to the Navy, subjecting the Navy's chances for achieving cost, quality, and innovation in shipbuilding to all the customary distortions of monopoly power: less ship-based military effectiveness for its money; more gaming of the acquisition and legislative processes to blunt competition; lower technical efficiency of shipbuilding practices; and fewer innovations to drive the advancement of nuclear propulsion and undersea warfare. By contrast, Northrop Grumman's acquisition of Newport News not only prevents of monopoly control over nuclear shipbuilding, it also improves the economic incentives already distorting performance under the industrial structure associated with the status quo.

The results of this analysis suggest two concluding observations. First, General Dynamics' acquisition of Newport News would impose a regulatory burden on the Navy and the DoD far greater than that which constitutes simple cost-based contract management. To the already difficult task of identifying costs and making an appropriate allocation of them to Navy projects, this new regulatory regime would add the still more challenging problem of determining what nuclear ships should cost, in the absence of direct benchmarks or competitive prices. In addition, it would add to this regulatory burden the problem of having to broker tools and technologies derived from the Navy's investments in nuclear shipbuilding and undersea warfare to any team that might compete with General Dynamics for any class of ships. The overall prospect of this new regulatory burden would seem to run in contradiction to the trend of deregulation (i.e., "acquisition reform") that has been a hallmark of DoD's recent acquisition policies.

/27/ See Ronald O'Rourke. "Navy Shipbuilding: Proposed Mergers Involving Newport News Shipbuilding: Issues for Congress," CRS Report for Congress, RL30969, May 22, 2001, p. 1-38-

The second observation suggested by this analysis is that the acquisition of Newport News will play an important part in how successfully naval systems will be able to keep pace with the transformation of military forces that has been signaled by the new Administration. If naval platforms--aircraft carriers, submarines, and surface combatants--cannot keep pace technologically and economically with the emerging demands of future warfare, they will fall out of operating, program-budget, and acquisition plans in favor of non-naval systems that are more cost-effective. The effect of Newport News' acquisition on the expected cost of existing systems that may be constructed over the next six years is only the smallest part of the equation that will determine the competitiveness of naval systems for the future. More important will be the ongoing ingenuity of naval systems and industrial engineers and shipyard managers to transform these platforms from workhorses of the Cold War to centerpieces of the revolution in military affairs. Economic theory would strongly suggest that success in that transformation is more likely to emerge from the competitive friction of two equally-matched rivals than from a market structure dominated by one, highly-regulated firm.

TAB C5

Limitations of Regulatory Control in Naval Shipbuilding

The purpose of this paper is to explain the limitations of using regulatory control of monopoly to achieve efficiency, and to indicate how these limitations on regulating a nuclear shipbuilding monopoly would impose an extraordinary burden on the Department of Defense. Most of these limitations arise from constraints on the availability of the information required by economic regulation. "Informational constraints" refer to the inescapable reality that a regulator, such as the DoD, cannot ever have complete information as to the lowest possible costs of producing desired technologies, nor have complete knowledge about the true range of technological possibilities available to its supplier. Indeed, in the absence of competitive pressure, even the managers of the regulated monopolist may face information constraints of their own making, since they are not forced to evaluate and investigate innovative and cost-reduction opportunities. A monopolist seeking to maximize its own profit has inherent incentives to charge high prices, and to provide as low a level of quality as it can persuade the customer to accept, for any given level of payment./1/ The discipline of competitive forces is the most effective way to uncover opportunities for cost reduction and quality improvements. The thesis of this paper is that if General Dynamics were to acquire Newport News Shipbuilding, forming a monopoly over nuclear shipbuilding, these regulatory problems would adversely affect the dynamic efficiency of the business and the value for money that the DoD would obtain from it.

The problems of regulation

Unregulated monopolies typically perform poorly relative to competitive firms along several dimensions. Adverse results include losses to customers arising from the monopolist's ability to set price above the cost of production, as well as low technical efficiency in production, and low incentives for innovation and quality improvement/2/ resulting from the lack of market pressure provided by competing firms. Of course, it is all of these problems that give rise to the orientation of U.S. antitrust law and DoD policy toward promoting competitive market structures and policies.

Nonetheless, some products are produced in such small numbers and with such large-scale technology that reliance on a single supplier may seem to hold the most promise for efficient operation. When such a product is essential, governments have in some instances granted one firm an exclusive franchise to supply the product and then attempted to mitigate the negative economic consequences of the resulting monopoly by regulating the prices paid for the output of the firm./3/

/1/ "Quality" should be understood in two senses: the degree to which a product is free of defects, as well as the level of innovation or the performance characteristics embodied in the product.

/2/ See for example J. Tirole, The theory of industrial organization, MIT press 1988, p 75-76.

/3/ The need for regulation routinely arises in natural monopoly utility industries such as local electric power and local water distribution, and some transportation facilities such as railway lines and airports.

The core of economic regulation is this regulatory designation of the

supplier, and regulatory control of the price that will be paid for the supplier's product. The major challenge facing a regulator seeking to set such a price is that the regulator has no way of knowing very much about the costs of producing various levels of quality./4/ The regulator would like to get whatever quality it desires at the lowest possible cost, or alternatively, the regulator would like to obtain the highest possible quality for a given level of cost.

Unfortunately, the regulated firm often has objectives that are in conflict with those of the regulator, and it is from this conflict, together with the opportunities given to the firm by virtue of the regulator's informational constraints, that key problems of effective regulation arise. Provision of quality is difficult: the incomes and comfort of the firm's management and workers and the profits of the firm's shareholders will be enhanced to the extent that the firm gets paid more for delivering a given level of quality, or delivers lower quality for a given amount of money.

Conflicting objectives between the regulator and the firm means it is unrealistic to expect the firm's managers to reveal all they might know in answer to the question: "What is the lowest possible cost of producing this technology, with these particular quality characteristics?" The monopolist wishes to generate profits for itself that are as high as possible. This requires that it do what it can to raise prices and ignore what may be cost-effective, but unprofitable expenditures aimed at enhancing quality. These objectives mean that the monopolist has an incentive to make use of the difference in information available to the regulator and the firm; at a minimum, if the managers of the firm simply have doubts about the correct answers to what is an inevitably uncertain forecasting exercise, an informational problem will arise as a result of the understandable tendency they will have, in the absence of competitive pressure, to resolve those doubts in favor of an inflated budget or reduced quality goals.

Thus, in attempting to generate efficient outcomes, the regulator of a monopoly has to try to induce it to act in ways that are against its own self-interest. Well-understood regulatory methods do exist that are effective in keeping costs down, or that are effective in sponsoring high quality. However, these methods are far from perfect. The informational constraint results in two related problems. First, what the monopolist and regulator attain under regulation is almost surely not going to be any of the desirable and feasible combinations of cost and quality. Second, there will not be any way of knowing how far off the mark the results have been. While designating a single firm as the sole source may avoid many of the more or less quantifiable costs of supporting an "extra" supplier, there is no assurance that the added costs and reduced quality resulting from imperfect regulation do not far outstrip those savings. A review of the specific tools available to regulators will illustrate the risks involved.

/4/ Although the "should-cost" studies carried out by the Department of Defense do provide an extraordinary level of information, they cannot provide information equivalent to that revealed in a competitive process between suppliers competing to demonstrate their ability to deliver a high-quality product at low cost. Such suppliers have strong incentives to develop and reveal definitive information that cannot be expected from an administrative process.

Regulatory Methods

The large economic literature on regulation somewhat obscures the relative

simplicity of the basic regulatory options. Regulatory methods can be classified according to the extent to which they focus on attaining highest quality or alternatively, lowest cost. These competing objectives translate directly into a regulatory spectrum of price control that can be described according to the strength of cost control incentives.

"Low-powered incentives" for cost control are provided by "cost-plus" regulation./5/ Under cost-plus regulation, the firm reports its costs to the regulator and receives reimbursement for them, plus some level of markup. This type of regulation does allow the regulator to specify difficult quality targets and have some reason to hope that if they are attainable at all they will be met. However, even if a firm is allowed to spend as much as it likes on quality enhancement, there is still nothing to rule out the possibility that subjecting the firm to the competition of another supplier could have delivered the same or even better quality at significantly lower cost

At the other end of the spectrum, creation of "high-powered incentives" for cost control is the primary objective of "fixed-price" contracting. With fixed-price contracting, an agreement is reached between the regulator and the supplier as to how much will be paid for the product. The supplier then produces the product and delivers it to the regulator. Note that while costs will be controlled under fixed-price contracting, the firm gets any money left over from exercising control. Unless the regulator has been able to specify, in detail, every dimension of quality in advance, as part of the original contract, the supplier may be expected to act on its incentives to reduce costs and enhance its own profit by cutting corners on quality. This problem is especially marked in product sectors involving new technology with unknown characteristics. In such a circumstance, such thorough contracting in advance of production is not practical.

After a bad experience with pure fixed-price contracting, it is not surprising when regulators return to procedures that retain some quality incentive by allowing a share of cost overruns to be passed on the buyer. For example, the Air Force experience with wing problems on the C5A--problems that necessitated subcontract expenditures for repairs, even as the supplier, Lockheed, was almost destroyed by the cap on its payments--certainly made clear the risks of pure fixed-price contracting in an arena in which risky technological advances are of paramount importance. Of course, after painful experience with both cost-plus and fixed-price contracting with sole source suppliers, the DoD worked to find ways such as prototype competitions, to reduce technological uncertainty before committing to a single firm, even for one specific program. Prototype competitions reduce the time window during which the inevitable problems of regulated monopoly may emerge, by deferring down-selection to the last possible minute. The existence of multiple potential suppliers for any particular program

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/5/ See Jean-Jacques Laffont and Jean Tirole, A Theory of Incentives in Regulation and Procurement, MIT Press, 1993, Chapter 1.

was crucial for implementation of this strategy./6/ Prototyping success stories, albeit qualified ones such as the competitively prototyped F-16 fighter program, are prominent in the history of modern defense contracting. Even if a competitor will be placed in a long-term sole source position after winning a contract, market discipline is provided by the knowledge that the Department of Defense can respond to bad performance by turning to an alternative supplier on future

programs, or on similar programs in the near future.

Even the cost control aspects of more successful cases of regulated monopoly fixed-price contracting are subject to qualification. When a regulator gives a sole source provider a contract with a fixed-price component, the resulting price may not be particularly low. The amount of the payment is set via negotiation between the regulator and the firm, prior to the start of production. There is no assurance that the discipline of the market would not have provided a significantly lower fixed-price. Again, this is at least partly a result of imperfect information in the hands of the regulator.

From the standpoint of the entire society, the fact that costs are controlled to the benefit of any party at all accounts for the theoretical appeal of fixed-price contracting. Experiments with fixed prices carried out by the Department of Defense have more likely been driven by a desire to reduce the political fallout of costs that grow far in excess of original budgets. To the extent that a move toward fixed prices has reduced that fallout, the shift has served some purpose. However, there is no assurance that use of fixed price contracts in sole source situations has delivered any price benefits relative to what a competitive process would have delivered, or that fixed-price contracts secure the desired and proper level of technical performance. It may be the case that as the DoD has moved toward tighter control of cost overruns, public concern with the escalating costs of various technological advances has made an entirely predictable shift toward equal concern with failures of performance.

Regulators ranging from the DoD to various public utility authorities have sought to balance price and quality by refining their regulatory methods. Contracting methods may specify a "sharing" percentage, which specifies that a portion of cost-overruns will be reimbursed, or attempt to use various quality incentive payments on top of a base fixed-price scheme. While these methods may move outcomes closer to the regulator's objectives, the fundamental problem posed by the informational constraint remains: one cannot know how much lower costs could have been or how much better quality could have been, but one can be assured that the gap between regulatory outcomes and competitive potential is ever-present.

As Alfred Kahn, the "father of deregulation" has said:

> The essence of the case for competition is that the potential performance of an industry is unknowable; it is the rivalry of independent suppliers that offers the greatest possible assurance that all economically feasible

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/6/ Smith, G., et al., "The use of prototypes in weapon system development," Project Air Force (R-2345), Santa Monica, CA: Rand Corporation, 1981.

> avenues for cost reduction and service innovation will in fact be explored and their results subjected to the impartial test of the marketplace./7/

The impartial test of competitive procurement for weapon systems is no less essential, if weapons embodying the best possible combination of cost and performance are to find their way to the to the ultimate test of battle.

Summary and implications for nuclear shipbuilding

Problems posed by information constraints would apply in force if nuclear

shipbuilding were to become a monopoly. Particularly serious would be the potential loss of incentives for technical progress. One paramount technology that would be at risk is the electric drive system./8/ Currently only General Dynamics and Newport News have the capabilities on the level required by the US Navy to develop this technology./9/ Competition between these two firms would help to ensure that the technology would be developed at the lowest feasible cost, and that it would be available on a timely basis. A merger of these firms would not only make it difficult for regulators to determine the appropriate cost of developing electric drive, or to determine the actual limits on its performance characteristics, but could likely lead to a delay in development and integration of electric drive into naval vessels./10/

The risks to cost efficiency when a cost-plus approach is followed are illustrated by the Navy's own experience with the relatively high costs of NNS, in its role as a long-term monopoly supplier of aircraft carriers. There is no easy fix to problems such as this, as long as a monopoly position is maintained. With respect to nuclear submarines, if the Navy moves toward a fixed-price approach in order to reduce excessive costs, it is likely to encounter problems of quality degradation that could not be eased by the prospect of a quick return to a competitive situation. Once the expertise and capability possessed by a

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/7/ Alfred E. Kahn, The Economics of Regulation: Principles and Institutions, Vol. 2: Institutional Issues, John Wiley and Sons, New York, 1971, p. 305.

/8/ Richard Danzig, former Navy secretary, likened the change to integrated power to that "from sail to steam or from propeller to jet engines or to nuclear power." See, Navy Office of Information, "Navy Selects Integrated Power Systems and Electric Drive for DD 21", January 6, 2000.

/9/ See Ronald O'Rourke. "Navy Shipbuilding: Proposed Mergers Involving Newport News Shipbuilding: Issues for Congress," CRS Report for Congress, RL30969, May 22, 2001, p. 26. Ronald O'Rourke, "Navy Zumwalt (DD-21) Class Destroyer Program: Background and Issues for Congress", CRS Report for Congress RS20698, Updated March 13, 2001, p. 4-5; Otto Kreisher, "Influencing Events Ashore," Navy League of the United States.

/10/ Economic theory suggests that General Dynamics, without fear of competition in the development of electric drive, may slow that technology's introduction onto ships in order to extend the production of older-generation ships on which its immediate returns are greater (For a discussion of economic incentives created by procurement practices, see Rogerson, W., "Incentive Models Of The Defense Procurement Process," in Defense Handbook of Defense Economics, edited by Hartley, K., and T. Sandler, (1995), Elsevier, P.311-346). The successful introduction of the DD-21, with electric drive, would hasten the end of production on the DDG-51 class of ships, an established program on which General Dynamics' Bath Iron Works shipyard now enjoys almost risk-free returns. Faced with a competitor in the development of electric drive, General Dynamics could not afford to delay its advancement of the technology for fear of losing the lead over this keystone technology to a rival.

competitive supplier have been dispersed, re-constitution may be possible only at extremely high cost and with long delay.

In conclusion, no approach to regulating monopoly businesses yet devised is immune from potentially serious problems. We contend that problems similar to those observed in every other regulatory setting would arise in any attempt on

the part of the DoD to regulate a monopoly supplier of nuclear ships. It is not just that practical difficulties make cost auditing imperfect; the underlying incentives of a monopoly supplier make difficulties inevitable. It would be misleading to infer from the relatively responsive behavior of a supplier firm under competition that the same firm would continue to be responsive if it were a monopoly under regulation. Maintaining a competitive environment is the only effective way to avoid or mitigate these problems.

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