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Breaking the Yardstick: The Dangers of Market-based Governance

by Don J. DeYoung

Overview

In the middle of the last century, America became a superpower. It happened, in part, because of a well-balanced technological partnership between the Federal Government and commercial sector. After winning a world war against fascism, this public-private alliance went on to cure infectious diseases, create instant global communications, land humans on the Moon, and prevail in a long Cold War against communism. This, and more, was accomplished without bankrupting the Nation's economy. The partnership's record of service to the American people and the world has been remarkable.

A key element of this partnership has been Department of Defense laboratories. They helped make the U.S. military the most formidable fighting force in the world. Among their many achievements, the labs developed and fielded the first modern radar in time for duty in World War II; invented the first intelligence satellite, indispensable during the Cold War; pioneered the original concepts and satellite prototypes of the Global Positioning System, vital for all post–Cold War conflicts; created fundamental "stealth" principles and night vision devices, a lethal combination in the first Gulf War; and produced the thermobaric bomb, which spared U.S. troops the bloody prospect of tunnel-to-tunnel combat in the mountains of Afghanistan.

In recent years, however, the private sector has been increasingly tasked to carry out the labs' functions on the belief that "through the implementation of free market forces, more efficient and effective use of resources can be obtained," which the Defense Science Board asserted in 1996.[1] As this development has progressed, there is a growing body of evidence that, rather than faster, better, and cheaper, the new approach is actually slower, less effective, and costlier. This is, in part, because the government's own scientific and engineering competence, a hallmark of the great successes in the past, is destroyed or bypassed as a result of the private sector's ascendant role.

This paper, a sequel to *The Silence of the Labs*,[2] examines how the loss of in-house scientific and engineering expertise impairs good governance, poses risks to national security, and sustains what President Dwight Eisenhower called "a disastrous rise of misplaced power."[3]

A Sea Story

The new attack boat is undergoing sea trials. Shrouded in a gray summer haze, the remote coast of the homeland slowly fades away. The boat slips under the rolling ocean surface and angles into a routine deep dive. The crew moves with efficient military discipline. As the boat glides downward, hairline fractures crawl slowly across the muzzle doors to the torpedo tubes. Those doors, made from an unproven alloy, must stand firm against the sea's relentless urge to claim the boat.

But the laws of physics are unforgiving. The waters gather their power as the boat descends. The fractures lengthen, propagate, and deepen. Without warning, two doors fail in rapid succession. Many miles away, a sonar station hears the metallic groans of the crushed, dying hull. The sounds echo in the deep and then cease. The submarine lies silent and broken on the dark ocean bottom—*all hands lost.*

But for luck, that fictional tale could have become reality for the USS *Seawolf.* During its construction, with approval from the Navy's program office, the contractors chose a titanium alloy for the boat's muzzle and breech doors instead of the usual steel. Because *Seawolf*'s torpedo tubes were larger than those of the older *Los Angeles*–class boats, the contractors, quite reasonably, wanted to use a material as strong as steel but only half the weight. The alloy, however, had another property—*under certain conditions it is brittle.*

Some government scientists knew about the phenomenon, called stress corrosion cracking (SCC), and understood how cracks can form by the simultaneous action of tensile stress and a corrosive environment—such as seawater. If consulted, these experts could have warned that SCC will fracture some titanium alloys, at times fast enough for one to "stand there and watch it happen."[4] Acquisition commands within the Department of Defense (DOD) cannot be knowledgeable in all scientific and technical fields that bear on their areas of responsibility, but they should have procedures to find, within the government, the required expertise to meet their mission.

The Naval Research Laboratory (NRL) had quantified the sensitivity of titanium alloys to SCC in seawater many years before *Seawolf* was designed.[5] One paper written in 1969 cautioned that "no prudent program manager would schedule a program in which SCC of new materials might be a problem without provision for a sound experimental characterization of stress-corrosion properties in the pertinent environment."[6] Unfortunately, NRL experts were not asked their opinion on using this alloy, nor were they consulted until after the mistake was detected—by chance. The stroke of luck occurred when, during *Seawolf's* construction, a hinge pin fractured while being straightened by a hydraulic press. It was made from the same titanium alloy as the muzzle door that it was intended to support.

Reacting quickly, the Navy formed a study team with "the best available experts on process and material technology."[7] This panel of government scientists determined that the contractor's decision had indeed "placed a material with risk of unstable, catastrophic failure at the pressure hull boundary," and they proposed improvements to the process of selecting materials.[8] The Navy implemented the proposals and praised these "unbiased technical experts" for having "contributed to *Seawolf*'s safe and effective operation."[9]

Market-based Governance

Seawolf's troubles arose during a time of dramatic change within the Federal Government. In the 1990s, agencies were reinventing themselves by increasing their levels of contracting, downsizing their workforces, and importing commercial practices. By 1996, the year of the *Seawolf* investigation, more than 200,000 Federal jobs had been cut, and the government workforce as a percentage of the Nation's was at its smallest since 1933.[10] This campaign to reinvent government evolved, by 2001, into one of transforming governance itself.[11]

These efforts have produced a government that depends on a massive conglomeration of private interests to do its work. Private firms now manage defense acquisition programs, perform intelligence operations, deploy corporate soldiers, conduct background checks of civil servants, and, until recently, collected taxes. Contractors even prepare the government's contract documents, recommend contracting actions, assist in negotiating the deals, and investigate alleged misconduct by other contractors.[12]

This market-based governance is, at least in part, a response to the public's deep frustration with its government. Difficulties in solving problems and providing services made dissatisfaction with the Federal bureaucracy a bipartisan sentiment by the 1990s. By contrast, there was high confidence in the private sector's ability to deliver. Given industry's soaring efficiencies, derived in part from the development and use of information technologies, its enormous production capability, and its more flexible nature, the idea of making government perform more like a business was understandable.

Market-based governance is the pursuit of public goals by exporting governmental functions to private firms and by importing commercial management methods into the government.[13] Outsourcing is the chief tool for the first approach, whereas centralizing and downsizing are tools for the second. Historically, the government has used these tools successfully to fulfill its obligations while remaining accountable to the American people. So the merit of the tools is not the issue. At issue, however, is that excessive and inappropriate use of them destroys the government's ability to preserve its internal competence and make use of that which remains.

The Federal Yardstick

The U.S. Government ultimately bears sole accountability for national missions and public expenditures. Decisions concerning the types of work to be undertaken, when, by whom, and at what cost should be made by government officials responsible to the President. Such decisions often involve complex scientific and engineering issues, a challenge made more difficult by the fact that the companies competing for Federal contracts can be very compelling advocates of their products.

The government must be a smart buyer and be capable of overseeing its contracted work. For this the government uses, or should use, its *yardstick*.[14] In technical matters, this measure is the collective competence of government scientists and engineers (S&Es). Their advice must be technically authoritative, knowledgeable of the mission, and accountable to the public interest. William Perry, before becoming Secretary of Defense, underscored that necessity when he stated that the government "requires internal technical capability of sufficient breadth, depth, and continuity to assure that the public interest is served."[15]

More specifically, this "internal technical capability" is the cadre of government S&Es who *perform* research and development (R&D). Their hands-on expertise distinguishes them from the much larger acquisition workforce. The S&Es provide authoritative advice to the acquisition workforce, which is in turn responsible for managing procurement programs. The two communities serve a common purpose, but they operate within different environments, with different requirements and skills. As Wernher von Braun, then-director of the National Aeronautics and Space Administration (NASA) Marshall Space Flight Center, explained it:

> In order for us to use the very best judgment possible in spending the taxpayer's money intelligently, we just have to do a certain amount of this research and development work ourselves . . . otherwise, our own ability to establish standards and to evaluate the proposals—and later the performance—of contractors would not be up to par.[16]

A strong yardstick requires a competent S&E staff, which must include a small number of exceptionally creative individuals; adequate financial and physical resources; sound management practices; a sufficient degree of autonomy to sustain an innovative environment; and

Don J. DeYoung is a Senior Research Fellow in the Center for Technology and National Security Policy at the National Defense University. He can be reached at deyoungd@ndu.edu.

the ability to perform challenging R&D. But as the *Seawolf* revealed, preserving the yardstick is not enough. The government must also be willing to use it.

With its yardstick, NASA used an effective partnership of public and private talent to achieve its historic feats of space exploration. The government's role was vital and its personnel were competent. John Glenn's humorous remark about the Mercury missions and his ride into orbit hints at the importance of that competence: "We were riding into space on a collection of parts supplied by the lowest bidder on a government contract, and I could hear them all."[17]

Glenn believed those low-bid parts would get *Friendship 7* home. Some of that confidence came from a trust in the yardstick, the S&Es who provided authoritative and objective expertise to the mission. Because NASA's workforce was insulated from market pressures to earn a profit, its only bottom line was accountability to the American people.

Fractured Yardstick

In 1986, the space shuttle *Challenger* exploded on liftoff, killing all seven crewmembers. In the 1990s, the Hubble telescope was launched with a misshapen mirror and three spacecraft were lost on missions to Mars—one of them because one team worked in centimeters while another used inches. In 2003, the shuttle *Columbia* disintegrated upon reentry, killing all aboard. Just 1 month earlier, an outsourcing panel had proposed that the shuttle program move toward a "point at which government oversight of human space transportation is minimal."[18]

The loss of *Columbia* drew attention to NASA's troubled yardstick when the investigators implicated both approaches of market-based governance: exporting public functions and importing commercial processes:

> Years of workforce reductions and outsourcing have culled from NASA's workforce the layers of experience and hands-on systems knowledge that once provided a capacity for safety oversight. . . .
>
> Aiming to align its inspection regime with the International Organization for Standardization 9000/9001 protocol, commonly used in industrial environments—environments very different than the Shuttle Program—the Human Space Flight Program shifted from a comprehensive "oversight" inspection process to a more limited "insight" process.[19]

By contrast, the investigators paid homage to NASA's Apollo-era culture, noting that it "valued the interaction among research and testing, hands-on engineering experience, and a dependence on the exceptional quality of its workforce and leadership that provided the in-house technical capability to oversee the work of contractors."[20] Barely a year after the investigators finished their work, inadequate oversight was again blamed when the returning *Genesis* satellite capsule crashed in the Utah desert. NASA's administrator later announced that his agency "has relied more than I would like to see on contractors for technical decision-making at the strategic level."[21]

Market-based governance also drives DOD, where its yardstick resides principally within the Service labs.[22] The following sections suggest that in a market-based environment the tools of outsourcing, centralizing, and downsizing have had a destructive impact on the yardstick and yielded outcomes that have impaired good government, posed risks to national security, and sustained a rise of misplaced power.

Excessive Outsourcing

In 1996, the same year that *Seawolf*'s safety problem became evident, two Defense Science Board (DSB) reports asserted that outsourcing Federal work would yield savings of 30 to 40 percent. One of the reports advocated that DOD privatize its lab facilities, adding, "It is quite likely that private industry would compete heavily to obtain the DoD laboratories, particularly if they come fully equipped."[23]

Eventually, a growing body of evidence yielded more sober assessments about the merits of outsourcing R&D. For example, the Government Accountability Office (GAO) found that the DSB estimate of $6 billion in annual savings was overstated by as much as $4 billion.[24] Nonetheless, an increasing amount of the yardstick's R&D has been placed on contract over the years. Navy labs outsourced 50 percent of their workload in 2000, up from 26 percent in 1969. Army labs outsourced 65 percent, up from 38 percent.[25] This was the situation prior to September 11, 2001.

After the 2001 terror attacks, DOD and other agencies were tasked with larger workloads. Federal contracting doubled by 2006.[26] So, with smaller in-house S&E workforces, some turned to lead systems integrators (LSIs): a contractor, or team of contractors, hired to execute a large, complex Federal acquisition program. Commercial firms thus assumed unprecedented authority—but LSIs have produced troublesome results:

- Army's $234-billion Future Combat System (FCS). Costs more than doubled from $92 billion, and the program fell years behind schedule.[27] Items to be acquired have been reduced for lack of technological feasibility, affordability, or both.
- Coast Guard's $24-billion Integrated Deepwater Systems. Six years after the project started, the GAO reported "cost breaches, schedule slips, and assets designed and delivered with significant defects."[28] Eight patrol boats failed seaworthiness tests.[29]
- Navy's $25-billion to $33-billion Littoral Combat Ship (LCS). Costs for two lead ships more than doubled and three ships were dropped from procurement. LCS did not have an executable business case or realistic cost estimates, which led to higher costs, schedule delays, and quality problems.[30]
- Department of Homeland Security's (DHS's) $20-million Project 28. The 28-mile "virtual fence" along the Arizona-Mexico border was rejected because it "did not fully meet agency expectations."[31] DHS will replace the fence with new towers, radars, cameras, and computer software.[32]

These outcomes should not be a surprise. As far back as 1961, Harold Brown, then-director for Defense Research and Engineering (DDR&E), observed that "it is not always wise or economical to try either to have a large project directed by a military user who does not understand whether what he wants is feasible, or to let the contractor be his own director."[33] He believed that DOD labs were needed "to manage or help manage weapons system development."

And as recently as 2002, 1 year before the FCS contract was awarded, the Army's plans were briefed to a study team chaired by Hans Binnendijk, director of the Center for Technology and National Security Policy (CTNSP) at the National Defense University. The subsequent report stated that the team was "not comfortable with an approach that turns this much control over to the private sector," and warned that there must be sufficient technical expertise within

the government so that outside technical advice does not become de facto technical decisionmaking.[34]

The criticism of LSIs grew as price tags fattened and schedules stretched. In the wake of the Deepwater problems, the Coast Guard's commandant stated, "We've relied too much on contractors to do the work of government." While not addressing LSIs directly, the Institute for Foreign Policy Analysis went to the heart of the matter, stating, "Increasingly the Pentagon leadership is losing its ability to tell the difference between sound and unsound decisions on innovative technology and is outsourcing key decision-making as well."[35]

Congress has now banned the use of new LSIs after October 2010, and it suspended the "competitive sourcing" of Federal jobs.[36] In addition, there have been proposals to increase the size of the acquisition workforce and improve DOD cost estimating. Though these actions may be necessary, they are not sufficient. Procurement problems will persist until the executive and legislative branches strengthen the Pentagon's strongest voice for independent, authoritative technical advice—its S&E workforce. In short, *acquisition reform will not succeed without laboratory reform.*

A healthy yardstick is vital for success in specifying the types of work to be undertaken, when, by whom, and at what cost, and for judging the quality of the work DOD places on contract. Excessive cumulative levels of outsourcing must be prevented. Contracts may be justified on their individual merit, but when taken together, they can break the yardstick, or erode the government's willingness to use it, as in the case of the *Seawolf*.

Inappropriate Centralizing

DOD labs helped make America's military the most formidable fighting force in the world. In addition to the innovations mentioned earlier, they more recently invented the hand-launched Dragon Eye surveillance plane, used by combat forces in Iraq and now exhibited in the National Air and Space Museum, as well as a novel biosensor that was deployed in time for the 2005 Presidential inauguration.

Talent is the lifeblood of a lab; facilities are its muscle. Lab contributions to military power were due, in part, to the way they were allowed to manage their people and facilities. Ironically, after the Soviet Union's collapse, DOD adopted its adversary's devotion to centralized administration and standard processes. That business model does not work well in a lab environment. Peter Drucker, who has been called the most important management thinker of our time, thought that R&D "should not have to depend on central service staffs" because those staffs are "focused on their functional areas rather than on performance and results."[37]

Personnel Management. DOD is modernizing the Civil Service system. On balance, the features of the National Security Personnel System (NSPS) may work well for the general workforce. However, the one-size-fits-all system would destroy the personnel demonstration projects ("demos") that have helped the labs recruit and retain talent.

In terms of flexibility and effectiveness, the personnel authorities offered by the demos exceed those under NSPS by a significant degree. There is no debate on that score. In 2006, the directors of eight labs—from across the Army, Navy, and Air Force—sent an unprecedented joint letter to the office of the DDR&E. It compared the NSPS and demo projects, confirmed the superior nature of the demo authorities, and requested DDR&E help in preserving the demos.[38] The letter was not answered. However, a study on Army science and technology (S&T) examined the letter and concluded that "DOD should approve the request recently put forward by senior laboratory managers from each of the Services to the DDR&E."[39]

Separate personnel systems for Federal labs were first advocated by a White House study, chaired in 1983 by David Packard.[40] The idea was urged again in 1988 by the president of the National Academy of Public Administration, who testified to Congress that:

> [t]he traditional "cookie cutter" approach—that all personnel issues impact all employees and all cultures alike and therefore call for mega-solutions across the board—should be abandoned. . . . The federal "cultures" that might warrant tailor-made personnel systems are not the Cabinet-level departments. They are . . . the military research laboratories, not the Department of Defense.[41]

The lab demos were finally established in 1994, and evidence shows that these systems have been crucial for attracting the best S&E talent. For example, when measured against non-Federal peer groups, the National Institutes of Health (NIH), National Institute of Standards and Technology (NIST), and NRL compare favorably to comparable private sector labs in terms of publications and National Academy memberships. In some cases, they set the bar for their private sector counterparts.[42]

NIH, NIST, and NRL may not be typical of all public sector institutions, but separate personnel systems suggest a primary reason for success. *All three have unique systems tailored to their R&D missions.* NIH is managed under Title 42 of the Public Health Service. NIST had a demo that was later made permanent by Congress. NRL has a demo now, but it may be pulled into the NSPS, along with eight other DOD labs. This would place them at a serious disadvantage in the coming years.

The government is facing a large-scale exodus from its workforce. By 2012, according to the Office of Personnel Management, more than 50 percent of the current workforce, including a third of its scientists, will be gone.[43] Replacing them amid the worrisome and widely reported global trends in science and engineering education means the government will be competing for talent at the same time the national S&E workforce is shrinking and foreign competition is strengthening.[44]

A recent CTNSP study outlines a strategy to rebuild the DOD S&E workforce over the coming years. However, it warns that if this workforce continues to decline relative to the size of the national workforce, "a point will be reached where it becomes irrelevant. . . . It will not be able to maintain competence in newly developing fields of science and technology while at the same time maintaining competence in the traditional fields that will continue to be important to DOD."[45]

Facility Management. In the last 5 years, the Army and Navy centralized their facility management functions under single commands. The Navy led the way in 2003, when the Chief of Naval Operations (CNO) consolidated his organization from eight claimancies (facility-owning commands) down to one: the commander, Navy Installations (CNI). The CNO's action applied to his organization alone, so the property and base operating support (BOS) functions of the four naval warfare centers were placed under CNI ownership.[46] NRL was not included because it reports to the Chief of Naval Research, and ultimately to the Assistant Secretary of the Navy for Research, Development, and Acquisition (ASN [RDA]). Navy policy also mandates that NRL manage its own real property and BOS functions because of its "unique Navy-wide and national responsibilities."[47]

The CNI uses a management concept that it imported from General Motors (GM). Sometime earlier, GM adopted the original idea from McDonald's and relieved its product divisions (such as Buick and Chevrolet) of their facilities, centralized their management, and standardized the delivery of services.[48] The CNI describes its version of the concept this way: "The installation will be controlled by a central committee,"[49] and it "will establish a standard level of service to be provided to all Navy funded tenant activities that is consistent across all regions."[50]

Management of R&D facilities by central committee, with standard levels of service, is a mistake. A one-of-a-kind nanoscience facility requires a far higher level of service than one established for piers or base housing. The Center for Naval Analyses expressed similar misgivings in a report to the CNO: "There is a difference between RDT&E and upkeep and maintenance. . . . NAVAIR [Naval Air Systems Command] and NAVSEA [Naval Sea Systems Command] should retain their claimancies. They have laboratories and test ranges with technologically sophisticated, sensitive, and expensive equipment. Delays and errors are extremely costly."[51]

The value of an imported process depends on how closely the government environment resembles the industrial one. This was underscored in a tragic way when the shuttle program adopted the inappropriate "insight" inspection regime. As for the similarity between the Navy and GM environments, the auto maker is "a single-product, single-technology, single-market business,"[52] which also fairly describes McDonald's. It does not describe the U.S. Navy, which requires efforts across a wide range of scientific disciplines and technology areas; and its operational environments, such as steel-crushing ocean depths, demand extraordinary levels of technical sophistication and reliability.

Cost reduction is a poor reason to import a risky commercial concept into a lab. By itself, successful innovation can save vast sums of money. For example, NRL developed an algorithm that allowed new and legacy military phones to work together.[53] This meant that legacy phones did not have to be retired by DOD and North Atlantic Treaty Organization forces. Nearly $600 million was saved, *nine* times the CNI's projected savings from consolidating global base operations.[54]

The Base Realignment and Closure (BRAC) Commission understood the risks of applying inappropriate management methods to R&D. In 2005, it rejected a proposal to absorb NRL's facilities and BOS functions into a "mega-base" operated by CNI's Naval District Washington region. The commissioners ruled that "NRL's continued control of laboratory buildings, structures, and other physical assets is essential to NRL's research mission," and they endorsed the ASN (RDA) policy by codifying it in law.[55] Unfortunately, neither the commission's statutory ruling, ASN (RDA) policy, nor the CNO's own directive has stopped CNI from asserting an inappropriate and unapproved authority to manage NRL facilities.[56]

Risky Downsizing

Closing unneeded infrastructure is good stewardship of taxpayer dollars. However, as the private sector's role has increased, DOD labs have been marginalized and closed despite the urgent need for technology's help on today's battlefields. In March 2004, DOD certified to Congress that a significant level of excess capacity still existed within its base structure.[57] This cleared the way for a fifth round of closures and realignments. Previous cuts had already run deep. Between 1990 and 2000, DOD lab personnel were reduced by 36 percent, due in large part to BRAC.[58]

What stops the Pentagon from cutting too deeply? BRAC law prevents it by requiring that the Secretary of Defense base *all* proposals on DOD's 20-year Force Structure Plan. This ensures that today's cuts do not place tomorrow's military in jeopardy. Data on Future Required Capacity were key to knowing if lab closures would support or undermine the Force Structure Plan, and it was the job of the Technical Joint Cross-Service Group (TJCSG) to derive those data.[59]

The TJCSG improved upon the analyses of earlier BRACs by adding the number of on-site contractor personnel into the calculations of capacity. Previously, the large numbers of contractors who work at the labs and use their infrastructure were not counted. The TJCSG's complete account of all on-site personnel showed current excess capacity levels to be far less than expected—an average of 7.8 percent from 2001 to 2003, and only 4.4 percent for 2003.[60] Hence, small cuts would not affect today's forces.

As for the law's requirement to support tomorrow's warfighter, the data on Future Required Capacity projected a future deficit of necessary infrastructure, which meant that closures and cuts would deepen the shortfall and, in the law's language, "deviate substantially" from the Force Structure Plan.[61] However, as revealed by a newspaper investigation, the data on Future Required Capacity were missing from the TJCSG's May 19, 2005, final report to the BRAC Commission, though the data were contained in a draft 9 days earlier.[62]

Congress and the commission were unaware that the proposals deviated substantially from the Force Structure Plan, so the lab closures and realignments were approved. The resulting cuts to the S&E workforce could place future troops at risk by exacerbating a projected shortfall of technical support. Moreover, the cuts ensure gross waste. For example, the closure of Fort Monmouth, New Jersey, is estimated to cost more than twice the original projection and take as many as 13 additional years to reconstitute its capability at Aberdeen, Maryland.[63] Lastly, the cuts apply more stress to the already fracturing yardstick.

Reform Works

Excessive outsourcing, inappropriate centralizing, and risky downsizing are endangering the Pentagon's yardstick. The good news is that the yardstick was threatened once before, and the challenge was met successfully.

The year was 1961. President John Kennedy called it "a most serious time in the life of our country and in the life of freedom around the globe." In April, the first human to reach outer space spoke Russian. Days later, the United States was humiliated in Cuba's Bay of Pigs. In August, construction started on the Berlin Wall. And in October, the Soviet Union detonated a 58-megaton hydrogen bomb that sent an atmospheric shockwave around the planet three times, the most powerful manmade explosion in history. In the midst of these grave events, DDR&E Harold Brown announced that the Secretary of Defense would be strengthening the DOD labs.

Brown's efforts were aided by a government-wide panel, led by budget director David Bell. Members included the Secretary of Defense, the President's science advisor, and the leaders of NASA, the National Science Foundation, and the Civil Service Commission. They

were tasked by the President to assess "the effect of the use of contractors on direct federal operations, the federal personnel system, and the government's own capabilities, including the capability to review contractor operations and carry on scientific and technical work in areas where the contract device has not been used."[64]

President Kennedy's concerns were sparked by contracting abuses in the 1950s and by a growing realization that the increased outsourcing spurred by the Hoover Commission had not markedly improved efficiency. In fact, President Eisenhower's Science Advisory Committee had concluded by 1958 that an extreme reliance on contracts damaged "the morale and vitality of needed government laboratories."[65]

The Bell Report, as it became known, made a big impact. Salary scales were improved. Agencies were given the authorization to allocate, with no set limits, Civil Service grades 16 through 18 to positions primarily concerned with R&D.[66] Appointments of exceptionally qualified individuals to steps above the minimum entrance step in grades GS–13 and up were allowed.[67] More discretionary research funding was provided, and construction funds for new lab facilities were increased considerably. These and other reforms yielded "significant improvement in [the labs'] ability to attract first-class people."[68]

The reforms were not born out of affection for government infrastructure. In fact, DOD conducted hundreds of base closures and realignments during the 1960s, proving that it is possible for the Pentagon to nurture a high-quality S&E workforce and cut infrastructure at the same time.[69] It took only the commitment to do so.

Signs appeared in the 1980s that the in-house system was again in need of help. Scores of studies have analyzed the problems and offered a remarkably consistent set of solutions. In fact, a 2002 tri-Service report by the Naval Research Advisory Committee, Army Science Board, and Air Force Scientific Advisory Board noted that the subject "has been exhaustively investigated" and found the labs' situation critical.[70]

Little has been done in the wake of these studies, with the notable exception of establishing the now-threatened lab personnel demos. The problems are well known, well understood, and solvable. Five solutions are listed below:

- Divide the Senior Executive Service into an Executive Management Corps (EMC) and a Professional and Technical Corps (PTC). This change was proposed by the National Commission on the Public Service.[71] Like the current Senior Executive Service, the EMC and PTC *must* be equivalent in rank to general/flag officers. Personnel within the PTC should run the labs.

- Exclude the lab personnel demos from NSPS permanently—*but do not freeze them in time*. Empower them to pioneer additional personnel concepts. This can be done using legislated authorities that remain unimplemented or otherwise constrained by the DOD Office of Force Management and Personnel. One example is Section 1114 of the Fiscal Year (FY) 2001 National Defense Authorization Act, by which Congress placed the creation of new demo authorities in the Secretary of Defense's hands.

- Create a separate R&D military construction budget. The current process pits "tomorrow" against "today" by forcing R&D to compete with operational needs, such as hospitals or enlisted housing. R&D has not fared well since the reform period of the 1960s. For example, NRL received $166 million (FY08 dollars) from 1963 through 1968, but only $154 million (FY08 dollars) over all years after 1968.

- Restore to civilian lab directors all the authorities lost over the last two decades, including those to make program and personnel decisions, to allocate funds, and to otherwise manage the necessary resources to carry out the mission. One example is to return facility management authorities to the Army labs and naval warfare centers. Another is to reinstate the full strength "direct hire" authorities held by the labs until the 1980s.

- Restore the dual-executive relationship of the military and civilian leadership at all labs where it has been weakened or eliminated. While difficult in practice, authority must be shared equally to meet the mission. The military officer assures continuing ties with the Services that the labs exist to support. The senior civilian assures stable, long-term direction of the organization and the tough technical oversight needed to protect the public's interests.

Accountability-based Governance

The last two decades stand in stark contrast to the reform era, when the Kennedy and Johnson administrations, during a time at least as dangerous as our own, preserved the labs' ability to perform long-term research and oversee contracted work. It is tempting to blame "bureaucracy" for the dismal situation, but doing so would miss the problem and its solution.

The Problem

America's great technological achievements in the 20th century were born of a healthy partnership between the public and private sectors. By comparison, market-based governance has spawned great failures, and the costs have been dear in terms of wasted dollars, lost time, and unmet national needs. Less obvious is the diminished transparency of decisions, largely because companies are not subject to the Freedom of Information Act. Moreover, accountability erodes as the yardstick fractures and the government is forced to rely more and more on private sources. In time, private interests attain "unwarranted influence" and make public decisions through "misplaced power," the very concerns voiced by President Eisenhower in his farewell address.

Private interests pose a threat to democracy when they gain a role in governance, a fear felt keenly in the early days of the Republic. The authors of the *Federalist Papers* believed private interests to be unresponsive to the public good. James Madison argued that a republican, or representative, form of government was the best way to control them and thereby save the new democracy from being destroyed by corruption. In *The Federalist No. 10*, he stated, "No man is allowed to be a judge in his own cause, because his interest would certainly bias his judgment, and, not improbably, corrupt his integrity."

The Republic needs a strong yardstick. Without one, our government cannot govern well—not even if it retains the best and brightest on contract. The government's own assets must capably bear the responsibility for decisions that affect the Republic's interests, and they must maintain public confidence by the manner in which those decisions are made. This is vital. As Adlai Stevenson stated, "Public confidence in the integrity of the Government is indispensable to faith in democracy; and when we lose faith in the system, we have lost faith in everything we fight and spend for."

The Solution

In matters involving science and technology, competent government S&Es, in sufficient numbers, with sustained support from the executive branch, are the only means for tempering the private sector's natural tendencies and for harnessing its formidable skills in ways that serve public purposes. A healthy balance was restored in the 1960s. It can be done again. The Bell Report's central finding offers clear direction and should be endorsed as a global principle by the new administration: "No matter how heavily the Government relies on private contracting, it should never lose a strong internal competence in research and development."

This is critical because market-based governance is accountable to a financial bottom line and to a well, or poorly, written contract. Without strong oversight, it injects political illegitimacy into the exercise of state power and risks the failure of national missions. By contrast, accountability-based governance contributes to making government safe for democracy. Our republic is more than a market, our government more than a business, and our citizens more than consumers.

However, given the demonstrated costs of market-based governance, one question still needs to be answered. If the problems of the government's yardstick are so well known, well understood, and solvable, then what explains the persistent inaction?

Misplaced Power

President Eisenhower warned that "in the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist." Our vigilance failed when economic and political interests converged after the Cold War in a way that is eroding the government's will to support its yardstick—the S&Es who perform R&D within its defense labs. This is what makes recruiting high-quality talent, building new facilities, and eliminating burdensome bureaucracy so hard to achieve.

Power is misplaced when it is pulled away from the Pentagon into corporate boardrooms, where the Nation's interests are at risk of being traded for private interests. Back when there was a healthy balance in the technological partnership between DOD and the commercial sector, the Pentagon could ensure that decisions were made by government officials who were publicly accountable. Furthermore, the contracted work was overseen by government S&Es who were knowledgeable and objective because they performed R&D in the relevant areas and were insulated from market pressures to earn a profit.

The so-called revolving door helps to sustain the problem. A recent GAO study found that between 2004 and 2006, 52 contractor firms hired 2,435 former DOD officials who had previously served as generals, admirals, senior executives, program managers, and contracting officers.[72] Perhaps this is inevitable with the sharp disparity between private and public compensation. The average pay for a defense industry chief executive officer is 44 times that of a general with 20 years experience.[73] More dramatically, in 2007, one private security firm's fee for its senior manager of a 34-man team was more than twice the pay of General David Petraeus, then-commander of 160,000 U.S. troops and all coalition forces in Iraq.[74]

The military-industrial complex is not a conspiracy; it is a culmination of historical trends. Those trends are the outcomes of our collective choices, which are in turn dictated by our needs and values. In his 1978 critique of Western civilization, the Soviet émigré Alexander Solzhenitsyn, who was no friend of communism, lamented the West's "cult of material well-being" that depends on little more than a cold legal structure to restrain irresponsibility.[75] Thirty years after his warning, not even the code of law could protect us from ourselves and the most fearsome economic crisis since the Great Depression.

Money plays too great a role in public policymaking, a fact that might alarm us more if it were not lost in the glare of the West's passion for material well-being. This is the reservoir from which market-based governance derives its strength, and in turn it saps that of the government. The United Kingdom offers an example of the twisted priorities that can be caused by the commingling of societal choices, government requirements, and commercial interests. With public support waning, the Royal Navy's budgets declined. Strapped for cash, it now rents naval training facilities to a contractor who teaches basic seamanship to crews of the world's "super yachts." These mega-boats of the rich and famous are the size of frigates, and taken together they require a larger workforce than all the warships flying the Union Jack.[76]

The Choice

When the sons of jihadism attacked America, the sons and daughters of democracy responded. The first to do so were public servants and civilians, such as the firefighters who entered the burning Twin Towers knowing they might not come out alive, and Flight 93's passengers who died thwarting a larger massacre. Our Armed Forces then took the fight overseas and battled valiantly to liberate two societies from despotism.

But the storm that moves upon the West has not yet gathered its strength. We must develop new energy sources as oil is depleted, lessen manmade contributions to climate change, protect vital ecosystems, contain pandemics and drug-resistant infections, deter adversarial nations, secure our borders and seaports, and defend civilization from an opportunistic enemy that has apocalyptic goals and is not deterred by traditional means.

Our public sector labs exist to help meet such challenges. They have been there for us in the past. With reforms that restore a healthy partnership with the private sector, they will be there for us tomorrow. A broken yardstick is not fated. It is a choice.

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Center for Technology and National Security Policy

Hans Binnendijk
Director