

# Causal Inferences on the Cost Overruns and Schedule Delays of Large-Scale U.S. Federal Defense and Intelligence Acquisition Programs

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## ABSTRACT ■

A study was undertaken to understand why cost overruns and schedule delays have occurred and continue to occur on large-scale U.S. Department of Defense and intelligence community programs. Analysis of data from this study infers the causes of cost overruns and schedule slips on large-scale U.S. federal defense and intelligence acquisition programs to ineffective human resources policies and practices, consolidation of the aerospace industry, and too many stakeholders. In this article, each inferred cause and the resulting systematic effects are discussed in detail. Moreover, block diagrams have been developed for each cause and illustrate the sequential flow from inferred cause to systematic effects and reveal key interrelationships among each cause.

**KEYWORDS:** acquisition management; aerospace industry; human resources; stakeholders; federal government

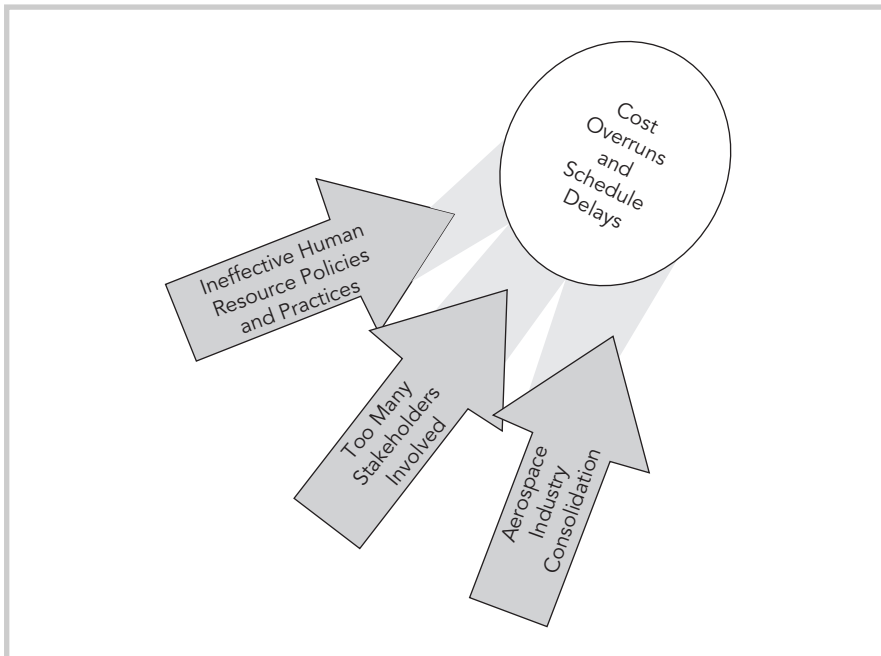
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## INTRODUCTION ■

The purpose of this study was to understand why cost overruns and schedule delays continue to occur in large-scale U.S. Department of Defense (DOD) and intelligence community (IC) acquisition programs. Based on the study data, we determined that ineffective human resources policies and practices, the consolidation of the aerospace industry, and too many stakeholders involved in monitoring programs continue to create cost overruns and schedule slips on major acquisition programs (see Figure 1).

The study data show that these causes have had a devastating impact on large-scale federal acquisition programs. This article utilizes the data detailed in Meier (2008) to show how each effect is directly traceable to one of the three inferred causes. The effects discussed in Meier (2008) include overzealous advocacy, immature technology, requirements instability, ineffective acquisition strategy, unrealistic program baselines, inadequate systems engineering, and workforce issues.

The burgeoning cost overruns and schedule delays from initial estimates on large weapons systems significantly impact national security. First, the warfighters suffer because they are not equipped with the latest technology to fight continuing and emerging threats and must continue to rely on outdated legacy systems. Second, the taxpayers must pay these overruns with funds that could be used for other promising programs. Even though many of the programs listed in Meier (2008) and this article have been under public scrutiny for many years, the programs continue to experience unprecedented overruns. For example, statistical data from a recent Government Accountability Office (GAO) report (2008a) on 95 weapons systems found that the total cost growth on these programs was \$295 billion, and the average schedule delay was 21 months. These large numbers represent a growing trend in cost overruns and schedule delays since the GAO began tracking these metrics in 2000. For comparison, the estimated total cost growth in the year 2000 of 75 DOD programs was \$42 billion, normalized to fiscal-year 2008 dollars. Even though the 2008 data accounted for 20 additional programs compared to the 2000 data, this represents, in absolute terms, a 702% cost growth increase over the course of 7 years. Equally important, the report found the average schedule delay in delivering initial capabilities was 16 months in 2000 compared to 21 months in 2007, representing a 31% increase in schedule delays over a 7-year period. And finally, one metric that measures the value that DOD receives per unit for the acquisition dollars invested in a program is the cost growth per unit. In 2007, 44% of DOD



**Figure 1:** Three inferred causes of cost overruns and schedule delays on large-scale defense and intelligence acquisition programs.

acquisition programs were paying at least 25% more per unit compared to 37% of programs in 2000, roughly a 7% increase in the number of programs paying more than 25% per unit. All of these trends unambiguously show that DOD is paying more money for delayed and, in some cases, less capability. The programs assessed in the GAO reports were considered large acquisitions by DOD and were selected based on the following factors: high dollar value, acquisition stage, and congressional interest.

### Methodology

The study data was obtained from: (1) responses from six requests for information (RFIs) from the aerospace industry; (2) more than 30 acquisition reports, documents, and studies; (3) interviews with 42 DOD and IC government and industry senior executives and program managers, each with more than 20 years of experience in the DOD and IC; and (4) interviews with three national laboratories and two think-tank organizations. A block

diagram is presented in Figure 2 that details the process. Once the complete set of data was assembled, it was organized, assimilated, and reviewed for common themes that led to cost overruns and schedule slips on large-scale U.S. DOD and IC acquisition programs, which are detailed in Meier (2008).

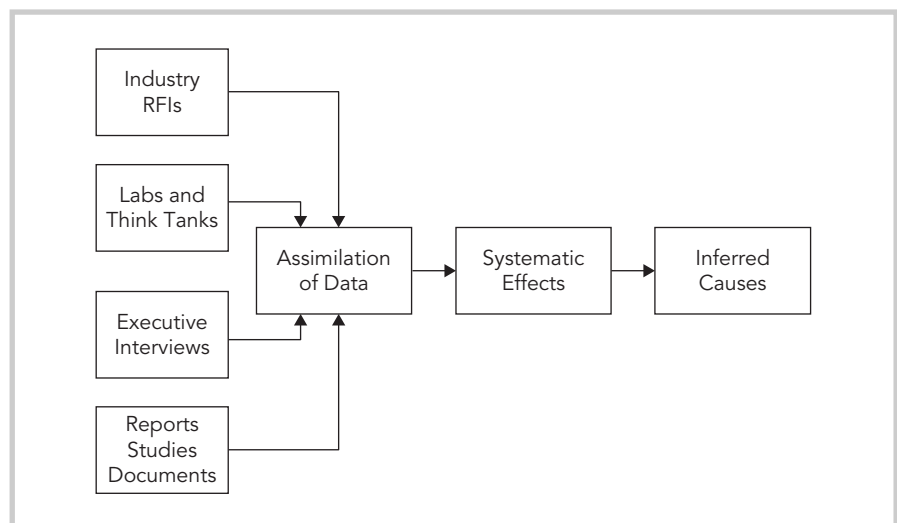
Further analysis of the study data to derive the root causes revealed that the effects detailed in Meier (2008) were related to three causes that could independently or in conjunction lead to cost overruns and schedule delays.

The industry RFI responses were collected from several corporate partners with deep understanding and expertise in the DOD and IC acquisition arena. The RFI responses were confidential, proprietary, and, in some cases, classified and were treated as such. Many of the reports, studies, and documents, such as GAO reports, are open to public dissemination. The government and industry executive interviews, as well as the interviews with think tanks and laboratories, were handled as confidential and proprietary. In general, the questions in the RFIs and interviews covered topics such as complexity, acquisition practices, leadership, management processes, technology development, contractual practices, incentives, and commercial practices.

### Inferred Causes

#### *Ineffective Human Resources Policies and Practices*

Although best practices and streamlined processes position a program for success, the study data indicate that the



**Figure 2:** Process flow for this study.

## Causal Inferences on the Cost Overruns and Schedule Delays

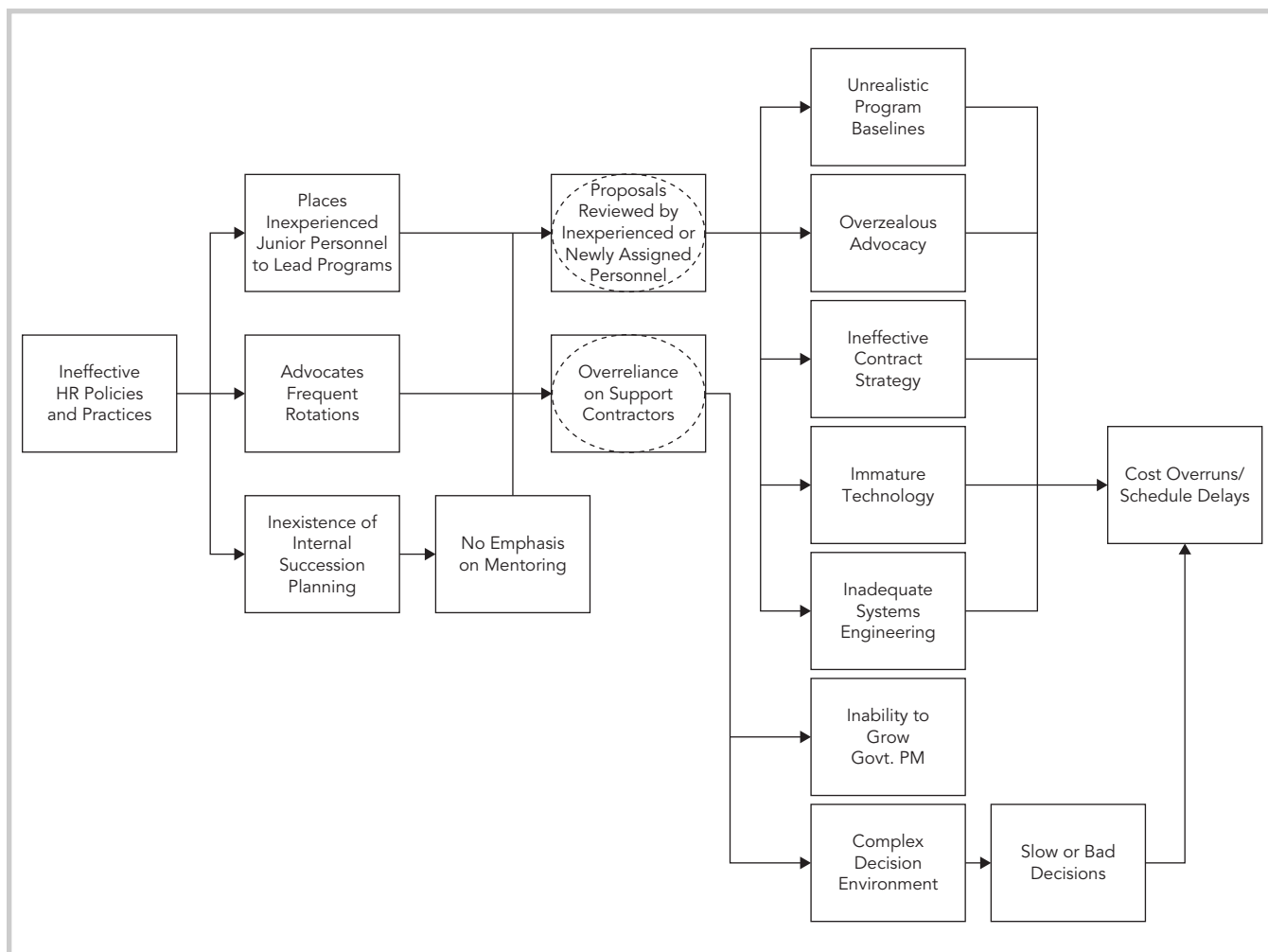
key to success comes down to people making good decisions on a daily basis. As one interview from the study states, “Standards and processes are key, but we need to rely on people, not processes.” Similar sentiments that bolster this viewpoint are expressed with “It’s about the people. If you can attract good people, you are doing it right.”

Results from the study data indicate that the current DOD and IC human resources policies and practices contribute to cost overruns and schedule slips because they place inexperienced personnel in decision-making positions and value-assignment rotations. First, in many cases, the study data

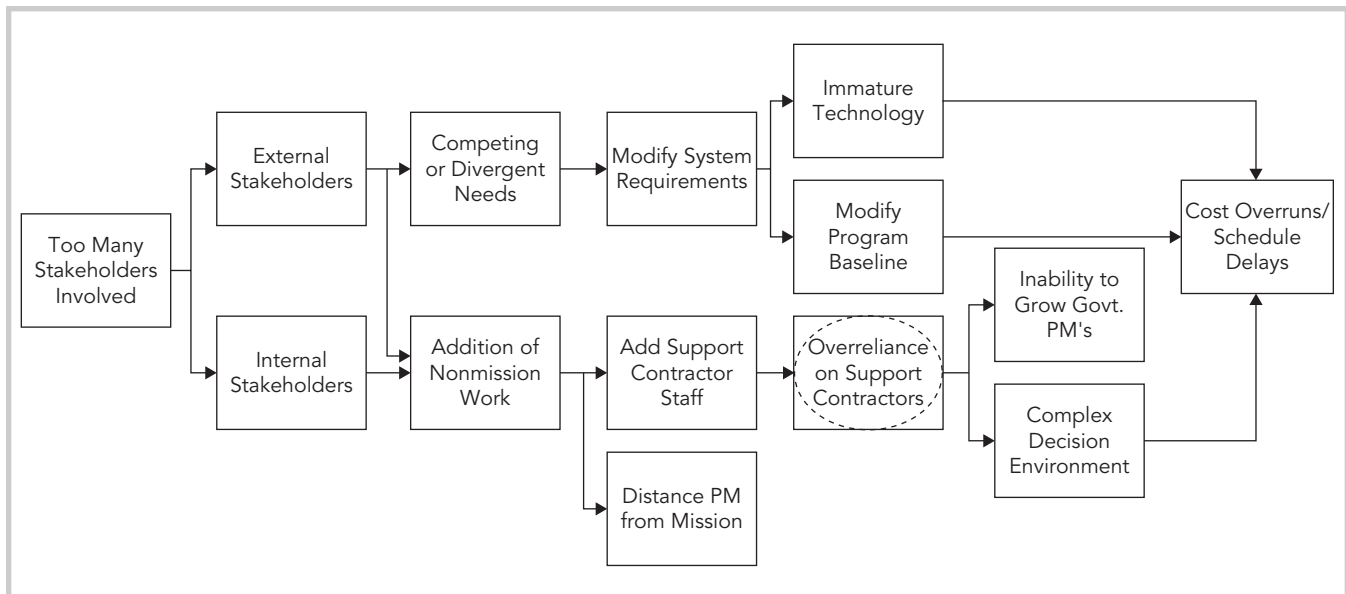
show that inexperienced or newly assigned program managers have difficulty judging contractor proposals, understanding the technical underpinnings of a system, or having the systems engineering experience to decompose customer needs into specific capabilities. And second, the current DOD personnel policies mandate rotations every 4 years, while the current IC policies encourage rotations every 3 years. Moreover, the study also found that the absence of formal succession management planning and mentoring programs in many of the federal acquisition organizations contribute to the inability of government acquisition agencies to

train and retain personnel. The nonexistence of succession planning has resulted in a culture that does not encourage mentoring of inexperienced or newly assigned individuals to help accelerate their learning.

A block diagram has been created that shows that the inferred cause—ineffective federal DOD and IC human resource policies and practices—has placed inexperienced personnel in decision-making positions, values frequent rotations, and does not support succession planning (see Figure 3). These three factors lead to: (1) a strong reliance on internal support contractors, who in turn create a complex decision-making environment



**Figure 3:** This block diagram shows how the inferred cause—ineffective federal DOD and IC human resource policies and practices—leads to cost overruns and schedule delays.



**Figure 4:** This flow diagram shows how the inferred cause—too many stakeholders—leads to cost overruns and schedule delays.

and inhibit the government’s ability to grow future program managers, and (2) ineffective government-led source-selection teams that review contractor proposals and do not have the ability to generate a credible program baseline; obtain a realistic understanding of the program’s proposed cost, schedule, and performance; translate customer needs into a specific capability through the appropriate systems engineering processes; develop a contract vehicle with the appropriate incentives to motivate a contractor; or assess technologies to determine their state of maturity. The blocks with the dashed ovals indicate the areas where two inferred causes overlap with the inferred causes of consolidation of the aerospace industry and too many stakeholders.

This inferred cause and the resulting effects can lead to cost overruns and schedule delays on large-scale programs and will be discussed in further detail in the sections to follow. The blocks with the dashed ovals indicate the areas where two inferred causes overlap and lead to the same effects. Specifically, Proposals Reviewed by Inexperienced or Newly Assigned Personnel overlaps with the

Aerospace Industry Consolidation inferred cause, and Overreliance on Support Contractors overlaps with the Too Many Stakeholders inferred cause (see Figures 4 and 5).

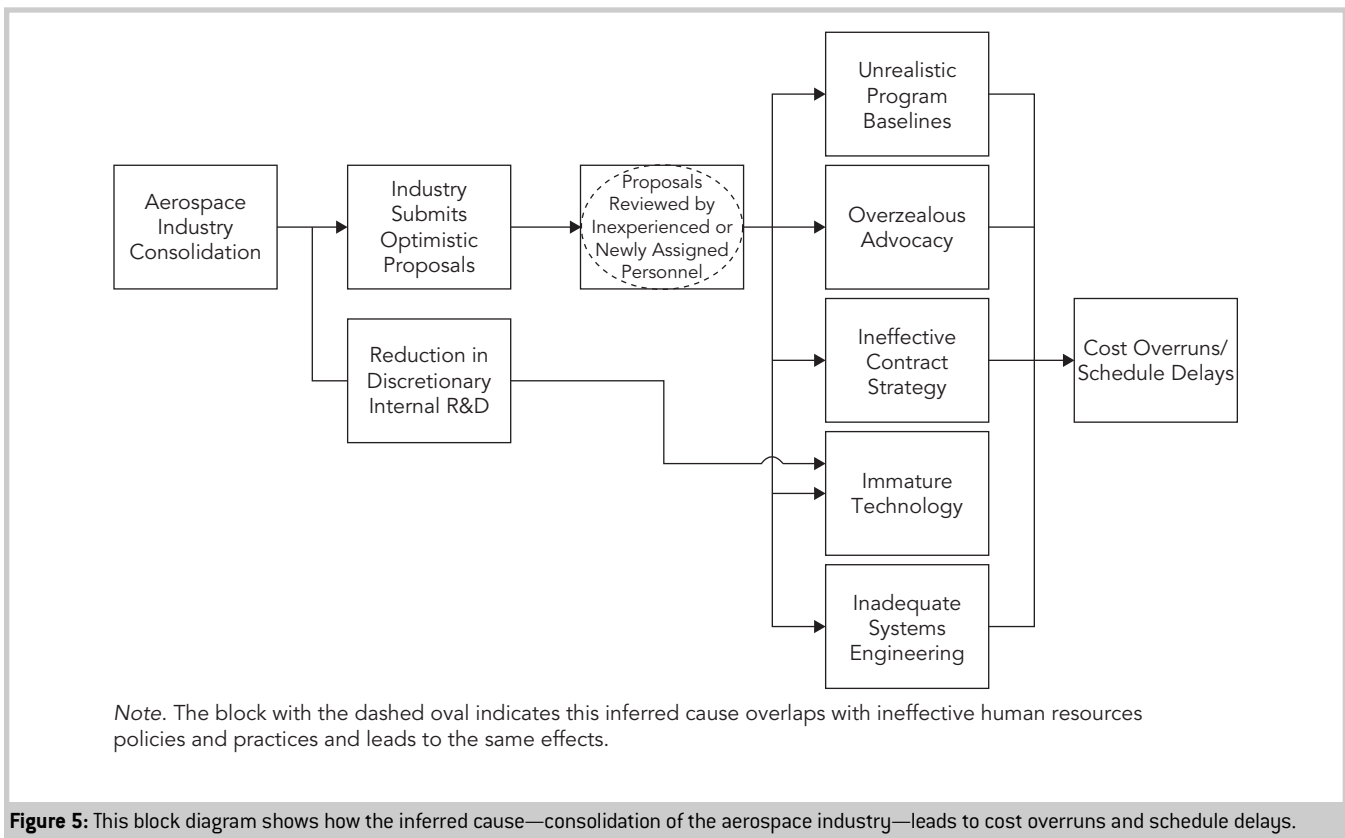
#### *Inexperienced Personnel*

The study data indicate that placing inexperienced personnel—that is, either junior personnel or newly assigned personnel—into program leadership positions that entail decision making can lead to cost overruns and schedule delays. The result can be bad decisions or slow decisions. It is obvious that a bad decision—which can lead to major redesign efforts, failed tests, or an inability to meet specifications—can result in schedule slips, cost overruns, or both. Similarly, slow decisions can have a similar impact to cost and schedule baseline as hundreds or thousands of contractors are billing a contract while a decision is pending.

The study data highlight the fact that an experienced program manager and program office team can make good decisions and timely decisions. As one study source quotes, “There is a big

difference between the A team and the A+ team. Experienced people have a set of things to watch for. They can give you a set of risks that are 90% accurate without a special process.” Conversely, other data from the study state that “inexperienced people have difficulty judging what’s important vs. nonimportant.” Additional study data regarding decision making cites that the “process in the DOD is designed to avoid decisions . . . we don’t need process—we need decision makers who know what they are doing.” For example, on one program that suffered a cost overrun of approximately \$130 million, the main culprit was that the “program continued to force fit a commercial-off-the-shelf (COTS) solution without re-examining the plan and realizing that the COTS products were not completely documented nor understood, and not maintained by commercial suppliers for intended program life cycle.” The lesson learned provided by the contractor RFI was that “decision makers must interpret early warning signs of a pending major problem and expeditiously address the problem.”

## Causal Inferences on the Cost Overruns and Schedule Delays



**Figure 5:** This block diagram shows how the inferred cause—consolidation of the aerospace industry—leads to cost overruns and schedule delays.

Other study data reiterates these viewpoints. For instance, data obtained in the study recount how a large system acquisition was “first managed by junior officers who had little domain knowledge or acquisition experience.” Subsequently, the initial development work was conducted for several years with inexperienced managers, and, consequently, component and subassembly tests failed; these failures ultimately revealed major weaknesses in designs. A major redesign effort was required, resulting in substantial schedule slips and large cost overruns. This well-known program suffered billions of dollars in cost overruns. The major lesson learned was that it is “important to select managers who have the experience to match the nature and degree of the end-term development challenge.” In summary, these examples clearly show that inexperience has led to significant cost overruns and schedule delays on large-scale acquisition programs.

Two reports cite similar issues regarding the significance of an experienced and competent program manager. The Report of the Defense Science Board (DSB) Task Forces on the Acquisition of National Security Space Programs (DOD, 2003) found “that the acquisition workforce has significant deficiencies: some program managers have inadequate authority; systems engineering has almost been eliminated; and some program problems are not reported in a timely and thorough fashion” (p. 23). The DSB (DOD, 2003) concludes that these deficiencies, coupled with a lack of incentives, have resulted in “widespread shortfalls in the experience level of government acquisition managers, with too many inexperienced individuals and too few seasoned professionals” (p. 3). In order to succeed, the same report states the government workforce should be “highly competent, and properly staffed, with commensurate authority.” The Booz Allen Hamilton

(BAH) study (2002) on the U.S. Air Force Space and Missile Command (SMC) found acquisition workforce problems related to a “lack of program management continuity and gaps in relevant experience” (p. 33).

A study by Thurman (2006) on the U.S. Air Force’s Space Missile Command, which acquires complex satellite systems, on personnel trends found that there has been a shift to younger, less experienced staff, such as lieutenants. Although the younger, less experienced personnel are highly capable and armed with the latest educational tools, they may not have the years of experience to manage a complex, expensive acquisition. Moreover, Thurman found there has been a marked personnel shift from engineering officers to program manager officers between the years of 1994 to 2005, which may indicate more program management oversight but less technical expertise to manage complex SMS satellite developments.

The DSB (DOD, 2003) found very similar statistics. The report states that in 1992 the SMC authorized 1,428 officers in the engineering and management career fields, with ranks from lieutenant to colonel. However, by 2003, that authorization had been reduced to a total of 856 across all ranks. Furthermore, there had been an overall reduction of 62% in the colonel and lieutenant colonel ranks and an increase of 414% in lieutenants, with the majority of lieutenants being assigned to the program management field. Both of these reports clearly point toward a shift to less experienced personnel managing large, complex systems.

Slow decisions can also cause significant cost overruns for a program. For example, a large acquisition may average approximately 1,500 full-time equivalent (FTE) persons who may charge the government a rate of approximately \$400,000 per year. The \$400,000 value includes salary, benefits, company overhead, and company facility costs, and corresponds to roughly \$12 million per week. Clearly, the math shows that if a decision is pending for 2 to 3 weeks, it can cost the program up to \$36 million of potential lost productivity while a decision is pending.

A portion of the technical decline in the acquisition community may be attributed to DOD's 1990s Total System Performance Responsibility (TSPR) management paradigm. TSPR relegated all decisions to the prime contractor and, accordingly, the government to an observer versus active participant in the system acquisition management process. Consequently, the government program manager's role in the TSPR paradigm was to observe the contractor from the sidelines. These generations of acquisition program managers—who are now senior program managers—are not cognizant of best practices and cannot mentor junior acquisition personnel. Comments in the study reflect issues with the TSPR paradigm, such as “senior level people who have grown

into those jobs were inexperienced junior level people that never got the fact finding skills.”

Remnants of the TSPR system are still relevant in one of today's large-scale acquisition programs. The Army's Future Combat System (FCS) program (discussed in GAO, 2008a) is managed by a lead system integrator who assumes all responsibility for developing requirements, selecting major subcontractors, and performing trade studies among cost, schedule, and performance. The GAO report (2008a) shows FCS has suffered a total program cost growth of 45.5% and schedule growth of 59.3%. In this particular program, the government assumes a level of risk and assumes that the contractor is working in the best interests of the government.

#### *Frequent Program-Manager Rotations*

The current DOD and IC human resource policies advocate frequent personnel rotations in order to be promoted to senior levels. These policies result in short program-manager tenures and certainly contribute to the cost overruns and schedule delays on many large DOD and IC programs. For example, the current policy issued by the director of national intelligence (DNI) on joint duty requires all IC government civilians to spend at least 12 months in another intelligence agency as a prerequisite to qualify for promotion to senior levels. Furthermore, many IC organizations now require internal rotations within the agency in order to be promoted to the GS-15 level. On the DOD side, the United States Air Force (USAF) has rotation guidelines of 3 to 4 years for its officers.

Much of the study data focused on the fact that building a large-scale system that is technically complex and acquisition-intensive is not a “tour” and that frequent turnover hurts accountability. For example, a recent GAO study (2008a) on 39 major weapons programs found the average program-manager tenure on a major weapons systems program was 17.2 months.

This startling number is in contrast to current DOD policy that prescribes tenures of 4 years as practicable for program managers of defense acquisition programs. Such inconsistency between policy and practice hinders program-manager accountability. More evidence is provided by the DSB (DOD, 2003) report that found the average tenure of a space program manager to be 2 years.

Study data supports these statistics with statements like “the community must recognize that acquisition and development is not a tour” but that acquisition programs require long-term experience and expertise. Additional study data found that “turnover in people hurts accountability.” The BAH (2002) report cites acquisition workforce problems in “program director continuity and long-term acquisition personnel experience challenges in retaining the acquisition workforce” (p. 49). As stated in Meier (2008), much of the study data suggested program-manager tours of 5 to 6 years to hold them accountable for mission success and to stem overzealous advocacy. The BAH (2002) study recommends that “program directors be in place at least two years prior to any milestone event and remain in place through milestone completion” (p. 49). The DSB (DOD, 2003) study recommends tenures for space program managers to be at least 4 years. And finally, a report by the Institute for Defense Analysis (IDA) to Congress on Leadership, Management, and Organization for National Security Space (2008) has a key recommendation to establish a norm that “space project management personnel be in a given position for sufficient time to maximize project success—four years or more—without adverse effect upon an individual's career” (p. 24).

Finally, in addition to the issues previously cited, inexperienced personnel also add to the bottom-line program cost because the development contractors are burdened by the inexperienced government team. One RFI

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quotes that “the contractor must train government staff to be acquisition people.” This training detracts from the contractor’s primary role as the system developer. In summary, the study data clearly indicate that program personnel turnover can contribute to cost overruns and schedule delays.

### *Nonexistence of Succession Planning and Mentoring*

Succession planning is vital to the long-term health of an organization; yet, the study responses indicate that succession planning is virtually nonexistent in many federal acquisition organizations. This is surprising because the business and organizational literature is stacked with evidence that succession planning and active mentoring can help accelerate the learning of less experienced or newly assigned personnel (Conger & Fuller, 2003; Leonard & Swap, 2004). This lack of any succession planning at many federal acquisition agencies has eliminated a culture that mentors inexperienced or newly assigned personnel and may contribute to cost overruns and schedule delays.

Much of the study data discusses how succession planning helps organizations to grow and retain personnel and may aid in preventing cost overruns and schedule delays on future acquisition programs. For example, one participant in the study states that “in the past we spent 3 days offsite examining contenders for each job down to the division chief level, then went through each person not on the list to identify what they needed to do to get on the list. The commitment was to develop people.” Another study participant states that “we are not proactive in grooming people and developing careers.” This view is reiterated in the study with the following: “In the past, all the senior managers got together and talked about everyone annually. Who can do the job now? Who has promise? We used to directly assign people to move around to further their careers. Now, feedback is not there for

future development.” In their article on succession management, Conger and Fuller (2003) recommend a two-pronged approach that involves both succession planning and leadership development to create a system that manages the current and future talent pools for an organization. They also cite examples from private industry where divisional vice presidents and their area managers meet offsite for an entire day. This information illustrates the strong emphasis and importance of succession planning in maintaining a vibrant organization.

When an organization does not develop a succession management plan, it ends up rendering mentoring—either formal or informal—nonexistent. The study pointed out that the most effective mentoring took place between highly educated and motivated personnel just out of school with little acquisition experience and seasoned senior government personnel. For example, one interviewee states, “In the past, high-caliber junior people would be sought and mentored by senior people. Mentors were personally engaged.” Additional study data support this viewpoint with “the government needs active mentoring—assign juniors to seniors and put mentoring in performance assessments.” Another response bolsters this view adding, “In the early days, there was an unofficial but nonetheless rigorous process for the career development of our people.” And finally, another input quotes, “Mentoring was on-the-job training—not a class—a supervisor or more senior colleague would see firsthand a person’s work skills then broaden them.” Many of these practices are consistent with best practices found in the literature. In their *Harvard Business Review* article, Leonard and Swap (2004) state that the deepest knowledge—what they call “deep smarts”—“can’t be transferred onto a series of PowerPoint slides or downloaded into a data repository. It has to be passed in person—slowly, patiently, and systematically” (p. 93). Knowledge

and transfer of it is paramount in the intelligence and defense communities because these organizations are entrusted to protect American lives. Leonard and Swap (2004) acknowledge that passing knowledge takes time and money. However, as they state in their article, where knowledge is vital, they ask, “How can companies afford not to invest?” Based on the data previously presented, DOD and the IC should consider devoting more time and effort to succession planning and mentoring programs.

### *Inexperienced Government Source-Selection Teams*

Inexperience, frequent rotations, and a lack of succession planning and mentoring resulting from ineffective government human resource policies and practices, coupled with the aerospace industry consolidation, have led to aggressive bids by industry on government proposals. The study data provides evidence that another factor that can lead to cost overruns and schedule delays is when the government source-selection team is inexperienced, newly assigned, or does not have appropriate subject-matter expertise. In these cases, the government team provides an inadequate review of an overly optimistic proposal and renders a faulty decision at the end of a source-selection activity. The study data recounted several cases where “the inexperienced government team during source selection got the program off on rocky footing that caused catastrophic consequences,” which then feeds into other areas such as overzealous advocacy, immature technology, ineffective acquisition strategy, unrealistic program baselines, and inadequate systems engineering (see Figure 2). One compelling quote on a program that experienced cost overruns and schedule delays is: “The source-selection team was inexperienced. The agency must put its best people on its most critical functions, such as source selections. Experienced people know when

to trust their instincts.” Another source cites that the government must ensure a “highly experienced government program office to make wise source-selection and programmatic decisions with speed and insight.” In summary, the data show that if a program is initiated with an unrealistic baseline, the risk of cost and schedule overruns is high.

#### *Overreliance on Contractors*

Inexperience, frequent rotations, and a lack of succession planning and mentoring driven by ineffective human resource policies and practices have also led federal acquisition organizations to develop a strong reliance on internal support contractors. The study data indicate that this additional staff adds extra cost and leads to a complex decision-making environment, ultimately resulting in cost overruns and schedule delays. On many programs, the data point out that the corporate memory and expertise of many programs is usually not found within the government ranks but with the contractor staff. According to the study data, this overreliance manifests itself in several ways: (1) it has created a complex decision-making environment; (2) it undercuts the ability of the organization to grow program managers; and (3) it blurs the lines of authority in the eyes of the development contractor when internal support contractors guide program decisions while not being held accountable for mission success.

Today, most acquisition program offices consist of more nongovernment than government personnel. The study details how the technical and programmatic expertise in many government program offices resides in the internal Systems Engineering and Technical Assistance (SETA) contractors support, Federally Funded Research and Development Centers (FFRDC) support, or consultants. The effects of large staffs of SETA, FFRDC, and consultants results in additional staffing and training costs; program control that may not be

in line with the government program manager; a complex decision-making environment; and blurred accountability lines inside and outside an organization, as many support staff have taken roles that in the past have been inherently for government personnel. For example, the data state that “the government has relinquished too much of its role to support contractors.” Another interviewee states, “SETAs are not necessary for the mission; the prime contractor is necessary for the mission.” Moreover, one response to the RFI states that “this large staff creates interference that government and contractors must overcome.” As one interview states, “SETAs are self-fulfilling prophecy. Formats, chart editing, etc. are all decisions made by SETAs.” Moreover, the study data note that the “expanded program management team becomes part of a collaborative decision process that is driven by inexperience in the front line management team and can easily encumber timely trades between program cost, schedule, and mission capability.” In addition, the prime contractor has to “orient and train the inexperienced team.” Another piece of study data states, “Too many SETAs intermingled with government staff blurs accountability.” Furthermore, secondary effects from the study cite that the “reliance on support contractors perpetuates the inability to develop future program managers and acquisition experts and delays decision processes.”

A GAO report (2008b) details the government’s strong reliance on contractors, which creates a complex environment where clear lines of authority are not delineated. The report, along with the study data, show that while hiring contractors offers many benefits, such as filling expertise gaps in the government workforce or fulfilling emergency needs, most acquisition agencies are highly staffed with contractors, FFRDCs, and consultants and the lines of authority become blurred in the eyes of the prime contractor. Basically, the GAO (2008b) report also found that

many contractors work in acquisition areas as support and perform activities historically performed by government specialists, so when prime contractors are looking for direction, in many cases they may interact with a support contractor instead of government personnel, which can lead to inefficiencies or poor guidance.

In order to monitor and control the current strong reliance on internal support contractors, the study data recommend that efficiencies could be gained with “dramatic reductions in the staff functions and SETA teams, limiting participants to those who are knowledgeable and capable of developing solutions rather than identifying potential problems.” One suggestion to review and improve CAAS and SETA government support is to “establish SETA work packages based on deliverable items such as reports, trade studies, or assessments instead of contracts based on level of effort work packages that do not require deliverables.” In summary, the study data provided ample evidence that internal support contractors add additional cost, guide program decisions, are not accountable, and create a complex decision-making environment.

#### ***Consolidation of the Aerospace Industry***

The study data provide evidence that the dramatic consolidation of the aerospace industry over the past decade has led to aggressive, overly optimistic bids by industry to win government contracts, which has led to program cost overruns and schedule delays. These overly optimistic bids are then evaluated by an inexperienced source-selection team that does not have the appropriate backgrounds or experience and ends up performing an inadequate review of the proposal. In many instances, the study data point out that the inexperienced government team does not make wise source-selection decisions, which leads to a program being initiated with overzealous advocacy,

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immature technology, ineffective acquisition strategy, unrealistic program baselines, and inadequate systems engineering.

A block diagram has been created and shows the inferred cause—consolidation of the aerospace industry—has resulted in aggressive bids by industry to win government contracts (see Figure 4). As shown in Figure 4, these overly optimistic proposals are then reviewed by an inexperienced government source-selection team that does not have the ability to generate a credible program baseline; obtain a realistic understanding of the program's proposed cost, schedule, and performance; translate customer needs into a specific capability through the appropriate systems engineering processes; develop a contract vehicle with the appropriate incentives to motivate a contractor; or assess technologies to determine their state of maturity. These factors taken individually or together can lead to cost overruns and schedule delays on complex large-scale federal programs. The block with the dashed oval indicates the area where another inferred cause overlaps and leads to the same effects. Specifically, in Figure 3, the dashed oval within the Proposals Reviewed by Inexperienced or Newly Assigned Personnel Box overlaps with Ineffective HR Policies and Practices.

The consolidation of the aerospace industry has been swift. For example, one industry RFI states that “the aerospace industry has suffered a reduction from 86 first- and second-tier companies to five major prime contractors.” A study by the GAO (2006) that addresses improvements in space systems acquisitions reports that in 1985 there were ten competent prime contractors competing for space programs and that today there are only two that could handle DOD's most complex space systems. Another study by Thurman (2006) on the national security space industrial base concludes that the space industrial base has consolidated from 53 space contractors in 1990 to four space

contractors in 2006. These four now comprise all the combined engineering, production personnel, and facilities of more than 50 firms that were in existence in the mid-1990s.

The aerospace industry has found itself—with the help of the government acquisition reform policies of the 1990s—with too much consolidation. This state of affairs has led to quasi-monopolies where each contractor is vying to become the sole provider in a particular defense sector. This behavior has led these participants to engage in “winner-takes-all” competitions for large programs. The DSB (DOD, 2003) report concludes that unrealistic estimates related to “proposals from competing contractors typically reflect the minimum program content and a price to win” (p. 2) contribute to acquisition problems on major space systems. The “Inexperienced Government Source-Selection Teams” subsection in this article also provides additional study data on the importance of experienced source-selection teams and the consequences of having an inexperienced source-selection team. For example, on one program that suffered cost overruns and schedule delays, “the inexperienced government team during source selection got the program off on rocky footing that caused catastrophic consequences.” And finally, one RFI states that “without a doubt the major problem in all of these troubled acquisitions can be traced to unrealistic cost and schedule expectations made during the proposal period.”

Interestingly, the DSB (DOD, 2003) report found that the incumbent contractor loses more than 90% of the time. This statistic is consistent with one contractor RFI that provided data that the probability of the incumbent contractor retaining incumbency was 1 in 8, which translates to an incumbent contractor losing 87.5% of the time during a recompet. The same RFI states “that in an effort to close consolidation business cases, non-incumbent firms offered aggressive bids.” Because

an incoming competitor is not “burdened” by the actual cost of an ongoing program, it can be more optimistic with its bid. Subsequently, in many cases, the government program office budget is reduced to match the winning proposal's unrealistically low estimate.

Changing contractors on a large system development can result in considerable costs for the government, since expertise is lost and retraining must occur. Equally important, factories and facilities will be liquidated only to be built elsewhere. One of the key recommendations of the DSB (DOD, 2003) report was that space system acquisitions should only be competed when it is in the best interest of the government, such as a new capability, new technology, or poor incumbent performance. While competition is advocated in order to provide the best value to the government, a careful analysis should take into account factors such as expertise loss, facility loss, and infrastructure additions.

The roots of the consolidation of the aerospace industry were spawned in the 1990s' DOD acquisition reform policies to address the DOD reduction in expenditures in the post-Cold War era. During this time period, DOD expenditure reductions of approximately 40% in the areas of procurement, research and development, and construction budgets caused the senior DOD leadership to create policies to balance lower budgets while maintaining a viable industrial infrastructure (Deutch, 2001). The original purpose of the consolidation policy was to encourage mergers to reduce the level of assets and promote cost-sharing efficiencies. From a policy and economic viewpoint, if assets were not reduced, smaller budgets would result in higher unit costs, ultimately resulting in lower profit margins for the defense industry. Even though the consolidation policy was aimed at encouraging mergers to reduce asset levels, many aerospace industry consolidations took the form of

acquisitions instead of mergers or partnerships.

Secondary effects from this consolidation may result in a reduction in internal research and development (IR&D) activities, formation of monopolies, and unhealthy competition. One study (Linster, Slate, & Waller, 2002) implied that as defense contractors rely more on partnerships and alliances, fewer resources will be devoted to research. R&D is critical to the long-term viability of the defense industry by providing new technologies to the warfighter. Too much consolidation without vibrant competition may not encourage new ideas or lower cost. Deutch (2001) also points out that with profits and equity prices falling, companies have moved to reduce capital investment and cut discretionary R&D. In summary, the consolidation of the aerospace industry has led to overly aggressive low bids by industry on large-scale government programs, which has contributed to cost and schedule overruns.

### ***Too Many Stakeholders Involved in Monitoring Programs***

Most large-scale federal acquisition programs involve large constituencies. These constituencies consist of external agencies that may serve as mission partners or interested parties and internal stakeholders that can subject a program to reporting requirements and internal management control processes. Therefore, a large part of a program manager's responsibility is devoted to responding to and interacting with a large constituency of stakeholders.

The study data provide evidence that if too many stakeholders interject themselves into large acquisition developments, two primary impacts can occur: (1) system requirements may change, which can significantly impact the system under development, and (2) additional work that does not directly support the acquisition is levied upon the program office. Both of these impacts may add considerable cost to

the system under development. This "nonmission" work takes the form of action items, external and internal process reporting, briefing requests, tours, and nonessential contract deliverables.

A block diagram has been created and shows the inferred cause—Too Many Stakeholders—has resulted in modifications to system requirements and additional nonmission work that does not directly support the acquisition program (see Figure 5). As shown in Figure 5, requirements changes can lead to technology changes and modifications to the program baseline, both of which contribute to cost overruns and schedule delays. Technology changes may render the technology baseline immature and extend the technology development phase into the acquisition execution phase, ultimately leading to cost growth or schedule slips. The study data details how nonmission work can detract the program manager from the core mission; add additional staff, which leads to additional program cost; and lead to an overreliance on internal support contractors, which can lead to a complex decision-making environment and poor decisions, ultimately leading to program cost overruns and schedule delays. Both requirements changes and nonmission work will be discussed individually in the next two sections. In Figure 3, the block with the dashed oval indicates the area where another inferred cause overlaps and leads to the same effects. Specifically, the dashed oval within the Overreliance on Support Contractors box overlaps with Ineffective HR Policies and Practices.

### ***Requirements Changes***

Requirements changes may occur because external stakeholders with divergent needs and wants advocate modifications to meet their specific needs without fully understanding the systematic impacts to the program being developed. One study source noted that the "larger user community involvement in defining interfaces and

requirements drive us to new technologies and use of large systems of systems." Several examples of programs that suffered requirements growth close to \$1 billion, such as the Space-Based Infrared System High (SBIRS) satellite and Advanced Extremely High Frequency (AEHF) communications satellite, can be found in Meier (2008). The financial impact of changing requirements can be seen in Figure 6. Data from the GAO (2008c) provides statistical data on 46 DOD programs that changed requirements and clearly show that initial cost increased on average by 11% for programs that did not change requirements, compared to 72% for programs that changed requirements, roughly a factor of seven. This data obviously shows that requirements changes lead to cost growth. Many other examples of programs that suffered requirements changes can be found in GAO (2008a).

### ***Nonmission Work***

The involvement of both internal and external stakeholders has created significant nonmission-related work for many large system program offices. First, external stakeholders tax the program office with nonmission added work, such as interagency taskings, tours, and briefings, that requires considerable time and additional staff to complete—and distract the program office from its focus on program execution. Second, internal stakeholders tax the development by requiring periodic briefings and internal action items and subjecting the program office to bureaucratic management control processes. With so many stakeholders involved in an acquisition, the program office finds itself devoting significant resources and time to work that does not directly contribute to the program mission. All of these additional resources slow program progress, distract the program manager from the mission, and add cost.

For example, one program manager who tries to insulate her technical staff from nonmission work estimated that

## Causal Inferences on the Cost Overruns and Schedule Delays

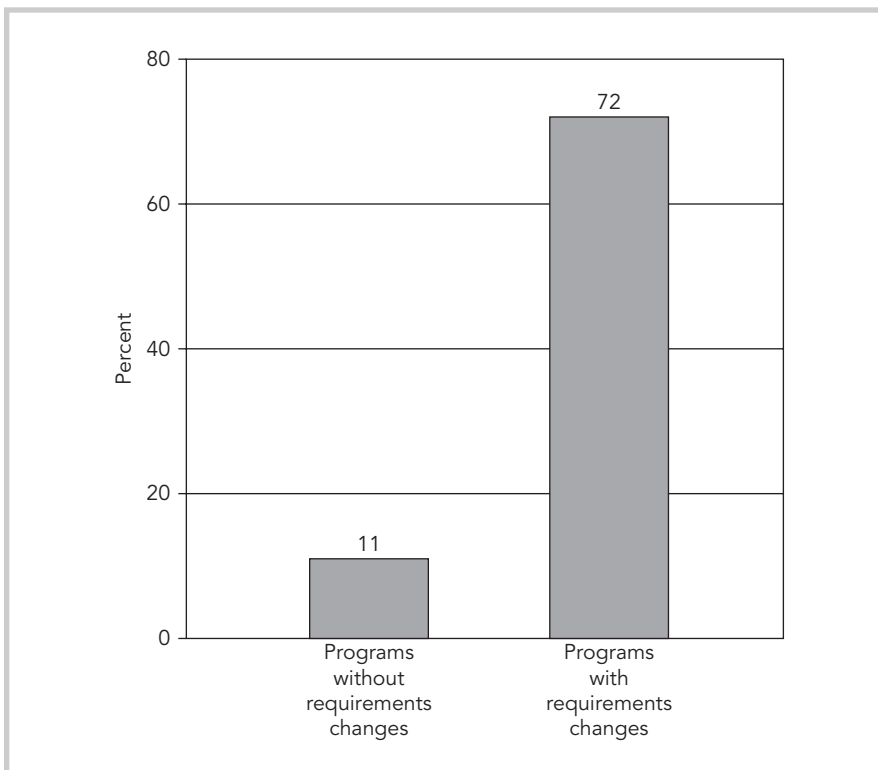


Figure 6: Cost growth due to requirements changes [GAO-08-674T].

“75% of her time is dedicated to non-mission work,” responding to both internal and external actions, and comments that these requests for data “impede program execution” and that “anyone can ask for anything.” Moreover, another program manager comments that “even our contractors are overwhelmed by requests for data.” This program manager created an “action staff of SETAs to do non-value-added work.” One interviewee from the study also discusses the frustration of nonmission work, stating, “The job description of all action staffs at all levels within the organization should be redefined to include completing actions at the highest-possible level within the organization and insulating the program offices from non-value-added work that will distract them from their primary mission responsibilities.” Another interviewee states, “Too many people are doing duplicate work. There are overlapping functions between

organizational directorates. Internal processes also add an additional layer of reporting, for as one response states, “A lot of corporate system engineering activities are not value-added.”

As discussed in the section on ineffective HR policies and practices, the study data show that these internal and external requests have spawned the creation of action staffs—mainly SETAs and FFRDCs—within the program office to manage the workload. As one interviewee states, “These SETA teams are too large and conservative; they guide engineering, change designs and tests, but never reduce costs.” These action staffs add program cost and create a complex decision-making environment.

The literature also supports the overemphasis on process and documentation. For example, Nowinski and Kohler (2006) discussed the overemphasis of paper as the driving requirement on large programs. They believe that “paper has become king and that

there is no longer a distinction between important paper and documentation” (p. 44). All of this generated paper has to be reviewed by SETAs, FFRDCs, committees, and any person who thinks he or she is interested. According to these authors, this type of situation establishes a counterproductive environment “where many people can say no and nobody can say yes” (p. 44).

This current environment of too many stakeholders will continue until federal agencies minimize the number of stakeholders involved in procurement and relieve program managers of external and internal management processes that do not support mission success. To make matters even worse, most new program budgets are built on historical program costs based on cost-plus award fee programs. This will perpetuate new program cost estimates to include these additional staff and non-mission work.

### Summary

In this article, the three inferred causes of cost overruns and schedule delays on large-scale DOD and IC acquisition programs have been traced to ineffective human resource policies and practices, the consolidation of the aerospace industry, and too much stakeholder involvement. In addition, thorough flow diagrams have been developed to show the inferred causes, subsequent effects, and interrelationships among the causes.

In order to change the current acquisition environment, there must be an overall commitment from senior leadership within DOD and the IC. Unless significant shifts in policies occur and the policies are rigorously adopted, these three causes will continue to undermine the ability of the federal defense and intelligence communities to deliver large acquisition programs within their proposed cost, schedule, and performance estimates. All players in the acquisition community involved in acquisitions—Congress, the DNI/Acquisition, DOD/Undersecretary for Acquisition

Technology & Logistics, senior comptrollers—must be unified in improving the federal acquisition environment to change the continuing cost overruns and schedule delays on large-scale acquisitions. ■

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