STATEMENT FOR THE RECORD

NORM V. BROWN
EXECUTIVE DIRECTOR
CENTER FOR PROGRAM TRANSFORMATION

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STATEMENT

Actions to Avoid "IT" Train-wrecks: An Agenda for Change

Good morning, Chairman Carper, Ranking Member Coburn, and distinguished members. First, let me thank you for inviting me to testify, and to congratulate you for holding this hearing, since literally billions of taxpayer dollars go down the drain every year in both visible and invisible Information Technology (IT) acquisition waste, and clearly you are on to something important. Vice Admiral Jerry O. Tuttle (RET), the former Deputy Chief of Naval Operations for C4I and icon for naval computing and net-centric warfare, would counsel "Lead, Follow, or Get out of the way"; thank you, Senators, for leading the way.

IT projects too often experience problems of Cost Explosions, Schedule Black-Holes, Performance Disappearances, and large-scale Train-wrecks—many caused by violating one or more fundamental laws of "IT" Physics, described later in my testimony.

Let us be clear about one thing: Although effectively managing a large-scale IT program is difficult, on the other hand, producing a large-scale IT Train Wreck is easy; the good news is that Wrecks can be avoided by effectively using well-known practices.

Today I would like to briefly offer actions that government Departments, Agencies, OMB, and Congress can take to prevent them. At its core, these actions address rapidly achievable improvements.

With your permission I will summarize my testimony and submit it in full for the record.

I'll begin with a structural observation: Much is expected of each Agency CIO. Many have responsibility without real authority. Many Federal Departments include numerous, essentially independent "fiefdoms" because congress has so arranged it, fiefdoms independently funded by Congress. The Pentagon rule is, "He that's got the gold makes the Rules"—so too in Federal Departments. Although I don't today have any solutions to offer, I would be happy to work with your staff to perhaps devise some.

Next an observation regarding those IT problems as relating to project management and oversight: When OMB testified before you last September, they expressed their recent interest in IT program execution, and that's a very good thing; but IT programs don't manage themselves.

From my understanding, very few Agencies have much in the way of any real IT program management and oversight. Earned Value Management is held-up as the do-all silver-bullet solution, yet little is done to prevent the easy gaming and corruption that Earned Value is vulnerable to, and associated rebaselining may lack the transparency needed to ensure effective oversight, and far too much is expected of it. Although it's a powerful visibility technique that supports program management, it cannot replace program management. Unfortunately, there seems little in the land of government IT Program Management that implements needed essential techniques like Risk Management, Requirements Management, or Integrated Baseline Reviews.

As a solution, I would recommend that each Agency be required to create their own "process lite" version of IT program management and oversight; that their focus be on implementing the critical detail that makes these processes effective with minimum overhead; and to use automated tools to identify remaining weaknesses and vulnerabilities. And while they are at it, it would be a good time to apply the "Lean Six Sigma" waste-cutting improvement process across OMB and the Agencies—to chop-off potential nodes of unnecessary work and all other non-value-added activities built-up over time in attempt to inspect-in quality and defuse responsibility.

Transparency is dandy, but it must be converted to visibility to be useful. A "transparent" contractor can deliver a 53' truck full of boxes of data, but what you really need is only the bottom-line information. What's needed is true visibility of IT project health and progress—in near real-time.

Since Earned Value seems to be the only principal visibility technique relied on by OMB, I would propose a more comprehensive visibility product—Exhibit 350—to provide real project visibility indicators monthly, primarily for the Program Manager, with quarterly simplified versions for component and Agency CIOs, OMB and Congress. I'll be happy to work with your staff and OMB to flesh this out if it would be useful.

Tracking schedule progress is not easy, and requires at least a good Task Activity Network. One reason for schedule surprises is that as pressure to meet schedule increases, the "hard-to-do things" are "kicked-down-the-road", with uncompleted difficult work now moved into future builds. As it turns out, these future builds typically will require a successive series of miracles to be accomplished in-order to complete the development on time and on budget; don't bet on those miracles happening.

To motivate Agencies to focus on IT project management and oversight, I would recommend adapting the "Nunn-McCurdy" notification process. Not that it's a great visibility technique—its not. But it in fact serves as a powerful motivator as something *really* to be avoided; as little else can do, it gives clear focus to the business of cost and schedule containment.

We have a serious problem regarding people: It's difficult to reward good talent, to hire good talent, to train good talent. We expect CIOs and our IT personnel to do more with less and then give them less, as if to prove the point. OMB needs to address this as a priority.

Training of project personnel in effectively implementing fundamental processes is minimal; while DoD has a certificate program in IT Program Management, GSA has long ago disbanded their excellent similar "Trail Boss" program for civilian agencies. A lack of training for the various communities charged with making IT developments work—the requirements, resourcing, testing and sustainment communities are even further behind management training—those communities have received essentially no education, training or any certification to do what they are asked to do. No training; no education; no certification and no experience-it's a wonder we do as well as we do, as bad as it is.

A Program Termination Process: The former Assistant Secretary of the Army for Acquisition, the Honorable Claude Bolton, is a strong proponent of terminating

projects if measurable outcomes cannot be achieved within the agreed-to program cost, schedule, performance baselines. The DoD has no formal decision making process or policies to terminate programs, and I am not aware of any for other Agencies. I think it wise and prudent to consider including such a process among ways to improve the government's IT acquisition process.

Contract incentives and other considerations are important, and I discuss them further in my testimony.

Now I will address my concerns and recommendations in more detail:

PROGRAM CONTROL AND MANAGEMENT

First, Require Effective Implementation of Fundamental Processes. Congress could and should require Departments and Agencies to formalize their processes for risk management, visibility and metrics, and other fundamental processes—acquisition planning, requirements development and management, continuous estimation of cost and schedule, and program management and oversight—together with mechanisms to assure their effective use and accountability, identification of their weaknesses and vulnerabilities, and their continuous improvement.

Focus on Rapid Deployment of Critical Detail. "Process Improvement" can come with a lot of baggage; Process-Priests make it into a religion; but focused on a core of effectively-implemented critical detail, fundamental processes can make a big difference in project success. Implementation of fundamental processes need not be overly complicated: pithy descriptions of actionable critical-detail coupled with quick deployment is infinitely more preferable to creation of study groups and "process action teams" who extensively coordinate, plan and define comprehensive lengthy descriptions which ultimately are never implemented; start with the core-details that are critical for a process to achieve its bottom-line potential and rapidly deploy them; avoid "box-checking" of label-engineered processes that produce great-sounding but hollow processes which—(borrowing from Macbeth (Scene 5)), have a sound and furry of correct-titles but whose actions signify nothing.

An Annual Agency IT Report to Congress should already be in the mail. Having seen from the inside the power of a simple annual report to Congress to bring-about real change in government, I would earnestly recommend such a report—from

each Department Secretary and Agency head—covering IT project status and health, and also progress in implementing fundamental process improvement.

Risk Management is the first fundamental process. Although all of these fundamental processes are equal in importance, Risk Management is first among them, and should be first deployed and checked for effectiveness.

Independent Expert Reviews are an important adjunct. The Defense Science Board study on software has recommended projects be reviewed by a team of independent experts because they provide an essential and needed means for identifying project risk. Despite its powerful potential for avoiding IT Train-wrecks, its use in government projects is, unfortunately, rare.

Require Certification of the Requirements-Budget Estimate. There are a number of powerful techniques that support the definition, management, tracking, and related cost estimation of requirements, which can and should be applied to ensure that project cost and schedule estimates are current and accurate. OMB could require that Exhibit 300's include a certification (together with supporting information) that the budget estimation process results in a realistic cost and schedule estimate for implementing existing requirements and addresses potential requirements growth. The certification should also describe the specific detailed process for requirements definition and cost/schedule estimation techniques which were utilized.

VISIBILITY

Transparency is lacking—missing is provision of relevant known, program status information to all stakeholders: Notwithstanding OMB's new and important focus on management of project execution, OMB's Management-Watch-List and High-Risk-List, while valuable adjuncts, do not provide the additional transparency needed to anticipate and identify emerging problems.

Conversely, Visibility is needed. Making the important aspects of project status and progress known is paramount. As the Sixth law of IT Physics states, "You can't manage what you can't see." There are a number of important metrics and indicators that are needed to provide information essential to effective and prudent management of large-scale IT projects, with differing levels of detail needed for Project Managers, Department or Agency management and senior

leadership, OMB, and Congress. Visibility becomes more useful as things become more tangible: Quantative measures; Knowledge Points; and frequent tangible deliveries of working product.

A new Exhibit 350 would go a long way. OMB could devise a much needed visibility companion to its Exhibit 300 documentation, which I denote as Exhibit 350 to indicate its intertwined relationship with its companion Exhibit 300. Exhibit 350 would constitute the core of a status report produced for and reviewed monthly by the project manager for each OMB-approved program, and a less detailed variant, say Exhibit 350-A to be provided quarterly through the cognizant Department or Agency Officials to OMB and Congress. Exhibit 350 would include a number of current indicators of project health and progress, such as: predicted Functional Availability; Defect Status; Integration Progress; Currently Estimated Cost at Completion and other important Earned Value indicators; Currently Estimated Schedule Completion, and Earned Schedule; Defect Containment; identification of key risks and status of associated Mitigation Activities; and other indicators tuned to the project's current phase.

Earned Value Management. While Earned Value, which quantifies products by intermediate and final products produced is a fundamentally important visibility process, however, it can be readily gamed or corrupted, producing misleading results which can be more dangerous than not implementing EV, since unrealistically positive results generate complacency. Seriously flawed Earned Value may be difficult to detect; however, experts can ferret-out the gaming and commonly made "adjustments" that can produce spurious and misleading results leading managers astray. Two of the common easily detected corrupting influences are tasks without products, and rubber-band rebaslining. While a few IT projects scan their Earned Value implementation for such landmines, most do not.

Nunn-McCurdy Certification. Nunn-McCurdy is a powerful visibility technique which should be borrowed from the Congressional Defense oversight process for government IT programs. Such a certification would require a Department Secretary or Agency Head, upon a breach in excess of some specified amount, say 25% of the contract cost baseline, to certify to Congress the continuing need; causes of the breach; that effective corrective action was put in place to prevent a future breach (including description of such actions); and, that a review of other

major projects has been conducted to check for potential existence of similar problems. Perhaps a similar certification might be considered for similar schedule slips. Although not a predictive mechanism (since its "red-light' goes on only after a significant cost increase has just about, if not already occurred), its greatest benefit is as a highly effective motivator throughout every Department and Agency—since it focuses attention at every associated management and executive level (including congress) on actions that could have been taken to avoid such a certification, and creates uncertainty as to potential negative effect upon congressional appropriations.

<p align="center">Incentives</p>

Contract Incentives. When properly employed, the contractor's interest and government's interest become aligned, cooperation and shared risk exist, and the likelihood of a successful outcome is significantly enhanced. Serious focus by agencies on contract incentive structures can make dramatic improvements in successful IT project outcome. The trick is creating the proper incentives--that's critical--but the details of this constitute an entire other discussion.

Employee Incentives. People. Teams. Success. People are more important than any process. Much has been written about the success of large-scale IT project development as dependent on knowledgeable, dedicated people and effective teamwork. Government personnel rules do little to encourage and incentivize the career government IT expert. Little meaningful financial incentive exists for outstanding contribution; in one Department, rewarding such a federal employee with a five percent bonus requires the personal approval of the Secretary of the Department. There is little likelihood that such a request would be made, and the betting is that it would not be approved. The government's ability to reward and incentivize its employees is in sorry shape, and OMB should initiate coordinated action to address this issue. The same can be said for the difficult conditions faced by CIOs and IT project managers with regard to their ability to hire needed talented employees. We ask them all to "do more with less", then we actually give them less, and are surprised at resulting failures.

Training of project personnel in effectively applying fundamental processes is virtually absent. These diverse activities include rapidly deploying an effective Earned-Value and Risk-Management process, establishing meaningful project and agency metrics, determining effective test strategies, structuring contract

incentives, managing and tracking requirements, maintaining a good cost and schedule estimate, using simulation to predict project completion within specified confidence limits, identifying risks, and ensuring a solid Task Activity Network.

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The Laws of IT Physics™: Although there are many factors influencing a successful project development outcome, and other "Laws" and corollaries exist, the following have been selected as most relevant to this hearing and testimony. In the interest of brevity, substantial explanatory text associated with these laws and their corollaries has been omitted.

First Law	Planning is a continuous process, not a one-time event.
Corollary	A Project Plan cannot survive past contract award and must continually change based on actual experience (requirement additions or modifications count as actual experience).

Second Law	Complexity kills IT projects since defects and security vulnerabilities increase nonlinearly with increased complexity.
Corollary	Minimizing and controlling complexity are key to successfully achieving a large-scale system development success both in the development of individual releases and in the cost and schedule of downstream upgrades to operational software. Government Project Offices should ensure that the complexity of system architecture, each lower level of design, source-code, and task activity Networks is minimized.

Third Law	Schedules and project chaos create Event Horizons, from which a project cannot recover.
Corollary	Avoid the Project Event Horizon; Compute Schedule Compression and Monte-Carlo simulate the Task Activity Network.

Fourth Law	The initial requirements for any large system will be incomplete, independent of the resources expended to develop them.
Corollary	Ensure planned requirements can be delivered within cost and schedule estimates, but also include budget for anticipated and actual requirements change; rigorously test, accept, and track requirements as they are met.

Fifth Law	Unvalidated requirements pave the road to project failure.
Corollary	Test and validate requirements as early as possible before basing significant projects upon them; use pilots where possible before fully committing.

Sixth Law	You can't manage what you can't see.
Corollary	Track Project Status and Progress against small, testable, incremental product deliverables and use quantitative project parameters, such as Earned Value, to make projects visible and manageable.

Seventh Law	Not controlling the right things assures failure.
Corollary	Use well established best practices such as Risk Management, Requirements Management; Defect Management; and Integrated Baseline Reviews to control projects.

Eighth Law	Poor defect management causes high rework and leads to project failure.
Corollary	Use automated testing and continuous integration to prevent defects, and continuously identify out of phase defects to correct their root causes.

Ninth Law	Unknown and untreated vulnerabilities originating in ineffectually implemented Processes destroy IT projects.
Corollary	Automate vulnerability identification and prioritize fixes which root-out and fix processes lacking critical essential detail needed to achieve bottom-line objectives.

Tenth Law	Development Contractors will do what is in their financial interest, and government organizations may be led toward a project Event Horizon.
Corollary	Incentivize well and wisely, trust but verify, and use Award-Fee type contracts; carefully construct the Award-Fee criteria to address principal project objectives over the near term; identify what Award-Fee structure will sufficiently motivate the development contractor.

Eleventh Law	Thoughtful, knowledgeable, committed people operating as a team are critical to IT Project Success.
Corollary	Treat people as the valuable resources that they are; take actions to create and maintain "jelled" teams.