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Management Practices and Tools: 2000-2004

This custom bibliography from the NASA Scientific and Technical Information Program lists a sampling of records found in the NASA Aeronautics and Space Database. The scope of this topic is divided into four parts and covers the adoption of proven personnel and management reforms to implement the national space exploration vision, including the use of “system-of-systems” approach; policies of spiral, evolutionary development; reliance upon lead systems integrators; and independent technical and cost assessments. This area of focus is one of the enabling technologies as defined by NASA’s *Report of the President’s Commission on Implementation of United States Space Exploration Policy*, published in June 2004.

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A Custom Bibliography From the
NASA Scientific and Technical Information Program

October 2004

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OCTOBER 2004

Part Two Part Three Part Four

Part One: "System-of-Systems" Approach

20040081523 Simulation Technologies, Inc., Mesa, AZ, USA

Aircrew Mission Training via Distributed Simulation (MTDS): Development of the Multi-Country Complex Synthetic Environment

Greschke, David A.; Cerutti, Stefano; Advanced Technologies for Military Training; April 2004; In English; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Recent military conflicts have been predominantly multinational in their execution. It has also been environment involving the use of high technology systems against relatively rudimentary and widely dispersed enemy forces. The lack of well-defined enemy lines and infrastructures has mandated aerospace operations an increasingly dynamic nature. In addition, due to the 'CNN effect' the world is demanding minimal collateral damage. Because these missions involve a complex system of systems, numerous individuals teams must interact with one another in order to plan and execute each mission. The training of the aerospace forces in this time-compressed, highly dynamic battlespace thus presents a major training challenge. While teams may have developed high levels of expertise in team tasks within their particular specialties, cultures and nationalities, they may not have similar levels of expertise involving the inter-team tasks needed to effectively operate as part of a larger dynamic aerospace force. Furthermore, all teams at a national level have limited opportunities to train together in realistic, collective training environments. One potential cost-effective solution to this training challenge is the use of Distributed Mission Training technologies to create a distributed virtual training environment in which the various teams and nations collectively train together from home station in a common virtual environment. This paper describes the technological aspects of Exercise First WAVE, a coalition force, Composite Operations (COMAO) mission training exercise using distributed simulation technologies being sponsored the NATO SAS Panel Task Group 034. During this exercise, British, Canadian, Dutch, French, German, Italian and US aircrews, together with command and control personnel will plan, brief, execute, replay, and debrief composite force air missions using real-time simulators located in their home countries interconnected via secure data links. The objectives of the project are to expand distributed simulation intercontinental distances; develop systems to mitigate difficulties caused by extreme long distance links; establish processes for creating scenarios to fulfill specified training objectives; implement systems distributed mission planning, briefing, and debriefing; and assess the effectiveness of distributed simulation for enhancing Warfighter skills in conducting coalition force operations.

Author

Command and Control; Complex Systems; Simulators; Networks; Training Simulators

20040078921 Naval Postgraduate School, Monterey, CA

Expeditionary Warfare- Force Protection

Higgins, Eric J.; Higgs, Ronald Leroy; Parkins, Gregory R.; Tionquiao, Vincent S.; Wells, Christopher Kevin; Jan. 2004; In English; Original contains color illustrations

Report No.(s): AD-A423483; NPS-97-04-001; No Copyright; Avail: CASI; A15, Hardcopy

In 2003, the Systems Engineering and Analysis students were tasked to develop a system of systems conceptual solution to provide force protection for the Sea Base conceptualized in the 2002 Expeditionary Warfare study. The Systems Engineering and Analysis Team used the Systems Engineering and Management process as the primary methodology to complete this multidisciplinary task. Survivability was identified as the most critical factor for evaluating the protection of the Sea Base and its transport assets. Threats to the Sea Base were reviewed, analyzed, and prioritized. System design and analysis focused on preliminary analyses of various sensors, search concepts, and weapons. These preliminary analyses identified capability gaps

that were translated into functional concepts and proposed architectures for detailed modeling and analysis. These proposed architectures were identified as either Point or Distributed. In order to adequately determine the relative performance of the proposed architectures generated by the team, a thorough and systematic design of experiments was developed and applied in the Naval Simulation System and EXTEND. Based on the results obtained, the Systems Engineering and Analysis Team determined that a Distributed Sensor and Weapons architecture would significantly increase the survivability of future Expeditionary Warfare forces.
DTIC
Navy; Protection; Warfare

20040073580 Naval Postgraduate School, Monterey, CA
Crossbow Executive Summary
Muldoon, Richard; Mar. 2002; In English; Original contains color illustrations
Report No.(s): AD-A422417; SEI12-001-ES; No Copyright; Avail: CASI; A03, Hardcopy

Distributing naval combat power into many small ships and unmanned air vehicles that capitalize on emerging technology offers a transformational way to think about naval combat in the littorals in the 2020 timeframe. Project CROSSBOW is an engineered system of systems that proposes to use such distributed forces to provide forward presence, to gain and maintain access, to provide sea control, and to project combat power in the littoral regions of the world. Project CROSSBOW is the result of a yearlong, campus-wide, integrated research systems engineering effort involving 40 student researchers and 15 supervising faculty members. This report (Volume 1) summaries the CROSSBOW project. It catalogs the major features of each of the components, and includes by reference a separate volume for each of the major systems (ships, aircraft, and logistics). It also presents the results of the mission and campaign analyses that informed the trade offs between these components. It describes certain functions of CROSSBOW in detil through specialized supporting studies. The student work presnted here is technologically feasible, integrated, and imaginative. This student project cannot by itslef provide definitive designs for analyses covering such a broad topic. It does strongly suggest that the underlying concepts have merit and deserve further serious study by the Navy as it transforms itself.
DTIC
Military Operations; Systems Engineering

20040068019 Defence Research and Development Canada, Val-Belair, Quebec, Canada
Introducing the Canadian Information Centric Workspace Concept
Thibault, Gaetan; LeMay, Francois; Military Data and Information Fusion; March 2004, 5-1 - 5-14; In English; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) is an evolving information operations (IO) concept in the Canadian Land Force. ISTAR provides the commander with a system to collect and process required information for producing intelligence on the threat and knowledge on the environment during operations, as well as knowledge needed to identify, acquire and engage targets. The various processes used to collect and analyze the information are the result of numerous individual systems some of which have only been recently introduced in the field while many others are still in development as a result of advances in the information age. This compendium of systems makes ISTAR a System of systems , as opposed to a single system. This paper presents the new Canadian information centric workspace concept that provides a more coherent information management approach to better support the Commander in both its tactical intelligence and operations activities at brigade level. The info-centric workspace concept aims at offering a seamless collaborative environment enabling the ISTAR staff to perform their tasks using different applications / services through a standardized Human Computer Interface (HCI).
Author
Information Management; Surveillance; Target Acquisition; Human-Computer Interface; Intelligence

20040059313 Naval Postgraduate School, Monterey, CA
CROSSBOW. Volume 1
Muldoon, Richard C.; Bauer, David; Carroll, Steven B.; Quast, Glen B.; Lantier, Lance; Dec. 2001; In English; Original contains color illustrations
Report No.(s): AD-A422295; SEI2-001; No Copyright; Avail: CASI; A07, Hardcopy

Distributing naval combat power into many small ships and unmanned air vehicles that capitalize on emerging technology offers a transformational way to think about naval combat in the littorals in the 2020 timeframe Project CROSSBOW is an

engineered system of systems that proposes to use such distributed forces to provide forward presence, to gain and maintain access, to provide sea control, and to project combat power in the littoral regions of the world, Project CROSSBOW is the result of a yearlong, campus-wide, integrated research systems engineering effort involving 40 student researchers and 15 supervising faculty members This report (Volume I) summarizes the CROSSBOW project It catalogs the major features of each of the components, and includes by reference a separate volume for each of the major systems (ships, aircraft, and logistics) , It also presents the results of the mission and campaign analyses that informed the trade-offs between these components It describes certain functions of CROSSBOW in detail through specialized supporting studies, The student work presented here is technologically feasible, integrated, and imaginative This student project cannot by itself provide definitive designs or analyses covering such a broad topic, It does strongly suggest that the underlying concepts have merit and deserve further serious study by the Navy as it transforms itself.
DTIC
Navy; Systems Engineering; Warfare

20040043783 Air Command and Staff Coll., Maxwell AFB, AL
Increasing Time Sensitive Targeting (TST) Efficiency Through Highly Integrated C2ISR
Waite, Mark K.; Apr. 2002; In English; Original contains color illustrations
Report No.(s): AD-A420652; AU/ACSC/121/2002-04; No Copyright; Avail: CASI; A03, Hardcopy

Recent conflicts in Kosovo and Iraq have demonstrated that there is an urgent need for C2ISR platforms to work together synergistically to prosecute objectives outlined by the CINC Coordination of C2ISR assets under JTF command is necessary to maintain unity of effort in support of the overall campaign plan. It is also necessary for C2 and ISR to work as one to support the Mission Commander (MC). Maximum effort needs to be taken to ensure friendly radar, collection, electronic warfare support (ES), command and control (C2), and communications assets are employed to their fullest potential. This paper explores procedural solutions to integrate C2 and ISR. Horizontal integration of C2 and ISR assets can enhance Time Sensitive Targeting operations. This paper examines the current structure of C2 and ISR, and the problems therein, focusing specifically on why having each work for a different directorate inside the AOC produces inefficiencies, Recent exercises utilized different architectures and organizational structures to make the process more efficient. I explore what can be done procedurally to fix the problem with current technologies, to focus the efforts of the C2 and ISR communities at the tactical level. This thesis utilizes lessons learned from recent exercises such as JEFX 99, JTFEX 01, and two C2 Red Flags. Additionally, it analyzes data from recent contingency operations, such as Operations ALLIED FORCE (OAF)and ENDURING FREEDOM (OEF). Having done that, I will explore the impacts of using the current system. Since C2ISR is a system of systems, the objective is to produce an integrated, executable C2ISR plan to support to the Mission Commander and Time Sensitive Targeting.
DTIC
Command and Control; Intelligence; Reconnaissance; Sensitivity; Surveillance; Targets

20040008439 Newcastle-upon-Tyne Univ., Newcastle
Final Version of DSoS Conceptual Model (CSDA1)
Apr. 2003; In English
Report No.(s): PB2004-102061; CS-TR-782; Copyright; Avail: National Technical Information Service (NTIS)

This document defines the key concepts underlying DSoS. Before coming to their definitions, it is worth emphasising the breadth of systems and issues that the project is addressing. There are different ways of building systems: at one extreme there are green fields projects where a whole system is constructed from scratch; at the other extreme, systems can be constructed mainly from (large) existing systems. It is the objective of the DSoS Project to investigate issues related to the integration of existing complete systems in order to generate a new set of dependable services from the resulting system of systems. Emphasis is put on systems of systems because the latter will typically be non-trivial systems in their own right. This is in distinction to the construction of a system from more-or-less basic components with simple, fixed, interfaces that are fully under the control of the designer of the required system. Clearly, building a system of systems is a recursive idea in that the required system could be a component of a yet larger system.
NTIS
Computer Systems Programs; Computer Systems Design

20030106960 Carnegie-Mellon Univ., Pittsburgh, PA
Proceedings of the System of Systems Interoperability Workshop (February 2003)
Levine, Linda; Meyers, B. C.; Morris, Ed; Place, Patrick R. H.; Plakosh, Daniel; Jun. 2003; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A416429; CMU/SEI-2003-TN-016; No Copyright; Avail: CASI; A03, Hardcopy

The Software Engineering Institute has initiated an internal research and development effort to investigate interoperability between systems. As part of the research, a workshop was held in February 2003 with an advisory board of Department of Defense experts. A preliminary model of interoperability was presented and feedback on the model was requested. This technical note documents the model of interoperability presented and the findings from the workshop.
DTIC
Systems Engineering; Interoperability

20030102173 Army Research Lab., White Sands Missile Range NM
Information Operations Vulnerability/Survivability Assessment (IOVSA): process Structure (Revision A)
Revilla, Arturo; Christianson, Nora; Gunderson, Eric; Ochoa, Cruz; zum Brunnen, Rick; Jun. 2003; In English
Report No.(s): AD-A415656; ARL-TR-2993; No Copyright; Avail: CASI; A03, Hardcopy

This document is a revision of the IOVSA methodology formalized in June 2000. The goal of this revised document will be the clarification of the work to be performed for each phase, the requirements, and the expected deliverables. Since this revision will be a living document, it will be updated as appropriate to include lessons learned. The intent of this revision is to facilitate the dialog between the U.S. Army Research Laboratory/Survivability Lethality Analysis Directorate (ARL/SLAD) and the decision-makers (program Executive Offices (PEOs), Program Managers (PMs), evaluators, contractors, etc.) for U.S. Army IT-based systems. As before, the IOVSA process will provide a structured methodology for assessing IT system/System of Systems (SoS) 10 susceptibilities and vulnerabilities. The process will provide flexibility that enables the analyst to customize it for the system/SoS under assessment. Additionally, the IOVSA results will provide critical information to system developers and decision-makers regarding the system's/SoS' 10 susceptibilities and vulnerabilities. Furthermore, enough information will be able to be extracted from the process to evaluate different countermeasure techniques and protection recommendations to determine their feasibility and cost/reward ratio.
DTIC
Systems Engineering; Information Systems

20030068379 Newcastle-upon-Tyne Univ., Newcastle
Revised Version of DSoS Conceptual Model
Jones, C. B.; Killijian, M. O.; Kopetz, H.; Marsden, E.; Moffat, N.; Sep. 2002
Report No.(s): PB2003-105215; CS-TR-746; Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this deliverable is to present a revised version of the DSoS conceptual model, which was first presented in deliverable BC1. As part of the revision, we have attempted to generalize the model by identifying abstract concepts that are applicable to more than one kind of system of systems. We have also developed a taxonomy in order to explore the range of possible systems of systems, and the different factors that could impact the dependability of such compositions of systems. The deliverable starts by introducing a set of basic concepts including a model of time. It concludes by summarizing the contents of the deliverable and briefly discussing further work.
NTIS
Taxonomy; Delivery

20030010361 Old Dominion Univ., Norfolk, VA USA
Virtual Collaborative Environments for System of Systems Engineering and Applications for ISAT
Dryer, David A.; [2002]; In English
Contract(s)/Grant(s): NCC1-01040; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes an system of systems or metasystems approach and models developed to help prepare engineering organizations for distributed engineering environments. These changes in engineering enterprises include competition in increasingly global environments; new partnering opportunities caused by advances in information and communication technologies, and virtual collaboration issues associated with dispersed teams. To help address challenges and needs in this environment, a framework is proposed that can be customized and adapted for NASA to assist in improved engineering activities conducted in distributed, enhanced engineering environments. The approach is designed to prepare engineers for such distributed collaborative environments by learning and applying e-engineering methods and tools to a real-world engineering development scenario. The approach consists of two phases: an e-engineering basics phase and e-engineering application phase. The e-engineering basics phase addresses skills required for e-engineering. The e-engineering application

phase applies these skills in a distributed collaborative environment to system development projects.
Author
Systems Engineering; Virtual Reality; Distributed Processing; Applications Programs (Computers); Multiprocessing (Computers)

20020092137 Naval Postgraduate School, Monterey, CA USA
Semantic and Syntactic Object Correlation in the Object-Oriented Method for Interoperability
Shedd, Stephen F.; Sep. 2002; In English; Original contains color images
Report No.(s): AD-A407201; No Copyright; Avail: CASI; A12, Hardcopy

In today's military interoperability is not a luxury, it is a necessity. Unfortunately, differences in data representation between various systems greatly complicate the task of achieving interoperability between them. Young's Object-Oriented Method for Interoperability (OOMI) describes a model-based, computer-aided methodology for resolving modeling differences among heterogeneous systems in order to enable system interoperability. The OOMI architecture and tool suite provide a high level of automation that will reduce the labor and complexity of integrating heterogeneous systems into a cooperative system of systems (federation of systems). The Component Model Correlation process in the OOMI architecture describes a methodology to correlate a component systems model of a real-world entity to the federation model of the same real-world entity. Once a correspondence is established, the OOMI tool suite facilitates the construction of wrapper-based translations between the component model and the federation model. These translations are then used in a runtime translator to enable interoperation between the federation of systems. This thesis describes the Component Model Correlation methodology and presents a prototype Component Model Correlator that assists an Interoperability Engineer in determining component model correspondence.
DTIC
Semantics; Computer Techniques; Object-Oriented Programming; Interoperability; Architecture (Computers); Mathematical Models

20020066452 WetStone Technologies, Inc., Cortland, NY USA
Computer Security Assistance Program for the Twenty-First Century (CSAP21) Advancement and Expert Technology Exchange (CAETE)
Hosmer, Chester; Apr. 2002; In English; Original contains color images
Contract(s)/Grant(s): F30602-99-C-0041; AF Proj. 7920
Report No.(s): AD-A403491; AFRL-IF-RS-TR-2002-75; No Copyright; Avail: CASI; A03, Hardcopy

This contract final technical report documents the CSAP21 Advancement and Expert Technology Exchange (CAETE) project results. This project expanded the capabilities of the Computer Security Assistance Program for the Twenty-First Century (CSAP21) system of systems architecture by enhancing and expanding the functionality of the Network Monitoring and Assessment (NMA) module of the Interactive Information Protection Decision Support System (IIPDSS) testbed.
DTIC
Computer Programs; Computer Networks; Information Systems; Computer Information Security

20020061893 Naval Postgraduate School, Monterey, CA USA
Class Translator for the Federation Interoperability Object Model (FIOM)
Lee, Shong Cheng; Mar. 2002; In English; Original contains color images
Report No.(s): AD-A402736; No Copyright; Avail: CASI; A16, Hardcopy

There is a growing need for systems to inter-operate in order to facilitate information sharing and to achieve objectives through joint task executions, The differences in data representation between the systems greatly complicate the task of achieving interoperability between them. Young's Object Oriented Method for Interoperability (OOMI) defines an architecture and suite of tools to resolve representational differences between systems. The OOMI architecture and tool suite will reduce the labor-intensity and complexity of the integration of disparate systems into a cooperative system of systems (federation of systems) and their subsequent deployment. At the heart of this architecture is the definition of translations between any two different classes of objects and a run-time component (the Translator) that will execute such translations. This thesis describes a prototype framework that implements the OOMI, a prototype class translation code generator that assists an Interoperability Engineer in the definition of the translations and a prototype Translator that executes these translations.
DTIC
Computer Programs; Object-Oriented Programming; Data Systems; Interoperability

20020043671 Coast Guard, Washington, DC USA

The Integrated Deepwater System (IDS) Ensuring Interoperability in the Acquisition of a Total System of Systems

Roden, Paul J.; Henke, Douglas J.; Feb. 26, 2002; In English; Original contains color images

Report No.(s): AD-A400091; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Coast Guard is in the process of recapitalizing its entire fleet of resources for offshore missions in one integrated long-term acquisition. The Integrated Deepwater System (IDS) Program will upgrade or replace the capabilities of existing assets in order to maximize operational effectiveness and minimize total ownership costs associated with the performance of all 'Deepwater' missions. This system of systems acquisition is unique in its breadth among all government acquisitions in that it includes surface assets, aircraft, C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance) and logistics capabilities. Interoperability between all system assets will be a critical success factor of the Integrated Deepwater System performance. Success will be measured by the performance of the entire Deepwater System and total costs of operation and support. This paper will discuss how the program has focused on developing a framework for successfully ensuring interoperability as it applies to intra-Coast Guard and inter-agency operations. Among the methods discussed are: use of specifications, Government/Contractor relationships, design development, contracting vehicles, software tools and inter-agency agreements.

DTIC

Systems Integration; Interoperability; System Effectiveness

20020029435 Office of Naval Research, Arlington, VA USA

Tactical Decision Making: The Interaction of Human Perception and Judgment with Automated Information Processing and Presentation, 1, Situational Awareness and Understanding

Marsh, Howard S.; Quinn, Paul W.; Toth, Gary J.; Jakubek, David A.; Tactical Decision Aids and Situational Awareness; January 2002, 2-1 - 2-19; In English; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy

Tactical decisions are made under conditions best described as 'the fog and friction of war'. They tend to be judgmental rather than analytical and are based on the decision maker's perception of the situation and of his or her options for meeting objectives defined by the commander. The perception and the resulting decisions are very sensitive to the quality and completeness of the knowledge that the decision maker obtains through interactions with the decision support systems. Modern information technology provides enormous potential for expanded situational awareness using a variety of information management, display, and human-system interaction tools that can help the decision makers penetrate the 'fog of war' and deal with the 'friction of war'. On the other hand, the increased use of automation also tends to remove the decision makers from direct observation of the situation and requires them to rely on information that is derived or inferred by processes that are embedded within a complex system of systems. This can impede the judgmental decision process due to lack of confidence in the information or due to a desire to obtain more information before committing to a course of action. The relationship between the human judgmental processes and the automated decision support systems is particularly important for tactical combat direction and execution, where the pressure to decide and act is intense and where the results of decisions are often lethal. This lecture explores the process in which the decision maker achieves an awareness and understanding of the situation based on observations and on his or her model of the world and of the current operational context.

Author

Decision Making; Decision Support Systems; Sensory Perception; Situational Awareness

20010003246 Department of the Air Force, Luke AFB, AZ USA

Winning in Time: Enabling Naturalistic Decision Making in Command and Control

Louisell, William C.; Usability of Information in Battle Management Operations; November 2000, 1-1 - 1-8; In English; Copyright; Avail: CASI; A02, Hardcopy

Key US proponents of the Revolution in Military Affairs described future war as a system of systems in which dominant battlespace knowledge would enable a system of sensors and shooters to be connected for the purpose of engagement through an advanced, information technology-based command and control function. Through dominant battlespace knowledge, the command and control function would achieve efficiency levels which would greatly alter the nature of conflict current time constants in the decision, action, feedback loop would be drastically shortened. The nature of weapons and platforms would change and the organization and training of forces would change.

Author

Command and Control; Information Systems; Warfare; Planning; Military Technology

20000105167 NASA Marshall Space Flight Center, Huntsville, AL USA

Economic Metrics for Commercial Reusable Space Transportation Systems

Shaw, Eric J.; Hamaker, Joseph, Technical Monitor; [2000]; In English; 51st, 2-6 Oct. 2000, Rio de Janeiro, Brazil; No Copyright; Avail: Other Sources; Abstract Only

The success of any effort depends upon the effective initial definition of its purpose, in terms of the needs to be satisfied and the goals to be fulfilled. If the desired product is 'A System' that is well-characterized, these high-level need and goal statements can be transformed into system requirements by traditional systems engineering techniques. The satisfaction of well-designed requirements can be tracked by fairly straightforward cost, schedule, and technical performance metrics. Unfortunately, some types of efforts, including those that NASA terms 'Programs,' tend to resist application of traditional systems engineering practices. In the NASA hierarchy of efforts, a 'Program' is often an ongoing effort with broad, high-level goals and objectives. A NASA 'project' is a finite effort, in terms of budget and schedule, that usually produces or involves one System. Programs usually contain more than one project and thus more than one System. Special care must be taken in the formulation of NASA Programs and their projects, to ensure that lower-level project requirements are traceable to top-level Program goals, feasible with the given cost and schedule constraints, and measurable against top-level goals. NASA Programs and projects are tasked to identify the advancement of technology as an explicit goal, which introduces more complicating factors. The justification for funding of technology development may be based on the technology's applicability to more than one System, Systems outside that Program or even external to NASA. Application of systems engineering to broad-based technology development, leading to effective measurement of the benefits, can be valid, but it requires that potential beneficiary Systems be organized into a hierarchical structure, creating a 'system of Systems.' In addition, these Systems evolve with the successful application of the technology, which creates the necessity for evolution of the benefit metrics to reflect the changing baseline. Still, economic metrics for technology development in these Programs and projects remain fairly straightforward, being based on reductions in acquisition and operating costs of the Systems. One of the most challenging requirements that NASA levies on its Programs is to plan for the commercialization of the developed technology. Some NASA Programs are created for the express purpose of developing technology for a particular industrial sector, such as aviation or space transportation, in financial partnership with that sector. With industrial investment, another set of goals, constraints and expectations are levied on the technology program. Economic benefit metrics then expand beyond cost and cost savings to include the marketability, profit, and investment return requirements of the private sector. Commercial investment criteria include low risk, potential for high return, and strategic alignment with existing product lines. These corporate criteria derive from top-level strategic plans and investment goals, which rank high among the most proprietary types of information in any business. As a result, top-level economic goals and objectives that industry partners bring to cooperative programs cannot usually be brought into technical processes, such as systems engineering, that are worked collaboratively between Industry and Government. In spite of these handicaps, the top-level economic goals and objectives of a joint technology program can be crafted in such a way that they accurately reflect the fiscal benefits from both Industry and Government perspectives. Valid economic metrics can then be designed that can track progress toward these goals and objectives, while maintaining the confidentiality necessary for the competitive process.

Author

Economics; Space Commercialization; Commercial Spacecraft; Reusable Spacecraft; NASA Programs; Space Transportation System

20000069241 Connecticut Univ., Storrs, CT USA

JINI: A Technology for 21st Century. Is it Ready For Prime Time?

Demurjian, Steven A., Sr.; Barr, Paul; Proceedings of the Twenty-Fourth Annual Software Engineering Workshop; March 2000; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-99-1-0244; No Copyright; Avail: CASI; A03, Hardcopy

Distributed computing applications for the 21st century are network centric, operating in a dynamic environment where clients, servers, and the network itself all have the potential to change drastically over time. A distributed application, a system of systems, must be constructed, consisting of legacy, commercial-off-the-shelf (COTS), database, and new client/server applications that must interact to communicate and exchange information between users, and allow users to accomplish their tasks in a productive manner. The issue is to promote the use of existing applications in new and innovative ways in a distributed environment that adds value. To adequately support this process, the network and its software infrastructure must be an active participant in the interoperation of distributed applications. Ideally, we are interested in new 'components' as needs, requirements, and even network topologies change over time. JINI is a new architecture built on top of Java's remote method invocation (RMI) that promotes the construction and deployment of robust and scalable distributed applications in a network centric setting. JINI technology is forcing software designers and engineers to abandon the client/server view in order

to adopt a client/services view. In JINI, a distributed application is conceptualized as a set of services (of all resources) being made available for discovery and use by clients. To accomplish this, JINI makes use of a lookup service, which is essentially a registry for tracking the services that are available within a distributed environment. Services in JINI discover and then join the lookup service, registering the services (of each resource) that are to be made available on the network. Thus, JINI is conceptually very similar to a distributed operating system, in the sense that resources of JINI are very similar to OS resources. However, in JINI these resources can be dynamically defined and changed.
Derived from text
Architecture (Computers); Distributed Processing; Applications Programs (Computers)

Management Practices and Tools: 2000-2004

This custom bibliography from the NASA Scientific and Technical Information Program lists a sampling of records found in the NASA Aeronautics and Space Database. The scope of this topic is divided into four parts and covers the adoption of proven personnel and management reforms to implement the national space exploration vision, including the use of "system-of-systems" approach; policies of spiral, evolutionary development; reliance upon lead systems integrators; and independent technical and cost assessments. This area of focus is one of the enabling technologies as defined by NASA's *Report of the President's Commission on Implementation of United States Space Exploration Policy*, published in June 2004.

Part One Part Three Part Four

Part Two: Spiral, Evolutionary Development

20040095359 NASA, Washington, DC, USA

Exploring the Unknown

Logsdon, John M., Editor; Garber, Stephen J., Editor; Launius, Roger D., Editor; 2004; In English

Report No.(s): NASA/SP-2004-4407/Vol.VI; No Copyright; Avail: CASI; A08, Hardcopy

One of the most important developments of the twentieth century has been the movement of humanity into space with machines and people. The extension of human activity into outer space has been accompanied by a high degree of self-awareness of its historical significance. Because most of the activity in outer space was carried out under government sponsorship, it was accompanied by the documentary record required of public institutions, and there has been a spate of official and privately written histories of most major aspects of space achievement to date. When top leaders considered what course of action to pursue in space, their deliberations and decisions often were carefully put on the record. There is, accordingly, no lack of material for those who aspire to understand the origins and evolution of U.S. space policies and programs.This reality forms the rationale for this series. Precisely because there is so much historical material available on space matters, the National Aeronautics and Space Administration (NASA) decided in 1988 that it would be extremely useful to have easily available to scholars and the interested public a selective collection of many of the seminal documents related to the evolution of the U.S. civilian space program. While recognizing that much space activity has taken place under the sponsorship of the Department of Defense and other national security organizations, the U.S. private sector, and in other countries around the world, NASA felt that there would be lasting value in a collection of documentary material primarily focused on the evolution of the U.S. government s civilian space program, most of which has been carried out since 1958 under the Agency s auspices. As a result, the NASA History Office contracted with the Space Policy Institute of George Washington University's Elliott School of International Affairs to prepare such a collection. This is the sixth volume in the documentary history series; two additional ones containing documents and introductory essays related to human space flight, including microgravity research in Earth orbit, will follow. The documents collected during this research project were assembled from a diverse number of both public and private sources. A major repository of primary source materials relative to the history of the civil space program is the NASA Historical Reference Collection of the NASA History Office located at the Agency s Headquarters in Washington, DC.

Derived from text

Histories; Space Programs; NASA Programs

20040084221 NASA Marshall Space Flight Center, Huntsville, AL, USA

Past, Present and Future Advanced ECLS Systems for Human Exploration of Space

Mitchell, Kenny; Strategic Research to Enable NASA's Exploration Missions Conference; June 2004, 33; In English; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

This paper will review the historical record of NASA's regenerative life support systems flight hardware with emphasis on the complexity of spiral development of technology as related to the International Space Station program. A brief summary of what constitutes ECLSS designs for human habitation will be included and will provide illustrations of the complex system/system integration issues. The new technology areas which need to be addressed in our future Code T initiatives will be highlighted. The development status of the current regenerative ECLSS for Space Station will be provided for the Oxygen Generation System and the Water Recovery System. In addition, the NASA is planning to augment the existing ISS capability

with a new technology development effort by Code U/Code T for CO2 reduction (Sabatier Reactor). This latest ISS spiral development activity will be highlighted in this paper.
Author
Oxygen Production; Life Support Systems; Carbon Dioxide; Complex Systems; Regeneration (Engineering)

20040073793 Space and Naval Warfare Systems Center, San Diego, CA
Enhancing Functionality and Autonomy in Man- Portable Robots
Pacis, E. B.; Everett, H. R.; Farrington, N.; Bruemmer, D.; Jan. 2004; In English; Original contains color illustrations
Report No.(s): AD-A422780; No Copyright; Avail: CASI; A03, Hardcopy

Current man-portable robotic systems are too heavy for troops to pack during extended missions in rugged terrain and typically require more user support than can be justified by their limited return in force multiplication or improved effectiveness. As a consequence, today's systems appear organically attractive only in life-threatening scenarios, such as detection of chemical/ biological/radiation hazards, mines, or improvised explosive devices. For the long term, significant improvements in both functionality (i.e., perform more useful tasks) and autonomy (i.e., with less human intervention) are required to increase the level of general acceptance and, hence, the number of units deployed by the user. In the near term, however, the focus must remain on robust and reliable solutions that reduce risk and save lives. This paper describes ongoing efforts to address these needs through a spiral development process that capitalizes on technology transfer to harvest applicable results of prior and ongoing activities throughout the technical community.
DTIC
Autonomy; Robotics; Robots

20040059009 Department of Defense, Arlington, VA
Acquisition: Acquisition Management of the Army's All Source Analysis System (D-2004-006)
Oct. 10, 2003; In English
Report No.(s): AD-A421622; IG/DOD-(D-2004-006); No Copyright; Avail: CASI; A03, Hardcopy

Who Should Read this Report and Why? DoD acquisition executives, program managers, and independent testers and evaluators should read this report because similar management control issues may apply to other weapons and information technology acquisitions. The All Source Analysis System (ASAS) is an Army Acquisition Category II, mission- critical weapon system that has been in development since 1979. It is a family of systems being acquired and deployed by evolutionary blocks and spiral version enhancements. A key ASAS component is the Remote Workstation. The combination hardware and software system provides automated information support to intelligence staff elements and other designated intelligence organizations. The Program Executive Officer, Command, Control and Communications Tactical is the ASAS Milestone Decision Authority. The Project Manager, Intelligence and Effects, in coordination with the Army Training and Doctrine Command System Manager and the Army Test and Evaluation Command, acquires, tests, and deploys ASAS hardware and software components. Total Army acquisition development and deployment costs for ASAS could exceed $2.5 billion.
DTIC
Analysis of Variance; Management Planning; Organizations; Procurement

20040043891 Massachusetts Inst. of Tech., Cambridge, MA
Stakeholder Collaboration in Air Force Acquisition: Adaptive Design Using System Representations
Dare, Robert E.; Jun. 2003; In English; Original contains color illustrations
Report No.(s): AD-A420811; No Copyright; Avail: CASI; A15, Hardcopy

This research, conducted under the auspices of the Lean Aerospace Initiative, sought to determine how Air Force development programs could achieve high levels of adaptability during the design phase of acquisition while maintaining effective management of program risk. Due to the tremendous uncertainty faced by many development programs in such areas as requirements, technology, and funding, traditional planning and measurement efforts, with their emphasis on stability, must be complemented by efforts to promote adaptability. The thesis of this research is that the quality and nature of the collaboration between stakeholders during the design phase of weapon system development programs determines how effectively they share knowledge, which in turn drives the level of program adaptability. To gain insight into the phenomena of stakeholder collaboration and adaptability, this research undertook retrospective studies of eight development programs, focusing on the design phase. During design, changes are typically more affordable than they are during the ensuing test period because they involve less rework. Command and Control (C2) systems were selected for the eight studies because of their

acute need to manage change over time, which arises from the rapid rate of technology change in the areas of communications and computers. The research focused on collaboration between three major stakeholders who contribute unique knowledge and fill different roles during the design phase. The first stakeholder is the user community or warfighter - the eventual operators of the system. Second is a government acquisition agency, or System Program Office (SPO), whose role is to establish and oversee one or more contracts with private industry to perform the development work within established programmatic constraints. The third major stakeholder is a prime contractor who develops the system in accordance with the government contract. (54 tables, 16 figures)
DTIC
Command and Control; Procurement

20030107140 Massachusetts Inst. of Tech., Cambridge, MA
Tools for Evolutionary Acquisition: A Study of Multi-Attribute Tradespace Exploration (MATE) Applied to the Space-Based Radar (SBR)
Spaulding, Timothy J.; Jul. 31, 2003; In English
Report No.(s): AD-A416698; CI02-1198; No Copyright; Avail: CASI; A07, Hardcopy

The Multi-Attribute Tradespace Exploration (MATE) process was applied to the Space-Based Radar (SBR), a space system under study by the USA Air Force. A system- level model of possible SBR architectures was created using data and analysis from previous high-level studies. Competing designs were evaluated through MATE's universal utility metric. The MATE model was qualitatively compared against a high- level design study and MATE's advantages were noted, specifically its ability to trace modeling assumptions and present a holistic view of the space of competing designs. A quantitative comparison revealed significant differences between MATE's recommended system design and that of the comparison high-level study. The potential for a simplification of the MATE method was explored through the use of several approximations to reveal user preferences. Comparisons were made through both a proportional utility loss metric and a general Spearman's Rho rank order correlation. Using these measures it was shown that while a linear or subjective approximation to utility curves resulted in excessive errors, approximation to weighting relationships did not. Finally, MATE's potential applicability to the Air Force acquisition process was studied. In general MATE was shown to be useful to any acquisition effort that derives its benefit from a networked approach and is of sufficient technical complexity as to make tradeoff decisions opaque to casual analysis. Specifically, MATE was shown to be useful in the analysis of alternatives as well as an aid to early milestone sourcing decisions.
DTIC
Space Based Radar; Systems Engineering; Air Defense; Decision Support Systems

20030067269 Carnegie-Mellon Univ., Pittsburgh, PA
A Basis for an Assembly Processor for COTS-Based Systems (APCS)
Carney, David J.; Oberndorf, Patricia A.; Place, Patrick R. H.; May 2003; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A413706; CMU/SEI-2003-TR-010; ESC*-TR-2003-010; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes a generic process framework for developing software systems based on commercial off-the-shelf (COTS) products. The framework is based on Barry Boehm's familiar spiral development process. However, it is primarily intended for projects that make significant use of commercial components and other preexisting software as elements of the system to be fielded. The aspects of the process that are most affected by this reliance on COTS components lie in the area of requirements, and the description of the process is most extensive in that area. The necessity of using system prototypes as the major vehicle for reducing risk is assumed, as are parallel and interleaved periods of gathering and refining knowledge about the system to be built. Each element of the process is first described and then depicted in several models, using Integrated Definition modeling technique (IDEFO). The paper describes how the interactions between the candidate COTS components, the stakeholders' implicit and explicit needs, and the context in which the system will operate all provide interacting constraints on both the process and the resulting system.
DTIC
Commercial Off-the-Shelf Products; Software Engineering; Computer Systems Programs; Prototypes

20030065617 Lockheed Martin Corp., Denver, CO, USA

Lockheed Martin Response to the OSP Challenge

Sullivan, Robert T.; Munkres, Randy; Megna, Thomas D.; Beckham, Joanne; June 25, 2003; In English, 14-17 Jul. 2003, Dayton, OH, USA

Contract(s)/Grant(s): NAS8-01098

Report No.(s): AIAA Paper 2003-2708; No Copyright; Avail: CASI; A02, Hardcopy

The Lockheed Martin Orbital Space Plane System provides crew transfer and rescue for the International Space Station more safely and affordably than current human space transportation systems. Through planned upgrades and spiral development, it is also capable of satisfying the Nation's evolving space transportation requirements and enabling the national vision for human space flight. The OSP System, formulated through rigorous requirements definition and decomposition, consists of spacecraft and launch vehicle flight elements, ground processing facilities and existing transportation, launch complex, range, mission control, weather, navigation, communication and tracking infrastructure. The concept of operations, including procurement, mission planning, launch preparation, launch and mission operations and vehicle maintenance, repair and turnaround, is structured to maximize flexibility and mission availability and minimize program life cycle cost. The approach to human rating and crew safety utilizes simplicity, performance margin, redundancy, abort modes and escape modes to mitigate credible hazards that cannot be designed out of the system.

Author

Aerospace Planes; Launch Vehicles; Ground Support Systems; Spacecraft Launching; Navigation; Spacecraft Docking

20020030266 Naval Postgraduate School, Monterey, CA USA

A Pattern-Matching Approach for Automated Scenario-Driven Testing of Structured Computational Policy

Sezgin, Mehmet; Sep. 2001; In English

Report No.(s): AD-A397521; No Copyright; Avail: Defense Technical Information Center (DTIC)

Organizations are policy-driven entities. Policy bases can be very large and complex; these factors are in the dynamic nature of policy evolution. The mechanical aspects of policy modification and assurance of the consistency, completeness, and correctness of a policy base can be automated to some degree. Such support is known as computer support for policy. We developed an object-oriented schema-based approach to structure policy. Our structural model consists of Unified Modeling Language class and collaboration diagrams. The structural model is used by a suite of testing tools. We present a case study to illustrate our approach to automated testing of policy., Our approach to test-case generation is based on the use of patterns within policy statements and relationships between policy objects. The test spectrum has query-specific tests at one end, and the generic types of tests at the other end. We introduce the use of statistical inference to reuse test cases by determining the patterns that approximate the query-to-be-executed. Query mapping, anytime reasoning and fuzzy logic concepts in policies and their applications are discussed.

DTIC

Models; Object-Oriented Programming; Policies; Software Engineering

20020019006 Naval Postgraduate School, Monterey, CA USA

The Design and Development of a Web-Interface for the Software Engineering Automation System

McDonald, James A., III; Sep. 2001; In English

Report No.(s): AD-A397079; No Copyright; Avail: CASI; A11, Hardcopy

The Software Engineering Automation System evolved from the Computer-Aided Prototyping System (CAPS) developed in the late 1980's and early 1990's to help software engineers rapidly produce working prototypes for hard real-time embedded systems. As software development methods such as the waterfall and spiral methods evolved the requirement for a system to prototype products became clear. CAPS was able to meet the needs of the software engineer, allowing them to edit the project, translate and compile the code, develop the interface, and execute the project. As the requirements change and customer's needs become clearer, the ability to rapidly change the prototype to meet these needs was met by the CAPS system. Today companies that are developing software systems are global in nature. Development could take place over a vast expanse of several continents. The change in the workplace environment bore the requirement to redesign SEAS to make it accessible globally as well as making it functional across multiple platforms. The envisioned redesign of the SEAS system takes the functionality of the current system and deploys it as a web application on the Internet.

DTIC

Real Time Operation; Software Engineering; Automatic Control

20010099577 Carnegie-Mellon Univ., Pittsburgh, PA USA

Spiral Development and Evolutionary Acquisition

Hansen, W. J.; Foreman, J. T.; Albert, C. C.; Brownsword, L. L.; Forrester, E. C.; Aug. 2001; In English

Contract(s)/Grant(s): F19628-95-C-0003

Report No.(s): AD-A393726; CMU/SEI-SR-005; No Copyright; Avail: CASI; A05, Hardcopy

The evolutionary acquisition strategy has been promulgated by the forthcoming DoD Instruction 5000.2. It introduces innovations throughout the acquisition cycle: before a contract is considered, technology readiness guides the choice of experiments; contracts are let for one or more blocks; and progress within each block is managed with spiral development. There is some confusion as to the nature of evolutionary acquisition and spiral development and their relationship. To address these problems, a workshop was held September 13-15, under joint sponsorship of the Deputy Under Secretary of Defense for Science and Technology, the Software Engineering Institute, and the Center for Software Engineering. This report summarizes the workshop and presents its recommendations. Themes appearing in the workshop presentations included the lack of understanding of the definitions of evolutionary acquisition and spiral development, some extensions to these definitions, the barriers imposed by existing funding and contracting policies, the need for teamwork among all stakeholders, and the role of education and training in acculturation. Work groups at the workshop recommended specific actions aimed at building and spreading a culture for evolutionary acquisition and spiral development. These actions can be grouped under the topics of improvements to contract models, revision of funding approaches, adaptation of acquisition policies, enhancement of integrated product teams, training and acculturation of participants, and studies of evolutionary acquisition and spiral development to validate and improve them.

DTIC

Procurement; Technology Assessment; Military Technology; Software Engineering; Conferences

20000116379 Carnegie-Mellon Univ., Pittsburgh, PA USA

Spiral Development: Experience, Principles, and Refinements

Boehm, Barry; Hansen, Wilfred J.; Jul. 2000; In English

Contract(s)/Grant(s): F19628-95-C-0003

Report No.(s): AD-A382590; CMU/SEI-2000-SR-008; No Copyright; Avail: CASI; A03, Hardcopy

Spiral development is a family of software development processes characterized by repeatedly iterating a set of elemental development processes and managing risk so it is actively being reduced. This paper characterizes spiral development by enumerating a few 'invariant' properties that any such process must exhibit. For each, a set of 'variants' is also presented, demonstrating a range of process definitions in the spiral development family. Each invariant excludes one or more 'hazardous spiral look-alike' models, which are also outlined. This report also shows how the spiral model can be used for a more cost-effective incremental commitment of funds, via an analogy of the spiral model to stud poker. An important and relatively recent innovation to the spiral model has been the introduction of anchor point milestones. The latter part of the paper describes and discusses these.

DTIC

Software Engineering; Computer Programming; Project Management

20000116376 Carnegie-Mellon Univ., Pittsburgh, PA USA

Spiral Development-Building the Culture; A Report on the CSE-SEI Workshop, February, 2000

Hansen, W. J.; Foreman, J. T.; Carney, D. J.; Forrester, E. C.; Graettinger, C. P.; Jul. 2000; In English

Contract(s)/Grant(s): F19628-95-C-0003

Report No.(s): AD-A382585; CMU/SEI-2000-SR-006; No Copyright; Avail: CASI; A04, Hardcopy

A number of organizations are successfully applying the Spiral Development Model (SDM) and finding it valuable in addressing such challenges as rapid development, COTS (commercial-off-the-shelf) software integration, new technologies, and product line management. However, other organizations have experienced difficulties with spiral development due to over-relaxed controls, underestimated risks, existing sequential development policies, inflexible financing mechanisms, ingrained cultures, and confusion about what spiral development is and how to apply it. To attack these problems, a workshop was held February 9-11, 2000, at the University of Southern California under the sponsorship of its Center for Software Engineering (CSE) and the Software Engineering Institute (SEI) of Carnegie Mellon University. Work groups at the workshop recommended specific actions aimed at building and spreading a culture for the SDM community. These can be described as defining, improving, promoting, and studying SDM, educating about SDM, adapting to SDM, and enhancing teamwork. This report summarizes the workshop and presents its recommendations.

DTIC

Software Engineering; Project Management; Mathematical Models; Computer Programming; Computer Programs

20000055731 NASA Ames Research Center, Moffett Field, CA USA

Formal Analysis of the Remote Agent Before and After Flight

Havelund, Klaus; Lowry, Mike; Park, SeungJoon; Pecheur, Charles; Penix, John; Visser, Willem; White, Jon L.; Lfm2000: Fifth NASA Langley Formal Methods Workshop; June 2000; In English; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes two separate efforts that used the SPIN model checker to verify deep space autonomy flight software. The first effort occurred at the beginning of a spiral development process and found five concurrency errors early in the design cycle that the developers acknowledge would not have been found through testing. This effort required a substantial manual modeling effort involving both abstraction and translation from the prototype LISP code to the PROMELA language used by SPIN. This experience and others led to research to address the gap between formal method tools and the development cycle used by software developers. The Java PathFinder tool which directly translates from Java to PROMELA was developed as part of this research, as well as automatic abstraction tools. In 1999 the flight software flew on a space mission, and a deadlock occurred in a sibling subsystem to the one which was the focus of the first verification effort. A second quick-response 'cleanroom' verification effort found the concurrency error in a short amount of time. The error was isomorphic to one of the concurrency errors found during the first verification effort. The paper demonstrates that formal methods tools can find concurrency errors that indeed lead to loss of spacecraft functions, even for the complex software required for autonomy. Second, it describes progress in automatic translation and abstraction that eventually will enable formal methods tools to be inserted directly into the aerospace software development cycle.

Author

Computer Programming; Software Engineering; Flight Control; Systems Engineering

Management Practices and Tools: 2000-2004

This custom bibliography from the NASA Scientific and Technical Information Program lists a sampling of records found in the NASA Aeronautics and Space Database. The scope of this topic is divided into four parts and covers the adoption of proven personnel and management reforms to implement the national space exploration vision, including the use of "system-of-systems" approach; policies of spiral, evolutionary development; reliance upon lead systems integrators; and independent technical and cost assessments. This area of focus is one of the enabling technologies as defined by NASA's *Report of the President's Commission on Implementation of United States Space Exploration Policy*, published in June 2004.

Part One Part Two Part Four

Part Three: Lead Systems Integrators

20040111452 Industrial Coll. of the Armed Forces, Washington, DC
Land Combat Systems
Briggs, Don; Schmitt, Mike; Channing, Roger; Severance, Paul; Jan. 2002; In English
Report No.(s): AD-A425328; No Copyright; Avail: CASI; A03, Hardcopy

During the 1990s, the U.S. Land Combat Systems (LCS) Industry went through a challenging period of consolidation as defense budgets declined and demand for ground combat equipment waned. Increasingly, joint ventures and partnerships have been formed between and among domestic and foreign LCS firms to maximize cash flow as well as share the risks and rewards of program development. In this regard, the U.S. Army's transformation vision is being closely watched as the worldwide LCS Industry seeks to capitalize on this potentially lucrative initiative. The vision requires that LCS firms become even more flexible and adaptable, but also forces them to fundamentally reexamine core capabilities. While 'metal bending' knowledge is still important, the industry's future prime contractors will be lead systems integrators who are able to deal with increasingly complex platforms and systems-of-systems. One weakness of the vision creating some uncertainty in the industry has been airlift requirements for this transformed force, which still exceed projected capabilities and warrant clarification by the Department of Defense. For the foreseeable future, the U.S. LCS Industry will be critical to meeting U.S. national security needs, necessitating continued close government stewardship. Dilemmas faced by such stewardship include deciding on the degree of foreign participation allowed by U.S. LCS firms and weighing LCS firms implementation of lean manufacturing techniques, necessary for their economic viability, against the nation s need for surge production in the event of emergencies. Although the LCS Industry faces challenges in coming years, its opportunities for growth appear to remain significant.
DTIC
Combat; Warfare

20030067995 Carnegie-Mellon Univ., Pittsburgh, PA
Application of Options Analysis for ReengineeringSM (OARSM) in a Lead System Integrator (LSI) Environment
Bergey, John; O'Brien, Liam; Smith, Dennis; Mar. 2003; In English
Report No.(s): AD-A414868; CMU/SEI-2003-TN-009; No Copyright; Avail: CASI; A03, Hardcopy

Since most organizations have a substantial legacy base of existing software assets, few development efforts start from scratch. However, there has not been a systematic way to identity components for reuse or to understand the types of changes that would be required for insertion into a product line architecture or a new software architecture. Options Analysis for ReengineeringSM (OARSM) is an approach for making decisions on mining software assets. Mining involves rehabilitating parts of an old system for use in a new system. OAR identifies potential reusable components and analyzes the changes that would be needed to rehabilitate them for reuse within a software product line or new software architecture. OAR also provides an analysis of mining options, as well as the cost, effort, level of difficulty, and risks associated with each option. Recently, OAR has been applied to help a lead system integrator (LSI) make effective decisions on reuse. An LSI is the agent for an organization that is responsible for acquiring a large software-intensive system or system of systems. This note describes the use of OAR to guide decision making on mining assets within an LSI context, referred to as LSI OAR.
DTIC
Software Engineering; Integrators; Large Scale Integration

20030052271 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Constellation X-Ray Mission and Support
Grady, Jean, Technical Monitor; Tananbaum, H.; November 2002; In English
Contract(s)/Grant(s): NCC5-368; No Copyright; Avail: CASI; A03, Hardcopy

This Fourth Annual Report summarizes work performed by the Smithsonian Astrophysical Observatory (SAO) for NASA Goddard Space Flight Center (GSFC) under Cooperative Agreement NCC5-368. The Agreement is entitled Constellation X-ray Mission Study and SAO continues to perform work under the overall direction of Dr. Harvey Tananbaum, the SAO Principal Investigator for the program. Mr. Robert Rasche is the SAO Program Manager and is responsible for day-to-day program management at SAO and coordination with GSFC. The report summarizes the main areas of SAO activity. Most of the work has been done jointly with personnel from GSFC and Marshall Space Flight Center (MSFC). We describe SAO participation in these efforts. As is appropriate to a Cooperative Agreement, SAO continued to work with GSFC in an integrated team mode. SAO was involved in the overall mission management, technology development, scientific direction, and mission definition. While formal overall management responsibility resides with GSFC, scientific lead and subordinate responsibilities continue to be shared by GSFC and SAO. The work performed by SAO is consistent with the SAO proposal 'Constellation X-ray Mission Study and Optics Development' dated September 1997, which was the basis for establishing the Cooperative Agreement under which SAO is currently funded. Over time, the scope of the effort has expanded somewhat to accommodate the needs of the project. Work, except for meeting support and high priority program tasks, has been at a level of effort. Priorities and work progress have been closely coordinated with the Constellation-X Project Formulation Manager at GSFC. Funding limitations constrained the work accomplished during this period. Nonetheless, a significant amount of work was accomplished. Under the Agreement, SAO performed work in seven major areas of activity. These areas related to: Constellation X-ray Mission Facility Definition Team and Study Management; Science Support; Spectroscopy X-ray Telescope (SXT); Systems Engineering; Travel in Support of the Work Effort; In-house Management and Coordination.
Author
X Ray Telescopes; Project Management; Mission Planning

20010039541 NASA Marshall Space Flight Center, Huntsville, AL USA
Flight Manifesting Process for NASA Microgravity Payloads
Matisak, Brian; Boudreaux, Mark; Anderson, Sherwood; Ramage, William; Henderson, Robin N., Technical Monitor; [2001]; In English; AIAA Space 2001 Conference and Exposition, 28-30 Aug. 2001, Albuquerque, NM, USA; No Copyright; Avail: Other Sources; Abstract Only

The objective of NASA's Microgravity Research Program is to utilize the low gravity environment of space to explore the nature of physical phenomena that contributes to progress in science and technology on Earth. Under the oversight of NASA Headquarters, the Microgravity Research Program Office (MRPO) at the Marshall Space Flight Center (MSFC) assumes all program management responsibilities associated with Microgravity Research and Space Product Development. One program management responsibility that plays a vital role to the success of the MRPO is the flight manifesting process for MRPO-sponsored payloads. In this paper, the authors will examine the various processes utilized by MRPO personnel in acquiring flight opportunities for MRPO-sponsored payloads.
Author
Microgravity; Project Management; Flight Operations

19990010538 National Security Agency, Fort Meade, MD USA
Turning Multiple Evaluated Products into Trusted Systems
Fowler, Joan; Gamble, Dan; Jul. 01, 1994; In English
Report No.(s): AD-A344763; NCSC-004; No Copyright; Avail: CASI; A03, Hardcopy

This Technical Report discusses how evaluated products can be combined to produce trusted systems which meet the requirements specified in a procurement document, thereby modifying, adapting, or eliminating portions of the composing product's TCB. Frequently, the requirements specified necessitate changes to the product TCBs. Because the product's rating may be invalidated when the product's TCB is changed without understanding, justification, and review; system level assurances are necessary to compensate for the changes. It is the responsibility of the system integrator/system designer to do the utmost to retain and not invalidate the product rating. However, even with this possible invalidation, the use of an evaluated product in a system provides the knowledge that the original product was scrutinized, and those portions of the product that are not changed continue to retain that scrutiny for the correctness of processing. Therefore, even if a product's TCB must be modified, adapted, or portions eliminated, the use of an evaluated product in a system development is advantageous over the use of a non-evaluated product for the similar functionality. The combination of unequal security qualified components to build

a system is another dilemma in the integration process which will not be discussed in this report.
DTIC
Information Systems; Systems Analysis; Evaluation; Product Development

19970041187 Sandia National Labs., Albuquerque, NM USA
A Summary of the GPS System Performance for STARS Mission 3
Creel, Earl E.; Jan. 1997; In English
Report No.(s): AD-A328963; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes the performance of the GPS system on the most recent flight of the STARS missile, STARS Mission 3 (M3). This mission was conducted under the Ballistic Missile Defense Organization's (BMDO's) Consolidated Targets Program. The USA Army Space and Strategic Defense Command (USASSDC) is the executing agent for this mission and the Department of Energy's (DOE's) Sandia National Laboratories (SNL) is the vehicle developer and integrator. The M3 flight, dually designated as the MSX Dedicated Targets 2 (MDT-2) mission occurred on August 31, 1996. This mission was conducted for the specific purpose of providing targets for viewing by the MSX satellite. STARS M3 was the first STARS flight to use GPS-derived data for missile guidance, and proved to be instrumental in the procurement of a wealth of experimental data which is still undergoing analysis by numerous scientific agencies within the BMDO complex. GPS accuracy was required for this mission because of the prescribed targeting requirements for the MDT-2 payload deliveries with respect to the MSX satellite flight path. During the flight test real time GPS-derived state vector data was also used to generate pointing angles for various down range sensors involved in the experiment. Background information describing the STARS missile, GPS subsystem architecture, and the GPS Kalman filter design is presented first, followed by a discussion of the telemetry data records obtained from this flight with interpretations and conclusions.
DTIC
Global Positioning System; Antimissile Defense; Flight Tests

19950011129 Storm Integration, Inc., San Jose, CA, USA
Implementation of a low-cost, commercial orbit determination system
Corrigan, Jim; NASA. Goddard Space Flight Center, Third International Symposium on Space Mission Operations and Ground Data Systems, Part 2; Nov 1, 1994, p 773-783; In English; No Copyright; Avail: CASI; A03, Hardcopy

Traditional satellite and launch control systems have consisted of custom solutions requiring significant development and maintenance costs. These systems have typically been designed to support specific program requirements and are expensive to modify and augment after delivery. The expanding role of space in today's marketplace combined with the increased sophistication and capabilities of modern satellites has created a need for more efficient, lower cost solutions to complete command and control systems. Recent technical advances have resulted in commercial-off-the-shelf products which greatly reduce the complete life-cycle costs associated with satellite launch and control system procurements. System integrators and spacecraft operators have, however, been slow to integrate these commercial based solutions into a comprehensive command and control system. This is due, in part, to a resistance to change and the fact that many available products are unable to effectively communicate with other commercial products. The USA Air Force, responsible for the health and safety of over 84 satellites via its Air Force Satellite Control Network (AFSCN), has embarked on an initiative to prove that commercial products can be used effectively to form a comprehensive command and control system. The initial version of this system is being installed at the Air Force's Center for Research Support (CERES) located at the National Test Facility in Colorado Springs, Colorado. The first stage of this initiative involved the identification of commercial products capable of satisfying each functional element of a command and control system. A significant requirement in this product selection criteria was flexibility and ability to integrate with other available commercial products. This paper discusses the functions and capabilities of the product selected to provide orbit determination functions for this comprehensive command and control system.
Author
Applications Programs (Computers); Low Cost; Orbit Calculation; Satellite Orbits

19920050623
Suit study - The impact of VMS in subsystem integration
Hill, Bernard; Watts, Roland; Feb 1, 1992; In English
Report No.(s): AIAA PAPER 92-1078; Copyright; Avail: Other Sources

One of the thrusts of the Wright Laboratory/FIVE-sponsored Subsystem Integration Technology (SUIT) study is to investigate the impact of emerging vehicle management system (VMS) concepts on subsystem integration. This paper

summarizes the issues relating to VMS/subsystem integration as examined during the Northrop SUIT study. Projected future weapon system requirements are identified and their impact on VMS and subsystem design interpreted. Integrated VMS/subsystem control and management functions are proposed. A candidate system VMS architecture satisfying the aforementioned weapon system requirements and providing the identified control and management functions is proposed. This architecture is used, together with the environmental control system, as an illustrative subsystem example, to address the risks associated with the design, development, procurement, integration and testing of integrated VMS/subsystem concepts. The conclusion is that the development process requires an airframer to adopt the role of subsystem integrator, the consequences of which are discussed.
AIAA
Avionics; Flight Control; Management Systems; Systems Integration; Weapon Systems

19920004655 General Accounting Office, Washington, DC, USA
NASA ADP procurement: Contracting and market share information. Fact sheet for Congressional Requesters
Brock, Jack L. JR., compiler; Apr 1, 1990; In English
Report No.(s): GAO/IMTEC-90-39FS; GAO/IMTEC-89-66FS; GAO/IMTEC-90-28FS; GAO/IMTEC-90-35FS; B-238835; No Copyright; Avail: CASI; A03, Hardcopy

This report focuses on specific aspects of NASA's ADP-related procurements. It includes the number and aggregate dollar value of their mainframe-related contracts, distribution of procurements among equipment manufacturers, and breakdown of various procurement methods used to obtain mainframe-related equipment. It also includes data on NASA's procurements of mainframe computer operating system software. NASA's procurements are grouped by the General Accounting Office (GAO) under sole source new contracts, new contracts that resulted from competitive procedures where only one offeror remained in the procurement at the time the awardee was selected, new contracts that resulted from competitive procedures where the awardee was selected from among multiple competitors, and new contracts with system developers and integrators - except any contracts separately categorized as awarded to 8(a) firms. Also obtained and analyzed were data on NASA's modifications to existing contracts, the use of GSA's multiple award schedule contracts, and other miscellaneous procurement methods.
J.P.S.
Cost Analysis; Data Systems; Government Procurement

Management Practices and Tools: 2000-2004

This custom bibliography from the NASA Scientific and Technical Information Program lists a sampling of records found in the NASA Aeronautics and Space Database. The scope of this topic is divided into four parts and covers the adoption of proven personnel and management reforms to implement the national space exploration vision, including the use of "system-of-systems" approach; policies of spiral, evolutionary development; reliance upon lead systems integrators; and independent technical and cost assessments. This area of focus is one of the enabling technologies as defined by NASA's *Report of the President's Commission on Implementation of United States Space Exploration Policy*, published in June 2004.

Part One Part Two Part Three

Part Four: Independent Technical and Cost Assessments

20040086899 Boeing Co., Canoga Park, CA, USA

The Product Development Imperative: Business Case for the Robust Design Computational System (RDCS) and the Acceleration Insertion of Materials (AIM) Technologies

Havskjold, Glenn; Innovative Design of Complex Engineering Systems; July 2004, 31-57; In English; No Copyright; Avail: CASI; A03, Hardcopy

To develop an advanced technology aerospace product on budget and on schedule, data indicates that what I am labeling a Product Development Imperative exists. This presentation discusses that imperative and shows how critical capabilities have been developed in the Robust Design Computational System and are being developed in the Accelerated Insertion of Materials program.A chart from a NASA study, published in Aerospace America, illustrates the economic issues in deciding to invest in an access to space capability. For each option shown, an up-front investment is required to achieve a desired benefit. Generally, the greater the desired benefit, the more investment is required. In the private sector, a financial analyst would compute a return on investment or an internal rate of return to assess the worth of the investment. Government agencies may or may not use such an analysis, but to justify investing, at some point a decision is made that the benefit of some option is worth the investment. If the size of the required cost increases, if the schedule increases, or if the benefit is smaller than planned, the cost-benefit analysis associated with the investment may be compromised. For development programs, the issue is how to develop an advanced technology product on a planned budget, on a planned schedule, and achieve the targeted goals. Author

Cost Effectiveness; NASA Programs; Cost Analysis

20040086487 NASA Marshall Space Flight Center, Huntsville, AL, USA

NASA's In-Space Propulsion Technology Program: Overview and Update

Johnson, Les; Alexander, Leslie; Baggett, Randy M.; Bonometti, Joseph A.; Herrmann, Melody; James, Bonnie F.; Montgomery, Sandy E.; [2004]; In English; 40th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 11-14 Jul. 2004, Fort Lauderdale, FL, USA; No Copyright; Avail: CASI; A02, Hardcopy

NASA's In-Space Propulsion Technology Program is investing in technologies that have the potential to revolutionize the robotic exploration of deep space. For robotic exploration and science missions, increased efficiencies of future propulsion systems are critical to reduce overall life-cycle costs and, in some cases, enable missions previously considered impossible. Continued reliance on conventional chemical propulsion alone will not enable the robust exploration of deep space - the maximum theoretical efficiencies have almost been reached and they are insufficient to meet needs for many ambitious science missions currently being considered. The In-Space Propulsion Technology Program s technology portfolio includes many advanced propulsion systems. From the next-generation ion propulsion system operating in the 5- to 10-kW range to aerocapture and solar sails, substantial advances in spacecraft propulsion performance are anticipated. Some of the most promising technologies for achieving these goals ase the environment of space itself for energy and propulsion and are generically called 'propellantless' because they do not require onboard fuel to achieve thrust. Propellantless propulsion technologies include scientific innovations such as solar sails, electrodynamic and momentum transfer tethers, aeroassist, and aerocapture. This paper will provide an overview of both propellantless and propellant-based advanced propulsion technologies, as well as NASA s plans for advancing them as part of the In-Space Propulsion Technology Program.
Author

NASA Programs; Spacecraft Propulsion; Technology Assessment

20030112022 Nebraska Univ., Omaha, NE, USA

NASA Spaceport Research: Opportunities for Space Grant and EPSCoR Involvement

Bowen, Brent; ONeil, Patrick; Box, Richard; Proceedings of the NASA Aerospace Technology Symposium 2002; March 2002; In English; Copyright; Avail: CASI; A02, Hardcopy

Over the last decade, the high cost of space programs has led to a significant decrease in space exploration and supporting programs. Current launch and recovery systems are too expensive to operate and maintain. In 1994, Congress passed the National Space Transportation Policy, which called on the National Aeronautics and Space Administration (NASA) to pursue technology development and demonstration efforts to support fbture government and private sector decisions on the development of operational second- and third-generation reusable launch vehicles. In response to the congressional mandate, NASA has undertaken a strategic initiative to expand future space exploration by encouraging commercialization and privatization of spaceport and launch knctions (Goldin, 2001). To support the development of revolutionary new technologies, NASA initiated the Integrated Space Transportation Plan (ISTP) managed by a partnership consisting of NASA, industry, the Department of Defense and academia (Vanneri, 2001). To build a new national space transportation system, NASA is pursuing commercialization and privatization of spaceport functions. In support of this new strategy, NASA Kennedy Space Center formed the Advanced Spaceport Technology Working Group (ASTWG) in 2001 (ASTWG, 2002). ASTWG is a partnership comprising NASA, industry, the Department of Defense, academia, and state and federal agencies.

Derived from text

Commercialization; Space Transportation System; NASA Programs; Space Exploration

20030020310 NASA Langley Research Center, Hampton, VA USA

NASA Langley WINN System Operational Assessment

Jonsson, Jon; Proceedings of the Second NASA Aviation Safety Program Weather Accident Prevention Review; January 2003, 101-111; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

An operational assessment of the NASA Langley Weather Information Network (WINN) System is presented. The objectives of this program include: 1) Determine if near real-time weather information presented on the flight deck improves pilot situational awareness of weather; and 2) Identify pilot interface issues related to the use of WINN system during test flights. This paper is in viewgraph form.

CASI

Information Systems; Weather; Communication Networks; Flight Operations; Technology Assessment; NASA Programs

20020067442 NASA Marshall Space Flight Center, Huntsville, AL USA

In-Space Propulsion Program Overview and Status

Carroll, Carol; Johnson, Les; Baggett, Randy; [2002]; In English, 17-21 Mar. 2003, Toulouse, France; No Copyright; Avail: Other Sources; Abstract Only

NASA's In-Space Propulsion (ISP) Program is designed to develop advanced propulsion technologies that can enable or greatly enhance near and mid-term NASA science missions by significantly reducing cost, mass, and/or travel times. These technologies include: Electric Propulsion (Solar and Nuclear Electric) [note: The Nuclear Electric Propulsion work will be transferred to the NSI program in FY03]; Propellantless Propulsion (aerocapture, solar sails, plasma sails, and momentum exchange tethers); Advanced Chemical Propulsion. The ISP approach to identifying and prioritizing these most promising technologies is to use mission analysis and subsequent peer review. These technologies under consideration are mid-Technology Readiness Level (TRL) up to TRL-6 for incorporation into mission planning within three - five years of initiation. In addition, maximum use of open competition is encouraged to seek optimum solutions under ISP. Several NASA Research Announcements (NRAs) have been released asking industry, academia and other organizations to propose propulsion technologies designed to improve our ability to conduct scientific study of the outer planets and beyond. The ISP Program is managed by NASA HQ (Headquarters) and implemented by the Marshall Space Flight Center in Huntsville, Alabama.

Author

NASA Programs; Technology Assessment; Research and Development; Spacecraft Propulsion

20020041929 Georgia Inst. of Tech., Atlanta, GA USA

Development of Advanced Life Cycle Costing Methods for Technology Benefit/Cost/Risk Assessment

Yackovetsky, Robert, Technical Monitor; Apr. 11, 2002; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG1-2149

Report No.(s): E-16-P77; No Copyright; Avail: CASI; A06, Hardcopy

The overall objective of this three-year grant is to provide NASA Langley's System Analysis Branch with improved affordability tools and methods based on probabilistic cost assessment techniques. In order to accomplish this objective, the Aerospace Systems Design Laboratory (ASDL) needs to pursue more detailed affordability, technology impact, and risk prediction methods and to demonstrate them on variety of advanced commercial transports. The affordability assessment, which is a cornerstone of ASDL methods, relies on the Aircraft Life Cycle Cost Analysis (ALCCA) program originally developed by NASA Ames Research Center and enhanced by ASDL. This grant proposed to improve ALCCA in support of the project objective by updating the research, design, test, and evaluation cost module, as well as the engine development cost module. Investigations into enhancements to ALCCA include improved engine development cost, process based costing, supportability cost, and system reliability with airline loss of revenue for system downtime. A probabilistic, stand-alone version of ALCCA/FLOPS will also be developed under this grant in order to capture the uncertainty involved in technology assessments. FLOPS (FLight Optimization System program) is an aircraft synthesis and sizing code developed by NASA Langley Research Center. This probabilistic version of the coupled program will be used within a Technology Impact Forecasting (TIF) method to determine what types of technologies would have to be infused in a system in order to meet customer requirements. A probabilistic analysis of the CER's (cost estimating relationships) within ALCCA will also be carried out under this contract in order to gain some insight as to the most influential costs and the impact that code fidelity could have on future RDS (Robust Design Simulation) studies.
Author
Technology Assessment; Cost Analysis; Cost Estimates; Engine Design; Forecasting; Life Cycle Costs

20020039994 Jet Propulsion Lab., Pasadena, CA USA
Information Technology Assessment Study: Executive Summary
Peterson, John, Editor; March 2002; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS7-1407
Report No.(s): JPL-Publ-02-02; No Copyright; Avail: CASI; A03, Hardcopy

A team was formed to assess NASA Office of Space Science (OSS) information technology research and development activities. These activities were reviewed for their relevance to OSS missions, for their potential for using products better supplied by industry or other government agencies, and for recommending an IT infusion strategy for appropriate products for OSS missions. Assessment scope and methodology and the findings and recommendations of OSS IT users and providers are presented.
Author
Technology Assessment; Research and Development; Aerospace Engineering; Information Systems; NASA Programs

20020039426 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Information Technology Assessment Study: Full Report
Peterson, John, Editor; March 2002; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS7-1407
Report No.(s): JPL-Publ-02-03; No Copyright; Avail: CASI; A14, Hardcopy

A team was formed to assess NASA Office of Space Science (OSS) information technology research and development activities. These activities were reviewed for their relevance to OSS missions, for their potential for using products better supplied by industry or other government agencies, and for recommending an information technology (IT) infusion strategy for appropriate products for OSS missions. Assessment scope and methodology are presented. IT needs and interests for future OSS missions and current NASA IT research and development (R&D) are discussed. Non-NASA participants provide overviews of some of their IT R&D programs. Implementation and infusion issues and the findings and recommendations of the assessment team are presented.
Author
Aerospace Engineering; Information Systems; Technology Assessment; NASA Programs

20020027706 Bureau of the Census, Washington, DC USA
Economic Census, Rhode Island. Manufacturing: Geographic Area Series
May 2000; In English
Report No.(s): PB2002-102420; EC97M31A-RI; No Copyright; Avail: CASI; A07, Hardcopy

The economic census is the major source of facts about the structure and functioning of the Nation's economy. It provides essential information for government, business, industry, and the general public. The economic census furnishes an important

part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. Specific uses of economic census data include the following: Policymaking agencies of the Federal Government use the data monitor economic activity and assess the effectiveness of policies; State and local government use the data to assess business activities; Trade associations study trends in their own and competing industries; Individual businesses use the data to locate potential markets and to analyze their own production and sales performance relative to industry or area average. Data from the 1997 Economic Census are published primarily on the basis of the North American Industry Classification System (NAICS).
NTIS
Census; Economic Factors; Economics; Trends; Economic Analysis

20020008687 NASA, Washington, DC USA
Report by the International Space Station (ISS) Management and Cost Evaluation (IMCE) Task Force
Young, A. Thomas; Kellogg, Yvonne, Technical Monitor; Nov. 01, 2001; In English; Original contains color illustrations; No Copyright; Avail: CASI; A05, Hardcopy

The International Space Station (ISS) Management and Cost Evaluation Task Force (IMCE) was chartered to conduct an independent external review and assessment of the ISS cost, budget, and management. In addition, the Task Force was asked to provide recommendations that could provide maximum benefit to the U.S. taxpayers and the International Partners within the President's budget request. The Task Force has made the following principal findings: (1) The ISS Program's technical achievements to date, as represented by on-orbit capability, are extraordinary; (2) The Existing ISS Program Plan for executing the FY 02-06 budget is not credible; (3) The existing deficiencies in management structure, institutional culture, cost estimating, and program control must be acknowledged and corrected for the Program to move forward in a credible fashion; (4) Additional budget flexibility, from within the Office of Space Flight (OSF) must be provided for a credible core complete program; (5) The research support program is proceeding assuming the budget that was in place before the FY02 budget runout reduction of $1B; (6) There are opportunities to maximize research on the core station program with modest cost impact; (7) The U.S. Core Complete configuration (three person crew) as an end-state will not achieve the unique research potential of the ISS; (8) The cost estimates for the U.S.-funded enhancement options (e.g., permanent seven person crew) are not sufficiently developed to assess credibility. After these findings, the Task Force has formulated several primary recommendations which are published here and include: (1) Major changes must be made in how the ISS program is managed; (2) Additional cost reductions are required within the baseline program; (3) Additional funds must be identified and applied from the Human Space Flight budget; (4) A clearly defined program with a credible end-state, agreed to by all stakeholders, must be developed and implemented.
Derived from text
International Space Station; Evaluation; Cost Analysis; Project Management; Budgeting; NASA Programs

20010088172 NASA Ames Research Center, Moffett Field, CA USA
Accelerating Innovation: Turning Goals into Reality
VanDalsem, William R.; Tu, Eugene, Technical Monitor; [2000]; In English; TIGRE Conference, 18-19 May 2000, Huntsville, AL, USA
Contract(s)/Grant(s): RTOP 509-10-00; No Copyright; Avail: CASI; A03, Hardcopy

The success of NASA's programs depends upon innovation, which is recognized by several characteristics. All aspects of a program including tools, processes, materials, subsystems, vehicles, and operations should be evaluated to determine possible innovations which might be implemented. Several examples are presented of ways in which innovation has substantially furthered the goals of NASA. The specific fields mentioned include high performance computing, advanced technologies for aerospace system design, advanced materials and manufacturing processes, neural based flight control, linear aerospike engines, advanced space propulsion systems, high altitude and long duration autonomous flights, advanced vehicle concepts, advanced space propulsion systems, as well as advanced weather information. A final list details the perceived ways in which NASA can benefit from continued innovation in such ways as partnering with the private sector.
CASI
NASA Programs; Technology Assessment; Technology Utilization; Research and Development

20010067489 NASA Marshall Space Flight Center, Huntsville, AL USA
The Launch Systems Operations Cost Model
Prince, Frank A.; Hamaker, Joseph W., Technical Monitor; [2001]; In English; 3rd Annual Joint ISPA/SCEA International Conference, 12-13 Jul. 2001, Washington, DC, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

One of NASA's primary missions is to reduce the cost of access to space while simultaneously increasing safety. A key component, and one of the least understood, is the recurring operations and support cost for reusable launch systems. In order to predict these costs, NASA, under the leadership of the Independent Program Assessment Office (IPAO), has commissioned the development of a Launch Systems Operations Cost Model (LSOCM). LSOCM is a tool to predict the operations & support (O&S) cost of new and modified reusable (and partially reusable) launch systems. The requirements are to predict the non-recurring cost for the ground infrastructure and the recurring cost of maintaining that infrastructure, performing vehicle logistics, and performing the O&S actions to return the vehicle to flight. In addition, the model must estimate the time required to cycle the vehicle through all of the ground processing activities. The current version of LSOCM is an amalgamation of existing tools, leveraging our understanding of shuttle operations cost with a means of predicting how the maintenance burden will change as the vehicle becomes more aircraft like. The use of the Conceptual Operations Manpower Estimating Tool/Operations Cost Model (COMET/OCM) provides a solid point of departure based on shuttle and expendable launch vehicle (ELV) experience. The incorporation of the Reliability and Maintainability Analysis Tool (RMAT) as expressed by a set of response surface model equations gives a method for estimating how changing launch system characteristics affects cost and cycle time as compared to today's shuttle system. Plans are being made to improve the model. The development team will be spending the next few months devising a structured methodology that will enable verified and validated algorithms to give accurate cost estimates. To assist in this endeavor the LSOCM team is part of an Agency wide effort to combine resources with other cost and operations professionals to support models, databases, and operations assessments.
Author
Launch Costs; Mathematical Models; Cost Reduction; Spacecraft Launching; Cost Analysis; Assessments

20010040766 Glaxochem Ltd., Ulverston, UK
Condition Based Maintenance: A Method of Assessing the Financial Benefits
Rajan, B. S.; Roylance, B. J.; International Journal of COMADEM; April 2001; ISSN 1363-7681; Volume 4, Issue No. 2, 13-18; In English; Copyright; Avail: Other Sources

A research investigation has been undertaken to develop a generic model that would allow cost benefit analyses of decisions to introduce Condition Monitoring, prior to their implementation. A prime objective of this study has been to develop a tool which will allow plant engineers, maintenance managers, etc., to objectively evaluate the likely financial effects of implementation of each of the various CM techniques that are currently available and then to optimize their selection such that the maximum financial benefit is achieved. The results of this study have resulted in an evaluation method that has been proved in batch process plants in the pharmaceutical industry and this has been coded into an MS Excel(c) workbook for ease of use. Both the development of the method and the use of the workbook are described in this paper.
Author
Cost Effectiveness; Maintenance; Cost Analysis

20000085866 NASA Langley Research Center, Hampton, VA USA
Improving The Discipline of Cost Estimation and Analysis
Piland, William M.; Pine, David J.; Wilson, Delano M.; [2000]; In English; 51st, 2-6 Oct. 2000, Rio de Janeiro, Brazil
Report No.(s): IAA-00-IAA.1.1.01; No Copyright; Avail: CASI; A03, Hardcopy

The need to improve the quality and accuracy of cost estimates of proposed new aerospace systems has been widely recognized. The industry has done the best job of maintaining related capability with improvements in estimation methods and giving appropriate priority to the hiring and training of qualified analysts. Some parts of Government, and National Aeronautics and Space Administration (NASA) in particular, continue to need major improvements in this area. Recently, NASA recognized that its cost estimation and analysis capabilities had eroded to the point that the ability to provide timely, reliable estimates was impacting the confidence in planning many program activities. As a result, this year the Agency established a lead role for cost estimation and analysis. The Independent Program Assessment Office located at the Langley Research Center was given this responsibility. This paper presents the plans for the newly established role. Described is how the Independent Program Assessment Office, working with all NASA Centers, NASA Headquarters, other Government agencies, and industry, is focused on creating cost estimation and analysis as a professional discipline that will be recognized equally with the technical disciplines needed to design new space and aeronautics activities. Investments in selected, new analysis tools, creating advanced training opportunities for analysts, and developing career paths for future analysts engaged in the discipline are all elements of the plan. Plans also include increasing the human resources available to conduct independent cost analysis of Agency programs during their formulation, to improve near-term capability to conduct economic cost-benefit assessments, to support NASA management's decision process, and to provide cost analysis results emphasizing 'full-cost' and 'full-life cycle' considerations. The Agency cost analysis improvement plan has been approved for

implementation starting this calendar year. Adequate financial and human resources are being made available to accomplish the goals of this important effort, and all indications are that NASA's cost estimation and analysis core competencies will be substantially improved within the foreseeable future.
Author
Cost Analysis; Cost Estimates; Economics; NASA Programs; Priorities

20000080383 Science Applications International Corp., Huntsville, AL USA
A NASA Spaceliner 100 Propulsion Oriented Technology Assessment
Jul. 19, 2000; In English; 36th Joint Propulsion, 19 Jul. 2000; Original contains color illustrations
Contract(s)/Grant(s): NAS8-99060; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this presentation is to provide an understanding of the products of the technology assessment and prioritization workshop, increase knowledge of the assessment process utilized, and stimulate interest in applying this process to many other space endeavors.
CASI
NASA Programs; Technology Utilization; Propulsion System Configurations; Technology Assessment

20000076808 NASA Langley Research Center, Hampton, VA USA
Improving the Discipline of Cost Estimation and Analysis
Piland, William M.; Pine, David J.; Wilson, Delano M.; [2000]; In English; 51st, 2-6 Oct. 2000, Rio de Janeiro, Brazil
Report No.(s): IAA-00-IAA.1.1.01; Copyright; Avail: CASI; A02, Hardcopy

The need to improve the quality and accuracy of cost estimates of proposed new aerospace systems has been widely recognized. The industry has done the best job of maintaining related capability with improvements in estimation methods and giving appropriate priority to the hiring and training of qualified analysts. Some parts of Government, and National Aeronautics and Space Administration (NASA) in particular, continue to need major improvements in this area. Recently, NASA recognized that its cost estimation and analysis capabilities had eroded to the point that the ability to provide timely, reliable estimates was impacting the confidence in planning man), program activities. As a result, this year the Agency established a lead role for cost estimation and analysis. The Independent Program Assessment Office located at the Langley Research Center was given this responsibility.
Author
Aerospace Systems; Cost Estimates; NASA Programs

20000069230 West Virginia Univ., Fairmont, WV USA
Software Measurement Frameworks to Assess the Value of Independent Verifications and Validation
Eickelmann, Nancy; Proceedings of the Twenty-Fourth Annual Software Engineering Workshop; March 2000; In English; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy

Software IV&V, as practiced by the NASA IV&V Facility, is a well-defined, proven, systems engineering discipline designed to reduce risk in major software systems development. However, we currently have no proven methodology for estimating resource requirements for IV&V based on sound financial criteria. The quantification of a cost structure associated with IV&V and the resulting benefits are essential to make objective decisions concerning the allocation of resources to IV&V activities. The development of ROI metrics for NASA IV&V would provide key information to make rational budgetary decisions that impact safety and mission critical aspects of all NASA software systems. To measure IV&V benefits and costs we must identify relevant measures and provide target ranges for those measures that may be used to evaluate whether or not the goals are achieved and to what degree. This requires a measurement strategy for software IV&V in the NASA context. This paper presents the NASA IV&V Balanced Scorecard strategic measurement framework and discusses its role in providing a minimal and usable core metrics set.
Author
Software Engineering; Computer Programs; Software Reliability; Program Verification (Computers)

20000053171 NASA Langley Research Center, Hampton, VA USA
Research Activities within NASA's Morphing Program
McGowan, Anna-Maria R.; Horta, Lucas G.; Harrison, Joycelyn S.; Raney, David L.; Structural Aspects of Flexible Aircraft Control; May 2000, 13-1 - 13-10; In English; Copyright; Avail: CASI; A02, Hardcopy

In the last decade, smart technologies have become important enabling technologies that cut across traditional boundaries

in science and engineering. Here smart is defined as the ability to respond to a stimulus in a predictable and reproducible manner. While multiple successes have been achieved in the laboratory, we have yet to see the general applicability of smart technologies to actual aircraft and spacecraft. The NASA Morphing program is an attempt to couple research across a wide range of disciplines to integrate smart technologies into high payoff applications on aircraft and spacecraft. The program bridges research in several technical disciplines and combines the effort into applications that include active aerodynamic control, active aeroelastic control, and vehicle performance improvement. System studies are used to assess the highest-payoff program objectives, and specific research activities are defined to address the technologies required for development of smart aircraft and spacecraft. This paper will discuss the overall goals of NASA's Morphing program, highlight some of the recent research efforts and discuss the multidisciplinary studies that support that research and some of the challenges associated with bringing the smart technologies to real applications on flight vehicles.

Author

NASA Programs; Smart Structures; Active Control; Aeroelasticity; Technology Assessment

Subject Terms

Corporate Sources

Document Authors