



IV&V Facility

Systems and Software Assurance Services (SAS)

**NASA/GSFC/IV&V Facility
Fairmont, West Virginia**

March 16, 2016



DISCLAIMER

In the event of any inconsistency between data provided in these charts or today's tour and the Final RFP, the language in the Final RFP, including any amendments, will govern.



AGENDA

- 8:30 - 9:00 Check-in, Register for Tour
- 9:00 – 10:00
 - Welcome, Introduction and Logistics
 - IV&V Program Vision and Mission
 - Procurement Overview
- 10:00 – 11:00
 - Technical Overview
- 11:00 – 12:00
 - Question and Answer
- 12:00 – 1:00
 - Break for Lunch
- 1:00 – 4:00
 - Tour of the IV&V Facilities



INTRODUCTION

- **Presenters:**
 - Laura Freeman, Contracting Officer (SEB voting member)
 - Wes Deadrick, IV&V Office Lead (SEB Chair)
 - Steve Husty, GSDO IV&V PM (SEB voting member)
- **IV&V Program Personnel:**
 - Greg Blaney, IV&V Director
 - Justin Morris, JSTAR Group Lead (SEB voting member)
 - Ken Rehm, S&MA Support Office Lead (SEB voting member)
- **GSFC Procurement Personnel:**
 - Carlos McKenzie, Associate Chief, 210.P
 - Monique Leigh, Procurement Manager, 210.P



LOGISTICS

- Use stairways in the event of a fire
- Restrooms are across elevators on every floor
- This presentation, attendee list and questions/answers will be placed in procurement proposal library
- Please silence all cell phones/tablets/laptops
- Vending machines with soda, snacks on the ground floor
- You will be responsible for lunch
- Internet access – free public wireless
 - Code on back of badge
- ***Please hold all questions during the presentation until the Q&A session***



IV&V Facility

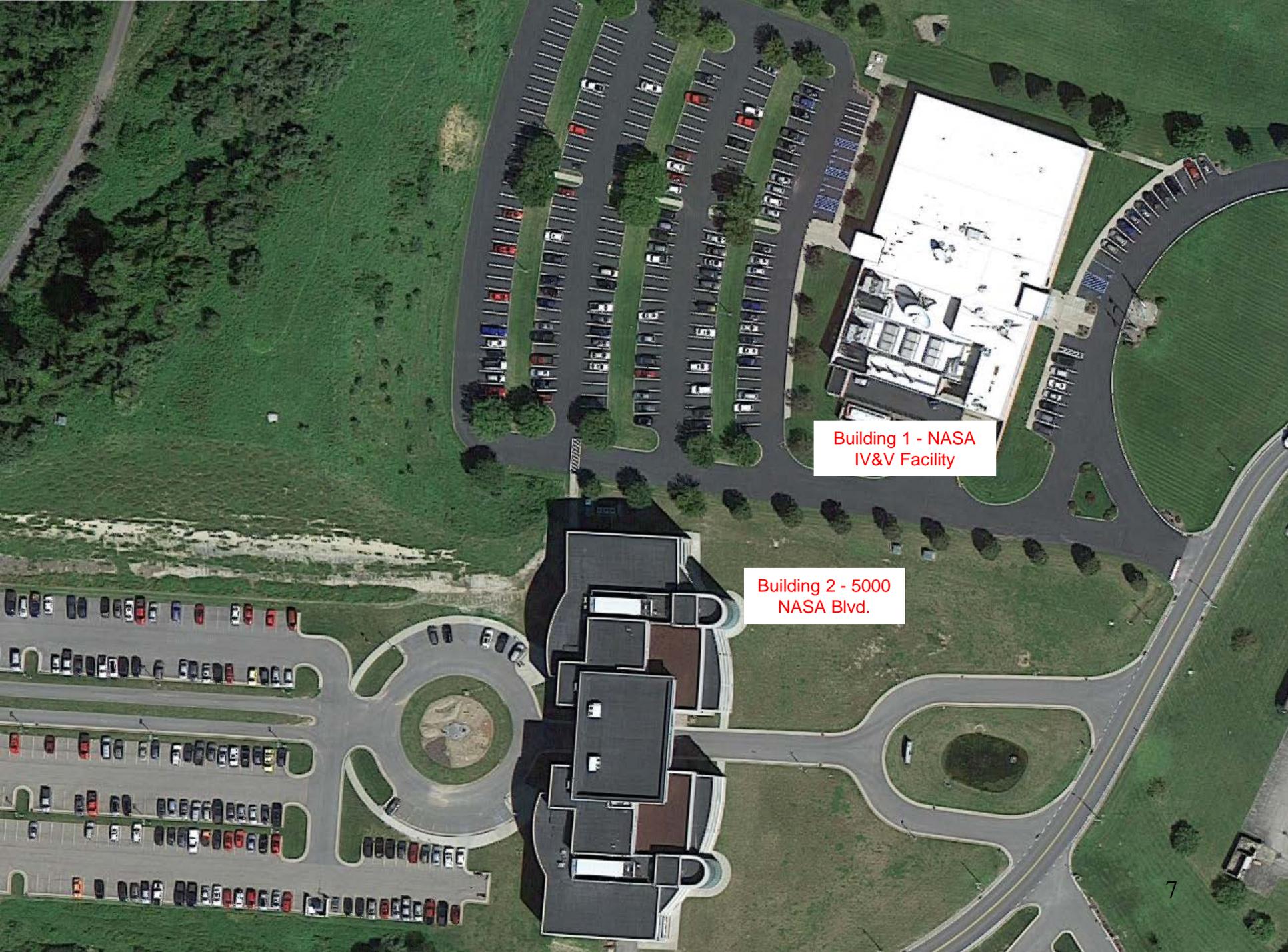
CONFERENCE INFORMATION

Join WebEx meeting

- Meeting number: 991 629 849
- Meeting password: sasivv123!

Join by phone

- 1-844-467-6272
- 942067
- Any company joining the WebEx meeting that has not previously registered, please send an e-mail to Laura Freeman with name, telephone number, and e-mail



Building 1 - NASA
IV&V Facility

Building 2 - 5000
NASA Blvd.



IV&V PROGRAM VISION, MISSION & VALUES

Vision

Be a world leader in systems and software engineering that enables our customer's success

Mission

To provide our customers assurance that their safety and mission-critical software will operate reliably and safely and to advance the systems and software engineering disciplines. In doing so, we work to standards of excellence, provide professional engineers, provide national and global leadership, focus on customer satisfaction, and adhere to and demonstrate our core set of values: safety, integrity, respect, teamwork, balance, innovation, and excellence

Values

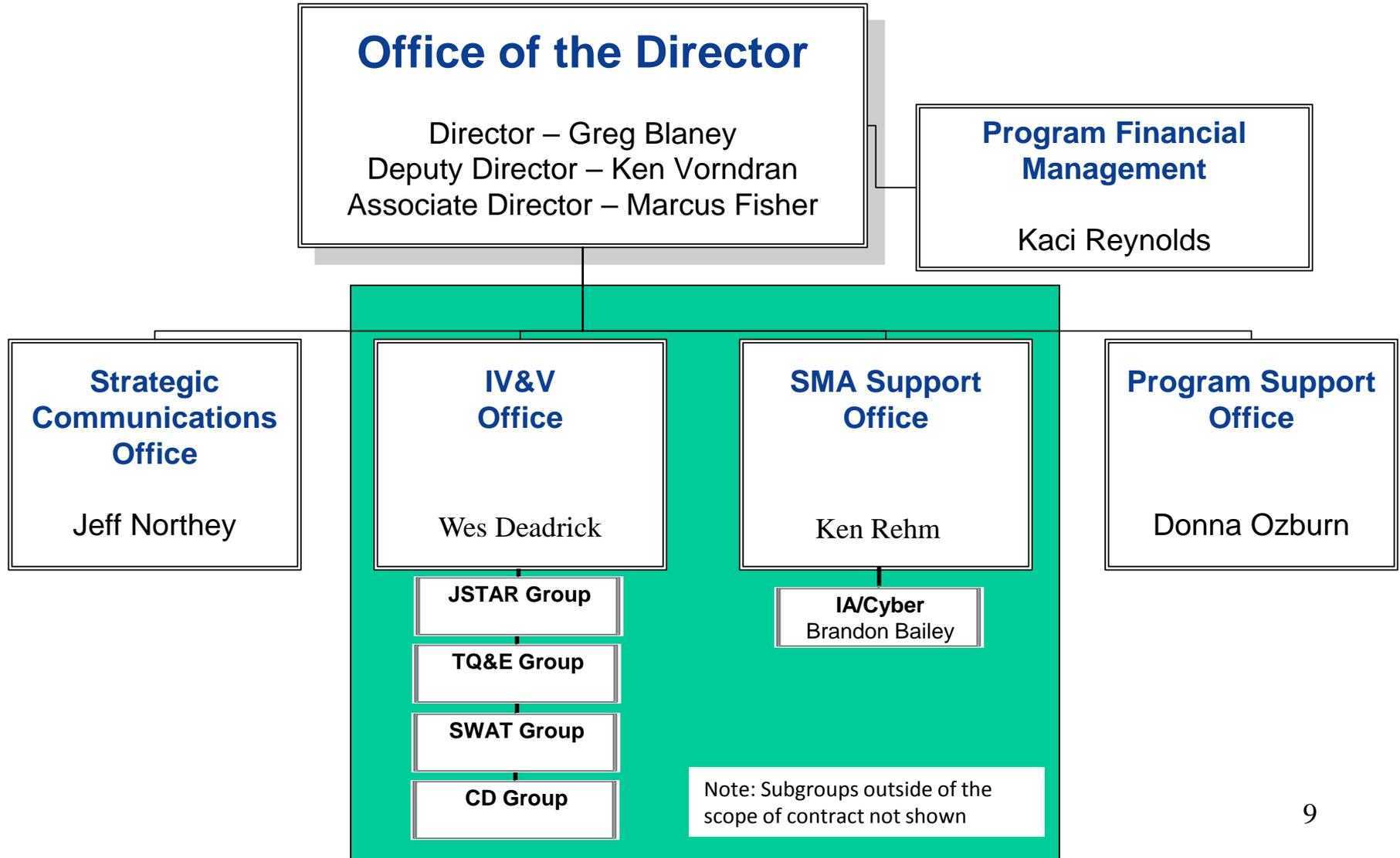
What members of an organization believe - are the behaviors or characteristics that are revered in all that is done both within and outside the NASA IV&V organization. These values are essential to maintaining and supporting the culture of the NASA IV&V organization. Are values are:

Safety, Integrity, Respect, Teamwork, Balance, Innovation and Excellence

The NASA IV&V organization embraces these values in words and deeds, as they collectively shape behaviors, pilot actions, deliver services to customers, and establish the NASA IV&V organization's culture.



NASA IV&V ORGANIZATION





IV&V PROGRAM

- Established 1993 based on recommendations from
 - National Research Council
 - Presidential commission report of the Space Shuttle Challenger accident
- Functionally reports to the Chief, Office of Safety and Mission Assurance (OSMA)
- IV&V Facility is GSFC Code 180.0
- Staff of ~250 personnel
 - ~45 Civil Servants
 - Single IV&V services contractor
 - Other support contractors (WVU, ...)
- ISO 9001:2008 Certified
- Only NASA Center with VPP Star Certification
- Legacy of Customer Satisfaction
 - 94% acceptance rate for findings
 - “The first time I got reviews back I was amazed. I never expected the quality of data that they provided ...” KSC SMA Lead
 - ... and many more





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IV&V PROGRAM SERVICES

- Life-cycle IV&V
- Independent Assessments
- Safety & Mission Assurance Support
 - Common support infrastructure for assuring core Software Assurance functions across the Agency
- Software Assurance Research Program (SARP)
https://www.nasa.gov/centers/ivv/research/research_index.html
- Jon McBride Software Testing And Research (JSTAR) Laboratory
 - World Class Emulation and Simulation
 - Independent Test Capability (ITC)
 - Robotics
 - Cybersecurity & Information Assurance
- STEM Outreach



Our goal is mission success!



DELIVERING ASSURANCE – HOW?

Independent Verification and Validation (IV&V) is an objective examination of system processes and products. Determines if the **right system** has been built and that it has been **built correctly**

NASA IV&V perspectives:

Will the system -

- Do what it is supposed to do?
- Not do what it is not supposed to do?
- Respond as expected under adverse conditions?

Technical Approaches:

- Lifecycle Analysis
- Catalog of Methods – rigorous, repeatable processes
- Information Assurance
- Lessons Learned Database
- Static and Dynamic Analysis
- Enhanced Testing – leveraging emulation/simulation/virtualization
- Knowledge Sharing Culture

Our assessment teams reduce risk by providing evidence-based assurance to stakeholders



JSTAR & INDEPENDENT TEST CAPABILITY TEAM

- ✓ Create specialized group for simulation and test

ITC team formed in 2009

ITC Charter

The NASA IV&V Program's Independent Test Capability (ITC) is responsible for acquiring, developing and maintaining adaptable test environments. These test environments enable the NASA's IV&V Program to perform dynamic analysis of software behaviors for multiple NASA missions.

The ITC team is the expert in simulation and the IV&V project teams are experts in the systems.

IV&V project teams utilize the solutions developed by the ITC team within the JSTAR laboratory.

- ✓ Provide infrastructure to support efforts
JSTAR Lab Built in 2010

Supports:

NASA Mission Simulators

Cyber Security

Training

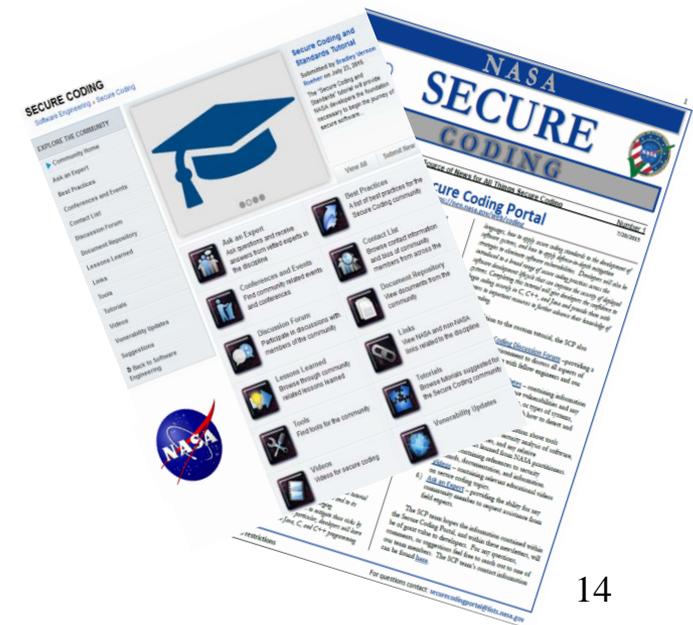
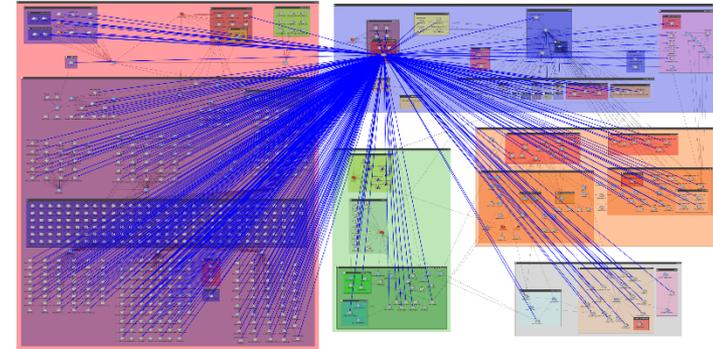
Independent Testing

- ✓ **IV&V Projects Utilized JSTAR**

- JPL and GSFC Blue Team VAP
- Autonomous Flight Safety System (AFSS)
- Global Precipitation Measurement (GPM)
- International Space Station (ISS)
- James Webb Space Telescope (JWST)
- Juno
- Mars Atmosphere and Volatile Evolution (MAVEN)
- Osiris-Rex
- Insight
- Multi-Purpose Crew Vehicle (MPCV)
- Space Launch Systems (SLS)
- SmallSat STF-1

CYBER SECURITY & INFORMATION ASSURANCE

- Due to their risky nature and potential impact to operational systems, cyber security assessments and training cannot be performed on live operational systems
 - State-of-the-art platform using virtualization
 - Virtual replicas of existing systems
 - Perform training, reconnaissance, & assessments on replicated systems
 - If virtual systems get corrupted they can simply be reloaded
- NASA Secure Coding Portal (SCP)
 - Launched July 2015
 - <https://nen.nasa.gov/web/coding>
 - Recognizing the need to counteract the threat of exploitation of custom developed software
 - A single touch point for NASA developers was established to learn how to develop code securely





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DELIVERING ASSURANCE – EXAMPLES

- **All High Priority NASA Missions:**
 - Human Exploration – SLS, MPCV, GSDO, International Space Station
 - Commercial Crew – Boeing, SpaceX
 - James Webb Space Telescope
 - Mars 2020, MSL, Juno, and many more
- **Department of Energy**
 - IV&V of DOE Insider Threat Program
- **FAA**
 - Independent Assessment of a contract management system
 - Independent Assessment of a launch risk analysis tool suite
- **New York City 911 – ECTP**
 - Systems Engineering IV&V effort worked in collaboration with NYC Mayors office to provide assurance that the emergency communications program
- **Jet Propulsion Laboratory and Other NASA Centers (currently at GSFC)**
 - Performed a Blue Team Vulnerability Assessment against mission threads
- **Implemented Non-Classified software security resources portal for NASA**
- **WVNG**
 - Cyber Security Training



“HOW DO WE KNOW WE ARE PROVIDING VALUE?”

IV&V is getting involved early in the software development lifecycle and detecting defects in-phase with software development

EVIDENCE: All active IV&V projects for NASA have started prior to mission PDR (at least 6 months prior in most cases). Average **96% phase containment over the past 4 years**. Widely accepted industry studies establish the value of early defect detection and the significant increase in cost of rework associated with software defects that are not found in phase.

IV&V is detecting and submitting quality defects with a very high acceptance rate

EVIDENCE: Last 4 years: **94% accepted and fixed by Projects**.

IV&V is providing statements of assurance and key input at milestone reviews

EVIDENCE: Provided **statements of assurance or identified residual risk at dozens of reviews**. Recent example related to cancellation of the GSDO 90% LACC review: The GSDO Chief Engineer said that had IV&V not stepped up and pointed out not only that the documents were insufficient, but why the documents were insufficient, the review would have gone on as scheduled. No one outside of IV&V had reviewed the documents in detail and no one would have had the negative information.

IV&V customers are very satisfied with our products and services

EVIDENCE: **93% satisfaction** based on customer surveys over the last 4 years. **Voice of the customer** (backup slides).

We tend to find a significant quantity of salient issues, and those issues are nearly always valid. So when we say things are good, that carries weight. Our customers repeatedly say we're providing significant value.



IV&V Facility

PROCUREMENT OVERVIEW OF DRAFT RFP NNG16544506R



HISTORICAL INFORMATION

- The IV&V services are currently provided through a Cost Plus Award Fee contract with TASC (Recently novated to Engility)
- Contract Number NNG12SA03C
- The current contract value is \$134M
- Five year period of performance from May 11, 2012 through May 10, 2017



ACTIVITIES TO DATE

- Draft Statement of Work Released 11/03/15
- Draft RFP Posted 03/04/16
- Industry Day 03/16/16
- Questions on Draft 04/04/16

ESTIMATED DATES

- Final RFP Release 05/04/16
- Proposals Received 06/06/16
- Selection 02/13/16
- Phase-In Award (Separate PO) 04/01/17
- Start of Technical Performance 05/11/17



RFP INFORMATION

- Type of Contract:
 - Cost Plus Fixed Fee
 - Single Award IDIQ
- Full and Open Competition
 - NAICS Code: 541330
 - Size Standard: Annual Revenue must be below \$38.5M for an Offeror to be considered a small business
- Ordering Period: 5 years from award
- Phase In: Up to 45 calendar days



ORGANIZATIONAL CONFLICT OF INTEREST

- **Impaired objectivity** - FAR 9.5 prohibits the Contractor from reviewing its own offers, products, or services, or those of its affiliate(s) or competitor(s) without proper safeguards to ensure objectivity in a manner that protects the Government's interests
- To the extent a future NASA solicitation seeks products or services that are subject to review in performance of this contract, the Contractor will be ineligible to provide those products or services unless the Contractor submits a specific plan fully mitigating the OCI and such plan is approved by the SAS Contracting Officer
- If the Contractor, through the performance of this contract, is required to participate in technical reviews or provide engineering consultation services on its own proposals/quotations, products, or services (or those of its affiliate(s) or competitor(s)) provided under a different contract(s), the Contractor shall be ineligible to perform such work as a prime or first-tier subcontractor, unless the Contractor submits a specific plan fully mitigating the OCI and such plan is approved by the SAS Contracting Officer.



PLACE OF PERFORMANCE

- Place of Performance:
 - IV&V Facilities – NASA will provide space at the IV&V Facility in Fairmont, WV for up to 100 persons
 - Other NASA Facilities - Twelve (12) spaces are available at Kennedy Space Flight Center, Florida; four (4) spaces are available at Goddard Space Flight Center, Greenbelt, MD and; four (4) spaces are available at Marshall Space Flight Center, Huntsville, Alabama; Twenty (20) spaces are available at Johnson Space Center, Houston, Texas
 - Contractor Facilities (if necessary)
 - Other sites as designated in Task Orders



GOVERNMENT FURNISHED PROPERTY

- Property at the NASA IV&V Facility
 - Contractors will be provided up to 100 seats which consists of:
 - One workstation, a phone set, and connectivity to network-based printers, storage systems, e-mail and Virtual Private Network capability
 - Office furniture and automation equipment (i.e. copiers, fax machines, etc.) and all supplies required for operation of automation equipment (i.e. paper, toner, etc.)
 - A Sensitive Compartmentalized Information Facility (SCIF) will be provided to perform classified information assurance activities
- Property used for the International Space Station
 - Existing Government property may be reviewed in Houston, Texas, March 22, 2016, 9:00 a.m.
 - Contact Tom Macaulay at Thomas.N.Macaulay@NASA.gov for more information and to make prior arrangements



IV&V Facility

GOVERNMENT FURNISHED SERVICES

- Information Technology (IT) Services at the Fairmont, WV IV&V facility
- IT Services for employees located at other NASA Facilities will be provided by that facility
- Software analysis tools and services provided by the Software Assurance Tools group (SWAT) to conduct verification and validation activities
- Access to Jon McBride Software Testing and Research (JSTAR) Lab for software simulation and testing resources and environments
- Access to Cyberlab for Information Assurance activities



IV&V Facility

CONTRACT EXECUTION INFORMATION

- The Statement of Work (Attachment A) describes the scope of the requirement
- Work is defined through Government generated Task Orders (TO)
- Contractor submits a TO Response based on the requirements in the TO

MISSION SUITABILITY

VOLUME

- Subfactor A – Technical Approach/Capability
 - Oral Proposals will be conducted at the IV&V Facility
 - Oral Proposals (60 slides 120 Minutes)
 - Slides submitted with proposal
 - Describe overall approach towards accomplishing critical Sections 3.1, 3.8 and 3.9 of the SOW
 - Respond to two (2) Scenarios (Enclosures 1-2)
 - Oral Proposal presentations will be scheduled within 15 days of written proposal
 - Attendance limited to five (5) representatives
 - Oral Proposals will be recorded and provided to the Offeror



MISSION SUITABILITY VOLUME

- Subfactor B – Management Approach
 - Management Approach will be provided in writing (Not Oral)
 - Describe management approach for accomplishing ALL of the SOW requirements
 - Limited to 35 pages for Subfactor B and Subfactor C, excluding Total Compensation Plan, Phase-in Plan, Small Business Subcontracting Plan



MISSION SUITABILITY VOLUME

- Subfactor C - Small Business Utilization
 - The Contracting Officer’s assessment of appropriate subcontracting goals for this acquisition, expressed as a percent of the IDIQ Maximum Ordering Value

Total Small Businesses (SB)	30.0%
Small Disadvantaged Business Concerns (SDB)	5.0%
Women Owned Small Business Concerns (WOSB)	10.0%
Historically Black Colleges and Universities (HBCU)	0.5%
HUBZone Small Business Concerns (HBZ)	6.0%
Veteran Owned Small Business Concerns (VOSB)	5%
Service-Disabled Veteran-Owned Small Business Concerns (SDVOSB)	1.5%



COST VOLUME

- Offerors are required to propose costs based on the Government Pricing Model (Exhibits 1-13) for each contract year
- The non-management direct labor categories and hours in the GPM can not be changed
- The Government position descriptions for non-management direct labor categories are in Enclosure 3
- Management and Administrative labor categories, hours shall be provided by the Offeror
- For evaluation purposes, all Management Costs shall be assumed onsite and all Administrative Costs assumed Offsite



COST VOLUME (Cont)

- Historical labor data includes unburdened hourly average rate of incumbent prime contractor only
- Scenarios are not priced
- No travel or material/supplies ODC's are to be proposed
- BOE's shall be provided for Program Management, Administrative Support and subcontracting



PAST PERFORMANCE VOLUME

- Information on most recent contracts (completed and ongoing) for similar efforts with a minimum average annual cost/fee incurred of \$8M that your company has had within the last five (5) years of the RFP release date
- Past Performance Questionnaires (Enclosure 5) submitted to CO by due date



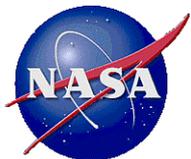
OVERALL EVALUATION

- Source Selection Procedures
 - FAR 15.3 and NFS 1815.3
 - Award based on initial offers, but the Government reserves the right to hold discussions with Offerors
- Mission Suitability Factor – Points (1000)
 - Technical Approach/Capability 500
 - Management Approach 400
 - Small Business Utilization 100



OVERALL EVALUATION (CONT.)

- Cost Evaluation Factor
 - The proposed costs of the Government Pricing Model (GPM) and Attachment B – Direct Labor Rates and Fee Matrices will be assessed to determine reasonableness and cost realism
 - Fee will not be adjusted as a result of cost realism adjustments
 - The total FFP Phase-in price and the proposed and probable GPM evaluated cost (including fee) will be presented to the Source Selection Authority as well as any cost risk associated with the proposal



OVERALL EVALUATION (CONT.)

- Past Performance Factor
 - Very High Level of Confidence
 - High Level of Confidence
 - Moderate Level of Confidence
 - Low Level of Confidence
 - Very Low Level of Confidence
 - Neutral



MISCELLANEOUS

- Further information will be provided on the Procurement Proposal Library at:
<https://foiaelibrary.gsfc.nasa.gov/>
- Check Website periodically for pertinent and most recent information
- Until release of the Final RFP, Offerors may continue to communicate with Government personnel
- Upon release of the Final RFP, all Government personnel associated with the acquisition shall refrain from communicating with prospective Offerors and refer all inquiries to the Contracting Officer



SOW TECHNICAL OVERVIEW

- Scope
 - To acquire specialized system and software engineering and development as well as system and software assurance services
 - These services are performed on selected systems being developed by or for NASA, other Federal, State and local government agencies, commercial entities and/or other organizations and institutions as directed by the Government
 - These services can include work on classified information systems



SOW TECHNICAL OVERVIEW

- Examples of past Missions and Projects include:
 - Spacecraft Flight Software Assurance on the Mars 2020 Mission
 - Spacecraft Flight Software Assurance on the James Webb Space Telescope Mission
 - Independent Oversight of the IV&V for NASA Commercial Crew Program
 - Independent Oversight of the IV&V for the City of New York's 911 System
 - Software Engineering and Development of a Risk Management Tool for NASA's Office of Safety and Mission Assurance



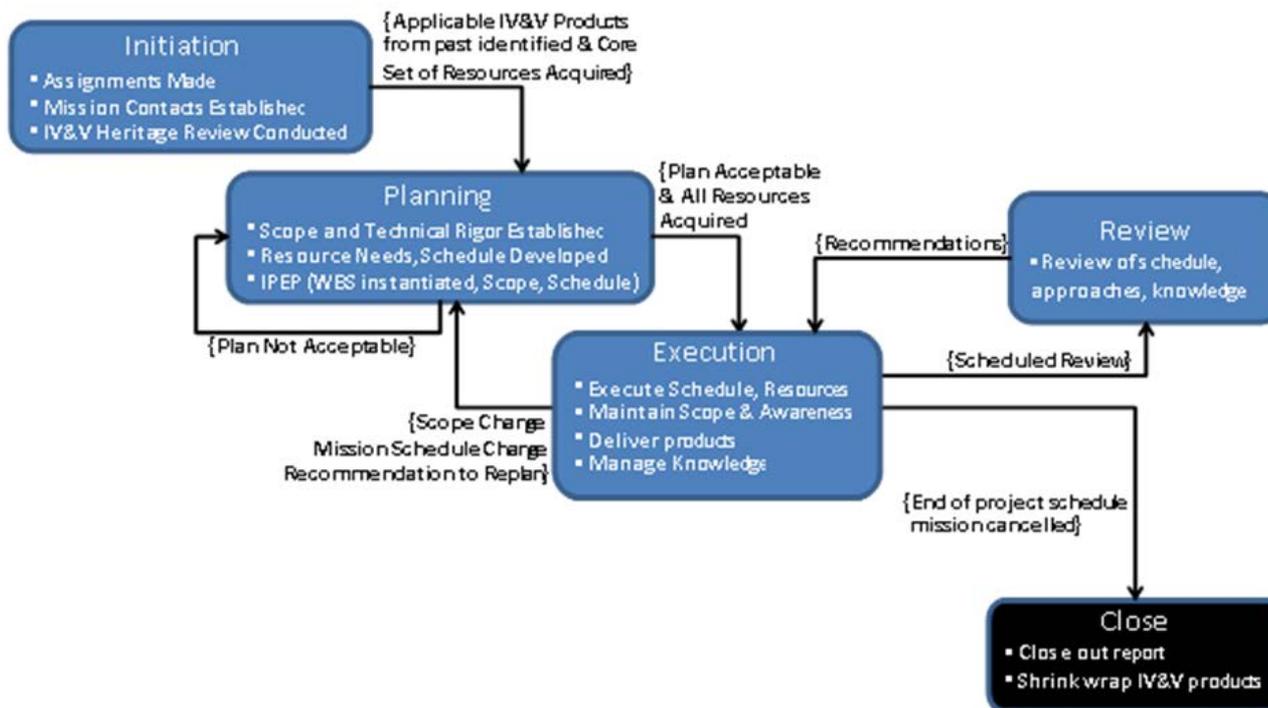
SOW: IV&V

- Independent Verification and Validation
 - A systems engineering process that produces empirical evidence to provide assurance to stakeholders of the correctness and completeness of the system’s software as it evolves through a development life cycle
 - Verification and Validation are sustained by technical reference(s) and complemented with analytical procedures
 - Defined by IVV 09-1 “Independent Verification and Validation Technical Framework” (a consistent approach for providing IV&V services; based on IEEE 1012)
 - Utilizes a set of standard methods (IV&V Catalog of Methods)
 - Complements the developer’s assurance activities by formulating an understanding of the operational needs of the system and its software
 - Our analysis targets the defined operational capabilities
 - Produces evidence that strengthens our assurance affirmations
 - Our evidence should alleviate or reduce the risk in the operational capabilities
 - IV&V is performed by an organization that is technically, managerially, and financially independent from the developing organization



SOW: IV&V

- Independent Verification and Validation Project Lifecycle States
 - An IV&V Project will go through five potentially overlapping states that comprise the project lifecycle: Initiation, Planning, Execution, Review, and Close
 - These states are detailed in Section 4.1 of IVV 09-4 “Project Management.”





SOW: CD

- Capability Development (CD)
 - The purpose of CD initiatives is to ensure the IV&V Program continually evaluates methods, tools and approaches for improvement and to innovate in areas of system and software assurance to enable IV&V Program strategic goals and outcomes
 - Focused on understanding the trends, challenges, emerging requirements/needs and problems with conducting IV&V and SMA
 - Based on integrating practical solutions into the engineering approaches employed by IV&V and SMA practitioners
 - CD advances the IV&V and SMA processes, tools, and knowledge through the exploration and integration of practical solutions
 - Emphasis is geared towards practical solutions for validated problems and seamless integration of CD solutions into the engineering approaches
 - Identification of candidate initiatives is done by the IV&V Office Lead and Group Leads within IVVO



SOW: TQ&E

- Technical Quality & Excellence (TQ&E)
 - Internally focused function to ensure that the best services and products from IV&V projects are being provided to our customers
 - Ensures high quality IV&V products and services result from performing best engineering approaches consistently across IV&V projects
 - Improvements made at the IV&V Project level are “bubbled up” and normalized to allow broader approach and utilization
 - As a learning organization, we provide multiple venues to share knowledge (e.g., TQ&E Checkpoint reviews, Tech Discussions, Workshops, Static Code Analysis Working Group)
 - Ensures that IV&V engineering approaches are effective and efficient



SOW: SWAT

- Software Assurance Tools (SWAT) Support
 - SWAT Support is an enabling function responsible for the software tools needed to support IV&V, CD, TQE, SMA and Management functions
 - This function integrates tools into the operational environment
 - SWAT Support maintains both CD and procured/licensed tools
 - SWAT Support provides knowledge and assistance in the use of the tools and tool based solutions
 - An enabling function for our prime IV&V contractor to work with and support our SWAT prime contractor



SOW: JSTAR

- Jon McBride Software Testing and Research (JSTAR) Support
 - The IV&V's Test Capability is housed in the Jon McBride Software Testing and Research (JSTAR) lab
 - JSTAR is a simulation and test environment function that is responsible for the acquisition, development, maintenance and deployment of embedded system test environments for the NASA IV&V Program
 - This function includes supporting the IV&V Projects in planning, development, and execution of independent testing of in-scope system and software test scenarios
 - An enabling function for our prime IV&V contractor to work with and support our JSTAR prime contractor



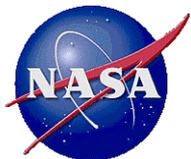
SOW: SMA SUPPORT

- Safety and Mission Assurance (SMA) Support
 - Focuses on supporting SMA organizations, primarily NASA Center SMA organizations, to provide software assurance support
 - The SMA Support Office (SSO) works with the Office of Safety and Mission Assurance (OSMA), Center SMA organizations, and other NASA HQ Support offices (as identified and approved) to benefit the Agency by providing additional level of safety and mission assurance, specifically as it relates to Software Assurance (SA)
 - Performs short-term focused tasks and provides trained staff to assist SMA personnel, including NASA Center SMA personnel, in accomplishing their SMA objectives, particularly where focused knowledge such as software analysis or software assurance expertise is required



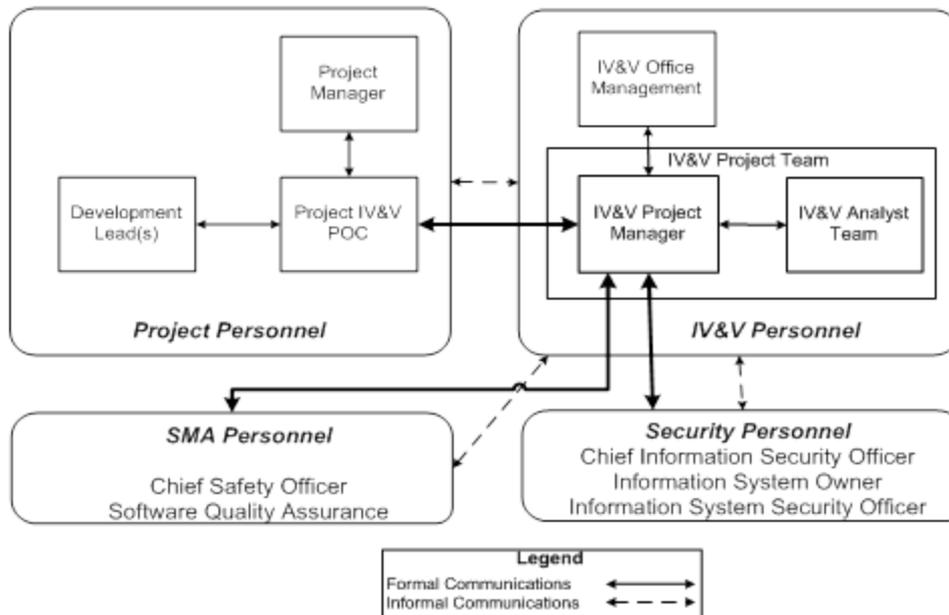
SOW: IA

- Information Assurance (IA)
 - The goal of IA within the IV&V Program is to conduct analysis, simulation, and test to provide assurance of information systems and cybersecurity services as it applies to mission critical systems and assets
 - IA related analyses may include, but are not limited to: Threat, Vulnerability, and Risk Assessments; Penetration Testing; Security Assessments for FEDRAMP, etc.
 - Successful application of IA enables the assessment, and mitigation, of security threats and risks over the course of the development lifecycle
 - Performance of IA related analyses may require access to classified project artifacts



IV&V PROJECT INTERFACES

- The NASA IV&V Program's paradigm for interfacing with a Development Project in the performance of IV&V relies on interfaces with:
 - Project Personnel
 - Point of Contact, Project Management, Development Leads, SW Developers
 - SMA Personnel
 - Chief Safety Officer, Software Quality Assurance
 - Security Personnel
 - Chief Information Security Officer, Information Security Owner, Information Sys Security Officer





OTHER PROJECT INTERFACES

- **SMA Project Interfaces**
 - SMA support personnel will interface with the IV&V SMA Office Lead and other support personnel (even across functional areas)
 - SMA support personnel will also interface directly with other SMA professionals at various Centers
- **Management Interfaces**
 - It is expected that the Contractor will conduct and maintain dialogue at various levels of the IV&V Program (Offices, Office of the Director).
 - At times, the Government may request Contractor management to support interactions external to the IV&V Program.
 - (Development Projects, SMA organizations, Center Management and associated personnel, etc.)
 - Additionally, the Contractor shall notify the Government if they initiate or are invited to interface or interact with external interfaces regarding IV&V Program information
- **The Government expects routine dialogue and interactions amongst personnel supporting the functional areas defined in this SOW as to be standard practice**
 - The Government expects that, on some occasions, personnel supporting TQ&E, CD, and SWAT may need to interface with IV&V customers and stakeholders



SOME THINGS TO NOTE

- There is potential for the Contractor to perform IV&V functions on Non-NASA projects
- There is potential for the Contractor to perform IV&V on classified projects
- The Contractor may be asked to serve as the Project Manager for an IV&V Project
- The Contractor is to manage the resources allocated across the projects and ensure optimal utilization of personnel in fulfilling project and Program requirements across the contract SOW
- We are looking for a partner in leading the advancement of IV&V and its application on our customer's systems to provide the highest levels of mission assurance



Q&A SESSION

- Please form line at microphone to pose question(s)
 - Provide name, company and question
 - Audio recorded
- Government may not be able to or in position to answer all questions at this event
 - Answers are preliminary
 - Government intends to post list of all questions with approved answers on procurement website
- Government will ensure each entity/attendee has equal opportunity to pose questions
 - Desire to avoid any one entity from domineering the Q&A session