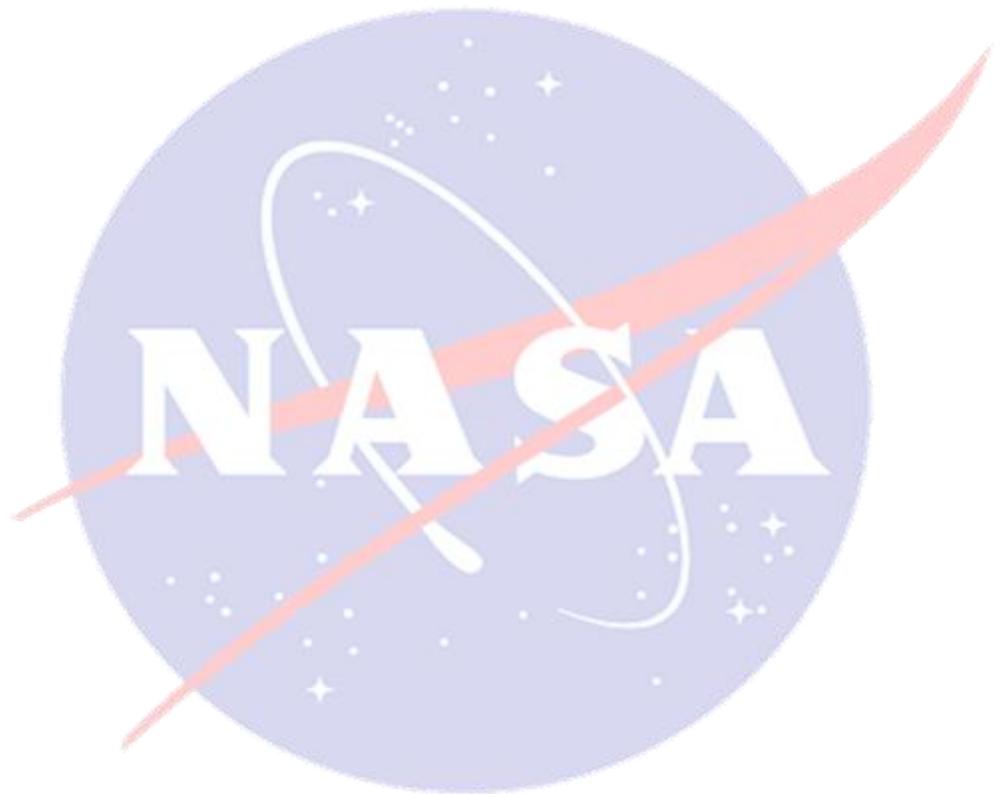




National Aeronautics and Space Administration

**OFFICE OF INSPECTOR GENERAL**

**NASA's Independent Verification and  
Validation Program**



OFFICE OF AUDITS

AUDIT REPORT  
JULY 16, 2014

**IG-14-024**

**(A-13-008-00)**

Final report released by:

A handwritten signature in black ink, appearing to read 'PKMJA', written in a cursive style.

Paul K. Martin  
Inspector General

## Acronyms

---

ACES	Agency Consolidated End-User Services
ASAP	Aerospace Safety Advisory Panel
FY	Fiscal Year
IV&V	Independent Verification and Validation
IT	Information Technology
NID	NASA Interim Directive
NPR	NASA Procedural Requirement
OCE	Office of Chief Engineer
OMB	Office of Management and Budget
OSMA	Office of Safety and Mission Assurance
O&M	Operations and Maintenance
TDRS	Tracking and Data Relay Satellite
WVU	West Virginia University

---

---

## OVERVIEW

---

# NASA'S INDEPENDENT VERIFICATION AND VALIDATION PROGRAM

## The Issue

---

NASA develops and operates a variety of space systems, including the International Space Station, the Hubble and James Webb Space telescopes, and the Space Launch System, each of which require increasingly complex computer software. As part of the Agency's quality control process, NASA's Independent Verification and Validation (IV&V) Program assesses whether software associated with Agency science and spaceflight activities will meet program, cost, schedule, and safety requirements. Because software developers have an inherent conflict in proving that their software works as intended, the IV&V process must be performed by an organization that is technically, managerially, and financially independent from the original software developers.

Each year NASA's Office of the Chief Engineer solicits input from all Agency Centers and locations for a list of software under development and selects for IV&V the projects with the greatest likelihood for and the worst potential consequences of failure. However, NASA does not have sufficient funds to finance IV&V services for all projects that meet these criteria. For example, in fiscal year (FY) 2014 NASA identified 17 projects for IV&V but the Program was only able to fund 13. As a result, the remaining projects were required to accept or find other ways to mitigate software-related risks.

Pursuant to language in NASA's FY 1992 appropriations legislation, the Agency was required to provide \$10 million to West Virginia University (WVU) to establish an IV&V Facility.<sup>1</sup> In response to this directive, in January 1992 NASA awarded the West Virginia University Research Corporation (the Corporation) a \$10 million grant to support IV&V research and build a facility for use as a computer operations and research center.<sup>2</sup> Located in Fairmont, West Virginia, the IV&V Facility (hereinafter Building 1) consists of a 44,824 square foot building with IV&V Program personnel occupying 20,297 square feet of the building and the remaining space leased to other tenants (11,463 square feet) or used as mechanical space (13,064 square feet). In July 2010, the IV&V Program leased two floors in a building adjacent to Building 1 to house contractor staff (hereinafter Building 2).

---

<sup>1</sup> Department of Veteran Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1992, Pub. L. No. 102-139, 105 Stat. 736 (October 28, 1991).

<sup>2</sup> The Corporation was established in 1985 as a nonprofit corporate affiliate of WVU to facilitate research efforts. According to its website, the Corporation fosters and supports research at WVU and provides evaluation, development, patenting, management, and marketing services for inventions of WVU faculty, staff, and students.

As stipulated in the grant, upon completion of Building 1 the title to the facility would transfer to the Corporation, which would then become responsible for the building's operations and maintenance (O&M) costs. However, in June 1993 while still constructing Building 1, WVU's Associate Provost for Research wrote West Virginia Senator Robert Byrd and Congressman Alan Mollohan expressing concern about the Corporation assuming responsibility for Building 1's O&M expenses and requesting their assistance in obtaining an agreement from NASA to cover those costs. Although we were unable to determine what action, if any, Senator Byrd and Congressman Mollohan took in response to the letter, in July 1993 NASA entered into the first of several cooperative agreements and contracts with the Corporation pursuant to which the Agency agreed to pay all O&M expenses associated with Building 1.<sup>3</sup> Since that time, NASA has paid the Corporation approximately \$82.8 million in O&M expenses. The most recent contract with the Corporation, covering FYs 2014 through 2018, is valued at \$40 million.

In FY 2013, NASA spent \$37.5 million on its IV&V Program, with one-third (\$12.3 million) spent on facility and program operations and the remaining two-thirds (\$25.2 million) on actual IV&V services. NASA's FY 2014 appropriation provided \$39.1 million for IV&V services and, according to budget documents, the Agency expects to request funding of \$31 million per year for its IV&V Program for FYs 2015 through 2018.

We initiated this audit to determine whether NASA is appropriately utilizing its IV&V funding. Details of the audit's scope and methodology are in Appendix A.

## Results

---

By continuing to occupy and maintain Building 1, NASA is paying more than necessary in O&M expenses, leaving the Agency with less funding to perform IV&V services on software projects. We estimate that NASA could save as much as \$9.7 million between FYs 2015 and 2018 if the IV&V Program took steps to reduce O&M expenses associated with Building 1. Specifically, we found that between October 2008 and September 2013, the IV&V Program spent approximately \$36.3 million for O&M expenses associated with Building 1. For example, although NASA does not own the Building, the IV&V Program paid the Corporation \$993,000 in 2010 to replace its roof – \$848,000 for the roof and \$145,000 for a roof replacement consultant.<sup>4</sup>

---

<sup>3</sup> The O&M contract that ended in September 2013 covered insurance, library supplies, phone services, postage and shipping, utilities, fire protection, garbage pickup, office supplies, environment maintenance, executive administrative assistant, mailroom operations, handyperson services, photocopy services, general office furnishings, and special projects.

<sup>4</sup> We also noted that the Corporation failed to provide a maintenance plan in accordance with the terms of the contract.

We also found that NASA incurred increased O&M expenses for Building 1, in part because the Corporation applied indirect costs to purchases it made for the Agency.<sup>5</sup> We reviewed the indirect costs the Corporation charged NASA between October 2012 and May 2013 and noted that indirect cost charges were added to items such as cell phone services, activities in support of educational outreach, and information technology equipment and services. We identified six purchases that initially cost \$212,820, but that figure increased to \$268,152 with the addition of \$55,332 in indirect cost charges.

In addition, we found that although Buildings 1 and 2 provided office space for IV&V Program staff, NASA paid significantly more for space in Building 1. For example, in FY 2013 NASA paid \$3.41 million in O&M expenses for Building 1, but only \$556,128 to lease 27,293 square feet of space in Building 2. Similarly, in FY 2014, projected O&M expenses are \$2.64 million for Building 1 compared to \$564,470 in rent for Building 2.<sup>6</sup>

We determined that NASA was not legally obligated to enter into agreements to pay O&M expenses associated with Building 1. However, NASA has chosen to pay these expenses over the last 20 years through a series of cooperative agreements and contracts with the Corporation. In our judgment, continuing this arrangement does not make fiscal sense for NASA, particularly when the Agency has more projects needing IV&V services than the current budget can accommodate.

We evaluated three possible options for NASA to lower occupancy costs and increase the amount of funding available for IV&V services:

1. Move IV&V personnel from Building 1 to Building 2.
2. Relocate West Virginia-based NASA civil servants to the Goddard Space Flight Center (Goddard) that provides administrative support to the IV&V Program.
3. Negotiate with the Corporation to lower O&M expenses.

---

<sup>5</sup> Indirect costs are costs incurred for common or joint objectives that cannot be readily and specifically identified with a project or activity. Indirect costs are distributed to projects or activities by means of an indirect cost rate. The Corporation determined the indirect rate of 26 percent would be added to applicable O&M contract purchases.

<sup>6</sup> In addition to these expenses, for FY 2014, the IV&V Program will pay \$3.77 million in O&M and other costs common to both buildings for items and services such as security, vehicles, and computers supplied through NASA's ACES contract. These expenses would remain if NASA moved staff out of Building 1.

## Management Action

---

In order to make additional funds available for IV&V services, we recommend the Chief of Safety and Mission Assurance and the Goddard Director analyze the alternatives for reducing occupancy costs associated with Building 1 and select the most cost-effective course of action. If the analysis determines that NASA should abandon the Building, the NASA Chief Counsel and the Goddard Space Flight Director should identify the most feasible way to dispose of it to obtain the highest possible return for the Agency.

## Other Matters

We found that although NASA appropriately identifies and selects projects needing IV&V services, the Agency does not manage projects that qualify for but do not receive IV&V in accordance with NASA's risk management guidance. In January 2013, the Aerospace Safety Advisory Panel recommended NASA establish a formal waiver process for projects that qualify for but do not receive IV&V services. Although NASA revised its risk management guidance in response, in our judgment the revision only partially addressed the Panel's concerns because it did not explicitly address documenting the reason for risk acceptance in accordance with Agency policy. Accordingly, we believe NASA needs to ensure that the waiver process includes documentation of the increased risk in the appropriate risk database that can serve as a key communication tool for project management across the Agency. Inclusion of these risks in the database will ensure that software safety specialists consider whether additional verification and validation is required or the risk can be accepted without mitigation.

To better assess risks associated with software projects not selected for IV&V, we recommend that the Chief of Safety and Mission Assurance ensure that NASA's IV&V waiver process includes documenting the risk of not performing IV&V in accordance with NASA's risk management guidance.

In response to a draft of this report, NASA concurred with our recommendations and agreed to analyze alternatives for reducing Building 1 occupancy costs and ensure projects assess and document the risk of not performing IV&V in accordance with NASA's risk management requirements. We consider NASA's planned actions responsive and will close the recommendations upon verification the Agency has completed them. We also reviewed management's comments regarding the technical accuracy of the draft and made changes as appropriate. Management's full response to the draft report is reprinted in Appendix C.

---

---

## CONTENTS

---

### INTRODUCTION

Background _____	1
Objectives _____	5

### RESULTS

More Effective Use of IV&V Funding Would Increase Program Productivity _____	6
Other Matters _____	11

### APPENDIX A

Scope and Methodology _____	15
Review of Internal Controls _____	17
Prior Coverage _____	17

### APPENDIX B

Funds Put to Better Use, Methodology, and Projection of Results _____	18
--	----

### APPENDIX C

Management Comments _____	21
---------------------------	----

### APPENDIX D

Report Distribution _____	23
---------------------------	----



---

---

## INTRODUCTION

---

### Background

NASA develops and operates a variety of space systems, including the International Space Station, the Hubble and James Webb Space telescopes, and the Space Launch System, that require increasingly complex computer software. As part of the Agency's software quality control process, NASA's Independent Verification and Validation (IV&V) Program assesses whether software associated with Agency science and spaceflight activities will meet program, cost, schedule, and safety requirements. Because software developers have an inherent conflict in proving their software works as intended, the IV&V process must be performed by an organization technically, managerially, and financially independent from the developers.

NASA established the Agency's IV&V Program in response to recommendations made in 1986 by the Presidential Commission on the Space Shuttle Challenger Accident. As a result of these recommendations, NASA also established the Office of Safety and Mission Assurance (OSMA) that same year.<sup>7</sup> Two years later, after reviewing the Space Shuttle Program and learning that the company that developed the Shuttle software had also performed validation and verification, the National Research Council recommended that "responsibility for ... software IV&V should be vested in entities separate from the [Shuttle] Program structure and the centers directly involved in [Shuttle] development and operation." As a result, OSMA became responsible for administering NASA's IV&V Program.<sup>8</sup>

**NASA's West Virginia IV&V Facility.** Pursuant to language in NASA's fiscal year (FY) 1992 appropriation, the Agency was required to make available \$10 million from its "construction of facilities funds" to West Virginia University (WVU) to establish an IV&V facility.<sup>9</sup> In response to this directive, in January 1992, NASA awarded the West Virginia University Research Corporation (the Corporation) a \$10 million grant to support IV&V research and build a computer operations and research center.<sup>10</sup> The grant required the completed facility host IV&V-related services performed by NASA

---

<sup>7</sup> When it was first established, OSMA was known as the Office of Safety, Reliability, and Quality Assurance.

<sup>8</sup> "Report of the Presidential Commission on the Space Shuttle Challenger Accident" (June 6, 1986), and National Research Council, "Post-Challenger Evaluation of Space Shuttle Risk Assessment and Management" (January 1988).

<sup>9</sup> Department of Veteran Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1992, Pub. L. No. 102-139, 105 Stat. 736 (1991).

<sup>10</sup> The Corporation was established in 1985 as a nonprofit corporate affiliate of WVU to facilitate the University's research efforts. According to its website, the Corporation fosters and supports research at WVU and provides evaluation, development, patenting, management, and marketing services for inventions of WVU faculty, staff, and students.

personnel, NASA contractors, or WVU staff. The terms of the grant also stated that upon completion of construction, the building title would transfer to the Corporation, which would then become responsible for the building's operations and maintenance costs (O&M). According to the grant, title would remain with the Corporation so long as it uses the building "for the Grant purpose."

Located in Fairmont, West Virginia, the IV&V Facility was completed in May 1994 at a total cost of \$12 million. In accordance with the grant, NASA transferred ownership of the facility to the Corporation. The facility – part of WVU's Marion County Business and Technology Campus – consists of a 2-story, 44,824 square foot office building. As of May 2014, IV&V Program personnel occupy 20,297 square feet of the building, with 11,463 square feet leased to other tenants and the remaining 13,064 square feet serving as mechanical space.<sup>11</sup>

In June 1993, while construction of the facility was ongoing, WVU's Associate Provost for Research wrote West Virginia Senator Robert Byrd and Representative Alan Mollohan expressing concern about the Corporation becoming responsible for O&M expenses and requested their assistance in obtaining an agreement from NASA to cover those costs. Although we were not able to determine what action, if any, Senator Byrd or Congressman Mollohan took in response to the letter, in July 1993, NASA entered into the first of several cooperative agreements and contracts with the Corporation in which the Agency agreed to pay all O&M expenses associated with the building.<sup>12</sup> As a result, NASA has paid the Corporation approximately \$82.8 million over the past 20 years for O&M expenses (see Table 1). The most recent contract between NASA and the Corporation, which covers FYs 2014 through 2018, is valued at \$40 million. In addition to covering O&M expenses, NASA signed two cooperative agreements with the Corporation, which provided more than \$5 million for IV&V-related research.

---

<sup>11</sup> The facility is located 23 miles from WVU's Morgantown campus.

<sup>12</sup> The O&M contract that ended in September 2013 covered insurance, library supplies, phone services, postage and shipping, utilities, fire protection, garbage pickup, office supplies, environment maintenance, executive administrative assistant, mailroom operations, handyman services, photocopy services, general office furnishings, and special projects.

**Table 1. NASA IV&V Program Contracts and Cooperative Agreements with WVU Research Corporation**

Time Period	Type of Instrument	Allotted Amounts		Total
		Research	O&M	
July-August 1993	O&M Pre-contract Cost Authorization	\$0	\$63,269	<b>\$63,269</b>
July 1993-February 1994	O&M Contract	0	504,359	<b>\$504,359</b>
March 1994-February 1997	Cooperative Agreement	1,728,600,	4,175,035	<b>\$5,903,635</b>
March 1997-September 2003	Cooperative Agreement	3,454,833	16,194,477	<b>\$19,649,310</b>
September 2003-September 2008	O&M Contract	0	25,571,284	<b>\$25,571,284</b>
October 2008-September 2013	O&M Contract	0	36,306,809	<b>\$36,306,809</b>
<b>Total</b>		<b>\$5,183,433</b>	<b>\$82,815,233</b>	<b>\$87,998,666</b>

Source: NASA Office of Inspector General summary of cooperative agreement and contract data provided by IV&V Program officials.

**NASA IV&V Program Staffing.** As of May 2014, 273 employees – 224 contractors, 44 civil servants, and 5 WVU staff – perform IV&V-related services for NASA. Approximately 47 employees (44 civil servants and 3 WVU employees) are housed in the facility NASA built, hereafter referred to as Building 1. Beginning in July 2010, the IV&V Program leased space in a nearby private office building (hereafter referred to as Building 2) for approximately 144 contractors. In addition to the contractors in Building 2, approximately 82 IV&V contractors are located throughout the United States, including 58 at various contractor and other locations, 22 employees at 4 NASA Centers, and 2 at WVU.<sup>13</sup> See Figure 1 for a photo of Buildings 1 and 2.

**Figure 1. NASA IV&V Program Facility**



Source: IV&V Program's website.

<sup>13</sup> The Centers are Goddard Space Flight Center, Johnson Space Center, Kennedy Space Center, and Marshall Space Flight Center.

**NASA IV&V Program Funding.** The IV&V Program budget funds IV&V services, as well as O&M and other costs associated with maintaining Buildings 1 and 2. In FY 2013, NASA spent \$37.5 million on its IV&V Program, with \$12.3 million going toward facility and program operations and the remaining \$25.2 million toward IV&V services. NASA’s FY 2014 appropriation provided \$39.1 million for the IV&V Program, and the Agency expects to request \$31 million per year for the Program for FYs 2015 through 2018. Table 2 shows the past and future budget allocations for facility operations and IV&V services.

**Table 2. NASA’s IV&V Program Budget**

Fiscal Year	Dollars in millions		
	Facility/Program Operations	IV&V Services	Total
2011 <sup>a</sup>	\$13.7	\$26.2	<b>\$39.9</b>
2012 <sup>a</sup>	13.1	26.0	<b>\$39.1</b>
2013 <sup>a</sup>	12.3	25.2	<b>\$37.5</b>
2014 <sup>b</sup>	13.6	25.5	<b>\$39.1</b>
2015 <sup>b</sup>	12.3	18.7	<b>\$31.0</b>
2016 <sup>b</sup>	12.6	18.4	<b>\$31.0</b>
2017 <sup>b</sup>	12.8	18.2	<b>\$31.0</b>
2018 <sup>b</sup>	13.0	18.0	<b>\$31.0</b>

<sup>a</sup> FYs 2011 through 2013 are actuals.

<sup>b</sup> FYs 2014 through 2018 are based on the President’s budget. On January 13, 2014, the Consolidated Appropriations Act stated that in FY 2014 not less than \$39.1 million would be provided for IV&V-related activities.

Source: NASA IV&V Program officials.

Based on estimates in the President’s budget, under NASA’s \$31 million IV&V funding request for FY 2018, 42 percent of these funds would be allocated toward facility and program operations with the remaining 58 percent spent on IV&V services.

The IV&V Program budget funds five offices:

- *IV&V Services* includes technical mission support, software assurance tools and licenses, independent testing capability, and capability development.
- The *Office of the Director* includes civil servant salaries, awards, training, and travel.
- The *Strategic Communication Office* includes knowledge management; public affairs; science, technology, engineering, and math (STEM) intern program; and educational outreach.
- The *Safety and Mission Assurance Support Office* includes software assurance support across Centers.
- The *Program Support Office* includes O&M, security, information technology, and vehicles.

**IV&V Selection Process.** When selecting projects that will receive IV&V services, the Office of the Chief Engineer (OCE) solicits input from all NASA locations regarding software under development, and identifies those projects with the greatest likelihood for and worst potential consequences of failure. Based on this information, the OCE selects the highest criticality software projects for IV&V. The IV&V Program creates an IV&V Project Execution Plan (IPEP) for those projects.<sup>14</sup> The IV&V Board of Advisors, under the leadership of the Chief of OSMA, reviews the projects selected by the OCE and makes a recommendation to the Chief of Safety and Mission Assurance regarding which projects to fund.<sup>15</sup> If funding is not available to perform IV&V services on all identified projects, NASA guidance permits a project to receive a waiver from the IV&V requirement.

### Objective

The objective of this audit was to determine whether NASA was appropriately utilizing its IV&V funding. Details of the audit's scope and methodology are in Appendix A.

---

<sup>14</sup> The IPEP informs the originating project about IV&V interactions, roles and responsibilities, technical products, and reporting methods and reflects who will conduct the IV&V services and how they plan to evaluate the software.

<sup>15</sup> The IV&V Board of Advisors is a NASA-level board chaired by the Chief of OSMA comprised of advisors representing each Mission Directorate, the Chief Information Officer, the Chief Engineer, the Goddard Center Director, and the NASA IV&V Program Director.

## MORE EFFECTIVE USE OF IV&V FUNDING WOULD INCREASE PROGRAM PRODUCTIVITY

NASA is paying more than necessary in O&M expenses by continuing to occupy and maintain Building 1, which leaves the Agency with less funding to perform IV&V services on critical projects. We estimated that NASA could save as much as \$9.7 million between FYs 2015 and 2018 if the IV&V Program took steps to reduce O&M expenses associated with Building 1 – money that could be used to evaluate more Agency software.

### NASA Can Make More Funds Available for IV&V Services by Reducing its Facilities-Related Costs

Each year the NASA IV&V Board of Advisors identifies more software projects for IV&V services than the IV&V Program is able to fund. For example, for FY 2014 the Board identified 17 projects for IV&V, but the Program was only able to fund 13 (see Table 3).<sup>16</sup> As a result, the other projects were required to accept or find other ways to mitigate software-related risks.

**Table 3. Projects Funded and Not Funded for IV&V in FY 2014**

Funded	Not Funded
<ul style="list-style-type: none"> <li>• Mars Atmosphere and Volatile Evolution (MAVEN)</li> <li>• Magnetosphere Multi-Scale mission (MMS)</li> <li>• Global Precipitation Measurement (GPM)</li> <li>• James Webb Space Telescope (JWST)</li> <li>• International Space Station (ISS)</li> <li>• Multi-Purpose Crew Vehicle (MPCV)</li> <li>• Space Launch System (SLS)</li> <li>• Ground Systems Development and Operations (GSDO)</li> <li>• Transiting Exoplanet Survey Satellite (TESS)<sup>a</sup></li> <li>• Space Network Ground Segment Sustainment (SGSS)<sup>b</sup></li> <li>• Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer (OSIRIS-Rex)<sup>b</sup></li> <li>• Solar Probe Plus (SPP)<sup>b</sup></li> <li>• Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSIGHT)<sup>b</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Soil Moisture Active and Passive (SMAP)</li> <li>• Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2)</li> <li>• Gravity Recovery and Cloud Experiment-Follow On (GRACE-FO)</li> <li>• Tracking and Data Relay Satellite-L (TDRS-L)</li> </ul>

<sup>a</sup> The IV&V Board of Advisors funded further research on TESS to develop recommendation on the level of IV&V to be performed.

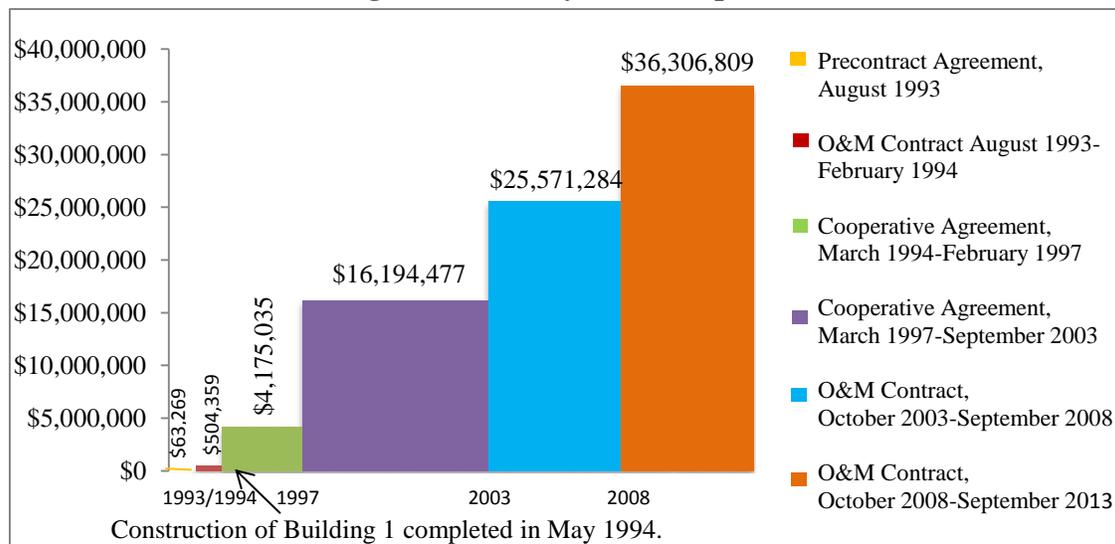
<sup>b</sup> Programs funded through an additional \$7.8 million allocation for IV&V services contained in NASA's FY 2014 appropriation.

Source: IV&V Board of Advisors, September 2013 meeting.

<sup>16</sup> The President's budget for 2014 provided \$31.3 million for IV&V services. This level of funding was sufficient to fund IV&V services for only 9 of the selected projects. NASA's FY 2014 appropriation allocated an additional \$7.8 million for IV&V services, thereby allowing the Agency to fund services for 4 additional projects—“Consolidation Appropriations Act, 2014.”

We looked for possible efficiencies to increase the level of IV&V services and found that the IV&V Program could free up additional funding if the Program followed the provisions of the original grant and stopped paying O&M expenses for Building 1. Over a 20-year period – July 1993 through September 2013 – NASA paid the Corporation \$82.8 million in O&M expenses by entering into a series of cooperative agreements and contracts (as shown in Figure 2).

**Figure 2. Facility O&M Expenses**



Source: NASA Office of Inspector General summary of cooperative agreement and contract data provided by IV&V Program officials.

We reviewed the O&M expenses for the most recently completed contract period (October 2008 through September 2013) and found that the IV&V Program spent approximately \$36.3 million. For example, although NASA does not own Building 1, the IV&V Program paid the Corporation \$993,000 to replace the building’s roof – \$848,000 for the roof and \$145,000 for a roof replacement consultant.<sup>17</sup>

In addition, we found that NASA’s O&M expenses increased because the Corporation applied indirect costs to purchases it makes for the Agency.<sup>18</sup> During the October 2008 through September 2013 contract period, the IV&V Program paid about \$2 million in indirect costs to the Corporation. We reviewed indirect costs charged to NASA between October 2012 and May 2013 and noted that the Corporation added these charges to a variety of items, such as cell phone services, activities in support of educational outreach, and information technology equipment and services. As shown in Table 4, we identified

<sup>17</sup> We also noted that the Corporation failed to provide a maintenance plan in accordance with the terms of the contract.

<sup>18</sup> Indirect costs are costs incurred for common or joint objectives that cannot be readily and specifically identified with a project or activity. Indirect costs are distributed to projects or activities by means of an indirect cost rate. The Corporation determined the indirect rate of 26 percent would be added to applicable O&M contract purchases.

six purchases that initially cost \$212,820, however, the inclusion of \$55,332 in indirect cost charges resulted in a total cost to the Agency of \$268,152.

**Table 4. Examples of IV&V Program Purchases with Indirect Costs Added by the Corporation**

Item Purchased	Item Cost	Indirect Cost	Total
U.S. cellular cell phone bill <sup>a</sup>	\$786	\$204	<b>\$990</b>
Honey Baked Ham – Students Day in the Park <sup>b</sup>	10,930	2,842	<b>\$13,772</b>
Speaker Day in the Park <sup>b</sup>	6,500	1,690	<b>\$8,910</b>
Dell KACE Renew	3,020	785	<b>\$3,805</b>
Dell Precision T7600 <sup>a</sup>	60,000	15,600	<b>\$75,600</b>
Direct labor (salaries and benefits) <sup>a</sup>	131,584	34,211	<b>\$165,795</b>
<b>Total</b>	<b>\$212,820</b>	<b>\$55,332</b>	<b>\$268,152</b>

<sup>a</sup> The item was purchased to support operations at Building 1 and 2.

<sup>b</sup> The item was purchased to support education-related activities.

Source: Data provided by IV&V Program officials.

We determined that upon completion of construction of Building 1, NASA was not legally obligated to pay the facility's O&M expenses, which should have been the responsibility of the Corporation as designated in the original grant. In our judgment, it does not make fiscal sense for NASA to continue to pay these expenses, particularly when it has more projects needing IV&V services than its current budget can accommodate.

### **NASA Should Reduce IV&V Occupancy Costs**

NASA has options to lower occupancy costs and increase the amount of funding available for IV&V services. Although Buildings 1 and 2 both provide office space for IV&V Program staff, NASA pays significantly more for the space in Building 1. For example, in FY 2013, NASA paid \$3.41 million in O&M expenses for Building 1 but only paid \$556,128 to lease 27,293 square feet in Building 2. Similarly, for FY 2014, projected O&M expenses for Building 1 are \$2.64 million compared to \$564,470 in rent for Building 2.<sup>19</sup>

We evaluated three possible alternatives to reduce the IV&V Program's O&M expenses:

1. Move IV&V personnel from Building 1 to Building 2.
2. Relocate West Virginia-based civil service staff to the Goddard Space Flight Center (Goddard).<sup>20</sup>
3. Negotiate with the Corporation to lower O&M expenses.

<sup>19</sup> In addition to these expenses, for FY 2014 the IV&V Program will pay \$3.77 million in O&M and other costs common to both buildings for items and services such as security, vehicles, and computers supplied through NASA's ACES contract. These expenses would remain if NASA moved staff out of Building 1.

<sup>20</sup> The NASA IV&V Program receives administrative support from Goddard Space Flight Center.

As shown in Table 5, each of these alternatives would generate significant savings compared to the current arrangement. See Appendix B for additional analysis on these potential cost savings.

**Table 5. IV&V Program Potential Savings**

Fiscal Year	Alternative 1 <sup>a</sup>	Alternative 2 <sup>b</sup>	Alternative 3 <sup>c</sup>
2015	(\$217,748)	(\$458,314)	\$675,953
2016	2,698,571	3,268,381	593,640
2017	2,747,407	3,329,583	607,624
2018	2,918,527	3,513,370	742,949
<b>Total</b>	<b>\$8,146,757</b>	<b>\$9,653,020</b>	<b>\$2,620,166</b>

<sup>a</sup> Alternative 1 – Savings for moving out of Building 1 and into Building 2.

<sup>b</sup> Alternative 2 – Savings for relocating civil servants to Goddard (locality pay not included in computation).

<sup>c</sup> Alternative 3 – Savings for negotiating lower costs for Building 1.

Source: Alternatives 1 and 2 are based on NASA Office of Inspector General assumptions and calculations, and Alternative 3 is based on calculations provided by IV&V Program officials.

In addition to these savings alternatives, NASA IV&V officials attempted to negotiate with the Corporation to lower O&M expenses, with possible savings for FYs 2014 through 2018 totaling \$2.62 million or 8.53 percent. However, during our audit, a WVU official stated they were not interested in negotiating to lower O&M expenses. The negotiations ended with no agreement reached between the IV&V Program and WVU. The IV&V Director noted that WVU was not concerned if the IV&V Program continued to occupy Building 1. According to a WVU official, the NASA IV&V Facility is a “zero sum gain” for the University, meaning that the Facility does not cost WVU any money nor does it provide any benefit to the University, therefore WVU is indifferent as to whether the IV&V Program continues to occupy the Building.

Should NASA officials conclude it is in the Agency’s best interest to abandon Building 1, the Agency will have to consider disposal options for the Building. Office of Management and Budget guidance identifies three possibilities for the disposition of property such as Building 1:<sup>21</sup>

1. NASA may seek compensation from the Corporation for the percentage of the current fair market value of the property attributable to the Agency’s participation in the project and permit the Corporation to retain title.
2. NASA may direct the Corporation to sell the property and pay the Agency for the percentage of the current fair market value of the property attributable to its participation in the project.

<sup>21</sup> Office of Management and Budget Circular A-110, “Uniform Administrative Requirements for Grants and Other Agreements with Institutions of Higher Education, Hospitals and Other Non-Profit Organizations,” revised November 19, 1993, as further amended September 30, 1999.

3. NASA may compensate the Corporation for the percentage of the current fair market value of the property attributable to the Corporation's participation in the project and direct the Corporation to transfer title to the property back to the Agency or an eligible third party.<sup>22</sup>.

## **Recommendations, Management's Response, and Evaluation of Management's Response**

In order to make additional funds available for IV&V services, we made two recommendations to NASA management.

**Recommendation 1.** The Chief of Safety and Mission Assurance and the Director of Goddard should analyze the alternatives for reducing occupancy costs associated with Building 1 and select the most cost-effective alternative.

**Management's Response.** Management concurred, stating that by December 31, 2014, they will analyze alternatives for reducing Building 1 occupancy costs and select a course of action that provides the best value for the Agency.

**Evaluation of Management's Response.** Management's comments are responsive; therefore, the recommendation is resolved and will be closed upon verification and completion of the proposed corrective action.

**Recommendation 2.** If the analysis determines NASA should abandon Building 1, the NASA Chief Counsel and the Goddard Center Director should identify the most feasible way to dispose of Building 1 to obtain the highest possible return for the Agency.

**Management's Response.** Management concurred, stating that if the analysis determines NASA should abandon the Building, the Goddard Center Director and the NASA property management team, in consultation with the NASA General Counsel, will identify the best way to dispose of it. Estimated date of completion is dependent upon the outcome of Recommendation 1.

**Evaluation of Management's Response.** Management's comments are responsive; therefore, the recommendation is resolved and will be closed upon verification and completion of the proposed corrective action.

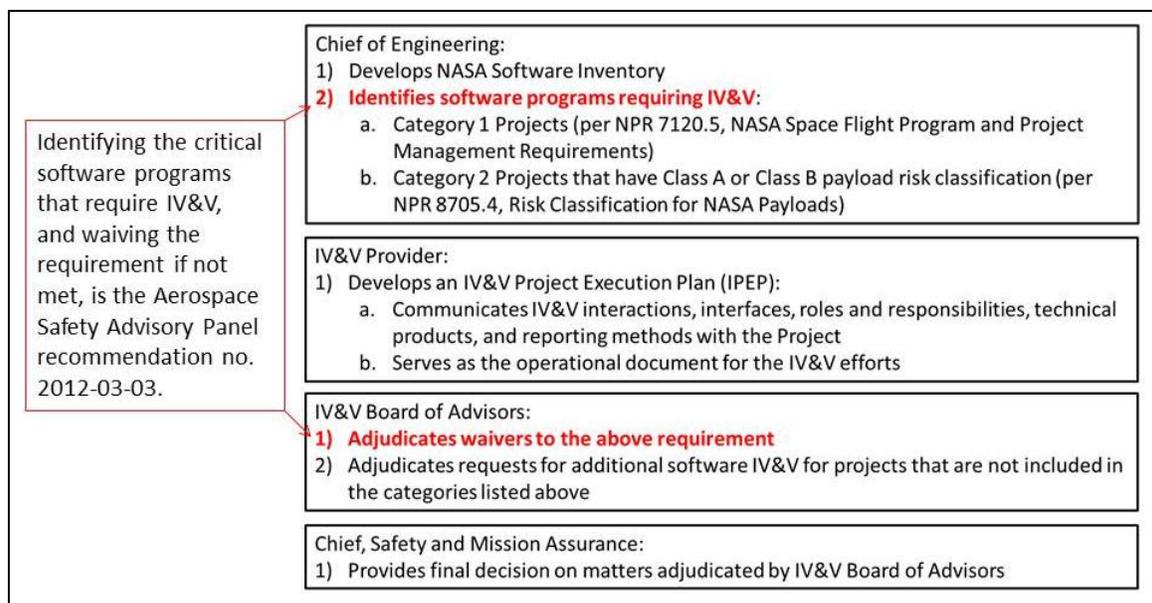
---

<sup>22</sup> The Assessor for Marion County, where the IV&V Facility is located, values Building 1 at \$7.2 million and the land on which it sits at \$717,000.

## OTHER MATTERS

We found that while NASA appropriately identifies projects requiring IV&V services, the Agency does not manage projects that need but do not receive these services in accordance with NASA’s risk management guidance. In its January 2013 “Annual Report for 2012” to Congress and NASA, the Aerospace Safety Advisory Panel (ASAP) recommended that NASA change the Agency’s IV&V selection process to define a level of criticality for software that would require IV&V services and institute a waiver process for software that do not receive these services.<sup>23</sup> ASAP stated that “if (IV&V) is not done then the reason for risk acceptance needs to be formally documented as it would be for any other known accepted risk.” In response, the OCE issued new guidance regarding the IV&V selection process, as shown in Figure 3.

**Figure 3. IV&V Project Identification and Selection Process**



Source: NASA Procedural Requirement 7150.2A, NID 7150-1, and ASAP’s “Annual Report for 2012.”

<sup>23</sup> ASAP is a NASA advisory committee composed of senior safety specialists from the military, industry, academia, and Government that reports to Congress and the Agency. Levels of software criticality at NASA range from one failure in the software causing the loss of life or loss of the spacecraft to multiple failures in the software merely causing some loss of data or inconvenience to the operator.

In our judgment, this guidance only partially addresses ASAP's recommendation because it does not explicitly address documenting the reason for risk acceptance, as required in NASA policy.<sup>24</sup> NASA needs to ensure that when projects do not meet the requirements for IV&V services the associated risks are managed in accordance with Agency risk management guidance.<sup>25</sup> This guidance states that when a decision is made to accept a risk, the risk manager shall ensure that acceptance is clearly documented in the project's risk database, including the assumptions and conditions on which the acceptance is based. It is important to document risks in this manner so that OSMA personnel, who plan and manage other software verification and validation activities across the Agency, have access to this information so that they can benefit from the software risk description and the documented rationale for accepting the risk.<sup>26</sup> In addition, other projects with similar software may benefit from knowing the actions taken to mitigate the risks.

For example, in 2009, software associated with a NASA tracking and data relay satellite (TDRS-K) was identified as a candidate for IV&V services; however, insufficient funding prevented the software from being evaluated, and no requirement existed for the project to note the lack of IV&V services in any risk database.<sup>27</sup> Although not required under NASA risk management guidance, TDRS-K project management decided to perform additional software verification and validation to increase their confidence that the software would perform as required. While this additional software verification and validation was technically independent from the organization that developed the software, it cannot be considered independent, as the testing was not managerially or financially independent. After launch, the flight software did not operate properly and allowed noise from a gyro to interfere with orbit operations, which in turn caused an issue with the satellite reaching proper orbit.<sup>28</sup> Ground controllers had to uplink a software change to fix the problem.

While there is no certainty that the IV&V Program would have found and corrected the software problem prior to launch, we confirmed that the Program listed "achieving orbit" as a high-risk software capability and could have performed IV&V on the software that controlled the gyro. The existence and details concerning this software issue are not recorded in the TDRS-K project's risk database and therefore not readily available to

---

<sup>24</sup> NASA Interim Directive (NID): NPR 7150.2A, NASA Software Engineering Requirements, with identification number "NID 7150-1" December 16, 2013.

<sup>25</sup> NPR 8000.4A "Agency Risk Management Procedural Requirements (Revalidated 1/29/14)," December 16, 2008.

<sup>26</sup> The project's software verification and validation is not considered independently verified and validated because it is not managerially, technically, and financially independent from the organization that developed the software.

<sup>27</sup> The TDRS project provides continuous communications services to NASA's low earth-orbiting missions.

<sup>28</sup> "Gyro" is commonly used as shorthand for "inertial reference unit." A gyro is used to determine "which way is up" when it is not feasible to use Earth's gravity or the direction of a star.

provide information for future decisions regarding the TDRS-K project or other projects that have similar software challenges. Further, if full documentation of this software's history was in a risk database, future projects implementing innovative gyro systems could use this information to make informed decisions related to IV&V services and risk management on their projects.

### **Recommendation**

**Recommendation 3.** To better assess risks associated with projects not selected for IV&V, we recommend the Chief of Safety and Mission Assurance ensure the IV&V waiver process includes a requirement to document the risk of not performing IV&V in accordance with NASA's risk management guidance.

**Management's Response.** Management concurred, stating that by June 30, 2015, they will ensure the IV&V waiver process includes a requirement to assess and document the risk of not performing IV&V in accordance with NASA's risk management requirements.

**Evaluation of Management's Response.** Management's comments are responsive; therefore, the recommendation is resolved and will be closed upon verification and completion of the proposed corrective action.



---

---

## SCOPE AND METHODOLOGY

---

### Scope and Methodology

We performed this audit from March 2013 through June 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We performed our fieldwork at the IV&V Facility in Fairmont, West Virginia; Goddard Space Flight Center; Johnson Space Center; and Marshall Space Flight Center. To assess NASA's utilization of IV&V funding and facilities, we analyzed data obtained from the OCE, OSMA, NASA Shared Services Center, and NASA IV&V Program officials. We interviewed key personnel from OCE at NASA Headquarters and Marshall Space Flight Center, the Chief of Safety and Mission Assurance, IV&V Program Director, IV&V support staff, select project managers, and Center software assurance engineers. We determined their roles and responsibilities as they relate to the process of providing IV&V services.

We obtained and reviewed the inventory of software maintained by the OCE to identify if other programs or projects could have been identified and included with the inventory and determined whether NASA followed the appropriate process for selecting programs and projects for IV&V. We also obtained and reviewed documentation related to the establishment of the IV&V Facility. In addition, we reviewed IV&V Program O&M expenses, indirect costs, and identified facility alternatives. In our review of the research grant and any associated documentation, we obtained legal counsel to identify legal issues. Our review identified ways in which more funds could be available for IV&V services.

**Federal Laws, Regulations, Policies, and Guidance.** We reviewed all applicable Federal, Agency, and Center level regulations and guidance, including the following:

- Code of Federal Regulations (CFR), Title 14, Aeronautics and Space, Chapter V, National Aeronautics and Space Administration, Part 1260, "Grants and Cooperative Agreements"
- "Department of Veteran Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1992" (Public Law 102-139, 105 Stat. 736), October 28, 1991

- Office of Management and Budget (OMB) Circular A-21, “Cost Principles for Educational Institutions,” revised May 10, 2004
- OMB Circular A-110, “Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations,” revised November 19, 1993, as further amended September 30, 1999
- OMB Circular A-122, Cost Principles for Non-profit Organizations, revised May 10, 2004

#### *NASA Policies and Procedures*

- NASA Procedural Requirement (NPR) 7120.5E, “NASA Space Flight Program and Project Management Requirements w/changes 1-10,” August 14, 2012
- NPR 7150.2A, “NASA Software Engineering Requirements,” November 19, 2009
- NPR 8000.4A “Agency Risk Management Procedural Requirements (Revalidated 1/29/14),” December 16, 2008
- NPR 8705.4, “Risk Classification for NASA Payloads (Revalidated w/change 2 dated June 12, 2013,” June 14, 2004
- NPR 8831.2E, “Facility Maintenance and Operations Management,” November 18, 2008
- NASA Policy Directive 7120.4D, “NASA Engineering and Program/Project Management Policy,” March 16, 2010
- NASA Policy Directive 8800.14D, “Policy for Real Estate Management (Revalidated, October 14, 2009),” July 15, 2004

“NASA Interim Directive (NID) 7150-1, NID for NPR 7150.2A, NASA Software Engineering Requirements,” December 16, 2013.

**Use of Computer-Processed Data.** We used computer-processed data to perform this audit. We obtained information from the Chief of Safety and Mission Assurance and NASA’s Chief Engineer that was a result of data manually entered into a spreadsheet to report NASA’s software inventory. This information was reviewed but not verified during the audit. We also obtained computer processed data from IV&V Program officials to support the special program totals identified in the NASA Form (NF) 533 M, “Monthly Contractor Financial Management Report,” for FYs 2009 through 2013. Because of our interest in IV&V special projects, we selected the four special project accounts identified in the NF 533 M for reconciliation. Differences were identified but eventually IV&V officials provided documentation that reconciled these differences.

## Review of Internal Controls

We reviewed IV&V management system documentation, NASA requirements and directives, and interviewed NASA officials with oversight responsibilities for the NASA policy requirements. In our review of NPR 8000.4A, “Agency Risk Management Procedural Requirements (Revalidated 1/29/14),” December 16, 2008, we found when NASA software projects are critical enough to need IV&V, but not receive IV&V, the identified risk is not completely managed in accordance with NASA’s risk management guidance. We determined that NASA risk managers, when deciding to accept a risk, shall ensure that each acceptance is clearly documented in their organizational unit’s risk database (list), including the assumptions and conditions (risk acceptability criterion) on which the acceptance is based. If a software project needs IV&V services but does not receive these services, NASA should ensure that the waiver process includes documenting the acceptance of the associated risk in the appropriate project’s risk database. (See Other Matters)

## Prior Coverage

Reports related to the origins of the IV&V Program and performance of IV&V services at NASA date back to 1986. The NASA Office of Inspector General has not issued any applicable audit reports during the last 5 years. Unrestricted reports can be accessed over the Internet at <http://oig.nasa.gov/audits/reports/FY13> (NASA Office of Inspector General).

### NASA Office of Inspector General

“Independent Verification and Validation of Software,” IG-03-011, March 28, 2003

“Audit of Software Assurance,” IG-00-59, September 28, 2000

### NASA Aerospace Safety Advisory Panel

“Annual Report for 2012,” January 9, 2013

“ASAP Recommendations, Third Quarter 2012,” August 8, 2012

### National Research Council

Committee on Shuttle Criticality, Review and Hazard Analysis Audit of the Aeronautics and Space Engineering Board with staff support from the Space Applications Board, Commission on Engineering and Technical Systems, “Post-Challenger Evaluation of Space Shuttle Risk Assessment and Management,” January 1988

### Presidential (Rogers) Commission

“Report of the Presidential Commission on the Space Shuttle Challenger Accident,” June 6, 1986

---

---

## FUNDS PUT TO BETTER USE, METHODOLOGY, AND PROJECTION OF RESULTS

---

We performed an analysis on the budgets for O&M and other expenses provided to us by IV&V officials to identify savings for two of the alternatives we identified:<sup>29</sup>

- *Alternative 1* would relocate the staff currently located in Building 1 to leased space in Building 2 and dispose of Building 1. For the additional space leased in Building 2, we identified and included build-out costs and information technology (IT) costs. These costs were calculated using the same methodology (costs per square foot) as the build-out costs the IV&V Program paid in FY 2010. These build-out costs are included in the FY 2015 cost estimates for Alternative 1.
- *Alternative 2* would relocate civil servant staff to Goddard where the IV&V Program is supported and dispose of Building 1. The NASA Shared Services Center (NSSC) calculated relocation cost estimates for 44 civil servant staff based on a family of four, a house hunting trip, movement of goods, 60 days storage, 60 days temporary quarters, real estate sale and purchase costs, miscellaneous expenses, and tax allowances. These relocation costs are included in the FY 2015 cost estimates for Alternative 2.

For our analysis, we confirmed with IV&V officials the expense categories and associated costs identified with Building 1, Building 2, or both buildings. Building 1 costs include facility insurance, electric, fire protection fee, garbage, natural gas, water, Crothal (O&M contractor), NASA special projects, capital replacement special projects, and facility and administration. Building 2 costs include the lease (all costs identified in Building 1 are included in the lease for Building 2) and any costs for office build-out and IT build-out when space was originally leased. Both buildings costs include General Service Administration vehicles; Agency Consolidated End-User Services (ACES); Task Order Management System; Goddard Protective Services; direct labor costs and overhead costs at 27 percent; library supplies; phone service; postage and shipping; Adnet labor; Adnet hardware, software, and IT security; Adnet maintenance; Adnet professional services and training; and office supplies. We also confirmed the costs that would be eliminated if Building 1 was vacated and disposed of (all special projects and facility and administration). See Table 6 for the alternatives and potential savings identified during our analysis.

---

<sup>29</sup> O&M expenses include 19 categories: direct labor and overhead at 27 percent; facility insurance; library supplies; phone service; postage and shipping; electric; fire protection fee; garbage; natural gas; water; O&M contractor; Adnet labor; Adnet hardware, software, information technology security; Adnet maintenance; Adnet professional services and training; office supplies; NASA special projects; capital replacement special projects; and facility and administration. Other expenses include General Service Administration vehicles, ACES, Task Order Management System, Goddard Protective Services, and Building 2 lease.

**Table 6. IV&V Program O&M and Other Expenses and the Potential Savings for the Identified Alternatives**

Fiscal Year	O&M and Other Expenses				Alternative 1		Alternative 2	
	Building 1	Building 2	Both Buildings 1 and 2	Total	Costs of adding space in Building 2 for civil servants and eliminating Building 1	Savings	Costs of relocating civil servants to Goddard and eliminating Building 1	Savings
2015	\$2.98M	\$.57 M	\$3.90M	\$7.45M	\$7.67M	\$(.22M)	\$7.91M	\$(.46M)
2016	2.93M	.58M	4.00M	\$7.51M	4.81M	2.70M	4.24M	3.27M
2017	2.98M	.59M	4.21M	\$7.78M	5.03M	2.75M	4.45M	3.33M
2018	3.15M	.60M	4.22M	\$7.97M	5.06M	2.91M	4.46M	3.51M
<b>Total</b>	<b>\$12.04M</b>	<b>\$2.34M</b>	<b>\$16.33M</b>	<b>\$30.71M</b>	<b>\$22.57M</b>	<b>\$8.14M</b>	<b>\$21.06M</b>	<b>\$9.65M</b>
Savings over 4 years						26.52%		31.42%

**Legend**

M = dollars in millions  
K = dollars in thousands

- Included \$1,084,014.22 office build-out and \$1,880,688.36 IT build-out (\$2,964,702.58)
- Included charges for relocating 44 civil servants (44 x \$85,522.84 = \$3,763,004.96)
- Savings

Source: Data provided by NASA IV&V Program official and NASA Office of Inspector General analysis.

For costs associated with both buildings, we made assumptions for the two alternatives. Using a conservative approach, we identified most costs (General Service Administration vehicles; ACES; Task Order Management System; library supplies; phone service; postage and shipping; Adnet labor; Adnet hardware, software, and IT security; Adnet maintenance; Adnet professional services and training; and office supplies) would continue under both alternatives, either being paid by the IV&V Program or Goddard, and no reductions were identified.

The remaining expenses increased, reduced, or eliminated as follows:

- Goddard Protective Services would still be required but would decrease because of the reduced entry points by 25 percent under Alternative 1 and 50 percent under Alternative 2.
- The O&M contractor would still be required for both Alternative 1 and Alternative 2 but would decrease by about 67 percent.
- Direct labor and overhead costs for a site support contractor would still be required for both Alternatives 1 and 2 but would decrease by about 67 percent for each.

- The Building 2 lease costs would increase for Alternative 1 because of the additional leased space but would remain the same for Alternative 2.
- Facility insurance, electric, fire protection fee, garbage, natural gas, and water are included with the Building 2 lease costs and would be eliminated for both Alternatives 1 and 2.
- Special projects (NASA and Capital Replacement) and indirect costs are associated only with Building 1 and would be discontinued for both Alternatives 1 and 2.

IV&V support personnel believe that for Alternative 1 more leased space in Building 2 is required than what we propose. IV&V officials identified 14,793 square feet of space available in Building 2 and said that 210 square feet is required per person. As of May 2014, the staffing for both buildings was 190. IV&V requirements identified that the available space under Alternative 1 would accommodate 200 staff members. For current staffing, the proposed space appears more than adequate.

In addition to the above expenses, for Alternative 2 there could be additional labor expenses depending on the location to which civil servants are assigned. If the civil servants are relocated to Goddard, the increase in labor could be as much as \$2.3 million for FYs 2015 through 2018. This was calculated using Office of Personnel Management 2014 pay tables for Goddard locality and the rest of the United States (Fairmont, West Virginia). Salaries for Goddard are 8.81 percent higher and the civil servant labor identified for FYs 2015 through 2018 was \$26.3 million, thus \$26.3 million times 8.81 percent is equal to \$2,317,030.

With this information we then calculated the costs for FYs 2015 through 2018 and then calculated the associated dollar savings (funds put to better use) and the savings percentages calculated if the IV&V Facility continued to operate as proposed.<sup>30</sup>

---

<sup>30</sup> We did not calculate the costs for FY 2014 because IV&V Program officials would need time to initiate the alternatives.

---

---

## MANAGEMENT COMMENTS

---

National Aeronautics and Space Administration  
Headquarters  
Washington, DC 20546-0001



JUL 10 2014

Reply to Attn of: Office of Safety and Mission Assurance

TO: Assistant Inspector General for Audits  
FROM: Chief, Safety and Mission Assurance  
SUBJECT: Response to OIG Draft Report, "NASA's Independent Verification and Validation Program" (A-13-008-00)

The Office of Safety and Mission Assurance (OSMA) appreciates the opportunity to review your draft report entitled "NASA's Independent Verification and Validation Program" (A-13-008-00), dated June 18, 2014.

In the report the Office of Inspector General (OIG) makes three recommendations relating to Independent Verification and Validation (IV&V) fund availability and risk assessments associated with projects not selected for IV&V. NASA's response to the recommendations outlined in the report, including planned corrective actions, follows:

**Recommendation 1:** In order to make additional funds available for IV&V services, the Chief of Safety and Mission Assurance and the Director, Goddard Space Flight Center should analyze alternatives for reducing occupancy costs associated with Building 1 and select the most cost-effective alternative.

**Management's Response:** NASA concurs with Recommendation 1. NASA will analyze alternatives for reducing Building 1 occupancy cost and will select a course of action that provides the best value for the Agency. The estimated completion date is December 31, 2014.

**Recommendation 2:** If the analysis determines that NASA should abandon Building 1, the NASA General Counsel and the Goddard Director should identify the most feasible way to dispose of Building 1 to obtain the highest possible return for the Agency.

**Management's Response:** NASA concurs with Recommendation 2. If the analysis determines that NASA should abandon Building 1, the Goddard Center Director and the NASA property management team, in consultation with the NASA General Counsel, will identify the best way to dispose of Building 1. Estimated completion is dependent upon the outcome of Recommendation 1.

2

**Recommendation 3:** To better assess risks associated with projects not selected for IV&V, the Chief of Safety and Mission Assurance should ensure that the IV&V waiver process includes a requirement to document the risk of not performing IV&V in accordance with NASA's risk management guidance.

**Management's Response:** NASA concurs with Recommendation 3. NASA will ensure the IV&V waiver process includes a requirement for a project to assess and document the risk of not performing IV&V in accordance with NASA's risk management requirements. The estimated completion date is June 30, 2015.

We have reviewed the draft report for information that we believe should not be publicly released. Technical corrections to the report have been provided separately to the OIG.

Again, thank you for the opportunity to review and comment on the subject draft report. If you have any questions or require additional information regarding this response, please contact Paul Mexcur at (202) 358-5265.



Terrence W. Wilcutt

cc:  
Chief Engineer/Mr. Roe  
Goddard Space Flight Center/Mr. Scolese  
IV&V Program Office/Mr. Blaney  
General Counsel/Ms. Thompson-King

---

---

## REPORT DISTRIBUTION

---

### **National Aeronautics and Space Administration**

Administrator  
Deputy Administrator  
Chief of Staff  
Goddard Space Flight Center Director  
Chief of Safety and Mission Assurance  
NASA Independent Verification & Validation Program Office Director  
NASA Chief Engineer

### **Non-NASA Organizations and Individuals**

Office of Management and Budget  
Deputy Associate Director, Energy and Science Division  
Branch Chief, Science and Space Programs Branch  
Government Accountability Office  
Director, Office of Acquisition and Sourcing Management

### **Congressional Committees and Subcommittees, Chairman and Ranking Member**

Senate Committee on Appropriations  
Subcommittee on Commerce, Justice, Science, and Related Agencies  
Senate Committee on Commerce, Science, and Transportation  
Subcommittee on Science and Space  
Senate Committee on Homeland Security and Governmental Affairs  
House Committee on Appropriations  
Subcommittee on Commerce, Justice, Science, and Related Agencies  
House Committee on Oversight and Government Reform  
Subcommittee on Government Operations  
House Committee on Science, Space, and Technology  
Subcommittee on Oversight  
Subcommittee on Space



Major Contributors to the Report:

Wen Song, Director, Information Technology Directorate

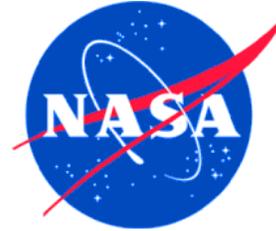
Cedric D. Campbell, Esq. Associate Counsel to the Inspector General

Vincent Small, Project Manager

Mike Beims, Audit Lead

Bessie Cox, Auditor

Bret Skalsky, Auditor



OFFICE OF AUDITS

OFFICE OF INSPECTOR GENERAL

ADDITIONAL COPIES

Visit <http://oig.nasa.gov/audits/reports/FY14/> to obtain additional copies of this report, or contact the Assistant Inspector General for Audits at 202-358-1232.

COMMENTS ON THIS REPORT

In order to help us improve the quality of our products, if you wish to comment on the quality or usefulness of this report, please send your comments to Mr. Laurence Hawkins, Audit Operations and Quality Assurance Director, at [Laurence.B.Hawkins@nasa.gov](mailto:Laurence.B.Hawkins@nasa.gov) or call 202-358-1543.

SUGGESTIONS FOR FUTURE AUDITS

To suggest ideas for or to request future audits, contact the Assistant Inspector General for Audits. Ideas and requests can also be mailed to:

Assistant Inspector General for Audits  
NASA Headquarters  
Washington, DC 20546-0001

NASA HOTLINE

To report fraud, waste, abuse, or mismanagement, contact the NASA OIG Hotline at 800-424-9183 or 800-535-8134 (TDD). You may also write to the NASA Inspector General, P.O. Box 23089, L'Enfant Plaza Station, Washington, DC 20026, or use <http://oig.nasa.gov/hotline.html#form>. The identity of each writer and caller can be kept confidential, upon request, to the extent permitted by law.