GO-96-003

AUDIT REPORT

WALLOPS FLIGHT FACILITY SOUNDING ROCKET PROGRAM

GODDARD SPACE FLIGHT CENTER

JULY 17, 1996

National Aeronautics and Space Administration

OFFICE OF INSPECTOR GENERAL

National Aeronautics and
Space Administration

Headquarters
Washington, DC 20546-0001

JUL 17 1996

Reply to Attn of: W

TO: 100/Center Director, GSFC

FROM: W/Assistant Inspector General for Auditing

SUBJECT: NASA Sounding Rocket Program
Assignment No. A-GO-95-005
Report No. GO-96-003

The NASA Office of Inspector General has completed an audit of the NASA Sounding Rocket Program. The overall objective of the audit was to determine whether the Sounding Rocket Program is managed effectively. Specific objectives were to determine whether:

- Controls over the acquisition/development, approval of launches, and safety, reliability and reusability of rockets are effective.

- Controls over launches performed on a reimbursable basis for other government agencies, foreign governments, or commercial customers are effective.

The NASA Sounding Rocket Program has generally been effective with an overall launch success rate of 97 percent since 1981. In addition, management controls over the approval of launches, safety and reliability were adequate. Audit work in the areas of rocket reusability and reimbursable agreements was not performed due to a lack of program activities.

The audit did show that opportunities exist to more efficiently manage the program. Specifically, we identified the following three conditions requiring management's attention:

- Acceptance process for Black Brant rocket motors takes longer than necessary.

- Excess rocket motors are in inventory.
- Dollar value of rocket motor inventory is understated.

In addition, several miscellaneous observations were made during the audit. These observations are presented in the Other Matters section of the report for management's information and disposition.

Five recommendations are made to GSFC management which, if implemented, will help ensure that Sounding Rocket Program operations are conducted more efficiently.

A draft report was issued on May 29, 1996, requesting written comments. The Center's official response was received on June 28, 1996. The Center's response is included after each recommendation and is presented in its entirety as Attachment I to the report. The response indicates that management has planned or taken corrective actions that are generally considered responsive to the intent of the report's recommendations. We, therefore, consider recommendation 4 to be closed for reporting purposes. With respect to recommendations 1, 2, 3 and 5, please notify our office when they are considered closed.

If you have any questions, please contact Kevin Carson, Audit Field Office Manager, at 301-286-5561; Robert Wesolowski, Director, Audit Division-A or me at 202-358-1232.

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Enclosure

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EXECUTIVE SUMMARY

INTRODUCTION

The NASA Office of Inspector General has completed an audit of the NASA Sounding Rocket Program. Sounding rockets are solid fuel rocket motors, carry scientific instruments averaging 700 pounds, and are uniquely suited for performing low altitude measurements (between balloon and spacecraft altitude) and for measuring vertical variations of many atmospheric parameters. The Sounding Rocket Program conducts about 30 launches per year with an annual budget of approximately $38 million, including approximately $2 million for Spartan Program launch operations and $6 million for science payloads and research performed under program grants.

OBJECTIVES

The overall objective of the audit was to determine whether the Sounding Rocket Program is managed effectively. Specific objectives were to determine whether:

- Controls over the acquisition/development, approval of launches, and safety, reliability and reusability of rockets are effective.

- Controls over launches performed on a reimbursable basis for other government agencies, foreign governments, or commercial customers are effective.

RESULTS OF AUDIT

The NASA Sounding Rocket Program has generally been effective with an overall launch success rate of 97 percent since 1981. In addition, management controls over the approval of launches, safety and reliability were adequate. Audit work in the areas of rocket reusability and reimbursable agreements was not performed due to a lack of program activities.

The audit did show that opportunities exist to more efficiently manage the program. Specifically, we identified the following three conditions requiring management's attention:

- Acceptance process for Black Brant rocket motors takes longer than necessary.
- Excess rocket motors are in inventory.
- Dollar value of rocket motor inventory is understated.

In addition, several miscellaneous observations were made during the audit. These observations are presented in the Other Matters section of the report for management's information and disposition.

Management actions to address these conditions will help ensure that Sounding Rocket Program operations are conducted more efficiently.

1. ACCEPTANCE PROCESS FOR BLACK BRANT ROCKET MOTORS TAKES LONGER THAN NECESSARY. The acceptance process for Black Brant rocket motors takes longer than necessary. Office of Management and Budget (OMB) Circular A-123, "Management Accountability and Control," states that managers are responsible for ensuring timely program performance and controlling costs. Delays in the current acceptance process are caused by (1) rocket motor inspections being performed on a spare time basis by the Naval Weapons Station (NWS), (2) the practice of taking more rocket motor x-rays than necessary, (3) performing duplicate reading of the x-rays, and (4) inspections by sources other than the NWS were not considered. These delays have resulted in:

- Increased reliance on long range requirements projections subjecting the program to greater risk of over or under buying of rocket motors.
- Increased risk that full contract quantities may not be received to support science launches. The manufacturer's replacement responsibility is limited to one year after the contract completion date.
- Increased costs. (page 9)

2. EXCESS ROCKET MOTORS ARE IN INVENTORY. The Sounding Rocket Projects Branch maintains 173 excess rocket motors in inventory. This condition exists because (1) program stocks were not correlated with program requirements, (2) action wasn't taken to dispose of identified excess rocket motors, and (3) disposal costs would have to be incurred. Maintaining an excessive inventory of rocket motors increases warehousing costs, unnecessarily increases the WFF explosives hazard, and consumes facilities that could be put to better use. (page 19)

3. DOLLAR VALUE OF ROCKET MOTOR INVENTORY IS UNDERSTATED. Rocket motors obtained by the WFF's Sounding Rocket Projects Branch from the Department of Defense (DoD) have not been properly valued and recorded in NASA's inventory records. The improper valuation and recording resulted from the WFF's Launch Vehicles Branch (responsible for receipt and recording of all rocket motors) not obtaining all applicable cost information from the DoD when the rocket motors were acquired. As a result, the dollar value of the rocket motor inventory is understated. Further, the dollar value of the inventory recorded in NASA's financial records is also understated. (page 25)

4. OTHER MATTERS. This report contains additional miscellaneous observations made during the audit. These observations are presented for management's information and disposition. (page 29)

RECOMMENDATIONS

We recommend:

1. The Sounding Rocket Projects Branch should take action to streamline the Black Brant sounding rocket motor acceptance process, to improve efficiency, reduce delay and reduce costs.

2. The Sounding Rocket Projects Branch should review the justification for performing Black Brant rocket motor inspections at the Naval Weapons Station, and pursue other potential sources.

3. The Sounding Rocket Projects Branch should take immediate action to dispose of the Arcas, Super Arcas, Aries, Honest John, Malemute, and Ute rocket motors in inventory that are excessive to known requirements.

4. The Sounding Rocket Projects Branch should examine the need for retention of the Taurus rocket motors and excess those not necessary to support future requirements.

5. The Launch Vehicles Branch should adjust the value of the identified rocket motors on the inventory records, and ensure that actual cost information is obtained and recorded if any rocket motors are acquired in the future.

INTRODUCTION

The NASA Office of Inspector General has completed an audit of the NASA Sounding Rocket Program. The Sounding Rocket Program is managed by the Goddard Space Flight Center's (GSFC) Suborbital Projects and Operations Directorate, located at the Wallops Flight Facility (WFF), Wallops Island, Virginia. Sounding Rocket Program policy, general oversight and budgeting are the responsibility of the NASA Headquarters (NHQ) Office of Space Science, Space Physics Division, Flight Programs Branch.

Sounding rockets are solid fuel rocket motors which carry scientific instruments averaging 700 pounds. These motors can be used individually or stacked up to four stages. The rockets range in length from six to 60 feet and fly near vertical trajectories to altitudes between 30 and 1050 miles. Sounding rockets are uniquely suited for performing low altitude measurements (between balloon and spacecraft altitude) and for measuring vertical variations of many atmospheric parameters.

The Sounding Rocket Program conducts about 30 launches per year from the White Sands Missile Range (WSMR), New Mexico, Poker Flats Research Range (PFRR), Alaska, the WFF, and various foreign countries. The cost of the Sounding Rocket Program launch operations is approximately $30 million per year. The total Sounding Rocket Program budget is approximately $38 million per year, including approximately $2 million for Spartan Program launch operations and $6 million for science payloads and research performed under program grants. The Spartan Program and science grants are managed by the NHQ Office of Space Science, Flight Programs Branch.

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OBJECTIVES, SCOPE, AND METHODOLOGY

OBJECTIVES

The overall objective of the audit was to determine whether the Sounding Rocket Program is managed effectively. Specific objectives were to determine whether:

- Controls over the acquisition/development, approval of launches, and safety, reliability and reusability of rockets are effective.
- Controls over launches performed on a reimbursable basis for other government agencies, foreign governments, or commercial customers are effective.

SCOPE AND METHODOLOGY

Interviews and discussions were conducted with personnel in the WFF's Projects Division, the Launch Vehicles Branch, and the Wallops Procurement Branch of GSFC's Institutional Procurement Division. Discussions were also conducted with personnel in the Flight Programs Branch of the NHQ Office of Space Science, and with representatives of the Canadian Commercial Corporation/Bristol Aerospace Limited, Canada. In addition to witnessing a launch readiness review, rehearsal, and launch, we made visits to the:

- WFF rocket storage, assembly and launch facilities.
- WFF flight hardware storage and integration facilities.
- WSMR rocket storage, assembly and launch facilities.
- Naval Weapons Station, Yorktown, Virginia, rocket X-ray Laboratory.

The following documents were also reviewed as part of the audit:

- Launch approval documents
- Acquisition and inventory records
- Prior, current, and future launch schedules
- Launch success/safety records
- Budget and accounting records

- Rocket motor inspection records

The audit did not examine science payload development and research performed under program grants or Spartan Program operations for which funds of approximately $8 million are included in the Sounding Rockets line in NASA's budget. The audit was specifically limited to the Sounding Rocket Program.

MANAGEMENT CONTROLS REVIEWED

The following significant management controls were identified and tested for effectiveness:

- Approval process for sounding rocket launches
- Rocket acquisition and inventory controls
- Federal Acquisition Regulation (FAR) and NASA FAR Supplement
- NASA Budget Administration Manual
- NASA's Fiscal Year (FY) 1995 budget submission to the Office of Management and Budget
- The general management control environment

Several management control weaknesses were identified and are described in detail in the Observations and Recommendations section of this report.

AUDIT FIELD WORK

Audit field work was conducted from March 1995 through January 1996. The audit was performed in accordance with generally accepted government auditing standards. During the audit, we identified conditions related to the acquisition, inventory, and storage of rocket motors that warranted GSFC management's immediate attention. As a result, we issued a Rapid Action Audit Report (RAR) (No. GO-95-007, dated August 30, 1995) which addressed our concerns. A RAR is issued when the significance or nature of an observation warrants immediate reporting to management for prompt corrective action during the audit. This RAR is presented as Attachment II to this report.

OBSERVATIONS AND RECOMMENDATIONS

OVERALL EVALUATION

The NASA Sounding Rocket Program has generally been effective with an overall launch success rate of 97 percent since 1981. In addition, management controls over the approval of launches, safety and reliability were adequate. Audit work in the areas of rocket reusability and reimbursable agreements was not performed due to a lack of program activities.

The audit did show that opportunities exist to more efficiently manage the program. Specifically, we identified the following three conditions requiring management's attention:

- Acceptance process for Black Brant rocket motors takes longer than necessary.
- Excess rocket motors are in inventory.
- Dollar value of rocket motor inventory is understated.

In addition, several miscellaneous observations were made during the audit. These observations are presented in the Other Matters section of the report for management's information and disposition.

Management actions to address these conditions will help ensure that Sounding Rocket Program operations are conducted more efficiently. The results of our review are presented in the following sections.

1. ACCEPTANCE PROCESS FOR BLACK BRANT ROCKET MOTORS TAKES LONGER THAN NECESSARY

The acceptance process for Black Brant rocket motors takes longer than necessary. Office of Management and Budget (OMB) Circular A-123, "Management Accountability and Control," states that managers are responsible for ensuring timely program performance and controlling costs. Delays in the current acceptance process are caused by (1) rocket motor inspections being performed on a spare time basis by the Naval Weapons Station (NWS), (2) the practice of taking more rocket motor x-rays than necessary, (3) performing duplicate reading of the x-rays, and (4) inspections by sources other than the NWS were not considered. These delays have resulted in:

- Increased reliance on long range requirements projections subjecting the program to greater risk of over or under buying of rocket motors.

- Increased risk that full contract quantities may not be received to support science launches. The manufacturer's replacement responsibility is limited to one year after the contract completion date.

- Increased costs.

OMB Circular A-123 states that Federal employees must ensure that government resources are used efficiently and effectively to achieve intended program results. The circular incorporates the Government Performance and Results Act requirement for Management Accountability. The concept of management accountability provides that managers are responsible for ensuring timely program performance and controlling costs. The circular further provides that implementation should be consistent with recommendations made by the National Performance Review. The National Performance Review calls for NASA to reinvent and streamline program operations to achieve results faster, better and at less cost.

ROCKET MOTOR ACCEPTANCE TIME AVERAGED OVER TWO YEARS

The current acceptance process for a Black Brant rocket motor includes (1) shipment by the manufacturer (Canadian Commercial Corporation/Bristol Aerospace Limited, Canada) to the inspection facility at the NWS, Yorktown, Virginia, (2) x-raying the rocket motor at the NWS, (3) manufacturer and NASA personnel reviewing the x-rays, (4) the NASA Technical Officer making an acceptance determination, and (5) shipment to NASA. Ideally, the acceptance process should take six weeks or less. However, as shown in the following chart, the acceptance process for the last nine Black Brant rocket motors took anywhere from 27 to 34 months, with an average time of 29 months.

ROCKET MOTORS ACCEPTED

Rocket Motor	Received by NWS	Final Acceptance	Total Time (Months)
#391	11/27/92	02/22/95	27
#483	12/24/92	07/11/95	30
#507	12/24/92	03/24/95	27
#368	12/24/92	04/19/95	28
#509	12/24/92	08/09/95	31
#260	12/24/92	11/05/95	34
#521	03/26/93	07/17/95	28
#520	03/26/93	08/29/95	29
#441	03/26/93	09/06/95	29
Average Acceptance Time			29

ACCEPTANCE TREND CONTINUES WITH MOTORS IN PROCESS

The trend of approximately two years for rocket motor acceptance appears to be continuing with the rocket motors currently in process. The chart below shows the status and processing time of 11 Black Brant rocket motors still in the acceptance process as of August 1995.

ROCKET MOTORS IN PROCESS

Rocket Motor	Date Delivered	Months In Process	Status
#431D	11/93	21	X-rays awaiting review
#432D	11/93	21	Awaiting x-ray
#437D	11/93	21	Awaiting x-ray
#492	11/93	21	Awaiting x-ray
#494	11/93	21	Awaiting x-ray
#495	11/93	21	Awaiting x-ray
#524	09/93	23	X-rays awaiting review
#526	09/93	23	X-rays awaiting review
#528	09/93	23	X-rays awaiting review
#531	09/93	23	X-rays awaiting review
#533	09/93	23	X-rays awaiting review

As shown in the chart, the 11 rocket motors have been awaiting acceptance for almost two years. These delays in the acceptance process are primarily caused by (1) inspections being performed by the NWS on a spare time basis, (2) the practice of taking more rocket motor x-rays than necessary, (3) performing duplicate reading of the x-rays, and (4) inspections by sources other than the NWS were not considered. Each of these causes is discussed in detail in the following paragraphs.

1. INSPECTIONS PERFORMED BY NWS ON A SPARE TIME AVAILABLE BASIS - Delays are occurring because rocket motor inspections for NASA are being performed on a spare time available basis by the NWS. The NWS's primary responsibility is to inspect Department of Defense (DoD) rocket motors. As a result, NASA's sounding rocket motors wait an average of 29 months to be inspected by the NWS. Further, we were informed that the NWS does not anticipate any change in the inspection time for NASA rocket motors.

2. DELAYS CAUSED BY TAKING EXTRA X-RAYS - Delays are also caused by taking extra x-rays. Specifically, the Sounding Rocket Program has instructed the NWS to take 217 x-ray images of each Black Brant rocket motor. The manufacturer of the Black Brant believes that 164 x-ray images are sufficient to determine the quality of a rocket motor. The requirement for 217 images was established by the former NASA Technical Officer for the Black Brant contract in earlier years, when manufacturing deficiencies were found. The manufacturing process has since been improved, with no defective rocket motors identified in the last three years.

3. PERFORMING DUPLICATE READINGS OF X-RAYS ALSO RESULTS IN DELAYS - The Sounding Rocket Program is also having duplicate x-ray readings performed. The NWS reads the x-ray images during the x-raying process and prepares a rocket motor inspection results report. A copy of the x-ray images and the inspection results report are forwarded to both the manufacturer and to the WFF Sounding Rocket Program Office. The manufacturer examines the images and provides the NASA Technical Officer with a recommendation on the acceptability of each rocket motor.

Concurrently, a WFF aerospace engineering specialist, whose primary job responsibility is to perform launch vehicle engineering support, re-reads every x-ray image taken by the NWS. This requirement was also established by the former Technical Officer, based upon a personal belief that duplicate readings were necessary. The WFF aerospace engineering specialist also provides the Technical Officer with a recommendation on acceptability. Because the WFF aerospace engineering specialist's reading is generally performed on a spare-time available basis, reading takes anywhere from six to eight months. The delay is likely to increase as a result of recent staff downsizing and budget reductions at the WFF, reducing the spare time available.

4. INSPECTIONS BY SOURCES OTHER THAN THE NWS WERE NOT CONSIDERED - Acceptance delays also resulted because alternative sources to the NWS for inspections were not considered. The NWS performs x-ray inspections of the Sounding Rocket Program's rocket motors under a cost-reimbursement purchase order. The original purchase order was for a one year service period that ended December 31, 1984. The Determinations and Findings document supporting acquisition from the NWS stated that the services "can only be obtained from the cited source." The purchase order has been extended annually, without determining whether the justification for obtaining the services from the NWS was still valid.

While the Determinations and Findings document supporting the acquisition from the NWS was valid in 1984, other sources, both governmental and commercial, now exist. For example, a commercial vendor advised us that they could x-ray a rocket motor of the Black Brant's dimensions in one day with two eight hour successive shifts of three personnel, or in two days of single eight hour shifts (Using the current facilities at the NWS, x-raying one rocket motor takes three personnel approximately one week). Current operations would allow this vendor to accommodate the Sounding Rocket Program's needs. We identified that the Department of the Navy could also perform the x-raying at the White Sands Missile Range (WSMR), White Sands, New Mexico. WSMR is where most Black Brant launches are currently conducted. The Black Brant manufacturer also indicated that if NASA requested, they would look at the potential for acquiring the capability for x-raying the motors at the factory.

CURRENT ACCEPTANCE PROCESS HAS IMPACTED PROGRAM RISK AND COSTS

The current Black Brant rocket motor acceptance process and associated delays have impacted the program in three areas. Specifically, delays in the acceptance process have resulted in (1) increased reliance on long range requirements projections, (2) increased risk that full contract quantities may not be received, and (3) increased costs. These impacts are described in the following sections.

1. Increased reliance on long range requirements projections have subjected the program to a greater risk of either over or under-buying of rocket motors. If over-buying occurs, program funds are invested in inventory prematurely with less certainty that they will ever be needed. For example, each rocket motor costs approximately $137,000 which must be paid within six months of delivery to the

NWS. The manufacturer is paid even though the rocket motor may not be accepted for use or rejected for another two years. Conversely, under-buying could result in rocket motors not being available to support scientific missions when needed.

2. Delays in the current acceptance process may also increase the risk that full contract quantities may not be received to support science launches. The manufacturer's replacement responsibility is limited to within one year after the contract completion date. If launch plans include the use of a delivered rocket motor that is subsequently rejected one year or more after contract completion, the manufacturer does not have to provide a replacement. This situation could delay a launch which could impact NASA's science mission.

3. The current acceptance process has also contributed to increased costs. Taking extra x-ray images, performing duplicate readings of those x-rays, and performing x-rays on a spare time basis also increases costs to NASA. For example, the NWS acknowledged that a reduction in the number of x-rays taken would reduce x-raying time and the cost charged to NASA. The NWS currently charges NASA $9,240 to inspect a rocket motor, and expects a price increase in 1996.

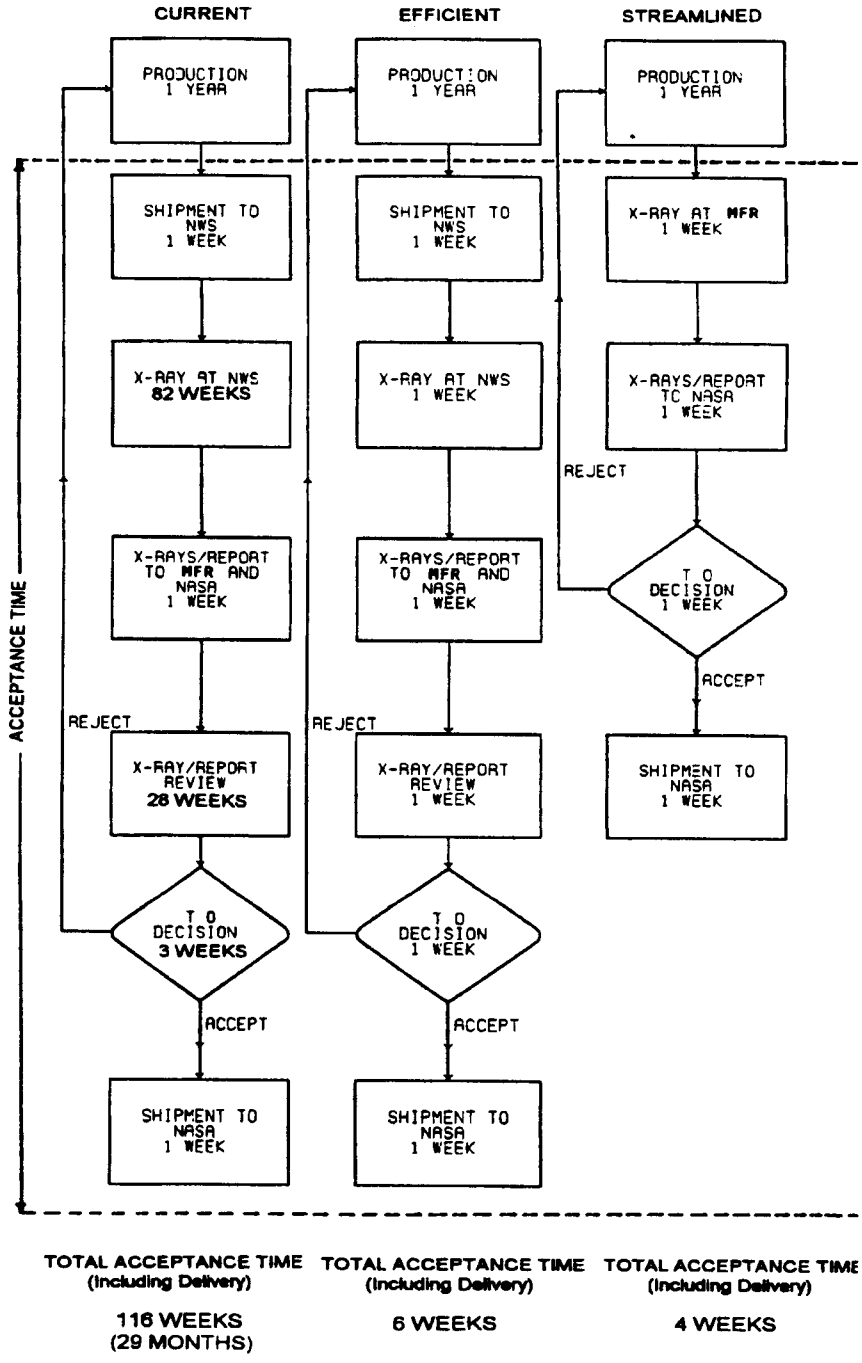
Duplicate x-ray readings by WFF personnel further delays acceptance about six to eight months, consumes the time of an aerospace engineering specialist, and costs the government an estimated $7,000 per year.

The NWS's inspection on a spare time basis results in an average wait of almost two years for inspection. Once started, an inspection takes approximately a week per rocket motor. A commercial source informed us that they can x-ray a motor in one to two days. The Department of the Navy informed us that they could perform the inspections for $2,400 per rocket motor. This could save about $6,840 per rocket motor and potentially reduce inspection costs by approximately $350,000 on the current Black Brant contract for 51 rocket motors. The Black Brant manufacturer also indicated a potential for providing x-ray inspection. The inspection of rocket motors at or near the manufacturer or the launch site (primarily WSMR) could further reduce acceptance delay.

ACCEPTANCE PROCESS CAN BE STREAMLINED

Streamlining the acceptance process could help the Sounding Rocket Program achieve results faster, better, and at less risk and cost. The following chart demonstrates the potential opportunity for reducing the acceptance process time.

ROCKET MOTOR ACCEPTANCE PROCESS



As shown in the chart, the current rocket motor inspection process takes approximately 29 months from the time production is completed until acceptance by NASA. Under a more efficient or streamlined acceptance process, this time could be reduced anywhere from four to six weeks.

The streamlined approach would reduce risks such as (1) over or under-buying, and (2) non-replacement for rejected rocket motors after contract completion. The streamlined approach could also potentially reduce x-ray costs on the current contract approximately $350,000, and eliminate duplicative functions such as re-reading x-rays.

The WFF Sounding Rockets Project Branch should take action to streamline the Black Brant sounding rocket motor acceptance process, to improve efficiency, reduce delay and reduce costs. At a minimum, the Sounding Rocket Projects Branch should review the justification for performing Black Brant rocket motor inspections at the NWS, and pursue other potential sources.

RECOMMENDATION 1 The Sounding Rocket Projects Branch should take action to streamline the Black Brant sounding rocket motor acceptance process, to improve efficiency, reduce delay and reduce costs.

MANAGEMENT RESPONSE Concur. Due to a recent general reorganization of the Suborbital Projects and Operations Directorate, Code 800, involved with overall Center streamlining, the functions of launch vehicle and systems support to the NASA Sounding Rocket Program now reside in the Mechanical Engineering Branch, Code 823. The Mechanical Engineering Branch concurs with the OIG's recommendation that action be taken to streamline the Black Brant rocket motor acceptance process in an effort to improve overall efficiency. The streamlined inspection and acceptance process will focus on reducing the overall time period required to inspect and evaluate the motors and, ultimately, reducing costs.

Code 823 is currently developing and implementing a new review process, which will include several primary features:

a. A rigid motor inspection schedule will be established with the Naval Weapons Station (NWS) and Bristol Aerospace for the inspection at NWS and for the submission to NASA of inspection reports by both parties within a 3-month total

period, beginning at the time of motor delivery from Bristol.

b. The x-ray inspection process at NWS will be streamlined to reduce the total number of x-rays taken on any specific motor. Only radiographic coverage specified by the manufacturer of the Black Brant will be performed (164 x-ray images).

c. Personnel within the Launch Vehicle and Recovery Systems Group in Code 823 will review both NWS and Bristol motor inspection reports and will not routinely provide duplicate review of x-rays. X-rays will be reviewed by NASA personnel only in the event of any discrepancy or special problems noted in the reports.

This new review process has been concurred with by both NWS and Bristol Aerospace and should result in a more efficient acceptance process.

EVALUATION OF MANAGEMENT'S RESPONSE

The actions planned are considered responsive to the intent of the recommendation. The reduction in the number of x-ray images taken from 217 to 164 should result in reduced costs for x-raying and thus cost savings to the Sounding Rocket Program.

RECOMMENDATION 2

The Sounding Rocket Projects Branch should review the justification for performing Black Brant rocket motor inspections at the NWS, and pursue other potential sources.

MANAGEMENT RESPONSE

Concur. The Launch Vehicle and Recovery Systems Group within the Mechanical Engineering Branch will conduct a study to assess the overall requirements and specifications for inspection of the Black Brant V rocket motor, which would, at a minimum, satisfy NASA quality assurance standards to ensure that the NASA Sounding Rocket Program obtains a safe and reliable rocket motor for general use within the program. This is a very important requirement for the Black Brant V motor due to its extensive, widespread use within the program.

This study will be as inclusive as possible and will be conducted with the attitude that changes will be made in the existing process if advantageous. It should be noted that NASA Headquarters has decided to extensively restructure the NASA Sounding Rocket Program in the near future. The program will be implemented by a mission contractor (Government-owned contractor-operated [GOCO] arrangement), which would be given responsibility to procure and implement safe and reliable launch vehicles in support of the program.

In this capacity, the program contractor would be held responsible for the procurement process of rocket motors, which would include the inspection/acceptance process.

This survey and assessment will apply in the near term to the streamlined process discussed above and in the longer term to the restructured program contractor in order to satisfy NASA-specified requirements.

EVALUATION OF MANAGEMENT'S RESPONSE

The actions planned are considered responsive to the intent of the recommendation.

2. EXCESS ROCKET MOTORS ARE IN INVENTORY

The Sounding Rocket Projects Branch maintains 173 excess rocket motors in inventory. This condition exists because (1) program stocks were not correlated with program requirements, (2) action wasn't taken to dispose of identified excess rocket motors, and (3) disposal costs would have to be incurred. Maintaining an excessive inventory of rocket motors increases warehousing costs, unnecessarily increases the WFF explosives hazard, and consumes facilities that could be put to better use.

The following three NASA publications provide specific guidance regarding purchasing of materials, supplies and equipment:

- NASA Management Instruction 4000.3A, "Supply and Equipment Management," states that only equipment and supplies necessary for the performance of NASA requirements will be acquired.

- NASA Handbook 4100.1C, "NASA Materials Inventory Management Manual," states that materials shall be acquired for immediate use, for stock based upon past usage history, or for future use to satisfy a known specific requirement.

- NASA Handbook 4200.1C, "NASA Equipment Management Manual," states that equipment for which no use is contemplated should not be retained beyond the point of cost effectiveness.

In the final audit report on WFF Operations and Programs (Report No. A-GO-89-005, dated May 20, 1991), the OIG concluded that the sounding rocket motor inventory was in excess of program needs. Recommendations were made to evaluate the inventories and, where appropriate, adjust to a level based on realistic need and predicted availability. At the time of the audit, the WFF generally concurred with the recommendations and initiated acceptable corrective actions. For example, a total of 208 Nike rocket motors were shipped from the WFF to the Naval Air Weapons Station at China Lake, California.

EXCESS ROCKET MOTORS STILL EXIST

During the current audit, we observed that the Sounding Rocket Projects Branch still maintains an excessive number of rocket motors in inventory. Based on an analysis of rocket motors used or planned for use from 1992 to 1995, we identified seven rocket motor types that had quantities in inventory that were in excess of known requirements. The chart below details by type, the number of rocket motors currently in inventory, the average number used per year, the number of excess motors, and the number planned for future use.

EXCESS ROCKET MOTORS

Motor Type	Number in Inventory*	Average Used Per Year**	FY 1996 Planned Launches	Excess***
Arcas	34	0	0	34
Super Arcas	13	0	0	13
Aries	14	0	0	14
Honest John	12	0	0	12
Malemute	8	0	0	8
Ute	6	0	0	6
Taurus	87	3	1	86
Totals	174		1	173

* as of May 1995
** based on actual and planned launches from 1992 to 1995
*** based upon known requirements beyond 1996

There has not been a use of the Arcas, Super Arcas, Aries, Honest John, Malemute or Ute motors for the past four years. Further, no uses of any of these motor types are planned for 1996. The Aries and Arcas rocket motors were also identified as being excess during the previous audit. The Sounding Rocket Projects Branch should take immediate action to dispose of these six rocket motor types.

The chart also shows that an excessive number of Taurus rocket motors are in inventory. Specifically, as of May 1995, there were 87 Taurus motors in the inventory. Between 1992 and 1995, a total of 11 Taurus motors were used, or an average of only three per year. The FY 1996 Launch Schedule identifies that only one Taurus motor will be needed. Therefore, 86 of the Taurus motors are currently excess to program needs. The Taurus motor was previously used on five different launch vehicle configurations. One of these configurations, the Taurus-Orion, which accounted for three of the 11 launches between 1992 and 1995, has been discontinued from service. Based on the current planned and historical use, consideration should be given to significantly reducing the number of Taurus rocket motors in inventory.

ROCKET MOTORS RETAINED TO AVOID DISPOSAL COSTS

Rocket motors in excess of known requirements are in inventory because program stocks were not correlated with program requirements, disposal actions weren't taken, and disposal costs would have to be incurred. Although WFF personnel responsible for storage operations have met annually with Sounding Rocket Projects Branch personnel to identify excess rocket motors, a thorough analysis has not been performed that correlates inventory with known requirements. In some instances, excess rocket motors have been

identified. However, no disposal action has been taken by the Sounding Rocket Projects Branch.

Sounding Rocket Projects Branch personnel stated that disposal actions have not been taken because there is limited demand for the rocket motors by other agencies, and costs would have to be incurred for transportation and destruction. In addition, these personnel stated that there is always a chance that some future use may arise for some of the rockets motors. Further, the Sounding Rocket Projects Branch incurs no cost for storage of the motors (storage costs are borne by the Launch Vehicles Branch and the Management Operations Directorate), but would incur costs for disposal.

Maintaining an excessive inventory of rocket motors consumes warehousing facilities that could be put to better use. For example, the Aries motors are very large and take up a significant amount of warehouse space at the WFF (See picture at EXHIBIT 1). Further, administrative costs increase because the WFF must also inventory the rocket motors every year, and maintain some of the motors under environmentally controlled conditions. The excessive number of rocket motors also increases the potential explosives hazard at the WFF. For these reasons, immediate action should be taken to dispose of the excess rocket motors.

RECOMMENDATION 3 The Sounding Rocket Projects Branch should take immediate action to dispose of the Arcas, Super Arcas, Aries, Honest John, Malemute, and Ute rocket motors in inventory that are excessive to known requirements.

MANAGEMENT RESPONSE Partially Concur. Sounding Rocket Program management at Wallops Flight Facility generally concurs with the OIG recommendation that all rocket motors in program inventory that are excess to known requirements should be disposed of. However, we do not feel that all 173 motors sited in the OIG report as excess are, indeed, "excess to known program requirements." The 34 Arcas motors are not actually a part of the NASA Sounding Rocket Program inventory. They were obtained surplus from the Air Force in the late 1970's by the Engineering Division at Wallops Flight Center for utilization as target launch vehicles for new radar systems development. Some of these motors were used during acceptance testing of new radar systems and for revalidation of systems following extensive modifications and upgrades. There is no current demand for the remaining motors, and Wallops management is in agreement that these 34 motors should be disposed of. The Mechanical Systems Branch will take action to dispose of these excess motors. This disposal will be effective as soon as possible and will be conducted in the most cost-effective manner.

The Aries motors that remain on the program inventory have been declared surplus to the needs of the program and are clearly "excess." We are currently negotiating with the U.S. Air Force's Phillips Laboratory to make these rocket motors available for use in suborbital development testing programs sponsored by that agency. Phillips Laboratory has verbally indicated a desire to obtain these 14 motors, and we expect to negotiate a written agreement in the near future. These motors will most likely be shipped to Hill Air Force Base, Utah, for refurbishment prior to any projected usage by the Department of Defense (DoD).

The 12 Honest John motors and six Ute motors are also surplus to needs of the program and will be immediately disposed. These motors may be burned locally, or they may be shipped to the U.S. Army's Sierra Depot, Herlong, California, for disposal. Such disposal has been performed under a reimbursable arrangement with NASA in the past.

It is strongly felt that the 13 remaining Super Arcas, eight remaining Malemute, and 87 Taurus motors currently in inventory should be retained for future use in the NASA Sounding Rocket Program. The justification for retaining these three types of motors for future use in the program is generally specific for each motor type. For the case of the Super Arcas, Attachment I shows it is the only launch vehicle with the capability of delivering extremely small (5-10 Kilograms [Kg]) payloads to mesospheric altitudes (100 Kilometers [Km]). It is true that no Super Arcas motors have been used for several years (Attachment 2). However, lapses of several years have been experienced in the past (between 1987 and 1991). It is highly probable that NASA Headquarters, Code Y will initiate new mesospheric atmospheric in-situ research programs in support of Mission to Planet Earth that will require the Super Arcas, which also has a built-in ejection device for high altitude decelerator deployment (a unique feature).

The Malemute rocket motor is a very high performance (and costly) motor that is utilized with a Terrier booster. It has the capability of reaching over 500 Km altitudes for payloads weighing up to 150 Kg. For payloads weighing less than 200 Kg, it is the vehicle of choice, assuming the higher altitudes provided by the 3-stage Black Brant X and 4-stage Black Brant XII are not required. The potential exists for two Terrier-Malemute launches from Spitzbergen, Norway, in FY 1998, if payload weights can be maintained below 200 Kg. The program has no plans to procure any additional Malemute motors in the future.

EVALUATION OF MANAGEMENT'S RESPONSE

The actions planned are considered responsive to the intent of the recommendation.

RECOMMENDATION 4

The Sounding Rocket Projects Branch should examine the need for retention of the Taurus rocket motors and excess those not necessary to support future requirements.

MANAGEMENT RESPONSE

Partially Concur. As discussed in the response to Recommendation 3, Sounding Rocket Program management feels strongly that the 87 Taurus rocket motors currently in inventory should be retained for future program use.

The justification for retaining the Taurus motors in the program lies in the fact that the motor has a very high thrust level (over 100,000 pounds) and short burn time, which makes it attractive for use in tandem-booster systems (Taurus-Nike and Talos-Taurus). These tandem-booster combinations are currently used on three launch vehicle types with a strong future possibility of a fourth (Taurus-Nike-Orion). Even though the Taurus-Orion vehicle is being replaced with the Terrier-Orion, the Taurus motor is planned to be utilized for three missions in early FY 1997. The Improved Honest John M21A1 motor, which NASA refers to as Taurus, is no longer available as surplus from the DoD. Our current inventory is all that exists, making any future acquisition of this very special rocket motor impossible.

EVALUATION OF MANAGEMENT'S RESPONSE

The actions planned are generally considered responsive to the intent of the recommendation. While we recognize that the Taurus motor is currently used on three different launch vehicle types (with the future possibility of a fourth), the motors average use per year is only 3.33 which equates to a 26 year supply. Based on NASA's continued downsizing, including potentially fewer launches, this usage rate could decrease. As such, we believe the need still exists to examine the quantity of Taurus motors being retained. This should be a focus of attention during the next meeting of the Sounding Rocket Program Motor Inventory Review Board.

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3. DOLLAR VALUE OF ROCKET MOTOR INVENTORY IS UNDERSTATED

Rocket motors obtained by the WFF's Sounding Rocket Projects Branch from the Department of Defense (DoD) have not been properly valued and recorded in NASA's inventory records. The improper valuation and recording resulted from the WFF's Launch Vehicles Branch (responsible for receipt and recording of all rocket motors) not obtaining all applicable cost information from the DoD when the rocket motors were acquired. As a result, the dollar value of the rocket motor inventory is understated. Further, the dollar value of the inventory recorded in NASA's financial records is also understated.

The NASA Financial Management Manual, section 9254-7a, "Acquisition of Inventory," states that additions to inventory by transfers from other NASA installations, or other Federal agencies will be recorded in general ledger account 1200 at the price actually paid for the material. If no payment is made for the item transferred, then the item will be picked up at the lower of net book value of the transferor or the fair market value.

Five different types of rocket motors obtained by the Sounding Rocket Projects Branch from the Department of Defense (DoD) have not been properly valued and recorded in inventory records. This improper valuation has resulted in the total value of the rocket motor inventory being understated, as described in the following examples.

Nike Motors- On the May 1995 Monthly Hardware Inventory report, there were a total of 82 Nike rocket motors. Of these 82 motors, 1 was correctly valued at a unit cost of $6,000. The remaining 81 motors were valued at a unit cost of $200, or $5,800 less than the recorded cost should have been. The $200 unit cost represented the transportation costs incurred for shipping the motors instead of either the actual purchase price, or the lower of net book value or the fair market value. By using a unit cost of $200 instead of $6,000, the Nike rocket motors were undervalued by a total of $469,800 (81 motors x $5,800 cost difference).

Taurus Motors- On the May 1995 Monthly Hardware Inventory report, there were a total of 87 Taurus rocket motors. Of these 87 motors, each was incorrectly valued at a unit cost of $800. The $800 unit cost represented the transportation costs incurred for shipping the motors. The actual value of the motors was $9,500, or a difference of $8,700. By using a unit cost of $800 instead of $9,500, the Taurus rocket motors were undervalued by a total of $756,900 (87 motors x $8,700 cost difference).

Similar conditions to those described in the preceding section were also identified with the inventory valuation of the Orion, Honest John, and Terrier Mark-70 rocket motors. This resulted in the valuation of the rocket motor inventory at the WFF being understated by approximately $4,649,530 as detailed in the following chart.

Motor Type	Total # In Inventory	Total # Undervalued	Unit Price Undervalued	Total $ Undervalued
Nike	82	81	$5,800	$ 469,800
Orion	158	158	21,000	3,318,000
Taurus	87	87	8,700	756,900
Honest John	12	2	8,700	17,400
Terrier (70's)	12	1	87,430	87,430
	Total			$4,649,530

This condition has occurred because personnel in the Launch Vehicles Branch record rocket motors at the cost shown on the DoD shipping document. Specifically, if DoD does not enter a unit cost on the shipping document, the Launch Vehicles Branch records the rocket motors at the transportation cost paid for shipment to NASA. Recording the value of the motors at their transportation cost instead of the actual rocket motor cost results in undervaluation of the inventory in NASA's financial records. As a result, GSFC General Ledger Account 1200, "Inventories, Program Stock, Government Owned/Held," is understated. We estimate the total recorded inventory value of $23,140,522 reported to NASA's Financial Management Division for fiscal year 1994 to be understated by $4,649,530. To correct this condition, the Launch Vehicles Branch should adjust the value of the identified rocket motors on the inventory records, and ensure that actual cost information is obtained and recorded if any rocket motors are acquired in the future.

RECOMMENDATION 5

The Launch Vehicles Branch should adjust the value of the identified rocket motors on the inventory records, and ensure that actual cost information is obtained and recorded if any rocket motors are acquired in the future.

MANAGEMENT RESPONSE

Concur. The NASA Sounding Rocket Program concurs with the OIG recommendation that the value for rocket motors held in program inventory should adequately reflect actual government costs for the motors when purchased by the DoD. The Mechanical Engineering Branch has initiated an action to ascertain the original cost data from the Army and Navy and then to update the program inventory value listings.

EVALUATION OF MANAGEMENT'S RESPONSE

The actions planned are considered responsive to the intent of the recommendation.

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4. OTHER MATTERS The following observations were made during the audit and are presented for management's information and disposition.

a. Internal Control Issues

Rejected Rocket Motors - The Launch Vehicles Branch has been storing two rejected Black Brant rocket motors since 1992. The rocket motors, serial numbers MV-465 and MV-480 were delivered to the NWS under contracts NAS5-30799 and NAS5-29783. After NWS inspection and NASA rejection, the motors were shipped to WFF, together with the accepted motors of the same batch. The rejects were unloaded at WFF and stored in building M-15, together with the accepted rocket motors. This practice has been done as a favor for the manufacturer. The manufacturer has been allowed to accumulate a full truckload of six rejects before removal. This practice reduces the manufacturer's shipping and handling cost. WFF handling and storage of the rejected rocket motors requires personnel time, consumes warehouse space, and increases risk of loss.

MANAGEMENT RESPONSE We concur that long-time storage at WFF of rejected motors should not be allowed. Both motors retained at WFF have been shipped to Bristol Aerospace at Bristol's expense. In the future, rejected motors will be returned to Bristol Aerospace directly from the inspection site.

Ball Aerospace Assets - During the audit, we found rocket motors and rocket motor hardware belonging to Ball Aerospace Corporation that were commingled with Sounding Rockets Program inventory. The rocket motors were recorded on the inventory records. However, rocket motor hardware valued at over $250,000, was not recorded on the inventory records. Warehousemen informed us that they were told by supervisory personnel not to record the rocket motor hardware on the inventory records. The commingling of inventory, as well as not recording all non-NASA inventory, could result in the loss of accountability, or the potential that non-NASA inventory could be used for NASA purposes.

MANAGEMENT RESPONSE WFF has implemented a new policy that ensures all non-NASA hardware in storage at WFF, including rocket motors, is accounted for in overall inventory. The inventory identifies items, location, ownership, serial numbers, costs, WFF arrival date, lot numbers, part numbers, manufacturer number and date, and launch vehicle/project identification where applicable.

Igniters and Parachutes - During our review of a judgmental sample of 21 items from the Hardware and Recovery Systems inventory, two rocket motor igniters and four parachutes with a total value of $15,734 could not be located. WFF personnel could not provide an explanation for the missing items.

MANAGEMENT RESPONSE

The four parachute systems have been located and accounted for. Inappropriate inventory control allowed personnel to remove these items without proper accounting. They were sent out for locator beacon retrofit and returned to WFF with new serial numbers without proper accounting. WFF has implemented new accounting and serial numbering procedures to alleviate these problems.

Independent Inventories - Physical inventories of the Sounding Rockets Program stock have been conducted by the same WFF Launch Vehicles Branch personnel that are responsible for maintaining the inventory records. NASA Handbook 4100.1C provides for the separation of duties between personnel responsible for warehousing operations and personnel responsible for conducting independent physical inventories.

MANAGEMENT RESPONSE

In the future, WFF will conduct independent physical inventories of Sounding Rocket Program stock through the use of WFF Logistics Branch or Mechanical Engineering Branch personnel not associated with warehousing or stock activities.

b. Sounding Rockets Program Budget Is Overstated

The Sounding Rockets Program budget is overstated by approximately $6 million. Specifically, the justification for the $38 million FY 1995 Sounding Rockets Program budget did not state that approximately $6 million was included for Space Physics Division science research. The justification also did not state that additional amounts for science research using sounding rockets, totaling approximately $7 million, were included elsewhere in the Office of Space Science budget. This condition was continued in the FY 1996 budget request. Including science amounts in the Sounding Rockets Program budget overstates the cost of operations and understates the total amount of science being conducted. This practice is not in compliance with OMB and NASA budgeting guidance on structuring by activities and consistency in presentation. Further, this practice is inconsistent with full cost accounting principles.

MANAGEMENT RESPONSE

NASA Headquarters/Code SS acknowledged that science funding should not be included in the program operations budget and has corrected the error.

ARIES ROCKET MOTORS STORED AT WFF

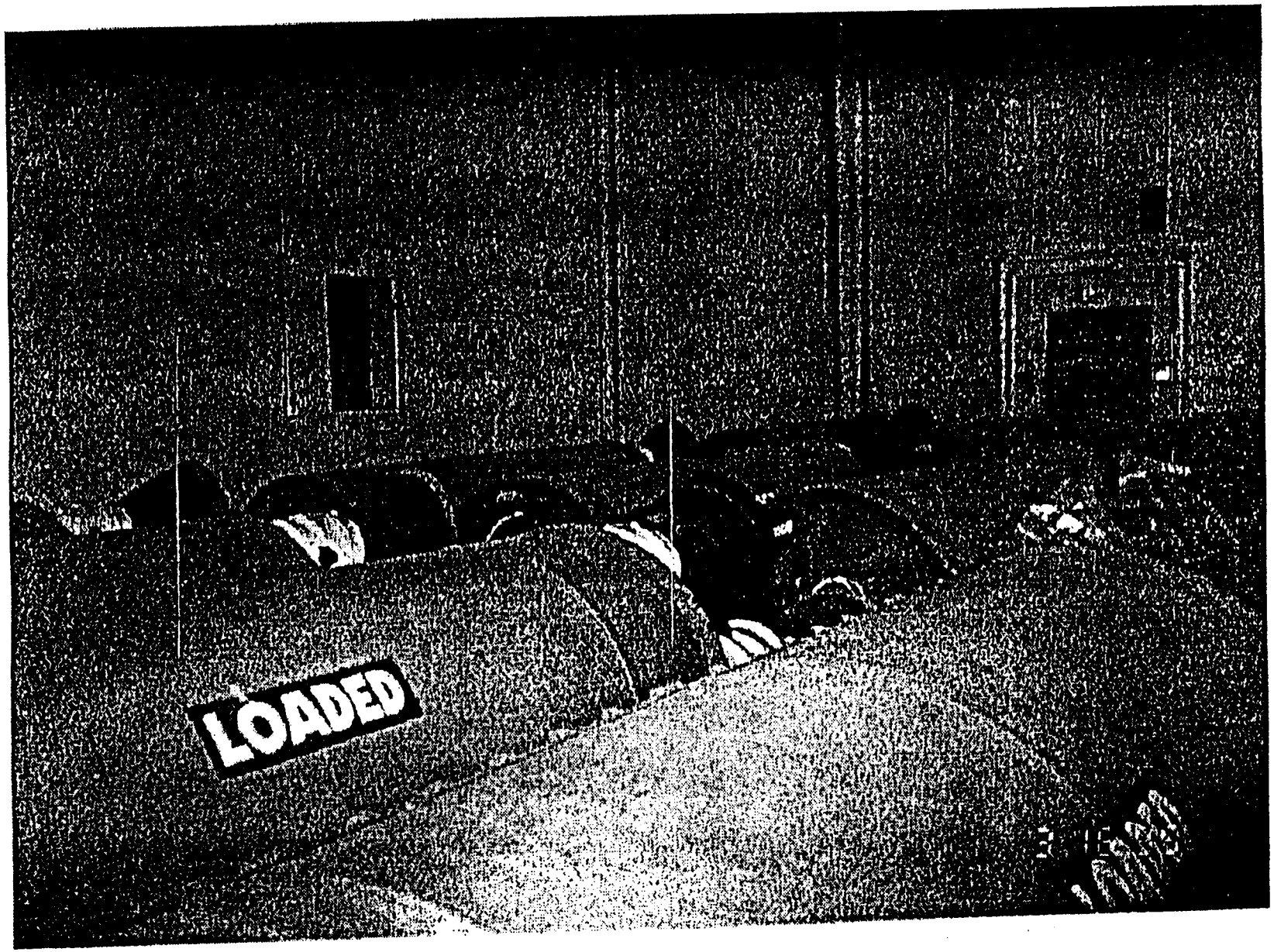

EXHIBIT I

Attachment I
Management's Response

National Aeronautics and
Space Administration
Goddard Space Flight Center
Greenbelt, MD 20771

Reply to Attn of 201

TO: NASA Headquarters
Attn: W/Assistant Inspector General for Auditing

FROM: 100/Director

SUBJECT: GSFC Response to OIG Draft Report on NASA Sounding Rocket Program, A-GO-95-005

Enclosed is our response to the subject draft audit report dated May 29, 1996.

We appreciate the opportunity you provided us to contribute to this report and are pleased with your response to management's considerations. We concur or partially concur with all of your recommendations.

Please call Ms. Barbara Sally at 301-286-8436 if you have any questions or need further information or followup on this response.

Joseph H. Rothenberg

Enclosure

Attachment I
Management's Response

GODDARD SPACE FLIGHT CENTER (GSFC)

RESPONSE TO

OFFICE OF INSPECTOR GENERAL (OIG)

DRAFT AUDIT REPORT A-GO-95-005

DATED MAY 29, 1996

ON

NASA SOUNDING ROCKET PROGRAM

Date_____

ENCLOSURE

Attachment I
Management's Response

The following is GSFC's response to the five recommendations and the five issues raised by the OIG as "Other Matters."

OIG RECOMMENDATION 1: ($0)

The Sounding Rocket Projects Branch should take action to streamline the Black Brant sounding rocket motor acceptance process to improve efficiency, reduce delay, and reduce costs.

GSFC RESPONSE TO RECOMMENDATION 1: ($0) CONCUR

Due to a recent general reorganization of the Suborbital Projects and Operations Directorate, Code 800, involved with overall Center streamlining, the functions of launch vehicle and systems support to the NASA Sounding Rocket Program now reside in the Mechanical Engineering Branch, Code 823. The Mechanical Engineering Branch concurs with the OIG's recommendation that action be taken to streamline the Black Brant rocket motor acceptance process in an effort to improve overall efficiency. The streamlined inspection and acceptance process will focus on reducing the overall time period required to inspect and evaluate the motors and, ultimately, reducing costs.

Code 823 is currently developing and implementing a new review process, which will include several primary features:

a. A rigid motor inspection schedule will be established with the Naval Weapons Station (NWS) and Bristol Aerospace for the inspection at NWS and for the submission to NASA of inspection reports by both parties within a 3-month total period, beginning at the time of motor delivery from Bristol.

b. The x-ray inspection process at NWS will be streamlined to reduce the total number of x-rays taken on any specific motor. Only radiographic coverage specified by the manufacturer of the Black Brant will be performed (164 x-ray images).

c. Personnel within the Launch Vehicle and Recovery Systems Group in Code 823 will review both NWS and Bristol motor inspection reports and will not routinely provide duplicate review of x-rays. X-rays will be reviewed by NASA personnel only in the event of any discrepancy or special problems noted in the reports.

This new review process has been concurred with by both NWS and Bristol Aerospace and should result in a more efficient acceptance process.

Attachment I
Management's Response

ACTION OFFICIAL:	GSFC/823/B. Flowers
CLOSURE OFFICIAL:	GSFC/820/N. Novack
CONCURRING OFFICIAL:	GSFC/800/A. Torres
PROJECTED CLOSURE DATE:	August 1, 1996

OIG RECOMMENDATION 2: ($0)

The Sounding Rocket Projects Branch should review the justification for performing Black Brant rocket motor inspections at the NWS and pursue other potential sources.

GSFC RESPONSE TO RECOMMENDATION 2: ($0) CONCUR

The Launch Vehicle and Recovery Systems Group within the Mechanical Engineering Branch will conduct a study to assess the overall requirements and specifications for inspection of the Black Brant V rocket motor, which would, at a minimum, satisfy NASA quality assurance standards to ensure that the NASA Sounding Rocket Program obtains a safe and reliable rocket motor for general use within the program. This is a very important requirement for the Black Brant V motor due to its extensive, widespread use within the program.

This study will be as inclusive as possible and will be conducted with the attitude that changes will be made in the existing process if advantageous. It should be noted that NASA Headquarters has decided to extensively restructure the NASA Sounding Rocket Program in the near future. The program will be implemented by a mission contractor (Government-owned contractor-operated [GOCO] arrangement), which would be given responsibility to procure and implement safe and reliable launch vehicles in support of the program. In this capacity, the program contractor would be held responsible for the procurement process of rocket motors, which would include the inspection/acceptance process.

This survey and assessment will apply in the near term to the streamlined process discussed above and in the longer term to the restructured program contractor in order to satisfy NASA-specified requirements.

ACTION OFFICIAL:	GSFC/823/B. Flowers
CLOSURE OFFICIAL:	GSFC/820/N. Novack
CONCURRING OFFICIAL:	GSFC/800/A. Torres
PROJECTED CLOSURE DATE:	September 1, 1996

Attachment I
Management's Response

OIG RECOMMENDATION 3: ($0)

The Sounding Rocket Projects Branch should take immediate action to dispose of the Arcas, Super Arcas, Aries, Honest John, Malemute, and Ute rocket motors in inventory that are excessive to known requirements.

GSFC RESPONSE TO RECOMMENDATION 3: ($0) PARTIALLY CONCUR

Sounding Rocket Program management at Wallops Flight Facility generally concurs with the OIG recommendation that all rocket motors in program inventory that are excess to known requirements should be disposed of. However, we do not feel that all 173 motors sited in the OIG report as excess are, indeed, "excess to known program requirements." The 34 Arcas motors are not actually a part of the NASA Sounding Rocket Program inventory. They were obtained surplus from the Air Force in the late 1970's by the Engineering Division at Wallops Flight Center for utilization as target launch vehicles for new radar systems development. Some of these motors were used during acceptance testing of new radar systems and for revalidation of systems following extensive modifications and upgrades. There is no current demand for the remaining motors, and Wallops management is in agreement that these 34 motors should be disposed of. The Mechanical Systems Branch will take action to dispose of these excess motors. This disposal will be effective as soon as possible and will be conducted in the most cost-effective manner.

The Aries motors that remain on the program inventory have been declared surplus to the needs of the program and are clearly "excess." We are currently negotiating with the U.S. Air Force's Phillips Laboratory to make these rocket motors available for use in suborbital development testing programs sponsored by that agency. Phillips Laboratory has verbally indicated a desire to obtain these 14 motors, and we expect to negotiate a written agreement in the near future. These motors will most likely be shipped to Hill Air Force Base, Utah, for refurbishment prior to any projected usage by the Department of Defense (DoD).

The 12 Honest John motors and six Ute motors are also surplus to needs of the program and will be immediately disposed. These motors may be burned locally, or they may be shipped to the U.S. Army's Sierra Depot, Herlong, California, for disposal. Such disposal has been performed under a reimbursable arrangement with NASA in the past.

It is strongly felt that the 13 remaining Super Arcas, eight remaining Malemute, and 87 Taurus motors currently in inventory should be retained for future use in the NASA Sounding Rocket Program. The justification for retaining these three types of motors for future use in the program

Attachment I
Management's Response

is generally specific for each motor type. For the case of the Super Arcas, Attachment 1 shows it is the only launch vehicle with the capability of delivering extremely small (5-10 Kilograms [Kg]) payloads to mesospheric altitudes (100 Kilometers [Km]). It is true that no Super Arcas motors have been used for several years (Attachment 2). However, lapses of several years have been experienced in the past (between 1987 and 1991). It is highly probable that NASA Headquarters, Code Y will initiate new mesospheric atmospheric in-situ research programs in support of Mission to Planet Earth that will require the Super Arcas, which also has a built-in ejection device for high altitude decelerator deployment (a unique feature).

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ACTION OFFICIAL:	GSFC/823/B. Flowers
CLOSURE OFFICIAL:	GSFC/820/N. Novack
CONCURRING OFFICIAL:	GSFC/800/A. Torres
PROJECTED CLOSURE DATE:	September 1, 1996

OIG RECOMMENDATION 4: ($0)

The Sounding Rocket Projects Branch should examine the need for retention of the Taurus rocket motors and excess those not necessary to support future requirements.

GSFC RESPONSE TO RECOMMENDATION 4: ($0) PARTIALLY CONCUR

As discussed in the response to Recommendation 3, Sounding Rocket Program management feels strongly that the 87 Taurus rocket motors currently in inventory should be retained for future program use.

The justification for retaining the Taurus motors in the program lies in that fact that the motor has a very high thrust level (over 100,000 pounds) and short burn time, which makes it attractive for use in tandem-booster systems (Taurus-Nike and Talos-Taurus). These tandem-booster combinations are currently used on three launch vehicle types with a strong future possibility of a fourth (Taurus-Nike-Orion). Even though the Taurus-Orion vehicle is being replaced with the Terrier-Orion, the Taurus motor is planned to be utilized for three missions in early FY97. The

Attachment I
Management's Response

Improved Honest John M21A1 motor, which NASA refers to as Taurus, is no longer available as surplus from the DoD. Our current inventory is all that exists, making any future acquisition of this very special rocket motor impossible. GSFC considers this recommendation to be closed for reporting purposes.

OIG RECOMMENDATION 5: ($0)

The Launch Vehicles Branch should adjust the value of the identified rocket motors on the inventory records and ensure that actual cost information is obtained and recorded if any rocket motors are acquired in the future.

GSFC RESPONSE TO RECOMMENDATION 5: ($0) CONCUR

The NASA Sounding Rocket Program concurs with the OIG recommendation that the value for rocket motors held in program inventory should adequately reflect actual government costs for the motors when purchased by the DoD. The Mechanical Engineering Branch has initiated an action to ascertain the original cost data from the Army and Navy and then to update the program inventory value listings.

ACTION OFFICIAL:	GSFC/823/B. Flowers
CLOSURE OFFICIAL:	GSFC/820/N. Novack
CONCURRING OFFICIAL:	GSFC/800/A. Torres
PROJECTED CLOSURE DATE:	August 1, 1996

OIG OTHER MATTERS

a. OIG Concern: WFF has allowed the storage of two rejected rocket motors since 1992 as a favor to the manufacturer until a full truckload of six rejected motors is accumulated.

GSFC Response: We concur that long-time storage at WFF of rejected motors should not be allowed. Both motors retained at WFF have been shipped to Bristol Aerospace at Bristol's expense. In the future, rejected motors will be returned to Bristol Aerospace directly from the inspection site.

Attachment I
Management's Response

b. OIG Concern: Rocket motors and motor hardware belonging to Ball Aerospace Corporation were commingled with NASA inventory and inconsistently accounted for on NASA inventory records.

GSFC Response: WFF has implemented a new policy that ensures all non-NASA hardware in storage at WFF, including rocket motors, is accounted for in overall inventory. The inventory identifies items, location, ownership, serial numbers, costs, WFF arrival date, lot numbers, part numbers, manufacturer number and date, and launch vehicle/project identification where applicable.

c. OIG Concern: Four parachute systems and two motor igniters could not be located in the Hardware and Recovery Systems inventory.

GSFC Response: The four parachute systems have been located and accounted for. Inappropriate inventory control allowed personnel to remove these items without proper accounting. They were sent out for locator beacon retrofit and returned to WFF with new serial numbers without proper accounting. WFF has implemented new accounting and serial numbering procedures to alleviate these problems.

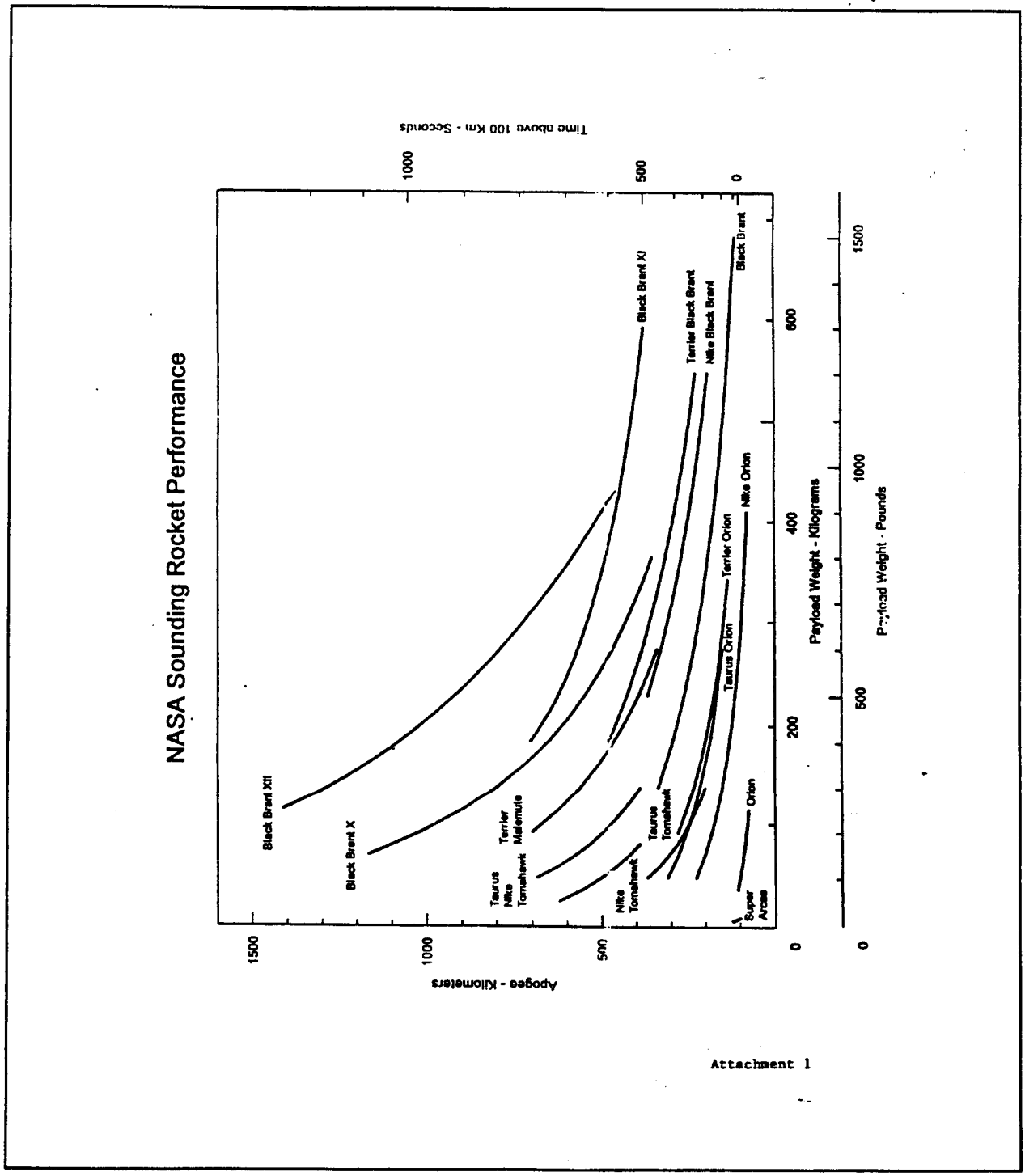
d. OIG Concern: NASA Handbook 4100.1C provides for the separation of duties between personnel responsible for warehousing operations and personnel responsible for conducting independent physical inventories. This has not been done for Sounding Rocket Program stock.

GSFC Response: In the future, WFF will conduct independent physical inventories of Sounding Rocket Program stock through the use of WFF Logistics Branch or Mechnical Engineering Branch personnel not associated with warehousing or stock activities.

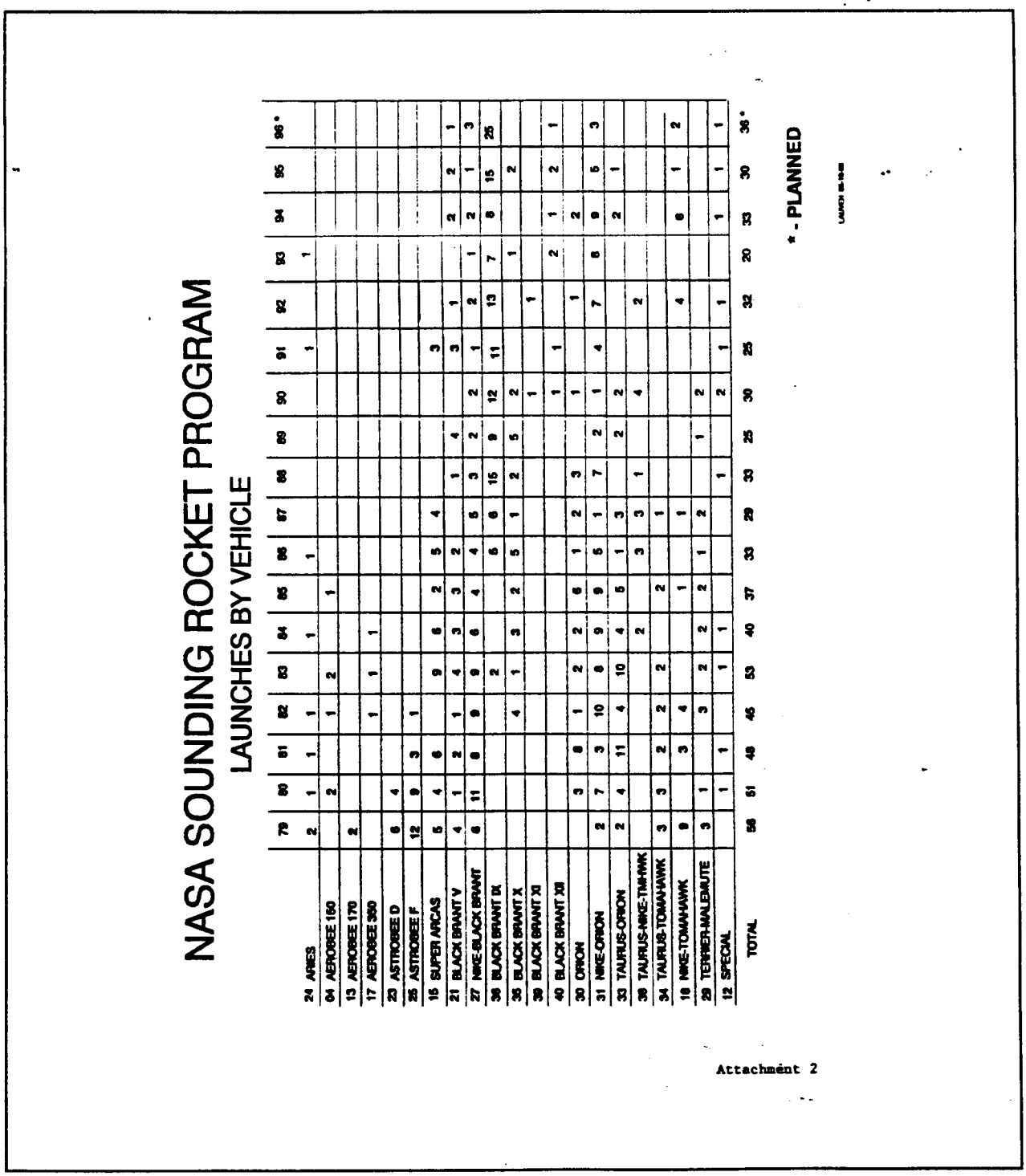
e. OIG Concern: The FY95 Sounding Rocket Program budget of $38M was overstated because it inappropriately included approximately $6M for science research rather than for program implementation.

GSFC Response: NASA Headquarters/Code SS acknowledged that science funding should not be included in the program operations budget and has corrected the error.

Attachment I
Management's Response



Attachment I
Management's Response



ATTACHMENT II

GO-95-007

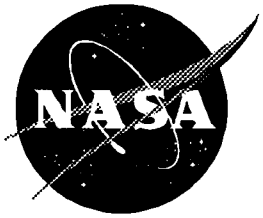
AUDIT REPORT

RAPID ACTION

WALLOPS FLIGHT FACILITY SOUNDING ROCKET PROGRAM ACQUISITION, INVENTORY, AND STORAGE OF ROCKET MOTORS

GODDARD SPACE FLIGHT CENTER

AUGUST 30, 1995



National Aeronautics and Space Administration

OFFICE OF INSPECTOR GENERAL

National Aeronautics and
Space Administration
Office of Inspector General
Goddard Space Flight Center
Greenbelt, MD 20771

AUG 30 1995

Reply to Attn of: 190

TO: 100/Center Director, GSFC

FROM: 190/OIG Center Director, GSFC

SUBJECT: Rapid Action Report on Wallops Flight Facility
Sounding Rocket Program,
Acquisition, Inventory, and Storage of Rocket Motors
Assignment No. A-GO-95-005
Report No. GO-95-007

The NASA Office of Inspector General is conducting an audit of the NASA Sounding Rocket Program located at the Wallops Flight Facility (WFF), Wallops Island, Virginia. The overall objective of the audit is to determine whether the Sounding Rocket Program is managed effectively. The specific audit objectives are to determine whether:

(1) controls over the acquisition/development, approval of launches, and safety, reliability and reusability of rockets are effective; and

(2) controls over launches performed on a reimbursable basis for other government agencies, foreign governments, or commercial customers are effective.

Audit work completed to date has identified three conditions that warrant management's immediate attention:

(1) acquisition of additional Terrier rocket motors will likely create excessive inventory;

(2) additional costs incurred for testing defective rocket motors were not recovered; and

(3) removal of Navy rocket motors from WFF should be requested.

Due to the significance and time sensitivity of these issues, we are providing this rapid action report containing recommendations for your immediate attention. Management actions to correct these conditions will better ensure efficient and effective Sounding Rocket Program operations.

A draft report was issued on June 21, 1995, requesting written comments. The Center's official response was received on July 31, 1995. The Center's response is included after each recommendation and is presented in its entirety as an Attachment to the report. The response indicates that management has planned or taken corrective actions that are considered responsive to the intent of the report's recommendations. We therefore consider recommendations 1 and 2 to be closed for reporting purposes. With respect to recommendation 3, please notify our office when it is considered closed. In accordance with NASA Management Instruction (NMI) 9910.1B, we request to be included in the center's concurrence cycle for closure of recommendation 4.

If you have any questions, please contact me or Kevin Carson at 286-5561.

Daniel J. Samoviski

Enclosure

cc:
W/Acting DAIGA
201/J. Clark
800/A. Torres

INTRODUCTION

The NASA Office of Inspector General is conducting an audit of the NASA Sounding Rocket Program located at the Wallops Flight Facility (WFF), Wallops Island, Virginia. During the survey portion of the audit, we identified three conditions which warrant management's immediate attention:

(1) acquisition of additional Terrier rocket motors will likely create excessive inventory;

(2) additional costs incurred for testing defective rocket motors were not recovered; and

(3) removal of Navy rocket motors from WFF should be requested.

Due to the significance and time sensitivity of these issues, we are providing this rapid action report containing recommendations for your immediate attention.

NASA's Sounding Rocket Program is managed by the Goddard Space Flight Center's (GSFC) Suborbital Projects and Operations Directorate, located at the WFF. Sounding rockets are uniquely suited for performing low altitude measurements (between balloon and spacecraft altitude) and for measuring vertical variations of many atmospheric parameters. Sounding rockets are solid fuel rocket motors used individually, or stacked up to four stages, and carry scientific instruments averaging 700 to 800 pounds. The rockets are used to carry scientific instruments to altitudes between 30 and 1,050 miles. The rockets range in length from six to 60 feet and fly near vertical trajectories.

The Sounding Rocket Program conducts about 30 launches each year from the WFF, White Sands Missile Range, New Mexico, Poker Flats Research Range, Alaska, and various foreign countries. The cost of the program's sounding rocket operations is approximately $31 million per year. This cost excludes the $7 million per year cost of science performed under program grants.

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OBJECTIVES, SCOPE, AND METHODOLOGY

OBJECTIVES

The overall objective of the audit is to determine whether the Sounding Rocket Program is managed effectively. Specific, objectives are to determine whether:

- controls over the acquisition/development, approval of launches, and safety, reliability and reusability of rockets are effective; and
- controls over launches performed on a reimbursable basis for other government agencies, foreign governments, or commercial customers are effective.

SCOPE AND METHODOLOGY

Interviews and discussions were held with WFF personnel in the Projects Division, the Launch Vehicles Branch, and the Wallops Procurement Branch of GSFC's Institutional Procurement Division. Review of documents and visits to facilities were conducted, which included:

- launch approval documents;
- acquisition and inventory records;
- WFF rocket storage, assembly and launch facilities;
- prior, current, and future launch schedules; and
- launch success/safety records.

MANAGEMENT CONTROLS REVIEWED

The following significant management controls were identified and tested for effectiveness:

- approval process for sounding rocket launches;
- rocket acquisition and inventory controls;
- Federal Acquisition Regulation (FAR) and NASA FAR Supplement; and
- the general management control environment.

AUDIT FIELD WORK

Audit field work was conducted from March 1, 1995 through April 10, 1995 at the WFF. The audit was performed in accordance with generally accepted government auditing standards. On April 11, 1995, the results of audit to date, were discussed with WFF management personnel. The discussion included the conditions described in this rapid action report.

OBSERVATIONS AND RECOMMENDATIONS

INTERIM RESULTS OF AUDIT

Audit work completed to date has identified three conditions that warrant management's immediate attention:

(1) acquisition of additional Terrier rocket motors will likely create excessive inventory;

(2) additional costs incurred for testing defective rocket motors were not recovered; and

(3) removal of Navy rocket motors from WFF should be requested.

Management actions to correct these conditions will better ensure efficient and effective Sounding Rocket Program operations.

1. ACQUISITION OF ADDITIONAL TERRIER ROCKET MOTORS WILL LIKELY CREATE EXCESSIVE INVENTORY

The Sounding Rocket Projects Branch (SRPB) planned acquisition of up to 150 Terrier Mark-70 rocket motors will likely result in an excess of approximately 166 Mark-12 rocket motors being held in inventory. This acquisition will approximately double the project's inventory of Terrier-type rocket motors from an 8 year, to more than a 15 year supply. The additional Terrier Mark-70 rocket motors were requested because they provide more propulsion than the Terrier Mark-12 models currently in inventory. The acquisition of the Mark-70 motors will result in the Terrier Mark-12 rocket motors not being needed, and NASA having to pay unneeded or unnecessary storage and disposal costs.

Federal regulations and internal NASA guidelines call for programs to maintain a minimum level of inventory. For example, the FAR, Part 7.202, states that agencies are required by 10 U.S.C. 2384(a) and 41 U.S.C. 253f to procure supplies in such quantity as "... does not exceed the quantity reasonably expected to be required by the agency." NASA Management Instruction 4000.3A, "Supply and Equipment Management," states that "Only equipment and supplies necessary for the performance of NASA requirements will be acquired." NASA Handbook 4100.1C, "NASA Materials Inventory Management Manual," states that "Materials shall be acquired for immediate use, for stock based upon past usage history,...or...for future use to satisfy a known specific requirement."

ACQUISITION OF 150 TERRIER MARK-70 ROCKET MOTORS WOULD CREATE A 15-PLUS YEAR INVENTORY

The SRPB has requested up to 150 excess Department of Defense (DoD) Terrier Mark-70 rocket motors. The branch's request to DoD was for approximately 20 rocket motors per year, or as many as 150 now, if the 20 per year rate could not be accommodated. These Mark-70s would be in addition to the 16 already in inventory. The SRPB also has 166 Terrier Mark-12s in inventory. These Mark-12s were acquired between 1992 and 1994. Based upon the current usage rate of 21 rocket motors per year, the current inventory (166 Mark-12s and 16 Mark-70s) represents more than an eight year supply of rocket motors. The acquisition of an additional 150 motors would almost double the amount of inventory from an 8 year supply to a more than 15 year supply. As of February 1995, only 29 Terrier rocket motor launches were approved or planned for the remainder of 1995 and for 1996. No specific requirements for launches with Terrier rocket motors were approved or planned beyond 1996. Without firm requirements past 1996, the acquisition of 150 additional Mark-70 rocket motors does not appear justified.

MARK-70s REQUESTED BECAUSE OF HIGHER PERFORMANCE

The SRPB wants the Mark-70 motor because it is a newer model, and provides more propulsion than the Mark-12s in inventory. Although the Terrier Mark-12 and Mark-70 have the same external dimensions, the Mark-12 contains approximately 1200 pounds of propellent, while the Mark-70 contains approximately 1500 pounds. The additional 300 pounds of propellent in the Mark-70 allows for an increase in the altitude achieved by the sounding rocket. This increase in rocket altitude provides an increase of about one minute and fifteen seconds in available time to conduct science. The SRPB is of the opinion that the Terrier Mark-70 would better help the project meet program objectives, since the purpose of the sounding rocket program is to provide scientific instruments the time to take measurements or test their operation in space.

ACQUISITION OF MARK-70s WOULD RESULT IN NEED FOR DISPOSAL OF MARK-12s JUST ACQUIRED

While the benefits of the Mark-70 are clear, its acquisition will likely result in the Mark-12s not being needed. This, in turn would require NASA to pay unnecessary storage or disposal costs. Further, the acquisition of 150 Terrier Mark-70s would substantially exceed known program requirements, even if all of the Mark-12s were to subsequently be disposed. In our opinion, NASA would not be in compliance with Federal regulations and NASA management guidelines which state that programs should maintain a minimum level of inventory. Such action would also incur unnecessary current year shipping expenses of more than $30,000, depending upon which DoD locations the Mark-70 motors are shipped from, and the number of shipments.

In our opinion, the SRPB acquisition of Terrier Mark-70 rocket motors should be limited to a quantity necessary to meet only Fiscal Year (FY) 1995 and 1996 project requirements. Any acquisition of Mark-70s in excess of FY 1995 and 1996 project requirements should be justified. The SRPB also should dispose of all Terrier Mark-12s once the acquisition of Mark-70s commences. Disposal of the Mark-12s will ensure that storage and disposal costs are kept to the absolute minimum.

RECOMMENDATION 1

The WFF's SRPB acquisition of Terrier Mark-70 rocket motors should be limited to a quantity necessary to meet only (FY) 1995 and 1996 project requirements. Any acquisition of Mark-70s in excess of FY 1995 and 1996 project requirements should be justified.

MANAGEMENT RESPONSE

Concur. The NASA Sounding Rocket Program concurs with the OIG's recommendation of only obtaining a limited number of surplus Navy Terrier Mark-70 rocket motors. It should be emphasized that the Mark-70, which is an improved-performance version of the older Navy Mark-12 Standard Missile booster, is very important with regard to future use in the NASA Sounding Rocket Program.

The more powerful Mark-70 was developed for the Navy's extended range Standard Missile and typically can provide about a 20 percent increase in very precious out-of-atmosphere scientific observing time for NASA astronomical and solar physics suborbital spacecraft. These more powerful Terrier boosters have only recently become surplus to the Navy due to Department of Defense (DoD) downsizing. Mission requirements dictated the use of a Mark-70 for a specific application in 1990 (NASA flight mission number 35.020 UE). This first Mark-70 used in the NASA Program was acquired from the Navy at a cost of $88,000. Now that the motors have become available on a surplus basis, the Program can afford to provide this increased performance capability to other missions.

As the OIG report correctly indicates, our initial planning in mid-1993 was to acquire as many as 150 Mark-70 motors (Attachment 1). This action was based on both what the anticipated programmatic needs would be over several years and on the historical practice of getting a relatively long-term supply of surplus motors from the DoD while they were available, not knowing what the potential future availability would be due to rapidly-changing DOD requirements. More recently, we have made inquiries and have been informed by the Navy that there is no current planning to dispose of the Mark-70 motors, and that they

should be available for future NASA use at the rate of 10-15 motors per year.

As the OIG report indicates, our current inventory shows 16 Mark-70 motors. However, of these, three are not owned by NASA but by DoD/Ballistic Missile Defense Organization (BMDO), one has been flown in Alaska (mission 35.031 UE/March 26, 1995), and three are currently scheduled to be launched by the end of October 1995. At that time our inventory should be down to only nine motors.

Attachment 2 is a copy of the Navy agreement to deliver only 15 motors for FY 1996 and to charge NASA only shipping and handling costs.

EVALUATION OF MANAGEMENT'S RESPONSE

The actions planned or taken are considered responsive to the intent of the recommendation. In addition, we consider this recommendation closed for reporting purposes.

RECOMMENDATION 2

The SRPB should dispose of all Terrier Mark-12 rocket motors in inventory if the Terrier Mark-70s are acquired.

MANAGEMENT RESPONSE

Nonconcur based on changed situation. Since NASA began using the Terrier Mark-12 booster in its suborbital rocket program during the late 1960's, the motors were obtained from the Navy by utilizing static-fired motor cases, which were reloaded with propellant grains that had exceeded Navy operational specified lifetime (but were acceptable to NASA). Even though the motors were not surplus, the cost NASA had to pay for re-grain operations was not excessive (approximately $7,000). About 5-6 years ago, the Navy discontinued using the Mark-12 motors entirely in favor of the new Mark-70 motor and eliminated the Mark-12 static-firing program; subsequently, the Navy instituted a program to dispose of the Mark-12 motors. Since more than half of the launch vehicles utilized in the NASA Sounding Rocket Program employ the Terrier booster, NASA quickly requested to obtain a several-year supply of these motors for its use, since future availability was in doubt.

Currently, the NASA inventory shows a program stock of 160 Mark-12 Terrier motors; however, only 25 have been modified for Sounding Rocket use. Eighteen of these are located at White Sands Missile Range (WSMR), six are at WFF assigned to the Australian Campaign in October, and one is unassigned at WFF.

Apparently, there is an OIG misconception that, as Mark-70 motors are introduced in the NASA Sounding Rocket Program, the Mark-12 motors will be phased out. This is not the case. Many missions will have launch vehicle requirements that can adequately be met by using the Mark-12, rather than the Mark-70, as a booster for both Black Brant V and Malemute upper stage motors. In addition, some payload configurations may not tolerate the use of the Mark-70 due to aeroelastic stability problems associated with the higher aerodynamic pressures encountered with the more powerful motor.

Over the past year, NASA has developed a new cost-effective all-surplus launch vehicle utilizing the Mark-12 booster in conjunction with the improved Orion sustainer. This configuration has been successfully flight tested at WFF and at the WSMR and has been designated NASA vehicle number 41 (see Attachment 3). It is anticipated that this new launch vehicle will see extensive service in the NASA Sounding Rocket Program (due to its low cost and ability to accommodate a wide range of payload configurations).

It is not planned to use the Mark-70 booster with this new launch vehicle. As a matter of fact, the additional use of the Mark-12 booster with the improved Orion sustainer could result in continued usage of Mark-12s near the current rate.

In summary, the Terrier Mark-12 booster motor will continue to be utilized on vehicle types 29, 35, 36, and 41; and the current program supply of these motors should be retained for future use.

EVALUATION OF MANAGEMENT'S RESPONSE

We understand that the sounding rocket program has now determined that the Mark-70s cannot be used for some payloads due to the effects of the more powerful motor during launch. The continued use and retention of Mark-12s will be required for these payloads. In addition, the sounding rocket program has developed a new launch vehicle that will use the Mark-12 as a primary component and could result in continued usage of the Mark-12 near the current rate. Based upon these changed conditions, we concur with management's position. As a result, no further action by management on this recommendation is necessary. We therefore consider this recommendation to be closed for reporting purposes.

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2. ADDITIONAL COSTS INCURRED FOR TESTING DEFECTIVE ROCKET MOTORS WERE NOT RECOVERED

The SRPB has not recovered the additional costs incurred for testing three defective Black Brant V rocket motors. The costs were not recovered because the Contracting Officers Technical Representative (COTR): (1) was not familiar with the contract provisions providing for recovery of such costs; and (2) did not make the contracting officer aware of the additional costs. Recovery of the additional testing costs would make an estimated $28,000 available for other uses by the SRPB.

NASA contract NAS-5-30977, with Canadian Commercial Corporation, Canada, requires the delivery of rocket motors that conform to the contract quality standard. Contract clause E.8, "Inspection of Supplies--Fixed-Price," provides for government acceptance inspection of the rocket motors, at government expense. However, when rocket motors delivered for acceptance do not meet the standard, the contract provides that:

- "The Contracting Officer may also charge the contractor for any additional cost of inspection or test when prior rejection makes reinspection or retest necessary."

- Further, "... the Government ... shall have the right to require the contractor ... at no increase in contract price, to replace the defective or nonconforming supplies at the original point of delivery..."

- "When supplies are returned to the contractor, the contractor shall bear the transportation cost from the original point of delivery to the contractor's plant..."

THREE DEFECTIVE ROCKET MOTORS SUPPLIED

The SRPB received three defective Black Brant V rocket motors from Canadian Commercial Corporation. The manufacturing contract provided for delivery of 80 Black Brant V rocket motors. Under the terms of the contract, the motors were shipped from the contractor's plant in Canada, to the Naval Weapons Station, Yorktown, Virginia. Once at Yorktown, each motor was x-rayed to determine whether it met contract acceptance criteria. As a result of the x-ray inspections, rocket motors with serial numbers 424, 427, and 480 were found to be defective.

- Rocket motor 424 was x-rayed in January 1991 and subsequently rejected. The rocket motor was shipped back to the contractor. A replacement rocket motor

has been provided by the contractor and currently awaits x-raying at Yorktown.

- Rocket motor 427 was x-rayed in February 1991 and subsequently rejected. The rocket motor was shipped back to the contractor where the defects were corrected. In January 1993, the rocket motor was re-shipped to Yorktown, x-rayed, and subsequently accepted.

- Rocket motor 480 was x-rayed in January 1992 and subsequently rejected. The motor presently awaits shipment back to the contractor. A replacement rocket motor has been provided by the contractor and currently awaits x-raying at Yorktown.

X-RAY COSTS CHARGED TO NASA

The cost of all x-rays are charged to the SRPB contract with Yorktown, Purchase Order S-01830D. The Yorktown contract provides for reimbursement of x-ray services at the current rate of $9,240, for each rocket motor inspected. Reinspection requires the same level of x-ray services as an original inspection, and is therefore charged at the same $9,240 rate, per rocket motor. The additional costs incurred as a result of the contractor supplying defective rocket motors have not been recovered or addressed with the contractor, even though terms of the contract with Canadian Commercial Corporation provide for recovery of the additional costs incurred.

CONTRACTING OFFICER WAS NOT AWARE THAT ADDITIONAL COSTS WERE INCURRED

The additional costs that have or will be incurred have not been recovered from the contractor because the COTR was not aware of the contract provisions that provide for recovery of the costs from the contractor. The COTR also did not make the Contracting Officer aware that additional costs have or will be incurred as a result of the contractor's delivery of defective rocket motors. Consequently, the Contracting Officer, together with the SRPB, has not taken action to recover or address the additional costs with the contractor.

REINSPECTION COSTS AND TRANSPORTATION CHARGES SHOULD BE RECOVERED

The additional cost of $9,240 for re-x-raying rocket motor 427 has been incurred by NASA and should be recovered from the contractor immediately. Total costs of $18,480 for x-raying the replacement rocket motors (numbers 424 and 480) will be incurred and billed to NASA under the Yorktown contract. In our opinion, these costs should be charged to the contractor upon incurrance.

Additional transportation costs may also have been incurred by NASA. Rocket motors are usually shipped by Government Bill of Lading (GBL), with the costs charged to NASA. We determined that rocket motors 424 and 427 were shipped collect, back to the contractor. The SRPB should ensure that rocket motor 480 is also shipped collect. We did not determine how rocket motor 427 was shipped to Yorktown the second time, or how the replacement rocket motors for 424 and 480 were shipped. If shipment was by GBL, these costs should also be recovered from the contractor.

RECOMMENDATION 3

The SRPB, together with the Contracting Officer, should pursue recovery of all appropriate additional inspection and transportation costs incurred by NASA as a result of the contractor providing defective rocket motors under contract NAS-5-30977.

MANAGEMENT RESPONSE

Concur. The SRPB concurs with the recommendation to pursue reclamation of x-ray inspection and transportation costs incurred on Black Brant V motor serial numbers MV-424, MV-427, and MV-480. This work was performed under Purchase Order S-01830D with the U.S. Naval Weapons Station, Yorktown, Virginia (Yorktown). We are currently obtaining costs for transportation and x-ray inspection of the aforementioned motors. We have also notified the Canadian Commercial Company (CCC) and Bristol Aerospace of our desire to recover these duplicative charges (Attachment 4).

Yorktown has been requested to identify by serial number those motors requiring future duplicative x-rays, with associated costs to NASA. In consonance with the Transportation Branch and the Contracting Officer's Technical Representative, the NASA Contracting Officer will calculate any duplicative costs for transporting replacement motors. CCC and Bristol will be notified by the Contracting Officer of both x-ray and transportation costs and requested to refund appropriate amounts to the Government.

EVALUATION OF MANAGEMENT'S RESPONSE

The actions planned or taken are considered responsive to the intent of the recommendation. Management's planned actions should result in a cost recovery of approximately $28,000 for the three rejected rocket motors discussed in the report. We also believe that further recoveries are possible since management was previously unaware of the contract provisions allowing for the recovery of additional costs for testing defective rocket motors. Current plans call for the future delivery of 56 additional Black Brant rocket motors. In our opinion, enforcement of this contract clause now will contribute to ensuring that defects in future Black Brant motors are kept to a minimum.

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3. REMOVAL OF NAVY ROCKET MOTORS FROM WFF SHOULD BE REQUESTED

The Launch Vehicles Branch is storing 724 Nike rocket motors at WFF as a favor for the Department of the Navy (Navy). The WFF plans to store these motors until needed for use at the Naval Air Weapons Station, China Lake, California. Storage of military rockets is not part of the WFF's mission. The mission of the WFF's Launch Vehicles Branch is to integrate rockets, payloads, and to conduct launches in support of NASA and other scientific missions. This condition creates an unwarranted increase in hazard risk to the safety of WFF personnel and the facility.

724 ROCKET MOTORS BEING STORED

During July and August 1994, the Launch Vehicles Branch accepted a total of 724 Nike rocket motors from the Department of the Army, Pueblo, Colorado, for storage at WFF. The rocket motors are stored on an outside lot in the general sounding rocket storage area (photograph at EXHIBIT 1). A few SRPB rocket motors are stored at the same location.

Each Nike rocket motor contains approximately 750 pounds of class "B" explosive propellent grain, or a total explosives weight of 543,000 pounds for the 724 rocket motors. The rocket motors are intended for military use at the Naval Air Weapons Station, China Lake, California. Launch Vehicles Branch personnel were unaware of a planned date for removal of the rocket motors from the WFF.

ROCKET MOTORS WERE STORED AS A FAVOR TO THE NAVY

Personnel from the Launch Vehicles Branch acknowledged that the stored rocket motors had no NASA purpose, and were accepted for storage solely as a favor to the Navy, under a verbal agreement. Under this agreement, the WFF provides free, secured, outside storage facilities. Upon removal, the Navy agrees to pay all shipping costs.

LARGE SCALE MILITARY ROCKET STORAGE IS NOT A PROPER FUNCTION FOR THE WFF

Serving as a military rocket storage depot is not a proper function for the WFF Launch Vehicles Branch. In addition, the storage of approximately 543,000 pounds of explosive propellent in one location creates an unwarranted increase in hazard risk to the safety of WFF personnel and the facility. We have notified the DoD Office of Inspector General of the shipment and storage of these rocket motors at the WFF. However, we believe that the WFF Launch Vehicles Branch should request the Navy to immediately remove the Nike rocket motors from the WFF.

RECOMMENDATION 4

The WFF Launch Vehicles Branch should request the Department of the Navy to immediately remove the 724 Nike rocket motors from the WFF.

MANAGEMENT RESPONSE

Partially Concur. We do not agree with the OIG's suggestion that storage for the Navy is not appropriate. The Navy first requested Goddard's assistance in providing for storage. 42 U.S.C. 2473(c)(6) charges NASA to cooperate with other Federal agencies in the use of NASA's services, equipment, and facilities. This is in the same section where Congress charged other agencies to provide NASA their services, equipment, and facilities in furtherance of NASA's missions. This same intent to promote cooperation among agencies in providing support for Government activities is also reflected in the Economy Act.

NASA has cooperated with the Navy in supporting their storage requirements, at no cost to NASA, consistent with the standards for providing support to another agency's programs. Nonetheless, the Suborbital Projects and Operations Directorate has notified the Navy of the concern raised in the OIG's report and has asked the Navy for its planned schedule with respect to taking possession of the motors (Attachment 5). To the extent, however, that continuation of storage at WFF is determined by both parties to further the Government's interests without undue impact on NASA activities, we are prepared to continue our cooperation as required by the Space Act.

We also note that the storage of these motors does not threaten the safety of Wallops facilities or personnel. These motors, along with other Wallops rocket motors, are stored in a remote, specially-designated pyrotechnic magazine area across the runway and not in proximity to the central Wallops facilities or population. All rocket motor storage at Wallops is in accordance with (1) NASA Safety Standard 1740.12, August 1993, "Safety Standards for Explosives, Propellants, and Pyrotechnics" and (2) Department of Defense Standard 6055.9, Change 3, July 1991, "Ammunition and Explosives Safety Standards."

EVALUATION OF MANAGEMENT'S RESPONSE

The actions planned or taken are considered responsive to the intent of the recommendation. We will however, remain in the concurrence cycle for this recommendation to assess the Navy's response to management's request that a schedule for removal be established.

We agree with management that the Space Act calls for cooperation between agencies. However, each agency has a defined mission and

is limited to conducting operations within the scope of that mission. NASA is a civilian agency with a mission of conducting aeronautical and space research. Large scale storage of military explosives is properly the role of the DoD.

Management's response states the support to the Navy has been "...at no cost to NASA..." However, shipping records indicate that the rocket motors were shipped to WFF on 46 tractor trailer trucks and that NASA performed receiving operations on 21 different dates. On each delivery date, this involved WFF personnel driving or transporting a forklift to the storage area (approx. 1/4 mile), unsecuring the area, unloading each truck, resecuring the area and returning the forklift to the main rocket motor warehouse operations building. No personnel or loading equipment are stationed at the storage site. Each receiving operation took WFF personnel an estimated one hour. In our view, the labor hours involved and the equipment usage represent costs to NASA. Further, similar costs will likely be incurred by NASA when the motors are removed.

Management's response states that the rocket motors do not threaten the safety of the WFF, and that they are stored in a "...remote, specially-designated pyrotechnic magazine area..." However, we observed (see EXHIBIT I) that the motors are stored on an outside lot, and not in an approved explosives storage magazine. Further, this lot is located in close proximity to an active runway at the WFF airport. In our opinion, adding more than half-a-million pounds of explosive to the WFF storage area increases the explosives hazard at the WFF main base.

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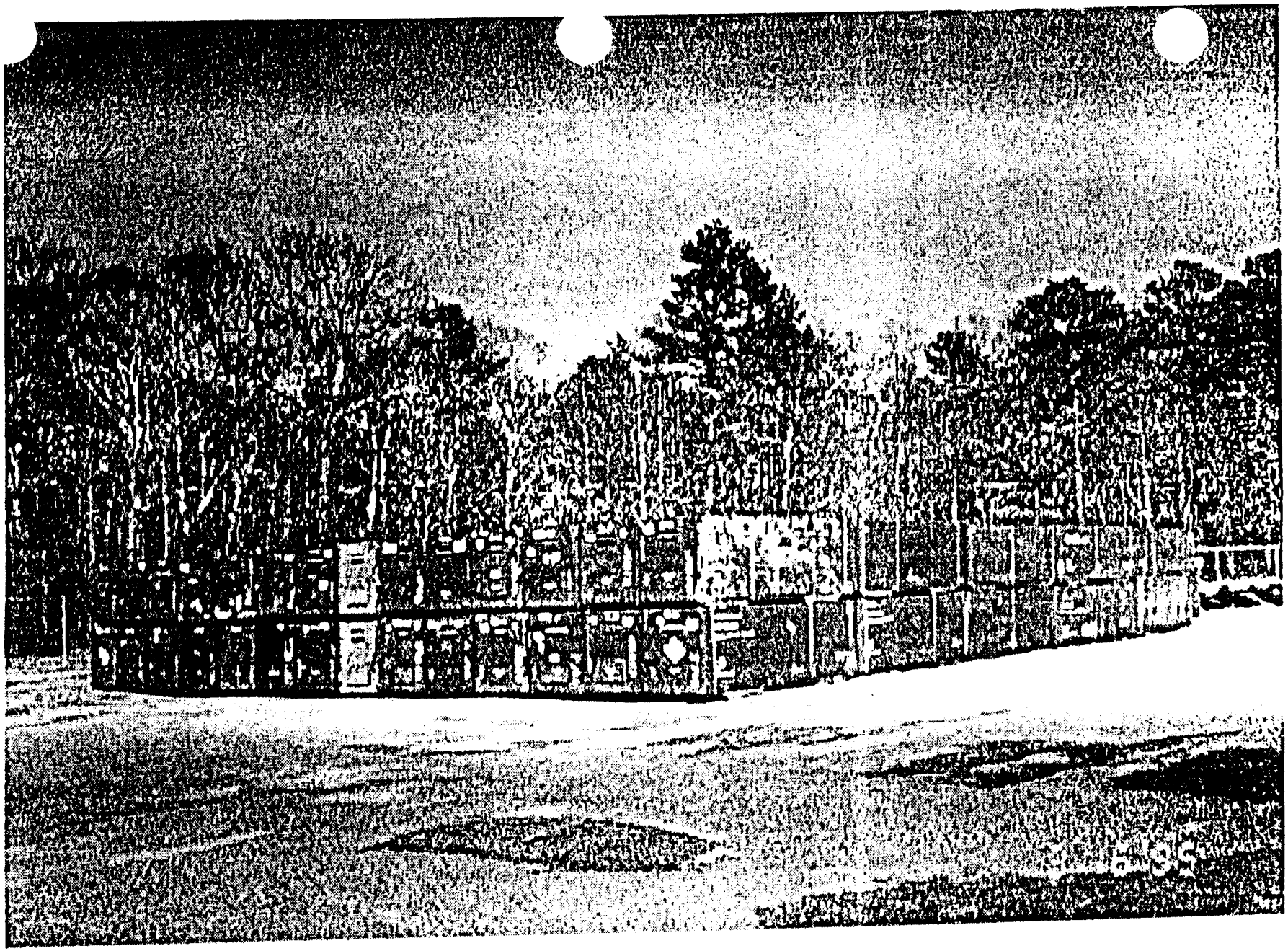
OTHER MATTERS

The following observation was made during the survey and is presented for management's information and resolution.

On Purchase Order S-01830D with the U.S. Naval Weapons Station, Yorktown, Virginia (Yorktown), the COTR was certifying that rocket motor x-ray services were received without verifying invoiced amounts. For example, one Yorktown invoice showed, "RADIOGRAPHIC INSP SVS" "$54,184.77." This invoice did not identify the specific rocket motors x-rayed and the related charges for each motor. The COTR certified the invoices based upon a general knowledge of how much work was being performed, and basically relied on the Yorktown accounting system. The COTR acknowledged that NASA could have been billed twice for the same services. The Contracting Officer was not aware that certification was being made without verification, and was authorizing payment based upon the COTR's certification. The Contracting Officer agreed that the condition was improper, and stated that corrective action would be taken immediately to ensure that amounts billed are verified before payment. The Contracting Officer also notified Yorktown, in writing, that detailed information was needed to verify the correctness of amounts billed on all future invoices.

MANAGEMENT RESPONSE

Corrective action has been implemented on the OIG's observation concerning certification of an invoice for rocket motor x-ray services. The Contracting Officer notified Yorktown that future invoices must include complete identification, by serial number, of rocket motors x-rayed or re-x-rayed (as a result of previous rejections) and that incomplete invoices will not be processed until the proper information is provided. The COTR will confirm x-raying of motors by serial number and will confirm x-raying of any previously rejected motors.



DoD Rocket Motors
181 Crates x 4 Rocket Motors per Crate = 724

EXHIBIT 1

Management's Response

National Aeronautics and
Space Administration
Goddard Space Flight Center
Greenbelt, MD 20771

Reply to Attn of
201

JUL 31 1995

TO: 190/Director, Center Office of Inspector General (OIG), GSFC

FROM: 100/Director

SUBJECT: GSFC Response to OIG Rapid Action Report on Wallops Flight Facility Sounding Rocket Program, Acquisition, Inventory, and Storage of Rocket Motors, A-GO-95-005

Enclosed is our response to the subject rapid action report dated June 21, 1995.

Please call Ms. JoAnn Clark at 286-7977 if you have any questions or need further coordination or assistance on this.

Joseph H. Rothenberg

Enclosure

Attachment
Management's Response

GODDARD SPACE FLIGHT CENTER (GSFC)

RESPONSE TO

OFFICE OF INSPECTOR GENERAL (OIG)

RAPID ACTION REPORT A-GO-95-005

DATED JUNE 21, 1995

WALLOPS FLIGHT FACILITY (WFF) SOUNDING ROCKET PROGRAM
ACQUISITION, INVENTORY, AND STORAGE OF ROCKET MOTORS

DATE JUL 31 1995

ENCLOSURE

Attachment
Management's Response

GSFC's narrative response is provided as follows.

OIG RECOMMENDATION 1: ($0)

The WFF's Sounding Rocket Projects Branch (SRPB) acquisition of Terrier Mark 70 rocket motors should be limited to a quantity necessary to meet only Fiscal Year (FY) 1995 and 1996 project requirements. Any acquisition of Mark 70's in excess of FY 1995 and 1996 project requirements should be justified.

GSFC RESPONSE TO RECOMMENDATION 1: ($0) CONCUR

The NASA Sounding Rocket Program concurs with the OIG's recommendation of only obtaining a limited number of surplus Navy Terrier Mark 70 rocket motors. It should be emphasized that the Mark 70, which is an improved-performance version of the older Navy Mark 12 Standard Missile booster, is very important with regard to future use in the NASA Sounding Rocket Program.

The more powerful Mark 70 was developed for the Navy's extended-range Standard Missile and typically can provide about a 20 percent increase in very precious out-of-atmosphere scientific observing time for NASA astronomical and solar physics suborbital spacecraft. These more powerful Terrier boosters have only recently become surplus to the Navy due to Department of Defense (DoD) downsizing. Mission requirements dictated the use of a Mark 70 for a specific application in 1990 (NASA flight mission number 35.020 UE). This first Mark 70 used in the NASA Program was acquired from the Navy at a cost of $88,000. Now that the motors have become available on a surplus basis, the Program can afford to provide this increased performance capability to other missions.

As the OIG report correctly indicates, our initial planning in mid-1993 was to acquire as many as 150 Mark 70 motors (Attachment 1). This action was based on both what the anticipated programmatic needs would be over several years and on the historical practice of getting a relatively long-term supply of surplus motors from the DoD while they were available, not knowing what the potential future availability would be due to

rapidly-changing DOD requirements. More recently, we have made inquiries and have been informed by the Navy that there is no current planning to dispose of the Mark 70 motors and that they should be available for future NASA use at the rate of 10-15 motors per year.

As the OIG report indicates, our current inventory shows 16 Mark 70 motors. However, of these, three are not owned by NASA but by DoD/Ballistic Missile Defense Organization (BMDO), one has been flown in Alaska (mission 35.021 UE/March 26, 1995), and three are currently scheduled to be launched by the end of October 1995. At that time our inventory should be down to only nine motors.

Attachment 2 is a copy of the Navy agreement to deliver only 15 motors for FY 1996 and to charge NASA only shipping and handling costs.

Since only limited numbers of Mark 70 booster motors will be obtained from the Navy, the NASA Sounding Rocket Program considers the action under this recommendation to be closed for reporting purposes.

OIG RECOMMENDATION 2: ($0)

The SRPB should dispose of all Terrier Mark 12 rocket motors in inventory if the Terrier Mark 70's are acquired.

GSFC RESPONSE TO RECOMMENDATION 2: ($0) NONCONCUR BASED ON CHANGED SITUATION

Since NASA began using the Terrier Mark 12 booster in its suborbital rocket program during the late 1960's, the motors were obtained from the Navy by utilizing static-fired motor cases, which were reloaded with propellant grains that had exceeded Navy operational specified lifetime (but were acceptable to NASA). Even though the motors were not surplus, the cost NASA had to pay for re-grain operations was not excessive (approximately $7K). About 5-6 years ago, the Navy discontinued using the Mark 12 motors entirely in favor of the new Mark 70 motor and eliminated the Mark 12 static-firing program; subsequently, the Navy

Attachment
Management's Response

instituted a program to dispose of the Mark 12 motors. Since more than half of the launch vehicles utilized in the NASA Sounding Rocket Program employ the Terrier booster, NASA quickly requested to obtain a several-year supply of these motors for its use, since future availability was in doubt.

Currently, the NASA inventory shows a program stock of 160 Mark 12 Terrier motors; however, only 25 have been modified for Sounding Rocket use. Eighteen of these are located at White Sands Missile Range (WSMR), six are at WFF assigned to the Australian Campaign in October, and one is unassigned at WFF.

Apparently, there is an OIG misconception that, as Mark 70 motors are introduced in the NASA Sounding Rocket Program, the Mark 12 motors will be phased out. This is not the case. Many missions will have launch vehicle requirements that can adequately be met by using the Mark 12, rather than the Mark 70, as a booster for both Black Brant V and Malemute upper stage motors. In addition, some payload configurations may not tolerate the use of the Mark 70 due to aeroelastic stability problems associated with the higher aerodynamic pressures encountered with the more powerful motor.

Over the past year, NASA has developed a new cost-effective all-surplus launch vehicle utilizing the Mark 12 booster in conjunction with the improved Orion sustainer. This configuration has been successfully flight tested at WFF and at the WSMR and has been designated NASA vehicle number 41 (see Attachment 3). It is anticipated that this new launch vehicle will see extensive service in the NASA Sounding Rocket Program (due to its low cost and ability to accommodate a wide range of payload configurations).

It is not planned to use the Mark 70 booster with this new launch vehicle. As a matter of fact, the additional use of the Mark 12 booster with the improved Orion sustainer could result in continued usage of Mark 12's near the current rate.

Attachment
Management's Response

In summary, the Terrier Mark 12 booster motor will continue to be utilized on vehicle types 29, 35, 36, and 41; and the current program supply of these motors should be retained for future use.

OIG RECOMMENDATION 3: ($0)

The SRPB, together with the Contracting Officer (CO), should pursue recovery of all appropriate additional inspection and transportation costs incurred by NASA as a result of the contractor providing defective rocket motors under contract NAS5-30977.

GSFC RESPONSE TO RECOMMENDATION 3: ($TBD) CONCUR

The SRPB concurs with the recommendation to pursue reclamation of x-ray inspection and transportation costs incurred on Black Brant V motor serial numbers MV-424, MV-427, and MV-480. This work was performed under Purchase Order S-01830D with the U. S. Naval Weapons Station, Yorktown, Virginia (Yorktown). We are currently obtaining costs for transportation and x-ray inspection of the aforementioned motors. We have also notified the Canadian Commercial Company (CCC) and Bristol Aerospace of our desire to recover these duplicative charges (Attachment 4).

Yorktown has been requested to identify by serial number those motors requiring future duplicative x-rays, with associated costs to NASA. In consonance with the Transportation Branch and the Contracting Officer's Technical Representative (COTR), the NASA CO will calculate any duplicative costs for transporting replacement motors. CCC and Bristol will be notified by the CO of both x-ray and transportation costs and requested to refund appropriate amounts to the Government.

The program appreciates notification of this and all other efforts to find duplicative charges, however small they may be. Upon determination of these costs and refund of such to the Government, this action will be considered closed out.

ACTION OFFICIAL:	GSFC/WFF/244.3/J. Savage
CLOSURE OFFICIAL:	GSFC/WFF/244.3/R. Swanson
CONCURRING OFFICIAL:	GSFC/WFF/244/W. Mears
PROJECTED CLOSURE DATE:	September 30, 1995

OIG RECOMMENDATION 4: ($0)

The WFF Launch Vehicles Branch should request the Department of the Navy to immediately remove the 724 Nike rocket motors from the WFF.

GSFC RESPONSE TO RECOMMENDATION 4: ($0) PARTIALLY CONCUR

We do not agree with the OIG's suggestion that storage for the Navy is not appropriate. The Navy first requested Goddard's assistance in providing for storage. 42 U.S.C. 2473(c)(6) charges NASA to cooperate with other Federal agencies in the use of NASA's services, equipment, and facilities. This is in the same section where Congress charged other agencies to provide NASA their services, equipment, and facilities in furtherance of NASA's missions. This same intent to promote cooperation among agencies in providing support for Government activities is also reflected in the Economy Act.

NASA has cooperated with the Navy in supporting their storage requirements, at no cost to NASA, consistent with the standards for providing support to another agency's programs. Nonetheless, the Suborbital Projects and Operations Directorate has notified the Navy of the concern raised in the OIG's report and has asked the Navy for its planned schedule with respect to taking possession of the motors (Attachment 5). To the extent, however, that continuation of storage at WFF is determined by both parties to further the Government's interests without undue impact on NASA activities, we are prepared to continue our cooperation as required by the Space Act.

We also note that the storage of these motors does not threaten the safety of Wallops facilities or personnel. These motors,

along with other Wallops rocket motors, are stored in a remote, specially-designated pyrotechnic magazine area across the runway and not in proximity to the central Wallops facilities or population. All rocket motor storage at Wallops is in accordance with (1) NASA Safety Standard 1740.12, August 1993, "Safety Standards for Explosives, Propellants, and Pyrotechnics" and (2) Department of Defense Standard 6055.9, Change 3, July 1991, "Ammunition and Explosives Safety Standards."

ACTION OFFICIAL:	GSFC/WFF/834/W. Brence
CLOSURE OFFICIAL:	GSFC/WFF/830/J. Duke
CONCURRING OFFICIAL:	GSFC/WFF/800/A. Torres
PROJECTED CLOSURE DATE:	November 15, 1995

OTHER MATTER

Corrective action has been implemented on the OIG's observation concerning certification of an invoice for rocket motor x-ray services. The Contracting Officer notified Yorktown that future invoices must include complete identification, by serial number, of rocket motors x-rayed or re-x-rayed (as a result of previous rejections) and that incomplete invoices will not be processed until the proper information is provided. The COTR will confirm x-raying of motors by serial number and will confirm x-raying of any previously rejected motors. This is considered closed for reporting purposes.

Attachment
Management's Response

841.2

APR 9 1993

Department of the Navy
Indian Head Division
Attn: Pete Fields/Code 6220
Naval Surface Warfare Center (NSWC)
101 Strauss Ave.
Indian Head, MD 20640-5035

Subject: Surplus Mk 70 Mod 1 Motors for NASA Sounding Rocket Program

It has come to my attention, as a result of a telephone conversation between Mr. David Kotsifakis (NASA Code 841.2) and Mr. Ed O'Connor (NSWC Code 6220T), that the NASA Sounding Rocket Program can obtain surplus Mk 70 Mod 1 Terrier motors. It is understood that the cost to our Program will be shipping charges and any charges for modifications performed by NSWC Indian Head.

We would like as many as 150 Mk 70 Mod 1 motors to be shipped to the Wallops Flight Facility for the Sounding Rocket Program. These motors will then be shipped to NSWC Indian Head for modification as requirements dictate. Any questions concerning our requirements should be directed to Mr. David Kotsifakis, telephone number (804) 824-1364.

ORIGINAL SIGNED BY.
LARRY J. EARLY.

Larry J. Early
Chief, Projects Division

cc:
840/Mr. R. Pless
841/Mr. W. Gurkin
841.2/Mr. C. Ballance, Jr.
841.2/Mr. D. Kotsifakis
Mail & File

841.2/MrDKotsifakis/bf:04/01/93:1615
Rewritten:841.2/MrCBallance/bf:04/02/93:1615

Attachment
Management's Response

DEPARTMENT OF THE NAVY
PROGRAM EXECUTIVE OFFICE
THEATER AIR DEFENSE
[illegible] JEFFERSON DAVIS HIGHWAY
ARLINGTON VA 22242-5170

R. Blas

ADVANCE COPY
ROUTE SHEET NO. 229

8800
Ser 422-221/073
26 April 1995

cc: Wall
Dave Y

From: Program Executive Office, Theater Air Defense
To: National Aeronautics and Space Administration, Goddard Space Flight Center, Wallops Island (Mr. D Kotsifakis)

Subj: REQUEST FOR MK 70 MOD 1 ROCKET MOTORS

Ref: (a) NASA/GSFC/WFF facsimile transmission of 15 Mar 95

1. The reference (a) request is approved for the transfer of 15 MK 70 Rocket Motors to your facility.

2. It is understood that the MK 70 Rocket Motors will be issued in an "as is" condition and used for non-tactical purposes in support of NASA's Sounding Rocket Program. It is also understood that no liability is intended or implied by this approval.

3. By copy of this letter Indian Head Division, Naval Surface Warfare Center (NAVSURFWARCENDIV), is authorized to locate and coordinate shipment of subject motors to your facility.

4. Request your office contact Mr. Edward O'Connor, (301) 743-4929, at the NAVSURFWARCENDIV Indian Head who will serve as point of contact and provide the details associated with the cost of handling and shipping of the 15 units.

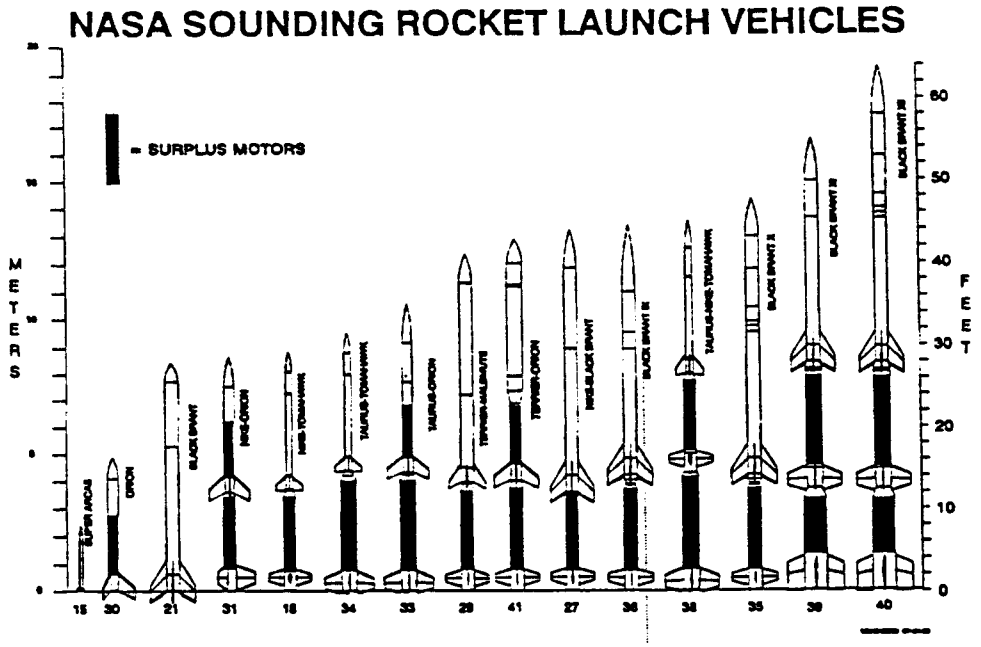
5. The PEO(TAD) point of contact is Mr. Sam Brown, PMS422-221, (703) 602-0651/3 ext 237.

R. L. Wilson

R. L. WILSON
By direction

Copy to:
NAVSURFWARCENDIV Indian Head (Code 6220, 6220T)
NAVORDCEN IMSD (W. Romero)

Attachment
Management's Response



Attachment
Management's Response

MAR 17 1995

244.3

Canadian Commercial Corporation
Attn: Gabriella Gref-Innes
50 O'Connor St.
Ottawa, Ontario, Canada K1A 0S6

SUBJECT: Possible Duplicated X-Ray and Inspection Costs under NAS5-30977

Under the subject contract, CCC/Bristol delivered 80 Black Brant sounding rocket motors. These were identified by serial numbers and were required to be x-rayed by the Naval Weapons Station in Yorktown, VA., prior to shipment to GSFC/WFF. Shipment of the motors was under Government Bill of Lading, at Government expense. Some motors required replacement by CCC/Bristol as a result of failing initial Yorktown inspection.

A recently conducted audit of the GSFC/WFF Sounding Rocket Program tentatively concluded that costs associated with x-ray inspection and transportation of replacement motors, borne by the Government, should have been paid by CCC/Bristol. We concur in that finding and have requested Yorktown to provide sufficient detail to specifically identify the duplicated costs. This notification is for your information only at this time; when details are available, they will be forwarded to you.

If you have any questions concerning this subject, please contact the undersigned at (804) 824-1276.

ORIGINAL SIGNED BY

K. Jay Savage
Contracting Officer

Attachment
Management's Response

National Aeronautics and
Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337-5099

Reply to Attn of: 834

JUL 12 1995

Mr. Larry Boyer
Naval Air Weapons Station
Weapons Department
China Lake, CA 93555-6001

Dear Mr. Boyer:

The NASA/Goddard Space Flight Center/Wallops Flight Facility (WFF) accepted 754 Nike rocket motors for temporary storage from your organization in July 1994.

We were glad to accommodate your request at that time; however, the NASA Sounding Rocket Program is presently under review by the NASA Office of the Inspector General and their recommendation is for the removal of these rocket motors. Therefore, I must ask that a schedule be established for the removal of these motors from WFF.

Scheduling and arrangements for removal should be organized with Mr. Kirk Webb of the Nondestructive Testing Section. Mr. Webb can be reached by telephone at (804) 824-1433 or by facsimile at (804) 824-2347.

If we can be of further assistance in the future, please do not hesitate to contact us.

Sincerely,

Arnold L. Torres
Director of Suborbital Projects and Operations