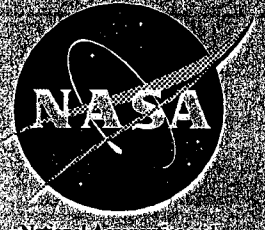
AR-96-001

AUDIT REPORT

RSRM ENHANCEMENT PROJECT

AMES RESEARCH CENTER

December 15, 1995



National Aeronautics and Space Administration

OFFICE OF INSPECTOR GENERAL

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

DEC 15 1995

Reply to Attn of:

W

TO: M/Associate Administrator for Space Flight
H/Associate Administrator for Procurement

FROM: W/Acting Deputy Assistant Inspector General for Auditing

SUBJECT: Audit Report on the RSRM
Enhancement Project
Ames Research Center
Assignment No. A-AR-93-003
Report No. AR-96-001

The Office of Inspector General has completed an audit of the Redesigned Solid Rocket Motor Enhancement (RSRME) Project. Enclosed is a copy of the subject final audit report.

In March 1990, NASA granted Thiokol limited authorization to proceed with a project intended to reduce the cost of building the Redesigned Solid Rocket Motor (RSRM) while improving its producibility and reliability. The $85 million effort, designated the "Redesigned Solid Rocket Motor Enhancement Project," was completed in late 1994. The objectives of the audit were to determine whether (1) cost savings had been realized as a result of the RSRME Project, and (2) costs complied with applicable laws and regulations.

The audit disclosed that:

Cost savings cannot be measured -- Although NASA cited expected cost savings as an important element of the enhancement project, NASA and Thiokol did not establish systems to measure and report cost savings because they believed such systems would be neither cost effective nor accurate, and the savings would be included in the negotiated price of the solid rocket motors. Significant modifications to the contract prevented us from determining the extent to which the expected cost savings were achieved.

NASA may not have complied with the Berger Amendment -- The Berger Amendment states that NASA may not use appropriated funds to substantially amortize new contractor facilities. Although the "Buy 3" RSRM contract's original period of performance would have ended just before 50 percent of the facility costs would have

been charged to NASA, the period of performance was significantly extended. As a result, most of Thiokol's investment in the RSRME facilities will be amortized to NASA when the contract ends in November 1999. By that time, NASA will have substantially amortized the Thiokol facilities, and may have inadvertently violated the intent of the Berger Amendment.

NASA did not fully comply with Government property regulations -- NASA provided Thiokol with property and equipment under conditions that did not fully comply with various requirements of the Federal Acquisition Regulation (FAR) and the NASA FAR Supplement. Also, NASA may have misclassified some of this property as "severable" rather than as "nonseverable" property.

We discussed a draft of this report with NASA management on July 27, 1995, and written responses were received from management on November 3, 1995. The comments incorporated into the report describe actions taken and planned in response to the report's recommendations. We consider the recommendations closed with the issuance of the final report. If you have any questions or would like any further information, please call Robert Wesolowski, Director, Audit Field Operations Division, or me at 358-1232.

Robert J. Wesolowski
for Carroll S. Little

Enclosure

cc:
JMC/P. Chait
W/D. Gandrud, ARC (w/o encl.)

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AMES RESEARCH CENTER

EXECUTIVE SUMMARY

INTRODUCTION

The NASA Office of Inspector General has completed an audit of the Redesigned Solid Rocket Motor Enhancement Project at Thiokol Corporation, Space Operations, Brigham City, Utah.

In March 1990, NASA granted Thiokol limited authorization to proceed with a project intended to reduce the cost of building the Redesigned Solid Rocket Motor (RSRM) while improving its producibility and reliability. The $85 million effort, designated as the "Redesigned Solid Rocket Motor Enhancement (RSRME) Project," was completed in late 1994.

OBJECTIVES

The objectives of the audit were to determine whether:

- Cost savings were realized as a result of the enhancement project; and
- Costs complied with applicable laws and regulations.

RESULTS OF AUDIT

The audit disclosed that:

- ***Cost savings cannot be measured.*** While NASA cited reduced costs as an important element for the project, NASA and Thiokol did not establish systems to measure and report cost savings because they believed such systems would be neither cost effective nor accurate, and the savings would be included in the negotiated price of the solid rocket motors. Significant modifications to the contract prevented us from determining the extent to which the expected cost savings were achieved.
- ***NASA may not have complied with the Berger Amendment.*** The Amendment, which is a recurring provision in NASA's annual Appropriations Act, states that NASA may not use appropriated funds to substantially amortize the cost of new contractor facilities.

Although the "Buy 3" contract's original period of performance would have ended just before 50 percent of the facility costs would have been charged to NASA, the period of performance was significantly extended due to a decreased shuttle flight rate and the cancellation of the Advanced Solid Rocket Motor (ASRM) project. Therefore, it appears that most of Thiokol's investment in the RSRME facilities will be amortized to NASA when the contract ends in November 1999. By that time, NASA will have substantially amortized the Thiokol facilities, and may have inadvertently violated the intent of the Berger Amendment. We believe this condition occurred because NASA had not sought clarification from Congress regarding the intent of the Amendment.

- ***NASA did not fully comply with Government property regulations.*** NASA provided Thiokol with general purpose equipment and software totaling about $22 million under conditions that did not fully comply with various requirements of the Federal Acquisition Regulation (FAR) and the NASA FAR Supplement. As a result, NASA could incur higher contract costs. Also, NASA may have misclassified about $7 million of this property as "severable" rather than as "nonseverable" property. We believe these conditions occurred because contracting officials were not adequately familiar with applicable property regulations.

Although not directly related to the audit objectives, the following matter was identified:

- ***NASA has not funded a large liability that would accrue to NASA if it terminated its incrementally-funded contract with Thiokol.*** The "Buy 3" contract (which provides for overall RSRM manufacturing, RSRME tooling, and other direct project implementation costs), is significantly underfunded when termination liability is considered.

RECOMMENDATIONS

1. Prior to authorizing a project, the NASA Associate Administrator for Space Flight should ensure that cost savings can be measured when savings are a project objective.

2. The NASA Associate Administrator for Procurement should ensure compliance with the Berger Amendment.

3. The NASA Associate Administrator for Procurement should reiterate the need to carefully consider whether Government production and research property intended to be installed on contractor premises is severable or nonseverable under the policy and definitions set forth in FAR 45.309 and 45.301.

GENERAL COMMENTS We appreciate the assistance and cooperation extended to us by all NASA and contractor personnel contacted during the audit.

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INTRODUCTION

The NASA Office of Inspector General has completed an audit of the Redesigned Solid Rocket Motor Enhancement Project at Thiokol Corporation, Space Operations, Brigham City, Utah.

In March 1990, NASA granted Thiokol limited authorization to proceed with a project intended to reduce the cost of building the Redesigned Solid Rocket Motor (RSRM) while improving its producibility and reliability. The effort, designated as the "Redesigned Solid Rocket Motor Enhancement (RSRME) Project," was completed in late 1994. The RSRME project was the result of an initiative that NASA took in 1988 to review the RSRM program and to recommend ways to enhance producibility and reliability without making design changes. Major elements of the project included new contractor-funded buildings and NASA-provided general purpose equipment, special tooling, and computer hardware and software. Thiokol had proposed a new nozzle facility as part of the enhancement project. NASA rejected the proposed nozzle facility because it considered the existing nozzle manufacturing process to be adequate, and because a new facility was thought to be not cost effective.

NASA directly funded $69.1 million of RSRME project costs under two contracts: severable property was funded under the non-fee-bearing facilities contract, number NAS8-38680(F); and special tooling and program implementation were funded under the "Buy 3" RSRM manufacturing contract, number NAS8-38100. In addition, NASA will pay $15.9 million indirectly through Thiokol's depreciation of non-severable property ("brick and mortar") that was funded by Thiokol. The total project cost was about $85 million.

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OBJECTIVES, SCOPE, AND METHODOLOGY

OBJECTIVES

The objectives of the audit were to determine whether:

- Cost savings were realized as a result of the RSRME project; and
- Costs complied with applicable laws and regulations.

SCOPE AND METHODOLOGY

NASA cited expected cost savings as an important element of the enhancements project. Therefore, we planned to evaluate the integrity of any systems used by Thiokol to measure and report cost savings. As discussed in the observations and recommendations section of this report, however, we learned that NASA and Thiokol had not established systems to track cost savings. Accordingly, we attempted to determine whether, from an overall program cost perspective, savings could be attributed to the RSRME project.

To determine whether project costs complied with applicable laws and regulations, we evaluated NASA's and Thiokol's methodology for accumulating, classifying and billing project costs. We also assessed NASA's and Thiokol's compliance with NASA's annual Appropriations Act, Federal Acquisition Regulation Part 45, and NASA FAR Supplement (NFS) Part 18-45. We did not determine the allowability of incurred and billed project costs since this is a function of the Defense Contract Audit Agency.

The audit was performed in accordance with generally accepted government auditing standards and included such examinations and tests of applicable records and documentation as were considered necessary in the circumstances.

AUDIT FIELD WORK

Audit field work was conducted at Thiokol Corporation, Space Operations Division, Brigham City, Utah, and from our office at the Ames Research Center, Moffett Field, California, from May 1993 through May 1994.

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OBSERVATIONS AND RECOMMENDATIONS

OVERALL EVALUATION The audit disclosed that:

- Cost savings resulting from the RSRME project cannot be measured. While NASA cited cost savings as an important element of the RSRME project, NASA and Thiokol did not establish systems to measure and report cost savings. In addition, significant modifications to the contract prevented us from determining the extent of cost savings that may be achieved.

- NASA may not have complied with a provision in its annual Appropriations Act. The provision, commonly referred to as the Berger Amendment, prohibits NASA from substantially amortizing the cost of new contractor-funded facilities. Notwithstanding this provision, most of Thiokol's investment in RSRME facilities will be amortized (charged) to NASA when the "Buy 3" RSRM manufacturing contract ends in November 1999. We believe this condition occurred because NASA had not sought clarification from Congress as to the acceptable portion of a contractor's facility that could be charged to NASA.

- NASA provided Thiokol with severable property including general purpose equipment, tooling and software totaling about $22 million under conditions that did not fully comply with the FAR and the NFS. For example, NASA provided the general purpose equipment and software without adequate justification; provided $11 million of property that should have been acquired by the contractor; and did not require Thiokol to screen existing Government equipment inventories before acquiring new equipment. The OIG believes that noncompliance with the FAR and the NFS may have caused NASA to incur higher property administration costs. Further, we believe NASA may have improperly classified about $7 million of property as severable rather than nonseverable property. We believe this condition occurred because contracting officials were not adequately familiar with applicable property regulations.

Although not directly related to the audit objectives, the following additional issue was identified:

- The RSRM "Buy 3" contract (which provides for overall RSRM manufacturing, RSRME tooling, and other direct RSRME project implementation costs), is significantly underfunded when termination liability is considered.

Discussion follows regarding each of these matters.

COST SAVINGS CANNOT BE MEASURED

NASA authorized the RSRME project based in part on anticipated cost savings. NASA did not conduct "formal" cost/benefit analyses prior to authorizing the project. Instead, NASA teams conducted a non-advocate RSRME Cost/Technical Review and provided their findings to the Associate Administrator for Space Flight. While not a cost/benefit analysis in the traditional sense, the review basically served the same purpose.

NASA and Thiokol agreed that systems would not be established to specifically track cost savings because they believed such systems would be neither cost effective nor accurate, and the savings would be included in the negotiated price of future motors. Significant changes in NASA requirements made it difficult, if not impossible, to determine whether savings objectives were achieved.

NASA officials advised that it would have been virtually impossible to determine the precise savings associated with the RSRME program. To illustrate, the RSRME influences in mix/cast, final assembly, nozzle, case preparation, and refurbishment work centers could not be totally segregated from other influences which resulted in savings, such as engineering changes, process changes, typical learning curve efficiencies, and production rate reductions (12 flights/year to 7 flights/year). They further advised that it would have been extremely complicated and costly to structure an accounting mechanism to capture these data. NASA officials said they believed the negotiated position for the RSRME, together with other contract features such as the cost underrun fee consideration, provided sufficient Government assurance of flight fidelity and contract cost control and savings.

In January 1989, NASA requested Thiokol to submit a proposal for a follow-on procurement ("Buy 3") of 66 flight sets of RSRMs

(2 motors per set) plus 10 flight support motors for a total of 142 motors. During the negotiations, NASA changed the quantities to 68 flight sets of RSRMs plus 6 flight support motors (again, a total of 142 motors).

Thiokol offered to build 142 motors for $2.32 billion (exclusive of fee and surcharges) if NASA would authorize the RSRME project. Thiokol's proposal included the RSRME project which consisted of mix/cast and final assembly facilities, a new nozzle facility, and a general upgrade of plant automation known as the Computer Integrated Enterprise. According to Thiokol, the expected cost savings from the RSRME project would exceed the total cost of the project by about $84 million, before the "Buy 3" contract was completed. Thiokol also stated that the RSRME project would result in higher quality motors.

In October 1990, NASA accepted the RSRME proposal based on the RSRME Cost/Technical Review, and declared cost savings an important objective of the enhancements project. (A proposed nozzle facility was not accepted.) Due to the lengthy negotiations that ensued, NASA authorized Thiokol to continue building RSRMs under the old "Buy 2" contract. In July 1991, NASA and Thiokol signed the "Buy 3" RSRM contract for $2.6 billion based on updated costs, fees, and changes to that point. The "Buy 3" contract included the RSRME project.

The RSRME project is essentially completed. However, various modifications and undefinitized changes to the "Buy 3" production contract have added about $1.4 billion to the contract, for a total cost of more than $4 billion. The majority of the cost increase, almost $1 billion, was caused by a stretch-out in the RSRM production schedule.

Concurrent with the $1.4 billion increase in the "Buy 3" production contract, Thiokol reduced its work force by several hundred people. The confluence of (1) the reduced production rate, (2) Thiokol's reduced work force, and (3) a more than $1.4 billion increase in the contract amount, made it virtually impossible to determine the extent of cost savings.

RECOMMENDATION 1 Prior to authorizing a project, the NASA Associate Administrator for Space Flight should ensure that cost savings can be measured when savings are a project objective.

Management's Response	NASA concurs with the intent of this recommendation and will ensure incorporation in the future where it is applicable, and appropriate to do so.
Evaluation of Management's Response	Actions planned or taken by NASA Headquarters are responsive to the recommendation.

NASA MAY NOT HAVE COMPLIED WITH THE BERGER AMENDMENT

NASA may not have complied with a recurring provision in its annual Appropriations Act known as the Berger Amendment. The Amendment states that NASA may not use appropriated funds to substantially amortize new contractor facilities that are used exclusively to support NASA contracts. NASA's possible noncompliance with the Amendment is related to its definition of the term "substantially amortize," and to the classification of property furnished to Thiokol. Until NASA determines Congress' intended definition of this term and the manner in which the Amendment should be applied, NASA may be inadvertently violating conditions of the Amendment.

The Berger Amendment states:

> *(N)o amount appropriated pursuant to this or any other Act may be used for the lease or construction of a new contractor-funded facility for exclusive use in support of a contract or contracts with the National Aeronautics and Space Administration under which the Administration would be required to substantially amortize through payment or reimbursement such contractor investment, unless an Appropriations Act specifies the lease or contract pursuant to which such facilities are to be constructed or leased or such facility is otherwise identified in such Act ... . (T)he Administrator may authorize such facility lease or construction, if he determines, in consultation with the Committees on Appropriations, that deferral of such action until the enactment of the next Appropriations Act would be inconsistent with the interest of the Nation in aeronautical and space activities.*

When NASA authorized the project, it defined "substantially" to mean that no more than 50 percent of the capitalized RSRME facilities should be amortized to NASA.

Although the "Buy 3" contract's original period of performance would have ended just before 50 percent of the facility costs would have been charged to NASA, the period of performance was significantly extended due to a decreased shuttle flight rate and the cancellation of the Advanced Solid Rocket Motor (ASRM) project.

While the RSRME project was in the proposal stage, the Associate Administrator for Space Flight discussed the implications of the Berger Amendment with NASA's General Counsel. The General Counsel did not specifically determine the overall intent of Congress regarding the Berger Amendment. However, in this particular case the General Counsel opined that the proposed project would not violate the Berger Amendment because (1) depreciation would be consistent with Cost Accounting Standards, and (2) the contract was planned to be charged only 7 years of the 15-year depreciable life of the facilities. (Therefore, the facilities would not be substantially amortized because slightly less than 50 percent of the facilities cost would be charged to NASA during the original contract period.)

Thiokol also obtained legal assistance to determine whether the Berger Amendment conflicted with the RSRME project. Thiokol's uncertainty was evidenced by its concern as to whether:

- The legislative restriction applied to the proposed RSRME facilities.

- The NASA definition (i.e., that less than 50 percent amortization would not be "substantial") was being prematurely and inappropriately imposed on the RSRME facilities.

- The NASA interpretation mandated cost-sharing by Thiokol for facilities reasonably required in performance of the contract.

Thiokol's legal research was inconclusive.

NASA took steps to ensure that the RSRME project would fit within its own definition of the Berger Amendment (i.e., that "substantially amortize" equated to 50 percent or less):

- NASA relied on Thiokol's estimate of $16.1 million for the "brick and mortar" facilities. About $7.7 million (or 48 percent) would be amortized (depreciated) during the Buy 3 contract.

- NASA inserted the following clause in the Buy 3 contract to prevent Thiokol from amortizing more than 50 percent during the original contract period, to insure that Thiokol stayed within the 50 percent definition.

> *Nonseverable facilities shall be capitalized and recovered in accordance with Thiokol's disclosed accounting practices; except that, in no event shall more than 50 percent of the capitalized costs of RSRME-associated facilities be amortized during the period of performance of this contract at the time of contract execution . . .* (emphasis in original).

NASA officials advised that if there were a "Buy 4," Thiokol would have charged the remainder of the depreciation against that contract.

The OIG was unable to find a definitive interpretation of the term "substantially amortize" in the legislative history of the Berger Amendment. The U. S. Senate added the Amendment and did not define "substantially amortize."

While the meaning of "substantially amortize" is ambiguous, the OIG believes the overall intent of the Berger Amendment is clear. The Amendment allows NASA to fund contractor facilities when an Appropriation Act specifies the lease or contract under which the facilities are to be constructed or leased, or when the facilities are otherwise identified in such Act. The Administrator can authorize the construction or lease of facilities, once approved by the Committees on Appropriations.

The OIG believes Congress intended that NASA fund new contractor construction only after the Congress had approved such construction. We believe our position is supported by a Senate report which states in part:

> *The Committee is concerned that several procurements, currently being considered at NASA, would commit the Government to long-term obligations without the benefit of approval through the budget process. Consequently, the Committee has included bill language which would prohibit NASA from entering into long-term contractual arrangements with contractors for the lease or purchase of a contractor-funded facility that would substantially amortize such a facility over a period of time.*

To avoid a possible violation of the Berger Amendment, we believe NASA should not enter into contractual arrangements to fund the cost

of contractor facilities that fall within the Amendment's definition, unless it has Congressional approval to do so. If NASA intends to fund contractor facilities without Congressional approval, we believe it should determine the intent of Congress regarding the Berger Amendment.

RECOMMENDATION 2 The NASA Associate Administrator for Procurement should ensure compliance with the Berger Amendment.

Management's Response NASA concurs with the recommendation. However, we do not agree that the RSRME "Buy 3" action gave rise to a possible violation of the Berger Amendment. Questions about the applicability of the Berger Amendment were raised in the pre-award phase of this procurement and resolved to the satisfaction of NASA management and the General Counsel. It was specifically determined that the project did not violate the terms of the legislation, because depreciation would be consistent with the Cost Accounting Standards and the contract was planned to be charged only 7 years of the 15-year depreciable life of the facilities. As entered, therefore, the contract did not require NASA to substantially amortize the contractor's investment in a contractor-funded facility. Consequently, the contract did not violate the Berger Amendment. This process demonstrates our awareness of the need for compliance, and careful analysis of the facts in each situation, to assure that violations do not occur.

Evaluation of Management's Response In their response to the report, NASA officials advised that when the RSRME program was authorized, NASA considered how the ASRM project might affect the amount of RSRME facility costs that would eventually be amortized to NASA. They said that if the ASRM project had continued to receive funding and had become operational as scheduled, then the Buy 3 contract would have been terminated for the convenience of the Government. Accordingly, there would not have been an RSRM Buy 4 contract to receive additional amortization costs.

NASA officials also advised that while most of Thiokol's investment in the RSRME facilities will have been amortized to NASA by the time the Buy 3 contract ends in November 1999, the contract terms, as executed, did not require NASA to substantially amortize this investment. Since the original contract terms did not require that "substantial" amortization would occur, NASA, in their opinion, did not violate the Berger Amendment.

We believe that neither (1) a contract termination, nor (2) NASA's intent at the time of contract execution, would have satisfactorily addressed the requirements of the Berger Amendment. Regarding a possible termination, NASA had set aside $40 million to cover the RSRME's termination liability in either Fiscal Years 1991 or 1992. If the contract had been terminated in either year, NASA would have paid for all related facilities that Thiokol had acquired before the termination date and, therefore, may have still violated the intent of the Berger Amendment. Regarding NASA's intent at the time of contract execution, the Berger Amendment, in our opinion, contains no provision that would grant NASA the prerogative to avoid the restriction on amortization based on the original intent of the contracting parties.

NASA has acknowledged the need for compliance with the Berger Amendment, and the need for a careful analysis of the facts in each situation. We believe the actions to be taken are responsive to the recommendation when taken in recognition of the OIG concerns expressed in this report.

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NASA DID NOT FULLY COMPLY WITH GOVERNMENT PROPERTY REGULATIONS

NASA provided Thiokol with about $22 million of severable property including general purpose equipment, tooling, and software. The audit disclosed that NASA had not fully complied with applicable FAR and NFS provisions because it allowed Thiokol to purchase property that was not adequately justified and did not meet monetary thresholds. Also, Thiokol acquired items without having screened available government inventories, and may have misclassified about $7 million of property as "severable" property rather than as nonseverable property. We believe these conditions occurred because NASA personnel were not familiar with the applicable property regulations. As a result of these conditions, NASA could ultimately incur additional indirect administrative costs over the remainder of the contract for maintaining approved property control systems, for safeguarding the property, and for disposing of excess property items.

NASA Provided $22 Million of General Purpose Equipment and Software Without Adequate Justification

FAR 45.302-1(a) states that agencies shall not furnish facilities (including general purpose equipment and software per contract NAS8-38680 (F)), for any purpose including restoration, replacement, or modernization, except:

- For use in a Government-owned, contractor-operated plant operated on a cost-plus-fee basis;
- For support of industrial preparedness programs;
- As components of special tooling or special test equipment acquired or fabricated at Government expense; or
- When, as a result of the prospective contractor's written statement asserting inability to obtain facilities, the agency head or designee issues a Determination and Finding that the contract cannot be fulfilled by any other practical means or that it is in the public interest to provide the facilities.

Since the first three exceptions did not apply to the RSRME project, Thiokol should have submitted a written statement to NASA asserting its inability to obtain facilities. In turn, NASA should have issued a Determination and Findings that the contract could not be fulfilled by any other practical means, or that it was in the public interest to provide the RSRME facilities. These procedures were not implemented.

According to procurement personnel at the Marshall Space Flight Center, the Prenegotiation Position Memorandum, Record of Negotiation, and contract satisfied the requirement for a Determination and Findings. We disagree with this position because the referenced documents did not meet FAR 45.302-1(a) requirements; i.e., the documents did not explain why the contract could not be fulfilled by other practical means, or that it was in the public interest to provide the RSRME facilities.

NASA Should Not Have Provided Items With a Unit Cost of Less Than $10,000

Even if NASA had issued a Determination and Findings in providing the general purpose equipment, tooling, and software, FAR 45.302-1(d) prohibits NASA from providing items with a unit cost of less than $10,000. NASA provided almost $11 million of computer hardware and software as part of the RSRME project. Most of the items had a unit cost of less than $10,000. For example, items acquired under the contract included a 30-day lease of a still video camera ($365), off-the-shelf word processing software ($243 per copy), and computer "mouses" ($50) each.

FAR 45.302-1(d) prohibits the Government from providing any general purpose items costing less than $10,000 unless the contractor:

- Is a nonprofit institution of higher education or other nonprofit organization whose primary purpose is the conduct of scientific research;
- Is operating a Government-owned plant on a cost-plus-fee basis;
- Is performing on a Government establishment or installation;
- Is performing under a contract specifying that it may acquire or fabricate special tooling, special test equipment, and components thereof subsequent to obtaining the approval of the contracting officer; or
- Cannot obtain the property from other than Government sources.

None of the above exceptions applied regarding the RSRME project. The contracting officer told us that he was not aware of the restriction against providing facility items costing less than $10,000.

NASA Did Not Ensure Required Screenings of Existing Government Equipment

NASA Far Supplement (NFS) 18-45.7001 states that Government inventories shall be screened prior to acquiring general purpose equipment. NASA did not ensure that Thiokol screened Government inventories before Thiokol purchased $4.2 million of the $22 million of severable property.

Thiokol's initial concept of the RSRME program called for all RSRME facilities (severable and nonseverable) to be company capital assets (purchased under commercial terms and conditions). As discussions and negotiations of the RSRME program progressed, NASA and Thiokol agreed that all RSRME severable facilities (general purpose equipment, tooling, and software) would be expensed directly to NASA; Thiokol would fund only the nonseverable facilities. Since it was originally planned that severable facilities would be Thiokol-owned, no NEMS screenings took place.

Thiokol Did Not Obtain Written Authorization Prior to Changes in the Equipment Schedule

Thiokol acquired general purpose equipment that was not listed in the contract schedule, and deleted equipment that was listed in the schedule, without receiving prior written authorization from the contracting officer as required by NFS 18-45.302-70(b). The NFS states that the contracting officer's written authorization is required before the project's scope can be changed. According to Thiokol officials, the above changes did not affect project "scope" because they believed the schedule of facilities was flexible and, therefore, they were allowed to change it.

Examples of items acquired without prior written authorization included: "N2 generator" ($334,070); load cells ($152,310); particle sensors ($20,000); and a temperature humidity sensor ($2,000). An item deleted without prior written authorization included a nuclear magnetic resonator ($89,250). We believe prior written authorizations would help NASA ensure adequate control over the items purchased under the contract.

NASA Provided Nonseverable Items

FAR 45.309(a) states that Government property shall not be installed on contractor premises in such a fashion as to be nonseverable unless the head of the contracting activity determines that it is necessary, and the contract under which the property is provided contains:

- A requirement for the contractor to reimburse the Government for the fair value of the property at contract completion;

- An option for the Government to acquire the underlying land; or

- An alternative provision that the agency head considers adequate to protect the Government's interest.

The FAR defines "nonseverable" property as that which cannot be removed after erection or installation, without substantial loss of value or damage to the property or the premises where installed. We believe NASA may have misclassified almost $7 million of property as "severable" property. Examples included such items as ceiling bridge cranes ($1,966,941); surge hoppers ($327,000) and silos ($1,316,670); air handlers, chillers, and vents ($365,454).

The contracting officer advised that he used his best judgement in determining whether proposed items should have been classified as severable or nonseverable. In our opinion, these items clearly met the FAR definition of "nonseverable" because their removal would have resulted in a substantial reduction in the value and functionality of the premises to which they were installed. Had these items been properly classified as "nonseverable," NASA could not have directly funded the items without violating its own interpretation of the Berger Amendment. Photographs of selected items are included as Appendix 2 to this report.

NASA Has Initiated Corrective Action

NASA has taken steps to improve the agency's compliance with government property regulations. To illustrate, the Office of Procurement, NASA Headquarters, issued a pamphlet entitled "Guidance on Providing Government Facilities to Contractors," dated July 1993. This pamphlet includes a decision tree for contracting officers to use in determining whether government property may be provided under the FAR. The "guidance" is a positive step in ensuring compliance with property regulations. (It does not, however, help contracting officers distinguish between severable and nonseverable property.) Also, NASA may be taking additional corrective steps in response to recommendations made by the U.S. General Accounting Office (GAO) in its report entitled NASA Property: Improving Management of Government Equipment Provided to Contractors (GAO/NSIAD-93-191, September 9, 1993). In view of the actions already taken and to be taken, we make only the following recommendation to bring attention to the issue of determining whether property is severable/nonseverable according to the applicable property regulations.

RECOMMENDATION 3	The NASA Associate Administrator for Procurement should reiterate the need to carefully consider whether Government production and research property intended to be installed on contractor premises is severable or nonseverable under the policy and definitions set forth in FAR 45.309 and 45.301.
Management's Response	NASA concurs with this recommendation and, as the report states (page 22), "NASA has initiated corrective action."
Evaluation of Management's Response	Actions planned or taken by NASA Headquarters are responsive to the recommendation.

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GENERAL COMMENTS

NASA has not funded a large liability that would accrue to NASA if it terminated its incrementally-funded contracts with Thiokol. NASA officials have maintained that NASA need not recognize (fiscally) the potential for termination liability because the agency is obligated only up to the amounts allotted to its contracts, as specified in the Limitation of Funds (LoF) clause. Until recently, the subject of termination liability was not important because NASA seldom terminated its contracts. However, with increasing congressional pressures to cancel or to cut back agency programs, NASA and Thiokol have greater reason for concern about the termination liability issue; from NASA's perspective, its large unfunded liability could materialize; from Thiokol's perspective, a major part of its substantial termination costs might not be reimbursable if NASA terminated its Thiokol contracts.

In an April 22, 1992, memorandum regarding "Funding for Termination Liabilities," NASA Headquarters stated its intention to:

- Delineate NASA policy on funding contract termination liability.

- Remind NASA personnel to avoid advising contractors that termination costs would be covered outside the funds obligated on the contract, at the time of termination.

- Solicit information from the NASA centers if a contractor's estimated termination liability exceeded currently allocated contract funding.

The memorandum had the effect of increasing confusion and concern among NASA's contracting officers and contractors regarding termination liability, and the possible termination of contracts that were not fully funded.

NASA incrementally funds the vast majority of its programs because NASA has insufficient funds to complete all the contracts it awards, at the time of their award.[1] For this reason, NASA generally inserts an LoF clause in its contracts. The clause states that NASA's liability to pay costs will not exceed the amount of funds obligated on the contract. NASA holds that the LoF clause expressly includes a limitation on NASA's liability for any costs associated with

termination of the contract; therefore, the LoF clause precludes possible violation of the Antideficiency Act. The Act generally prohibits Government employees from making expenditures or obligations that exceed available appropriations.

Thiokol disagrees with NASA's interpretation of the LoF clause and has notified the agency of what it believes to be an underfunded situation. In July 1993, Thiokol, in response to NASA, estimated that termination liability (i.e., cost liability in excess of booked, billed, or accrued costs) totaled $165 million. Thiokol notified NASA that, in light of NASA's current interpretation of the LoF clause, it was requesting that NASA set aside $165 million to cover the cost of a potential termination.

NASA decided against issuing a stop work order as would normally be required by a budget shortfall. In accordance with long-standing NASA practice, it did not cover potential termination liability for the overall "Buy 3" contract. However, NASA took the position that for the few programs it had terminated, Congress generally had appropriated funds to specifically pay termination costs. NASA also noted another avenue of relief from the restrictive language of the LoF clause, i.e., a termination settlement claim "may include certain reasonable costs which neither NASA nor the contractor anticipated" during contract performance. Presumably this position could be interpreted to mean that neither NASA nor the contractor anticipated that the program would be terminated.

We appreciate the assistance and cooperation extended to us by all Marshall Space Flight Center and Thiokol personnel contacted during the audit.

ENDNOTES

1. The use of incrementally funded contracts allows NASA to start more programs than it could otherwise fund at their inception. Growing budgets are necessary in order for this contracting strategy to work.

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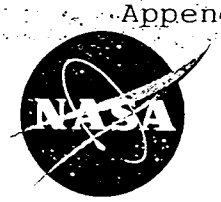
National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001



Reply to Attn of: ME

NOV 3 1995

TO: W/Inspector General

FROM: M/Associate Administrator for Space Flight

SUBJECT: Draft Audit Report on the RSRM Enhancement Project
Assignment No. A-AR-93-003

I appreciate the analyses of the subject study performed by the Ames Research Center Inspector General's staff. We concur with the three recommendations. However, I have enclosed a number of comments that I hope you will include in your final report .

We believe that the actions NASA will take, described in the enclosure, are adequate to fully answer the recommendations. **Therefore, I request closure** of the three OIG recommendations in the subject report.

If you have any questions, please contact Michael Allen at 202/358-4465.

J. Wayne Littles

Enclosure

cc:
M-6/D. Bates
M-7/Mr. O'Connor
ME/Mr. Starkey

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Comments on OIG Draft Audit Report (A-AR-93-003)
"RSRM Enhancement Project"

NASA has reviewed the draft report on the above subject and thanks the Inspector General for including many of the informal comments we discussed with the OIG auditors. NASA concurs with the three recommendations; however, we do have some reservations about the second recommendation and would also like to clarify a number of points as described below.

1. Page 2, First Paragraph

We request that the last sentence end with the word "Amendment."

We believe this has no bearing on the determination of how the Berger Amendment was applied. The contracting officer's decision on the classification of proposed equipment was made independent of its impact on compliance with the Berger Amendment.

2. Page 2, Second Paragraph

We suggest that the OIG delete the sentence, "As a result, NASA could incur higher contract costs and may have inadvertently violated the Berger Amendment."

As noted in item 1 above, the contracting officer's decision on the classification of proposed equipment was made independently, and has no relevance to the way the Berger Amendment is applied. Moreover, for the reasons stated in the response to Recommendation 2, we do not believe that the RSRME "Buy 3" action gave rise to a possible violation of the Berger Amendment.

3. Page 6, Second Paragraph

The last sentence should end with the word "NASA", for the same reason as explained in comment 1 above. The sentence will then read: "We believe...charged to NASA."

4. Page 6, Last Paragraph

Delete the sentence, "Noncompliance with the FAR and NFS may have caused NASA to incur higher property administration costs and to inadvertently violate the Berger Amendment." This deletion is necessary to agree with item 2 above.

5. Page 7, Third Paragraph

Under the section "Cost Savings Cannot Be Measured," add the words "nor accurate" so the sentence which reads, "NASA and Thiokol agreed that systems would not be established to specifically track cost savings because they believed such systems would not be cost effective nor accurate and the savings would be included in the negotiated price of future motors."

We also suggest that the following paragraph be added:

> According to NASA officials, although they wanted to track savings, it would have been virtually impossible to determine the precise savings associated with the RSRME program. The RSRME influences in mix/cast, final assembly, nozzle, case preparation, and refurbishment work centers could not be totally segregated from other influences which result in savings, such as engineering changes, process changes, typical learning curve efficiencies, and production rate reductions (12 flights/year to 7 flights/year). Furthermore, it would have been extremely complicated and costly to structure an accounting mechanism to capture these data. The negotiated position for RSRME, coupled with other contract features such as the cost underrun fee consideration, provided sufficient Government assurance of flight fidelity and contract cost control and savings.

We believe that these report changes are needed in order to fully reflect why NASA did not establish a system to track RSRME-related savings. An accounting system capable of isolating all influences on actual labor and non-labor savings, if possible at all, would have been very burdensome to establish and maintain. Therefore, the reason that measurement of RSRME-specific savings was not pursued by NASA was the recognition that an accurate method to accomplish this measurement does not exist in current accounting systems. An attempt to establish such systems would be expensive, labor intensive to support, and have a high probability of inadequacy. However, it should be noted that the main objective of the RSRME was to build a more reliable and easier to produce motor, which was successfully accomplished.

6. Page 9, Section on "NASA May Not Have Complied with the Berger Amendment"

We believe that this entire section (pages 9 through 12) should be deleted because based on the facts that were available when the RSRME program was initiated, NASA did not violate the Berger Amendment. At the time that the decision was made, the contract period of performance was 7 years, and the facility was being depreciated over a 15-year period. Therefore as executed, the contract did not require NASA to substantially (which NASA conservatively interpreted to mean over 50 percent) amortize the cost of the contractor's facility. Subsequent decisions caused the contract's period of performance to be extended, due to a decreased Shuttle flight rate and the cancellation of

the Advanced Solid Rocket Motor (ASRM) Project, and ultimately resulted in NASA amortizing more of the cost of this contractor facility. However, we believe that NASA made the proper decision based on the facts that were available at the time.

If the OIG does not agree to delete the section on the Berger Amendment, then the following changes (Items 7 , 8, 9, and 10 below) are requested.

7. Page 9, Third Paragraph

Delete the first sentence starting with "NASA and Thiokol...." As we have repeatedly noted, NASA applies the Berger Amendment, like other statutes, on a case by case basis. With respect to RSRME, NASA concluded the Berger Amendment did not apply because the contract, as executed, did not require NASA to amortize more than 50 percent of the capitalized facilities cost. We believe that this interpretation was very conservative, and is one that will withstand any test of reasonableness.

8. Page 9, Last Paragraph (Continued on Page 10)

Revise to read as follows:

Although the "Buy 3" contract original period of performance would have ended just before 50 percent of the facility costs would have been charged back to NASA, the contract period of performance was significantly extended due to a decreased Shuttle flight rate and the cancellation of the ASRM. According to NASA officials, when the RSRME program was authorized, the ASRM Project, then under development in Iuka, Mississippi, was considered in the discussion of RSRME facility costs to be amortized by NASA. If the ASRM Project had continued to receive funding and became operational as scheduled, the Buy 3 contract for 142 motors would have represented an over support condition for the Space Shuttle Program manifest and would have resulted in a termination for the convenience of the Government. There would then not have been an RSRM Buy 4 contract to receive additional amortization costs.

Because of events unknown at the time NASA undertook the RSRME "Buy 3" action, it appears that most of Thiokol's investment in the RSRME facilities will be amortized to NASA when the contract ends in November 1999. As executed, however, the contract did not require NASA to substantially amortize this investment and, therefore, did not violate the Berger Amendment.

9. Page 11, First Paragraph

The first sentence should be revised to read: "NASA used Thiokol's estimate for the "brick and mortar" facilities to cost $16.1 million." This should be changed for accuracy because the estimate was provided by Thiokol and was not a NASA derived number.

10. Page 11, Fifth and Sixth Paragraphs

Both paragraphs 5 and 6 should be deleted. The OIG implied that NASA classified equipment as severable or nonseverable based on whether it would result in a violation of the Berger Amendment. The classification of proposed items as severable or nonseverable would have no bearing on the percentage of those costs amortized back to NASA. If all severable equipment valued at $22 million had been classified as nonseverable, it would have been expensed over a 15-year depreciation schedule. Accordingly, NASA would have been charged less than 50 percent of those amortized costs because the contract period of performance was only 7 years. The contracting officer's decision on the classification of proposed equipment was made independent of its impact on compliance with the Berger Amendment.

11. Page 13, First Paragraph

Delete the sentence: "NASA also apparently misclassified about $7 million of property as "severable" property rather than as nonseverable property" We do not believe that this property was misclassified. In the past, similar items have been removed from buildings in which they were installed and located elsewhere without a substantial reduction in the value/functionality of those buildings. For example, although ceiling bridge cranes were removed from buildings at the ASRM Yellow Creek site, the buildings were scheduled for use under the RSRM nozzle program. Therefore, whether the removal of these items would have resulted in a substantial reduction in the value or functionality of the premises would depend largely on the planned use of the buildings after such removal. Therefore, it is our judgment that the classification was proper.

12. Page 13, First Paragraph

The last sentence "Misclassification of property....." should be deleted for the same reason stated in Item 10 above.

RECOMMENDATIONS

1. **"Prior to authorizing a project, the NASA Associate Administrator for Space Flight should ensure that cost savings can be measured when savings are a project objective."**

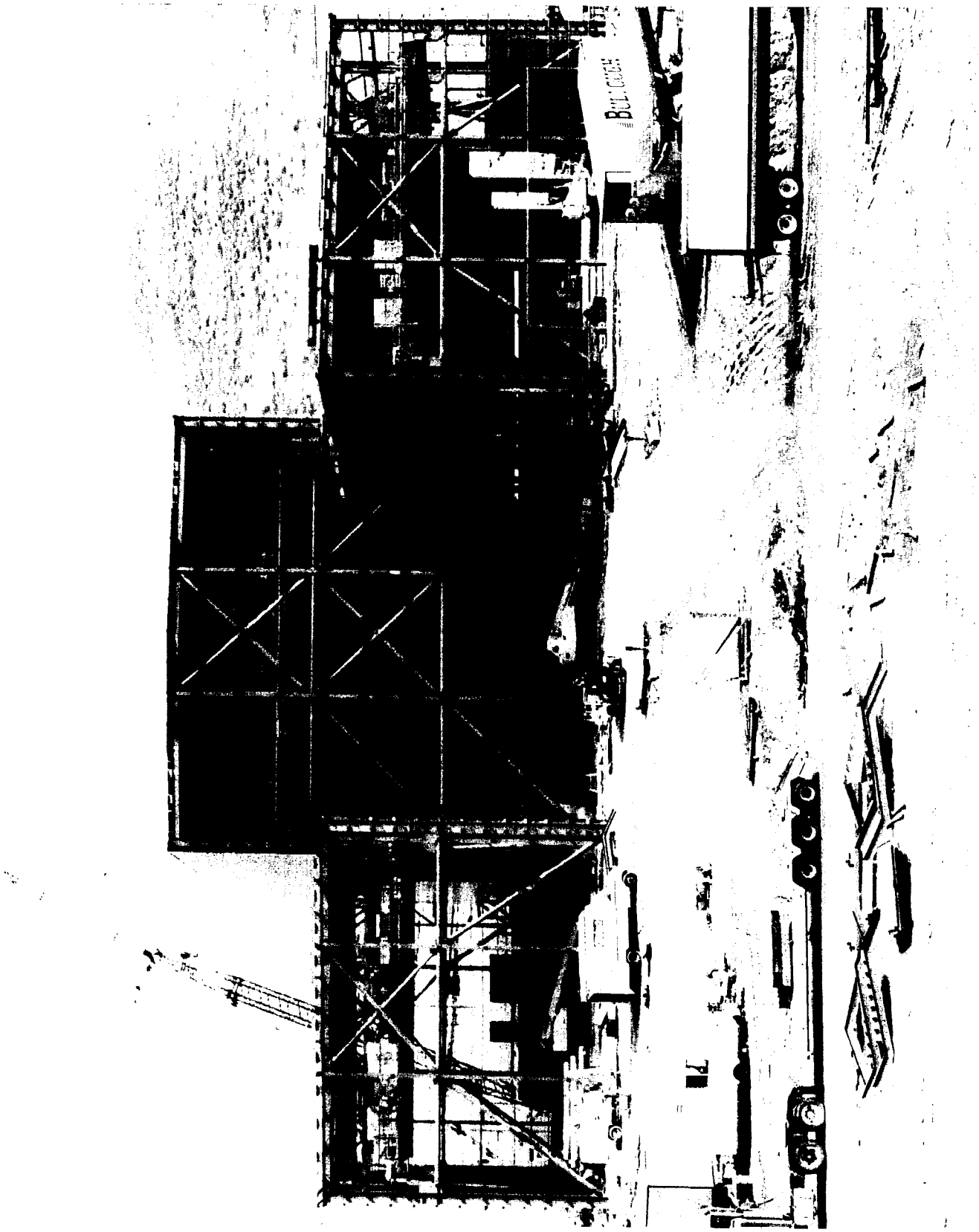
NASA concurs with the intent of this recommendation and will ensure incorporation in the future where it is applicable, and appropriate to do so.

2. **"The NASA Associate Administrator for Procurement should ensure compliance with the Berger Amendment."**

NASA concurs with the recommendation. However, we do not agree that the RSRME "Buy 3" action gave rise to a possible violation of the Berger Amendment. Questions about the applicability of the Berger Amendment were raised in the preaward phase of this procurement and resolved to the satisfaction of NASA management and the General Counsel. It was specifically determined that the project did not violate the terms of the legislation, because depreciation would be consistent with the Cost Accounting Standards and the contract was planned to be charged only 7 years of the 15-year depreciable life of the facilities. As entered, therefore, the contract did not require NASA to substantially amortize the contractor's investment in a contractor-funded facility. Consequently, the contract did not violate the Berger Amendment. This process demonstrates our awareness of the need for compliance, and careful analysis of the facts in each situation, to assure that violations do not occur.

3. **"The NASA Associate Administrator for Procurement should reiterate the need to carefully consider whether Government production and research property intended to be installed on contractor premises is severable or nonseverable under the policy and definitions set forth in FAR 45.309 and 45.301."**

NASA concurs with this recommendation and, as the report states (page 16), "NASA has initiated corrective action."



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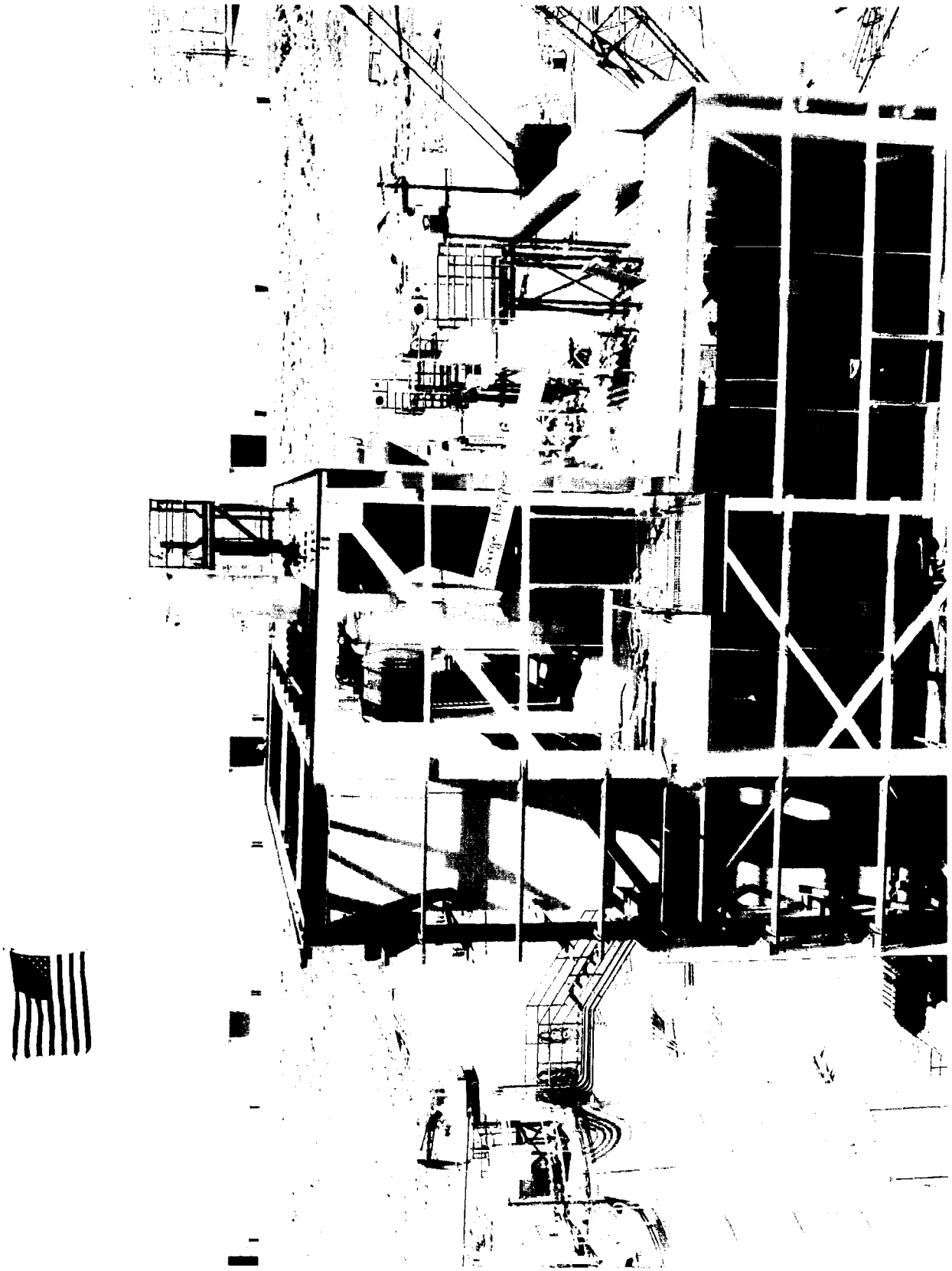

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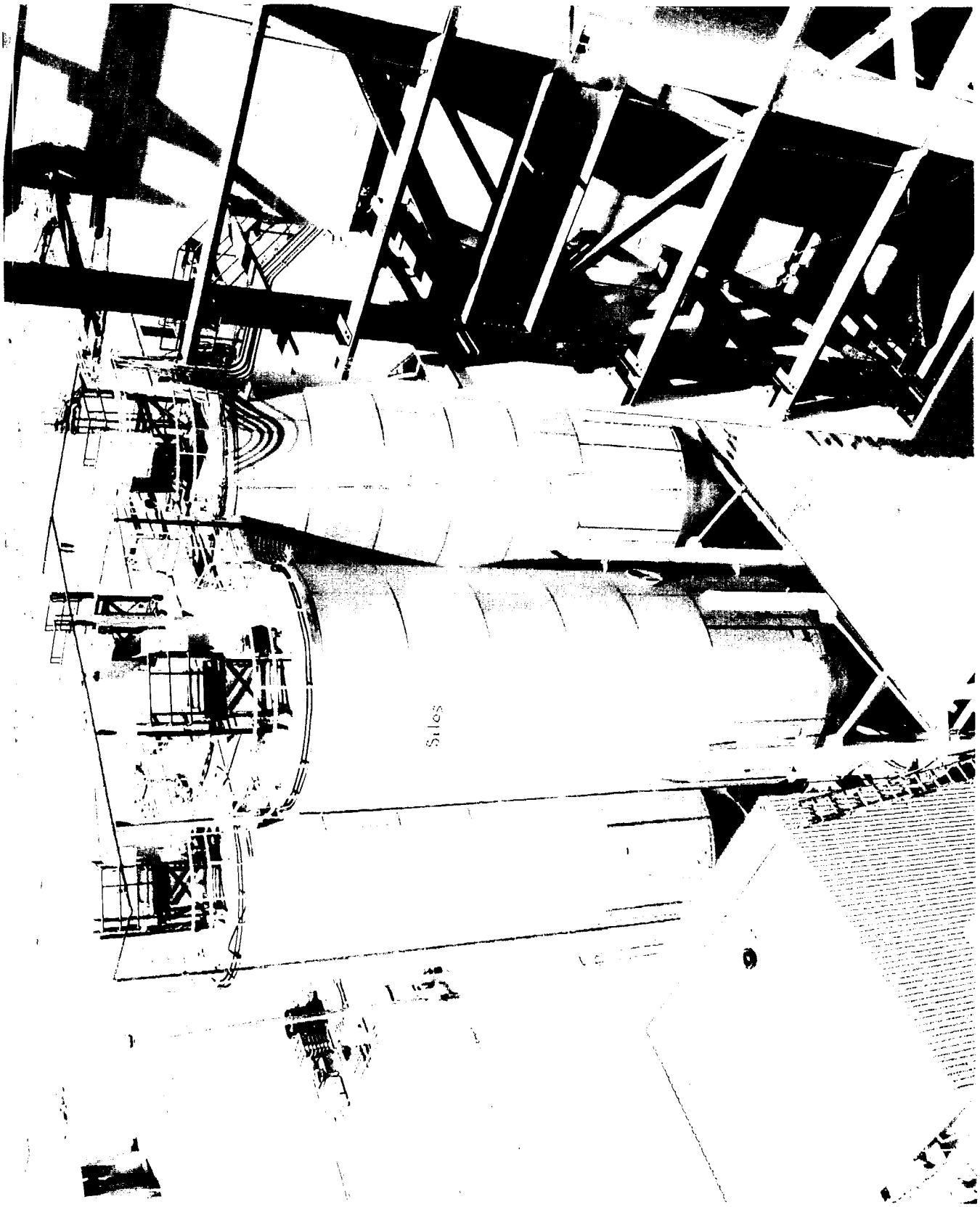

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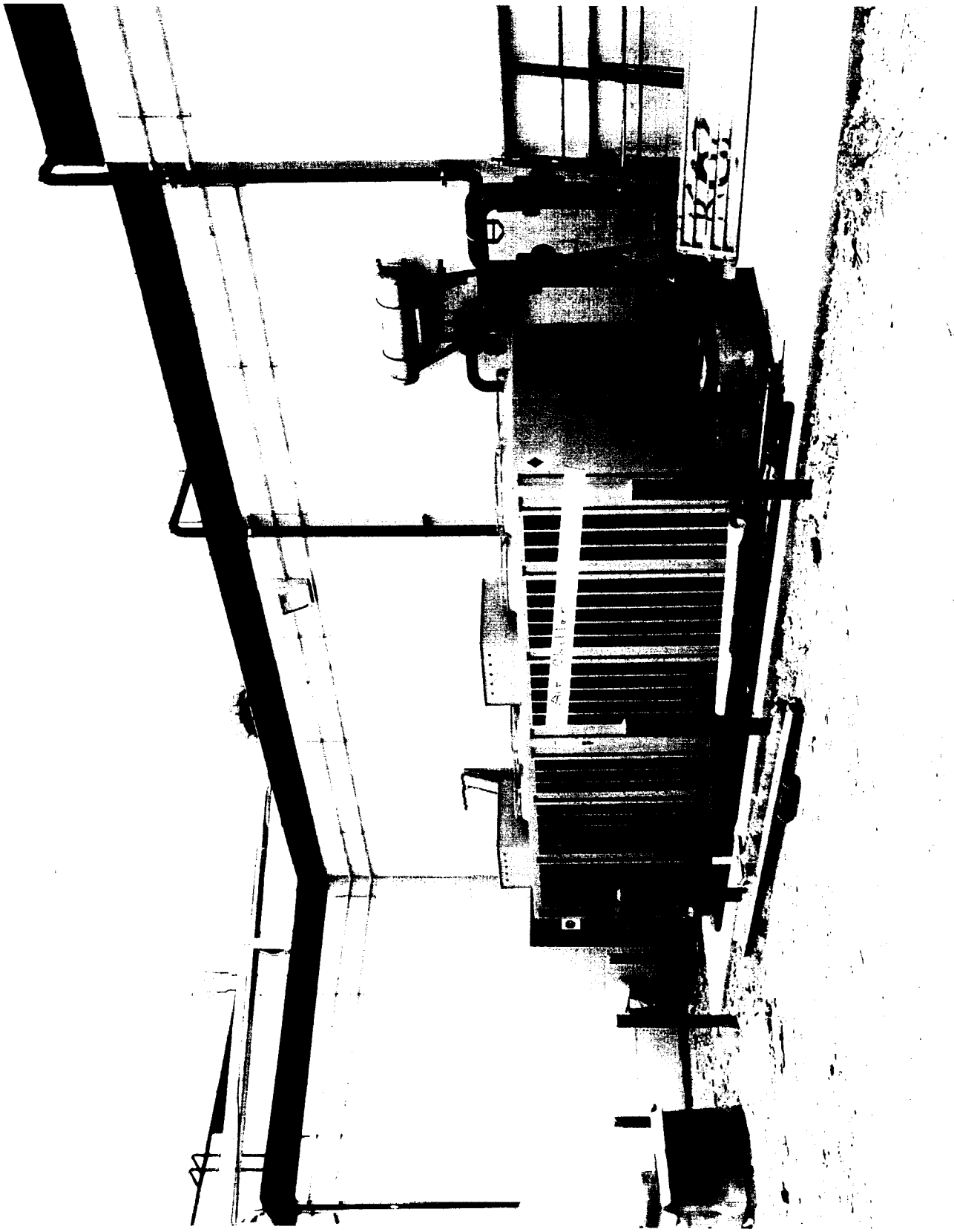

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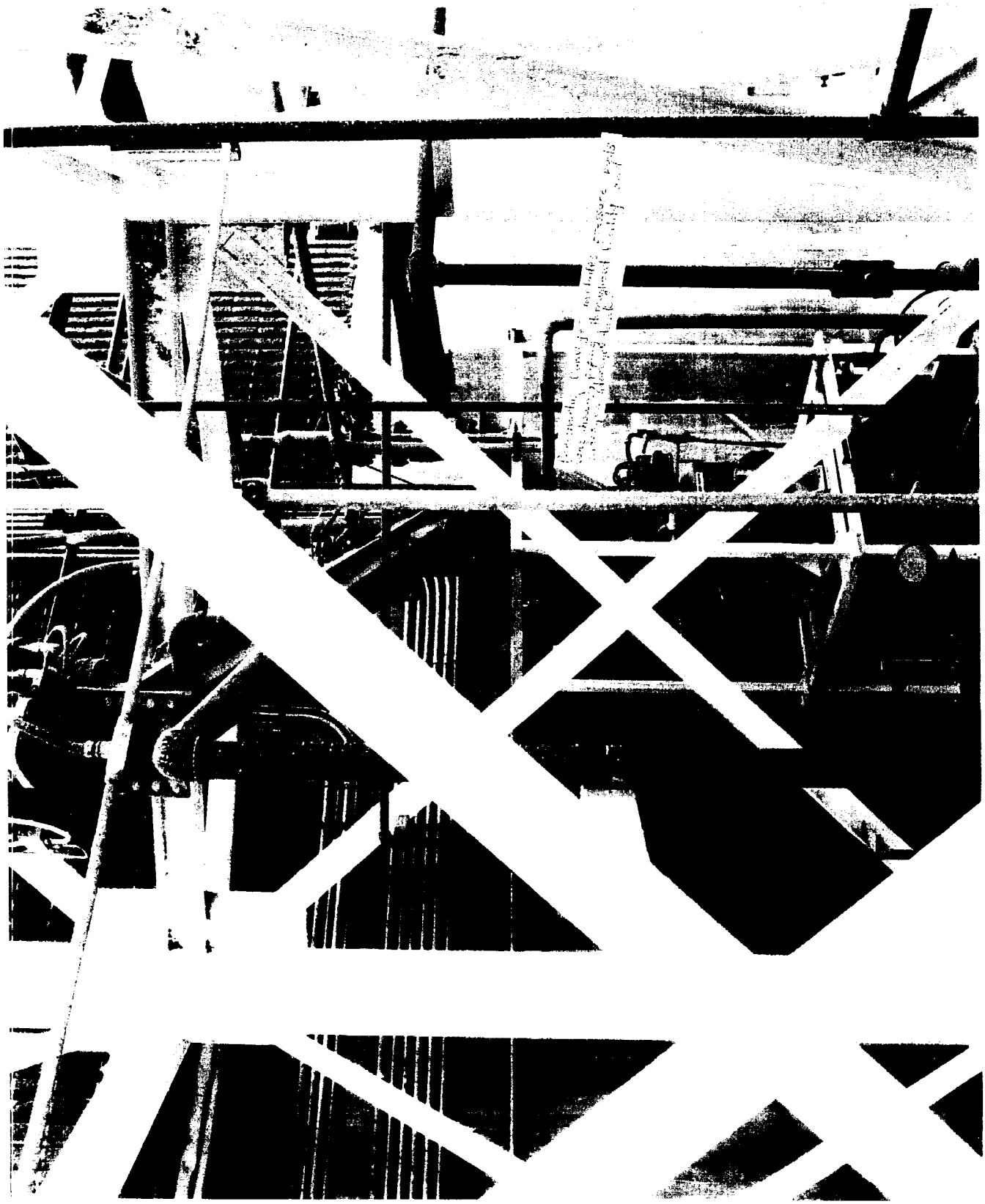

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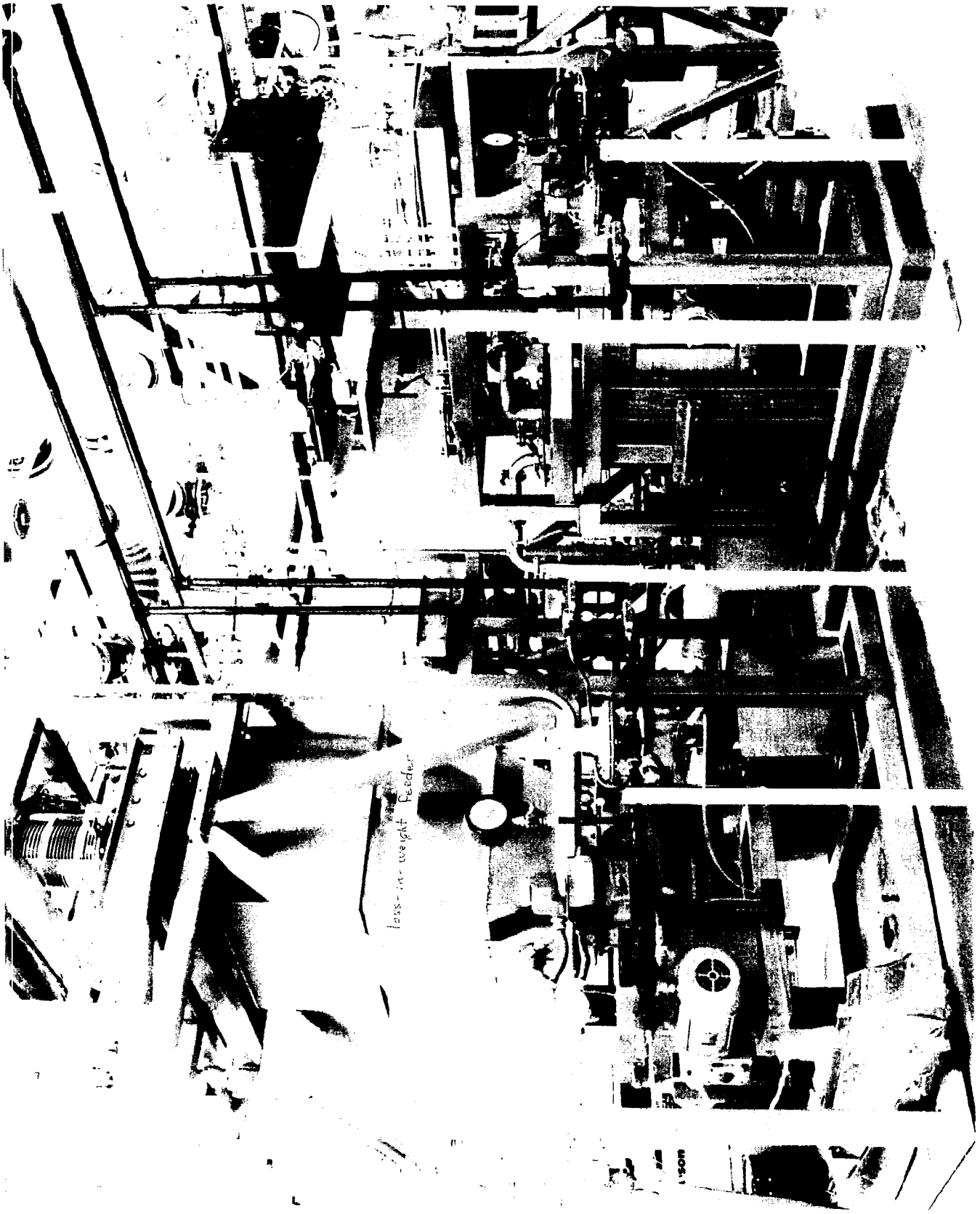

"LOSS-IN-WEIGHT FEEDER"
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