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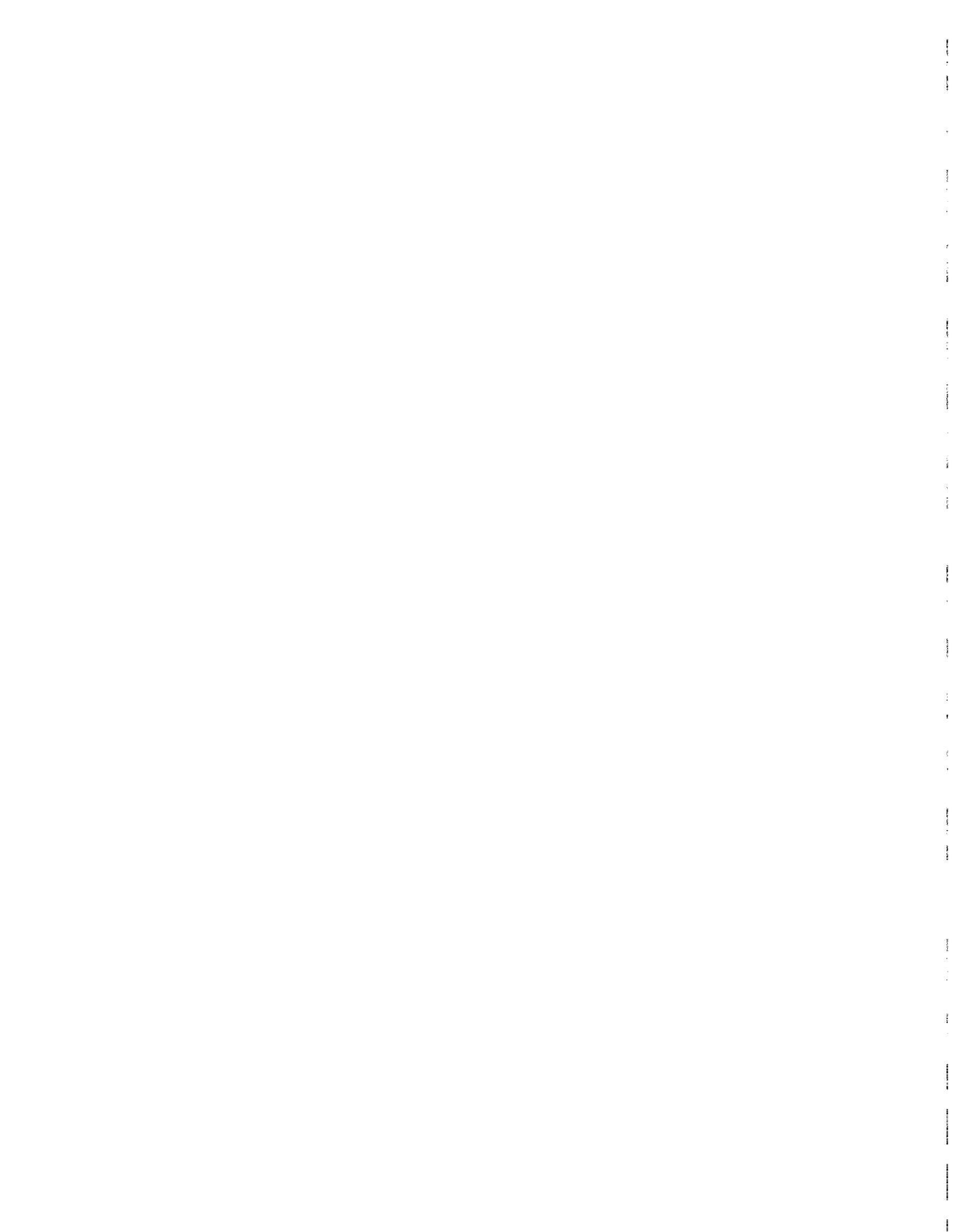
Report to the Chairmen, House and  
Senate Committees on Armed Services

March 1991

**DEFENSE  
PROCUREMENT**

**Qualification and  
Quality Requirements  
for Purchases of  
Critical Spare Parts**







United States  
General Accounting Office  
Washington, D.C. 20548

National Security and  
International Affairs Division

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The Honorable Sam Nunn  
Chairman, Committee on Armed Services  
United States Senate

The Honorable Les Aspin  
Chairman, Committee on Armed Services  
House of Representatives

As directed in Conference Report 100-989, dated September 28, 1988, we have reviewed how the Department of Defense (DOD) has implemented section 805, title VIII of the fiscal year 1989 National Defense Authorization Act. The act requires DOD to use appropriate requirements for qualification and contractual quality when purchasing critical spare parts for aircraft and ships. Specifically, we reviewed DOD's implementation plans and the criteria it used to designate spare parts as "critical." We also examined the procurement process at one procurement activity to determine whether there were any weaknesses in that process that could result in the purchase of critical spare parts of substandard quality. We selected the Air Force's San Antonio Air Logistics Center (SA-ALC) because it purchased many of the critical parts cited by original equipment, or prime, contractors as examples of DOD's use of inappropriate requirements for qualification and contractual quality.

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## Background

After a military service acquires a major system—for example, an aircraft engine—it must purchase spare parts to support the system. Some of these parts are designated as "critical." As part of its "Breakout Program," DOD has attempted to lower the cost of spare parts, including critical parts, by purchasing them from sources other than the prime contractor.

Under the Breakout Program, a DOD contracting officer must determine whether a potential source is able to produce parts that meet government-established requirements for qualification and contractual quality. The Federal Acquisition Regulation (FAR) defines a "qualification" requirement as testing or other quality assurance demonstrations that must be completed by a contractor before a contract is awarded, whereas "contractual quality" requirements are post-award procedures, tests, and inspections stipulated in the contract to ensure that the product conforms to contract specifications.

Both types of requirements are established by the contracting officer with the technical assistance of government engineers. The Breakout Program requires these officials to use sound engineering judgment and management in considering which critical spare parts to purchase from new contractors. In exercising this judgment, the contracting officer decides whether a new contractor must meet any qualification requirements, including the original or current production qualification requirements used by the prime contractor with its subcontractors. The contracting officer also decides whether the new source must meet other special standards of responsibility or have specialized facilities and equipment to ensure that adequate parts will be supplied.

## Results in Brief

The issue of what constitutes "appropriate" requirements has been a continuing subject of disagreement between DOD and industry officials, both before and after the enactment of section 805, title VIII, in September 1988. DOD officials said that there is no need for any regulations specifically designed to implement section 805 because current DOD procurement practices satisfy the requirements of the legislation. Industry officials disagree with DOD and believe that private industry's current requirements for qualification and quality should be used by DOD as a starting point in determining its requirements for new contractors. Although DOD officials have initiated changes in the procurement process to improve the quality of all spare parts, including critical spare parts, it is unclear what impact these changes will have.

DOD components and industry generally agree with the FAR definition that any part whose failure can cause injury or jeopardize a vital agency mission is "critical." Using this definition as a basis, each DOD component developed a slightly different definition of a critical spare part. DOD officials said that because section 805 did not establish an exact definition, the differing DOD component definitions, when used with sound engineering judgment, serve as criteria for selecting items for special treatment.

Our review of 13 critical spare parts that were managed by SA-ALC indicated that the activity's procurement procedures generally were adequate. However, recently awarded government contracts did not always incorporate engineers' stipulations that new contractors use the same casting and forging suppliers previously used by prime contractors. In response to our concerns, SA-ALC directorates are being required to take immediate corrective action, and SA-ALC regulations will be revised to

require that all engineering requirements be included in future solicitations and contracts for critical parts.

## Unspecified Requirements in Section 805

Section 805 states the following:

"In procuring any spare or repair part that is critical to the operation of an aircraft or ship, the Secretary of Defense shall require the contractor supplying such part to provide a part that meets all appropriate qualification and contractual quality requirements as may be specified and made available to prospective offerors. In establishing the appropriate qualification requirements, the Secretary of Defense shall utilize those requirements, if available, which were used to qualify the original production part, unless the Secretary of Defense determines in writing that any or all such requirements are unnecessary."

Section 805 stipulates that contractors providing critical spare parts meet "appropriate" requirements for qualification and contractual quality. Section 805 indicates that qualification requirements are those used to qualify the original production part, if available. However, standards for appropriate contractual quality requirements are not addressed, nor is "critical" defined. In addition, while the legislation permits the Secretary of Defense to waive "unnecessary" original production qualification requirements when purchasing critical spare parts from other contractors, it does not define the circumstances under which the Secretary may do so.

The House Conference Report's comments on section 805 stated that the legislation was not intended to supersede any law or regulation.<sup>1</sup> Furthermore, the conferees supported the efforts of DOD components to increase competition in procuring critical spare parts; however, they were also concerned that quality and safety not be compromised. They stated that when a critical spare part is purchased to support a fielded major system, "it may not be necessary to apply the same qualification and quality requirements used during the development or early production stages" of the system.

## DOD Believes That New Regulations Are Unnecessary

DOD officials stated that there was no need for any regulations specifically designed to implement section 805 because current DOD procurement practices satisfy its requirements. In addition, DOD officials said they had initiated changes in the procurement process to improve the quality of all spare parts, including critical spare parts. For example,

<sup>1</sup>House Report 100-989 (Conference Report), to accompany House Report 4481, September 28, 1988.

now DOD emphasizes quality as well as price in source selection. It is unclear, however, what impact these changes will have on the procurement process because they are in the preliminary stages of development.

## Definition of "Critical" Spare Part

DOD and industry officials generally agree with the FAR's definition that any part whose failure can cause injury or jeopardize a vital agency mission is "critical." Using the FAR definition of criticality as a basis, each DOD component developed a slightly different definition of a "critical" spare part. DOD officials said that because section 805 had not established an exact definition for "critical," the differing DOD component definitions, when used with sound engineering judgment, serve as criteria for selecting items for special treatment. There is no overall data on the number and value of critical spare parts because DOD does not compile such data.

## Disagreement on Procedures for Selecting New Sources of Critical Spare Parts

Section 805 was enacted as a result of a fundamental disagreement between DOD and certain original equipment prime contractors. That disagreement, concerning DOD's engineering judgments on which qualification and contractual quality procedures should be used for selecting new sources for critical spare parts, still exists. The prime contractors believe DOD is excluding important qualification and quality procedures used by the prime contractors to test parts supplied by subcontractors. For example, the new contractors are not always required to test parts in operating engines. DOD believes that these tests are not always needed because the tests are primarily intended to test the design of the part, not the ability of a new contractor to make the part. However, neither the prime contractors nor DOD has credible data to support their differing views. Although they disagree over the definition of terms in section 805, neither DOD nor the prime contractors believe that the legislation should be amended.

## Procurement Process at the Air Force's San Antonio Air Logistics Center

We examined 13 critical spare parts that were managed by SA-ALC to determine whether there were any systemic weaknesses in the procurement process that could result in the procurement of substandard parts. These parts, which included engine components for the F-5, F-15, F-16, C-5, C-130, and C-141 aircraft, were cited by the prime contractors as parts for which DOD had used inappropriate qualification and quality requirements. In procuring these parts, SA-ALC officials had excluded certain qualification tests—for example, tests of parts in operating

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engines—that the prime contractors believed were necessary to ensure safety.

While our review indicated that SA-ALC's procurement procedures generally were adequate and that no quality deficiencies existed in the 13 parts, we found that recently awarded government contracts with new sources for 4 of the 13 parts had not incorporated the SA-ALC engineers' stipulation that new contractors use the same casting or forging suppliers previously used by prime contractors.<sup>2</sup> The omission of such a requirement in a contract could result in a new contractor's procuring castings or forgings from an unknown source, which might cause the final finished critical part to be of substandard quality. SA-ALC engineers and contracting officials attributed this omission in their contracts with new sources to SA-ALC contracting personnel's not knowing how to interpret the engineers' criteria in documents used in the source selection and contract award phases.

We brought this problem to the attention of the Commander of SA-ALC in a letter dated September 17, 1990. The Commander informed us that the problem could be resolved by revising SA-ALC procurement regulations to require that all SA-ALC engineering requirements be clearly identified and included in solicitations and contracts for all critical engine, airframe, and equipment parts manufactured from a casting or a forging.<sup>3</sup> The Commander also informed us that SA-ALC directorates were being notified to take immediate corrective action pending the revisions to the regulations.

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Our findings are discussed in more detail in appendix I, and appendix II lists the 13 critical parts we reviewed. In written comments on a draft of this report, DOD concurred with our findings. These comments are reprinted as appendix III. Our objectives, scope, and methodology are discussed in appendix IV.

We are sending copies of this report to the Secretaries of Defense and the Air Force. Copies will also be made available to others on request.

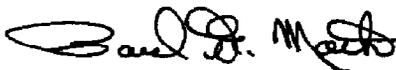
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<sup>2</sup>"Casting" consists of pouring molten metal into a mold, allowing it to cool and solidify into a nearly finished configuration, and then machining it into its final configuration. "Forging" consists of heating metal bar stock, hammering or pressing it in a die, and machining it into its final configuration.

<sup>3</sup>SA-ALC/KAFBR 57-2, DOD Replenishment Parts Breakout Program, July, 31, 1990. This regulation implements policies and provides detailed procedures for the Air Force's Breakout Program.

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Please contact me on (202) 275-4587 if you or your staff have any questions concerning the report. The major contributors to this report are listed in appendix V.

A handwritten signature in black ink, appearing to read "Paul F. Math". The signature is stylized with a large, looped initial "P" and a cursive "Math".

Paul F. Math  
Director, Research, Development,  
Acquisition, and Procurement Issues



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Appendix V  
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**Abbreviations**

|        |   |
|--------|---|
| AIA    | Aerospace Industries Association of America, Inc. |
| DLA    | Defense Logistics Agency                          |
| DOD    | Department of Defense                             |
| FAR    | Federal Acquisition Regulation                    |
| GAO    | General Accounting Office                         |
| NSN    | National Stock Number                             |
| SA-ALC | San Antonio Air Logistics Center                  |

# Section 805 and the Purchase of Critical Spare Parts

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## Background

In acquiring a major system such as an aircraft engine, the Department of Defense (DOD) establishes performance qualification and quality requirements for the engine and its subsystems. The prime contractor is generally permitted to develop its own detailed qualification and quality requirements for the individual parts used in the system within general guidelines established by DOD. DOD itself does not normally develop these detailed part qualification and quality requirements, nor does DOD direct the prime contractor's efforts. DOD does obtain some technical data for the individual parts (including drawings of the parts) after the system goes into production. The extent of the government's purchase of this data is based on the contracting officer's judgment of what data the government needs.

When DOD later decides to "break out" parts for the system—that is, to acquire spare parts for the system from contractors other than the original equipment prime contractor—DOD officials determine what their minimum information needs are with regard to qualifying new sources. Contracting officers and engineers, for example, may determine that the technical data DOD already has in its possession is adequate to re-procure the part. However, these officials may decide that DOD's current data is inadequate for re-procurement and that DOD needs to acquire additional data from the prime contractor, including information on current or prior qualification and quality requirements.

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## DOD Does Not Develop Specific Requirements for Individual Parts During System Development

The DOD service procuring an aircraft engine, or another major system, reviews the designs developed by offerors and selects the one that best satisfies the government's requirements. During full-scale development, the prime contractor prepares detailed drawings of each part in the engine and uses a variety of its own qualification tests to qualify each part before the engine, as a complete system, is offered to and accepted by the government.

DOD engineers said that once DOD accepts the prime contractor's engine, it considers the prime contractor to be a qualified source for the individual parts in the system. These engineers said that there is generally no need to re-qualify the individual parts that are ordered from the prime contractor. DOD also does not generally develop a data base on the procedures the prime contractor follows to qualify individual engine parts, on its manufacturing processes, or on its subcontractors' capabilities unless

this information is provided in the technical data purchased by DOD. Furthermore, DOD does not routinely purchase the prime contractor's qualification data, and the prime contractor does not routinely make such data available to the government.

DOD considers the part drawings it purchases from prime contractors to be the government's technical data package; when ordering spare parts from the prime contractor, DOD procurement personnel refer to the drawings. The technical data package also provides a starting point for DOD to determine its qualification and quality requirements if DOD later decides to purchase spare parts from a new source.

## Breakout Program Is Aimed at Lowering the Cost of Spare Parts

During the production run of the engine, the prime contractor manufactures and sells engines and an initial group (provisioning) of spare parts to DOD. After the system is delivered, DOD purchases replenishment parts from the prime contractor or from other sources. When deciding from whom to purchase these replenishment parts, the services and the Defense Logistics Agency (DLA) are required to comply with the DOD Spare Parts Breakout Program.<sup>1</sup>

The Breakout Program requires DOD activities to consider competitively procuring replenishment spare parts as soon as possible in the acquisition cycle. The objective is to reduce costs either by using competitive procurement methods or by purchasing parts directly from the manufacturer when the prime contractor is not the manufacturer of the part. At the same time, DOD procurement personnel must maintain the integrity of the systems and equipment in which the parts are to be used.

The program also sets forth procedures to screen and code parts in order to provide DOD contracting officers information regarding technical data and sources of supply. This information assists the contracting officer in selecting the appropriate method of contracting, identifying sources of supply, and making other decisions in the pre-award and award phases of the contract process. The contracting officer must consider system integrity, readiness, and opportunities to competitively acquire parts. The identification of sources for parts requires knowledge of manufacturing sources, operations performed on parts possessing critical characteristics, and the availability of technical data.

<sup>1</sup>Defense Federal Acquisition Regulation Supplement No. 6, DOD Spare Parts Breakout Program, November 25, 1988.

The program further requires that DOD activities exercise sound engineering judgment when determining whether critical characteristics of the item permit breakout or require retention of the present source. Both the original equipment prime contractors and the Aerospace Industries Association (AIA), representing these prime contractors, told us that they support the intent of the Breakout Program provided that DOD exercises sound engineering judgment.

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## DOD Believes That It Does Not Need to Change Regulations in Response to Section 805

Officials from the Office of the Assistant Secretary of Defense for Production and Logistics told us that they did not plan to change existing regulations or issue new regulations to implement section 805 because DOD was already complying with this law. Furthermore, the officials said that their decision was consistent with the Conference Report, which states that section 805 is not designed to supersede any regulation.

Although they have not issued regulations specifically implementing section 805, these officials said that, to be more fully responsive to the conferees' legislative intent, they were taking or planning a number of actions intended to improve procedures concerning the procurement of all spare parts, including critical parts. In March 1990 the Assistant Secretary of Defense for Production and Logistics issued an action plan for continuously improving the quality of all spare parts. Among the initiatives in the action plan are measures aimed at ensuring that technical data is available, adequate, and accurate for use in acquiring parts of sufficient quality. However, because this plan is in the preliminary stages of development, it is uncertain what effect the plan will have on the procurement process and critical spare parts.

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## Secretary of Defense Has Not Delegated Waiver Authority

Section 805 states that in establishing the appropriate qualification requirements, "the Secretary of Defense shall utilize those requirements, if available, which were used to qualify the original production part, unless the Secretary of Defense determines in writing that any or all such requirements are unnecessary." The Secretary has not specifically delegated waiver authority to any DOD components, and DOD officials told us that they did not believe a specific delegation was required.

We asked DOD for an official interpretation of this provision. In its written response, however, DOD did not discuss the quoted language; instead, it stated that the Secretary's responsibilities with regard to section 805 were to be a primary focus for oversight, to ascertain the degree of compliance and those actions required to comply with the law,

and to incorporate controls to ensure compliance. A DOD official told us that there was no need for a written waiver by the Secretary of Defense because section 805 gave DOD the flexibility to select only the qualification requirements it considered "appropriate."

Although the Secretary has not delegated waiver authority, the Air Force's San Antonio Air Logistics Center (SA-ALC) has issued letters of waiver stating that these letters were determinations by the Secretary of Defense that certain qualification tests were unnecessary. According to DOD officials, while SA-ALC had inappropriately assumed the delegation of authority from the Secretary of Defense, SA-ALC's engineering judgment on appropriate qualification requirements was adequate. DOD is considering requesting the Office of the Inspector General to review this matter at SA-ALC. DOD officials believe that the situation is unique to SA-ALC and that the issue does not need to be addressed on a DOD-wide basis.

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## Definition of "Critical" Spare Part Varies Among Military Services

The services, DLA, and industry officials generally agree with the Federal Acquisition Regulation's (FAR) definition of a "critical" part as any part whose failure can cause injury or jeopardize a vital agency mission. Using that definition as a basis, each service and DLA have developed slightly different definitions.

DOD officials said that the differing definitions, when used with sound engineering judgment, serve as criteria for selecting parts requiring special treatment. DOD officials told us that allowing each service and DLA to individually define "critical" spare parts ensures that all parts they perceive to be critical will be included in their population of parts requiring special treatment. AIA officials told us that, while they concur with the FAR definition, they prefer the broader Navy definition of "critical" aircraft parts, which, in addition to citing the FAR criteria, includes parts whose failure can cause unintentional release of armaments and injuries during escape and rescue.

DOD does not compile data on the number and value of critical spare parts. However, DOD officials told us they are considering preparing a master list of spare parts designated by the services and DLA as being "critical".

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## Differing Interpretations of What Constitutes “Appropriate” Qualification and Contractual Quality Requirements

Section 805 states that the requirements used to qualify the original production part shall be used, if available, in establishing qualification requirements when DOD purchases spare or repair parts. DOD and prime contractors interpret this statement differently. While DOD believes it is complying with section 805, prime contractors and AIA officials believe that DOD is not using “appropriate” qualification and quality requirements and is therefore not complying. They believe that DOD is not exercising sound engineering judgment, as required by Breakout Program regulations. However, neither DOD, the prime contractors, nor AIA could provide any quantitative data to support their positions.

DOD officials believe that the section 805 provision on using original production part requirements means that contracting officers should refer to these requirements when they believe it is necessary to do so and that the original production requirements are subject to change. These officials believe that section 805 is not intended to require that a critical part’s design be revalidated each time that the part is purchased. DOD officials told us that they interpret the phrase “if available” to mean that DOD must make a reasonable effort to obtain data only when the contracting officer believes it is necessary to revalidate original design requirements.

While AIA officials believe the Secretary of Defense must consider the original production part requirements when establishing DOD requirements for new sources, they said that the written waiver provision in section 805 requires DOD to apply the current, not the original, qualification and quality requirements used by the prime contractor for its subcontractors. AIA officials believe that when DOD determines what qualification tests are needed for a new potential source, DOD should not exclude some of the current tests, for example, certain tests in operating engines used by a prime contractor with its subcontractors.

Although they disagree over the interpretation of the terms in section 805, DOD, prime contractors, and AIA believe that, no changes need to be made to the language itself.

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## Our Review of 13 Critical Spare Parts

We asked the aerospace prime contractors who had expressed concern about DOD’s engineering judgment to identify examples of SA-ALC personnel’s use of inappropriate qualification requirements in purchasing critical spare parts from new sources. Our review of 13 parts the contractors identified did not disclose systemic problems resulting in the

procurement of substandard parts.<sup>2</sup> In addition, SA-ALC officials reported no deficiencies in quality or instances of failure for any of the 13 parts we reviewed. However, we found that contracts SA-ALC awarded to new sources did not always include the technical requirements stipulated by SA-ALC engineers—for example, the requirement that a new source for critical parts must purchase castings and forgings from the same subcontractor or vendor used by the prime contractor.

The 13 parts we reviewed were shaft couplings, fuel nozzle bodies, engine vane segments, torquemeter shafts, spur gears, carrier flange assemblies, and ring gears for the C-130 aircraft; rear compressor cases for the C-5 A/B aircraft; engine ball bearings for the F-5 aircraft; and oil pump housings, ratchet wheels, pawl carriers, and pawls (used in secondary power systems) for the F-15 and F-16 aircraft. Further details on these parts are listed in appendix II.

## DOD and Industry Officials Disagree Over Qualification Requirements

When SA-ALC determined the minimum government needs regarding qualification and quality requirements for new sources for the 13 critical spare parts we reviewed, SA-ALC engineers decided to exclude certain qualification and quality requirements that prime contractors believed were necessary to ensure that the quality of the parts was adequate.

In 1988, for example, SA-ALC purchased fuel nozzle bodies (NSN 2915-00-547-1766RW) used in the engines of C-130 aircraft. SA-ALC purchased the critical parts from a new source after qualifying that source by verifying that it had manufactured parts of similar complexity. The new source was also required to pass post-contract-award “first article” tests, which included dimensional measurement tests, metallurgical tests, heat treatment and finish inspections, and checks for compliance with other processes listed in the part drawings.

However, the prime contractor protested to the SA-ALC contracting officer that the new source had not been required to pass all the qualification tests that the prime contractor had required its subcontractors to pass. The prime contractor believed that the tests it had conducted on parts supplied by its subcontractors were necessary to ensure that the parts were of sufficient quality. These tests included a burner outlet

<sup>2</sup>In discussions with the Pratt and Whitney Aircraft Division, United Technologies Corporation, following the completion of our fieldwork, a company official told us that Pratt and Whitney had provided us with an incorrect part, the oil pump housing (National Stock Number [NSN] 4320-00-337-4714PT), for our review. The official stated that the company did not disagree with the Air Force's decision to break out this part and procure it from new sources.

temperature test, a burner rig test, a cold/hot start test, a 300-cycle accelerated endurance test, and a 2,000-hour simulated flight endurance test. The prime contractor claimed that SA-ALC, by not requiring new government sources to pass the same qualification tests, was discriminating against the prime contractor and making it noncompetitive.

SA-ALC officials rejected the prime contractor's protest because they believed that the government had the right to determine its own minimum needs. These officials considered the prime contractor's qualification tests to be unnecessary because they applied only to the qualification of a newly designed fuel nozzle body, not to a proven design.

SA-ALC officials said that they generally did not have complete data on all qualification tests conducted by the prime contractor because such data was not routinely purchased. Moreover, these officials believed it was unnecessary to ask a prime contractor for all the data it used to qualify the original production part. SA-ALC engineers told us that they used sound engineering judgment when determining new source requirements and that they reviewed available data on the prime contractor's current qualification requirements. Because neither DOD nor the prime contractors could provide adequate data on this issue, we could not evaluate and measure their engineering judgments.

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## **Contracts Do Not Always Include Casting or Forging Requirements**

Eight of the 13 parts we reviewed required either casting or forging in their manufacture. The other five were machined from bar stock.

For four of the eight parts requiring casting or forging (the torquemeter shaft, the spur gear, the carrier flange assembly, and the rear compressor case), we found that the SA-ALC engineers had stipulated that the government's new source must use the same casting or forging subcontractor the prime contractor used. However, we found that this stipulation was not being incorporated into SA-ALC's contracts with new sources. It will therefore be difficult for the government to require new part suppliers to use proven sources of supply for their castings and forgings after the contracts are awarded.

According to SA-ALC contracting officials, these omissions were caused by SA-ALC contracting personnel's not knowing how to interpret the engineers' criteria for approving new sources. SA-ALC engineers told us that in preparing documentation for approving new sources, they had stipulated that new sources obtain their castings or forgings from the same

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**Appendix I  
Section 805 and the Purchase of Critical  
Spare Parts**

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vendors used by the original equipment prime contractors. The engineers told us that they had made these stipulations because the necessary technical data on the casting or forging processes was not available.

For two of the parts—the carrier flange assembly and the rear compressor case—we found that the new sources had used castings or forgings purchased from vendors other than those used by the prime contractors.<sup>3</sup> Our review of the rear compressor case—a part used in the TF39 engine, which powers the C-5 A/B Galaxy Transport—disclosed that a contract with the second source did not include a restriction on forging sources. An official with the prime contractor for the TF39 engine told us that since 1978 the prime contractor had qualified three subcontractors to produce the forging. This official said the government's new source had purchased its forgings from a supplier who was not among these three suppliers.

SA-ALC officials acknowledged that its engineers' restrictions on forging sources should have been included in SA-ALC's contract with the new government source to ensure the integrity of the forging material. We found that the forging requirements were not in the contract because SA-ALC contracting officers lacked the expertise to analyze the SA-ALC engineers' qualification requirements which had been included in pre-award documentation the engineers provided to procurement personnel. According to SA-ALC procurement officials, while an engineer might prepare documents containing statements on the need for restrictions on forging or casting sources, unless the engineer makes these restrictions clear on standard acquisition data forms, the contracting officer will not include them in the contract with the new source. SA-ALC engineers told us that they had experienced similar problems in attempting to include other engineering requirements in new source contracts.

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<sup>3</sup>SA-ALC contracts for four of the eight parts requiring casting or forging stipulated that the new source must use the prime contractor's vendors. The other four parts were "reverse engineered," which means that DOD engineers or new contractor engineers examine an existing part to develop a technical data package to be used in a competitive procurement. According to Air Force officials, when a spare part is reverse engineered, the forging or casting used by the new source must be qualified along with the new source's manufacturing capability. Thus, in the case of the four reverse-engineered parts, the contracts do not require the new source to purchase castings or forgings from the prime contractors' approved vendors.

# Critical Spare Parts GAO Reviewed at the Air Force's San Antonio Air Logistics Center

| <b>Part name and NSN</b>                             | <b>Function of part in system</b>  | <b>Potential result if critical part fails</b>   |
|--|--|--|
| 1. Turbine shaft coupling<br>NSN 3040-00-312-9218RW  | Connects the turbine to the compressor in the T56 engine, which powers the C-130 aircraft.   | Disintegration of the turbine, resulting in engine failure and aircraft damage from the impact of the turbine fragments.   |
| 2. Fuel nozzle body<br>NSN 2915-00-547-1766RW        | Contains filters, valve guides, valves, and orifices for the fuel nozzle assembly in the T56 engine, which powers the C-130 aircraft.                                | Engine fire and burn-through of the combustion liner and outer casing, with damage to the aircraft depending on the extent of the fire.  |
| 3. Vane segment<br>NSN 2840-00-021-8168RW            | Directs hot gases into the turbine blades in the T56 engine, which powers the C-130 aircraft.  | Damage to the turbine blades and engine failure.   |
| 4. Torquemeter shaft<br>NSN 2840-00-055-5170RW       | Measures engine torque in the T56 engine powering the C-130 aircraft.  | Unbalanced inner and outer torquemeter shafts, engine failure, and severe damage to the aircraft from flying fragments.  |
| 5. Spur gear<br>NSN-3020-00-884-9235RW               | Drives the hydraulic pump attached to the reduction gearbox of the T56 engine, which powers the C-130 aircraft.  | Severe damage to the reduction gearbox and engine failure.   |
| 6. Carrier flange assembly<br>NSN 2840-00-610-8450RW | A component of the lubrication system for the reduction gearbox in the T56 engine powering the C-130 aircraft.   | Severe damage to the reduction gearbox and engine failure.   |
| 7. Rear compressor case<br>NSN 2840-01-166-2526PS    | Attaches to the forward compressor case to form the engine casing that supports the vanes in the engine compressor of the TF39 engine powering the C-5 A/B aircraft. | If this part ruptures, hot compressed air will escape, causing a loss of power and possible engine shutdown. If the case fails to hold the vanes correctly, the vanes could break out of their mountings and cause a massive engine failure. |
| 8. Ball bearing<br>NSN-3110-01 290-8474RX            | Located in the variable exhaust nozzle actuator in the J85-21B engine powering the F-5 aircraft.   | Jamming of the hydraulic piston inside the actuator in a closed position, causing an engine stall and forcing an emergency single-engine landing.  |
| 9. Oil pump housing<br>NSN 4320-00-337 4714PT        | Supports pump gears in the main oil pump of the F100 engine powering the F-15 and F-16 aircraft.   | Gears could rub against the housing and cause the pump shaft to shear, resulting in extensive damage, including engine failure.  |

(continued)

**Appendix II  
Critical Spare Parts GAO Reviewed at the Air  
Force's San Antonio Air Logistics Center**

| <b>Part name and NSN</b>                  | <b>Function of part in system</b>  | <b>Potential result if critical part fails</b>   |
|---|--|--|
| 10. Ratchet wheel<br>NSN-2835-00-303-3423 | A component of the secondary power system used to start the F100 engines in the F-15 aircraft  | Inability to start the engine either on the ground or in the air after engine shutdown. In-flight failure could cause a mission abort and a single-engine emergency landing. |
| 11. Pawl carrier<br>NSN 2835-01-003-8996  | A component of the secondary power system used to start the F100 engines that power the F-15 aircraft.   | Inability to start the engine either on the ground or in the air after engine shutdown. In-flight failure could cause a mission abort and a single-engine emergency landing. |
| 12. Pawl<br>NSN-2835-01-051-4932          | A component of the secondary power system used to start the F100 engines that power the F-15 aircraft.   | Inability to start the engine either on the ground or in the air after engine shutdown. In-flight failure could cause a mission abort and a single-engine emergency landing. |
| 13. Ring gear<br>NSN 3020-00-874-0640     | Used in the accessory drive assembly on certain versions of the GTCP85 gas turbine engine, which is used to drive generators and to provide high-pressure air for starting aircraft engines. Two versions are part of the auxiliary power units mounted on C-141 and C-130 aircraft. | Engine may not transmit power to the generator and accessories.  |

# Comments From the Department of Defense



ASSISTANT SECRETARY OF DEFENSE  
WASHINGTON, DC 20301-8000

January 30, 1991

(L/SD)

Mr. Frank C. Conahan  
Assistant Comptroller General  
National Security and International  
Affairs Division  
U.S. General Accounting Office  
Washington, DC 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, entitled "DEFENSE PROCUREMENT: Qualification and Quality Requirements for Purchases of Critical Spare Parts," dated January 11, 1991 (GAO Code 396926/OSD Case 8468-A).

The DoD has reviewed the report and concurs without further comment. The Department appreciates the opportunity to review the report in draft form.

Sincerely,

A handwritten signature in cursive script that reads "David J. Berteau".

David J. Berteau  
Principal Deputy

# Objectives, Scope, and Methodology

In Conference Report 100-989, dated September 28, 1988, the congressional conferees directed us to monitor DOD's implementation of section 805, title VIII of the fiscal year 1989 National Defense Authorization Act and to prepare and submit a report within 1 year. The conferees requested that we review any criteria DOD used to designate spare parts as "critical" and, to the extent that quality deficiencies in critical spare parts could be traced and documented, identify any organizational or systemic causes that might lead to the procurement of substandard critical spare parts. Our review focused on spare parts procured from both original equipment prime contractors and other sources.

To comply with the 1-year reporting requirement, we provided an interim status letter on October 11, 1989, and agreed to review 13 parts selected by prime contractors to determine whether there were any systemic problems that might lead to the procurement of substandard parts. Prime contractors believed that for these 13 parts contracting officers were not exercising sound engineering judgment when determining the minimum qualification and quality requirements for new sources. We limited our review to critical parts purchased by the Air Force's San Antonio Air Logistics Center because it purchased many of the critical parts cited by prime contractors as examples of DOD's use of inappropriate requirements for qualification and contractual quality.

During this review we interviewed DOD officials at the following locations:

- the Office of the Assistant Secretary of Defense for Production and Logistics and
- the Air Force Office of the Competition Advocate General, Washington, D.C.; the Air Force Systems Command, Wright Patterson Air Force Base, Ohio; and the Air Force's San Antonio Air Logistics Center, San Antonio, Texas.

To obtain private industry's perspective on section 805, we interviewed officials of the following industry associations and corporations at their headquarters, in our offices in Washington, D.C., or by telephone:

- the Aerospace Industries Association of America, Inc., Washington, D.C., and
- prime contractors responsible for the control of the design and the delivery of systems, including United Technologies Corporation, Pratt and Whitney Aircraft Division, Hartford, Connecticut; the General Motors Corporation, Allison Gas Turbine Division, Indianapolis, Indiana;

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**Appendix IV  
Objectives, Scope, and Methodology**

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the General Electric Corporation, Cincinnati, Ohio; NWL Control Systems, Kalamazoo, Michigan; and Allied Signal Garrett, Phoenix, Arizona.

We analyzed qualification and quality assurance data and discussed the validity of our facts with officials at these locations, in our office, or by telephone.

We performed our work between December 1988 and August 1990 in accordance with generally accepted government auditing standards.

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# Major Contributors to This Report

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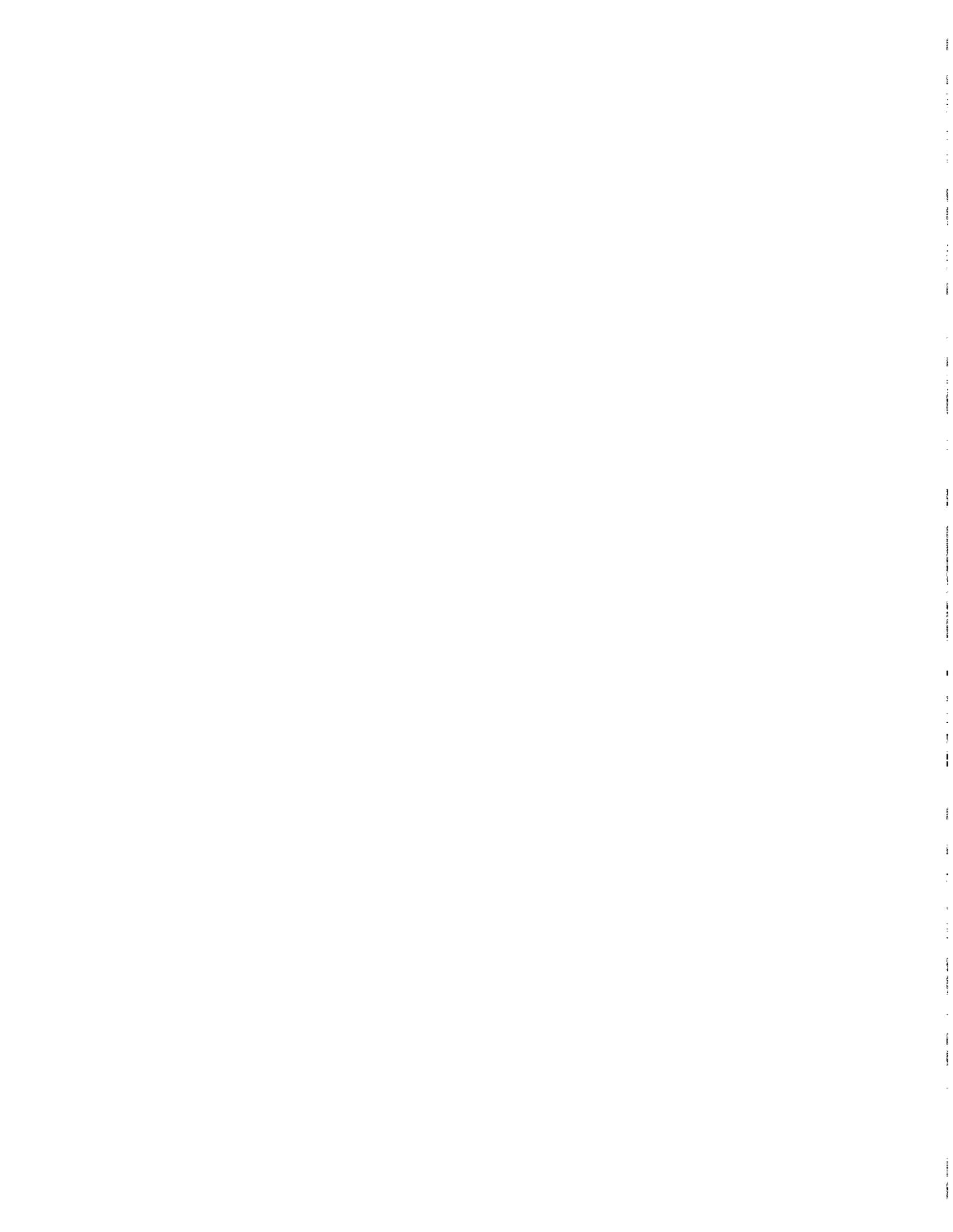
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