Audit Report

OFFICE OF THE INSPECTOR GENERAL

WARRANTIES FOR THE NAVY F-404 JET AIRCRAFT ENGINE

Report No. 94-041

February 14, 1994

Department of Defense

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INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202

February 14, 1994

MEMORANDUM FOR ASSISTANT SECRETARY OF THE NAVY (FINANCIAL MANAGEMENT)

SUBJECT: Audit Report on Warranties for the Navy F-404 Jet Aircraft Engine (Report No. 94-041)

We are providing this report for your information and use. This report resulted from our Audit of Jet Aircraft Engine Durability (Project No. 3LB-5007). It discusses the Navy's efforts to invoke the provisions of the F-404 jet aircraft engine's warranties.

Comments from the Assistant Secretary of the Navy (Research, Development and Acquisition) on a draft of this report were considered in preparing this final report. The comments conformed to the requirements of DoD Directive 7650.3 and there are no unresolved issues. Therefore, no additional comments are required.

The courtesies extended to the audit staff are appreciated. If you have any questions on this audit, please contact Mr. Christian Hendricks, Program Director, at (703) 692-3394 (DSN 222-3394) or Mr. James Kornides, Project Manager, at (703) 692-3420 (DSN 222-3420). The planned distribution of this report is in Appendix H. The audit team members are listed inside the back cover.

Robert J. Lieberman
Assistant Inspector General
for Auditing

This special version of the report has been revised to omit source selection and contractor confidential or proprietary information.

Office of the Inspector General, DoD

Report No. 94-041 **February 14, 1994**
(Project No. 3LB-5007.01)

REPORT ON WARRANTIES FOR THE NAVY F-404 JET AIRCRAFT ENGINE

EXECUTIVE SUMMARY

Introduction. This report covers part of our audit of Jet Aircraft Engine Durability (Project No. 3LB-5007). Additional issues related to the durability of jet engines used in DoD aircraft are or will be discussed in separate reports. The F-404 jet engine is used in the Navy's F/A-18 aircraft. At the time of the audit, General Electric had reevaluated the durability of the F-404 engine and recommended new reduced life limits for many of the components in the engine.

Objectives. The objective of this part of our audit was to evaluate the Navy's efforts to invoke the engine warranties and recover the cost of the reduced life of the F-404 engine's components. We also evaluated the effectiveness of applicable internal controls.

Audit Results. Although the Navy invoked the warranty provisions to obtain reimbursement for the life it will not achieve from nine defective F-404 engine components, it had not invoked the warranty provisions to obtain compensation (including redesign costs) for other defective components that are covered by warranty. As a result, the Navy can seek an estimated * * of additional compensation from General Electric for replacement and redesign of engine components.

Internal Controls. The audit identified no material internal control weaknesses and no weaknesses in implementation of the Federal Managers' Financial Integrity Act. See Part I for details of our review of internal controls assessed.

Potential Benefits of Audit. Approximately * * in potential monetary benefits can be realized by pursuing the recovery of the costs of all defective engine components (Appendix F).

Summary of Recommendations. We recommended that the Commander, Naval Air Systems Command invoke the provisions of the warranty that require General Electric to redesign or replace all F-404 engine components that are defective.

Management Comments. The Department of the Navy agreed to take the recommended actions. See Part II for a full discussion of management's responsiveness.

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* Contractor confidential or proprietary data has been deleted.

Audit Response. The Navy's comments to Recommendations 1., 2., and 3. are responsive and additional comments are not required. The Navy and General Electric agreed to further revisions on the life limits of the F-404 engine components after the issuance of our draft report. We have revised the report to reflect the new limits. (See Part IV for the complete text of the Navy's comments.)

Table of Contents

This report was prepared by the Logistics Support Directorate, Office of the Assistant Inspector General for Auditing, Department of Defense. Copies of the report can be obtained from the Secondary Reports Distribution Unit, Audit Planning and Technical Support Directorate (703) 614-6303 (DSN 224-6303).

Part I - Introduction

Background

The F-404 engine is used in the Navy's F/A-18 aircraft. The Navy began buying the engine in 1976, and at the time of the audit General Electric, the engine designer, was still manufacturing it. In 1987, the Navy introduced competition to reduce the cost of the F-404 engines. Pratt and Whitney was selected as the second source contractor. At the time of the audit, the Navy had procured 1,910 F-404 engines from General Electric and 215 engines from Pratt and Whitney valued at approximately * * .

The Navy has procured 17 lots of the F-404 engine. The advance acquisition contract for Lot 18 (FY 1994) has been awarded but not yet definitized, and deliveries are not scheduled to begin until April 1995. Each lot of engines is a group of engines bought as one item under a contract. General Electric manufactured lots 1 through 17 of the F-404 engines, while Pratt and Whitney manufactured some of the engines in lots 11, 12, and 13. General Electric will also manufacture lot 18.

As of January 1, 1985, DoD was required by Public Law 98-525 to obtain warranties when procuring major weapons systems that cost more than $100,000 or for which the total acquisition cost was more than $10 million. The Navy procured lots 1 through 9 of the F-404 engines before the enactment of the legislation and the contracts for those lots contained very limited warranty provisions. However, lots 10 through 18, which the Navy procured after the legislation was passed, contained more extensive warranties.

In 1992, General Electric reevaluated the durability of the components in the F-404 engine and recommended reduced life limits for many of them. Many of those components are warranted by General Electric.

Objectives

The objective of this audit was to evaluate the Navy's efforts to invoke the engine warranties and recover the cost of the reduced life of the F-404 engine's components. We also evaluated the effectiveness of applicable internal controls.

Scope and Methodology

Review of Records. We reviewed and evaluated Navy and contractor documents and records related to the life limits of the F-404 engine's components, and the warranties for those components, that were prepared

* Contractor confidential or proprietary data has been deleted.

between July 1985 and August 1993. We also interviewed cognizant Navy contracting officials and F/A-18 engine program office personnel, officials at General Electric and Pratt and Whitney, and personnel at the Defense plant representative offices.

Auditing Standards. This economy and efficiency audit was made from May through August 1993 in accordance with auditing standards issued by the Comptroller General of the United States for economy and efficiency audits, as implemented by the Inspector General, DoD, and accordingly included such tests of internal controls as were considered necessary. Organizations visited or contacted during the audit are in Appendix G.

Internal Controls

Controls Assessed. We evaluated the Navy's controls for ensuring that the warranty provisions for the F-404 engine were invoked where appropriate. We also reviewed the implementation of the Federal Managers' Financial Integrity Act pertaining to the audit objective.

Internal Control Weaknesses. Because some of the provisions of the warranties on the F-404 engines were not invoked, the applicable internal controls were not fully effective. Nevertheless, the internal weakness was not considered to be material. We did not disclose weaknesses in the implementation of the Federal Managers' Financial Integrity Act.

Prior Audits and Other Reviews

There has been no other audit coverage of this specific issue in the last 5 years.

Part II - Finding and Recommendations

Pursuing Reimbursement for Warranty Claims Associated with Defects in the Navy's F-404 Engine

Although the Navy invoked the warranty provisions to obtain reimbursement for the life it will not achieve from nine defective F-404 engine components, it had not invoked the warranty provisions to obtain compensation (including redesign costs) for all defective components that are covered by warranty. We attributed this condition to a lack of management oversight. As a result, the Navy can seek an estimated * * of additional compensation from General Electric for replacement and redesign of engine components.

Background

Public Law 98-525, section 1234, effective January 1, 1985, was passed as a result of congressional concerns that weapons systems often failed to meet their military missions, were operationally unreliable, and had defective and shoddy workmanship. The Public Law requires the Federal Government to obtain warranties on production contracts for major weapons systems that cost more than $100,000 or for which the total acquisition cost is more than $10 million. The contractor must provide the Government with a written guarantee that the weapons systems will conform to design and manufacturing requirements, be free from defects in material and workmanship, and conform to specific performance requirements.

The Public Law states that if the product does not meet the required specifications, the Secretary of Defense will instruct the contractor to promptly take corrective action. The contractor must correct the failure at no additional cost to the Government or repay reasonable costs that the Government incurred in taking the corrective action.

In accordance with Public Law 98-525, the Navy obtained comprehensive warranties for the F-404 engine components. The major components of the F-404 engine are illustrated in Appendix A. Beginning in March 1985, the Navy obtained warranties for each remaining lot (10 through 18) of the F-404 engines it procured or planned to procure. In addition to materials and workmanship, the expanded warranties also covered design and the structural life of the engine.

* Contractor confidential or proprietary data has been deleted.

F-404 Engine

In 1992, the Navy's F/A-18 engine program management office requested that General Electric reassess the lives of all critical rotating or life limited F-404 engine components. In 1992, the F-404 engine had caused two catastrophic accidents and the durability of the engine was in question. At the completion of its evaluation, General Electric recommended that the Navy reduce the life limits of many of the engine components.

Although controls over the administration of the contract were in place, the Navy did not consistently invoke the warranty coverage for each component among the lots of engines it bought. We attributed the Navy's nonexercise of all warranty contracts with General Electric to a lack of management oversight by the Navy's F-404 contracting office.

Navy Action to Invoke Warranties. When General Electric recommended that the Navy reduce the life limits of many components in the engine to levels well below the originally contracted specifications, the Navy invoked some of its warranty provisions for structural defects.

In January 1992, the Navy's contracting officer issued letters notifying General Electric of a warranty breach for the F-404 engine's stage 2 and stage 3 fan disks. In June 1992, the Navy notified the contractor of a warranty breach on the F-404 engine's stage 1 fan disk and forward cooling plate. In July 1993, the Navy issued letters notifying General Electric of a warranty breach for the F-404 engine's high pressure compressor (HPC) stage 3 disk, HPC forward spools (Nos. 1 and 2), low pressure turbine (LPT) disk, and LPT forward seals.

In August 1992, General Electric provided replacements for some of the components that the Navy claimed were not meeting structural life requirements. Replacement parts, including 50 forward cooling plates and 129 stage 1 fan disks, were provided by General Electric to the Navy. At the time of the audit, the Navy was negotiating on the remaining parts identified in its letters.

Additional Actions Needed to Recover the Cost of Reduced Component Life. Although the Navy took actions to invoke the warranty provisions covering structural defects on the components, listed above, additional actions are needed per the terms of the warranties. Specifically, there are additional components that will not achieve the life specified in the warranty, which the Navy had not pursued at the time of the audit.

Components in Lot 10. The Navy's letter notifying General Electric of a warranty breach on the stage 1 fan disk covered engines in lots 12 and higher. However, the letter did not include stage 1 fan disks and aft shafts in 173 engines that were purchased under lot 10.

Section E.4 of the Navy warranty for lot 10 engines (contract number N00019-85-C- 0129) states, if any cold section part of the engine (the stage 1 fan disk and aft shaft are cold section parts; that is, they are not located

in the combustion part of the engine) has a life without repair of less than that specified in the warranty, the contractor shall provide all engineering hardware necessary to complete a redesign that will achieve a life without repair of that stated in the warranty, engineering and redesign hardware support for development and qualification testing of the redesign, and all component rig or bench testing required for development and qualification of the redesign. Additionally, if repeated warranty breaches show any cold section part to have a life less than half that specified in the warranty, the contractor shall provide all parts and labor necessary to incorporate the redesign in each engine for which there is a warranty breach.

The stage 1 fan disk and the aft shaft have been redesigned. The 173 stage 1 fan disks purchased under lot 10 are expected to achieve * engine cycles, or less than half the * that are warranted under lot 10. Similarly, the aft shafts are expected to achieve only * of the * cycles warranted under lot 10.

Although the components are not expected to reach half their warranted lives, the Navy did not include the components in its letters that notified General Electric of breaches of the warranty. We estimated that at least * * should be pursued from General Electric for life lost on the stage 1 fan disk and the aft shafts acquired under lot 10 of the engine procurement (Appendix B).

Components in Lots 12 through 18. The warranty for lots 12 through 18 of the F-404 engines obtained under contract number N00019-86-C-0247 covers the full structural life of many of the F-404 engine components. Section B.2.h of the warranty states that the structural life (without repair or parts replacement) of the engines/modules tendered for delivery and accepted under this contract shall be not less than that defined by paragraph A.7. Paragraph A.7. contains a table identifying each component and its warranted life.

At the time of audit, the Navy had not notified General Electric of a warranty breach on the high pressure turbine module's disk, in lots 12 through 18. The disks are not expected to meet their structural life requirements as specified in paragraph A.7 of the warranty. We estimated that at least * should be pursued from General Electric through the warranty for life lost on the disk (Appendix C).

Components Built by Pratt and Whitney. We also evaluated the warranty provisions of the Navy's contract for F-404 engines (contract number N00019-86-C-0045) with Pratt and Whitney to determine Pratt and Whitney's responsibility for the replacement of defective engine components. Pratt and Whitney built F-404 engines in lots 12 and 13 and warranted the structural life of the engines in those lots.

Section E.2. of the warranty with Pratt and Whitney states that any warranty breach reveals a deficiency which must be corrected by redesign, the contractor will provide all hardware necessary to eliminate the cause of the breach, in each engine which has been tendered for delivery and accepted under this contract and has accrued at least * engine operating hours, providing the

* Contractor confidential or proprietary data has been deleted.

breach: is unique to the engines/modules delivered by the contractor or results from a design deficiency for which the contractor had design responsibility. Any design and development work necessary for qualification of a modification to eliminate the cause shall be funded or conducted by the Government.

General Electric may be responsible for some of the F-404 engine components built by Pratt and Whitney that do not meet their structural life requirements to the extent that failure to meet the structural life requirements is due to design deficiencies rather than manufacturing defects.

Although the Navy indicated that it was planning to pursue General Electric for the defective components in engines in lots 12 and 13 that Pratt and Whitney built, at the time of the audit, it had not taken action. We estimated that at least * * of components (based on the life lost from components in engines acquired in lots 12 and 13 from Pratt and Whitney [Appendix D]) should be pursued from General Electric.

Redesign. In addition to the reimbursement that is achievable by exercising the warranties for the life of the components that was lost because of poor durability, we believe that the Navy is entitled to recover the payments it made for redesigning components of the F-404 engines.

Sections E.3. and E.4. of the Navy's warranties with General Electric for lots 10 and 11 state that if any cold or hot section part of the engine has a life without repair of less than that specified in the warranty, the contractor shall provide all engineering hardware necessary to complete a redesign that will achieve a life without repair of that stated in the warranty, engineering and redesign hardware support for development and qualification testing of the redesign, and all component rig or bench testing required for bench testing required for development and qualification of the redesign.

Based on the new life limits recommended by General Electric, four of the components in the F-404 engine, the stage 1, 2, and 3 fan disks and the aft shaft, have been redesigned because they did not achieve their structural life requirements. The Navy had not taken action to obtain payment for the redesign. Instead, the Navy paid General Electric * * (Appendix E) to redesign those engine components under the Component Improvement Program, a program that provides for sustaining General Electric engineering efforts to improve the F-404 engine system. The Navy should follow through to recover * * from General Electric under the warranty.

Conclusions

The Navy's warranties provided remedies for the loss of engine life due to defective components. We concluded that the Navy should request compensation for an estimated * * for the engine life it will not achieve on

* Contractor confidential or proprietary data has been deleted.

engine components, and * * to have components redesigned. The costs can be recovered from General Electric under the provisions of the Navy's warranty for the engine. To recover the estimated * * , the Navy must act to invoke the provisions of its warranties.

Recommendations, Management Comments, and Audit Response

1. We recommend that the Commander, Naval Air Systems Command negotiate compensation from General Electric under the F-404 engine warranty provisions for the engine components procured under lot 10 and lots 12 through 18 that will not meet their warranted life.

Management Comments. The Navy concurred with the recommendation and suggested that we substitute the word "Request" with "Negotiate" because the contracting officer has requested compensation for all of the components not meeting the warranty provisions of contracts N00019-85-C-0129 and N00019-86-C-0247.

2. **We recommend that the Commander, Naval Air Systems Command negotiate compensation from General Electric for the F-404 engine components procured under lots 12 and 13 from Pratt and Whitney, that will not meet their warranted life, for which General Electric had design responsibility.**

Management Comments. The Navy concurred with the recommendation and stated that it intends to pursue compensation from General Electric for the engines procured from Pratt and Whitney in Lots 12 and 13.

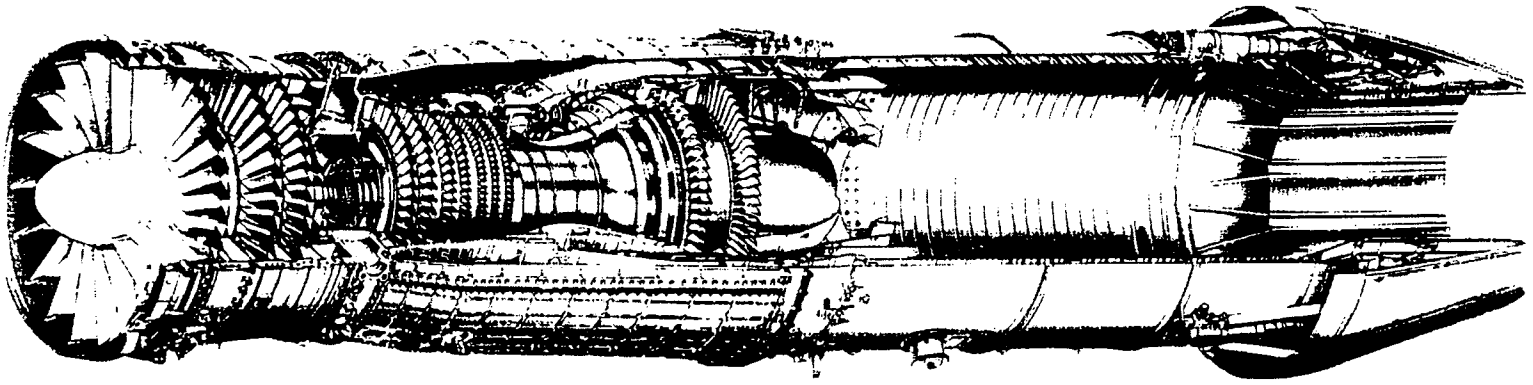
3. **We recommend that the Commander, Naval Air Systems Command negotiate compensation from General Electric for funds expended to redesign F-404 engine components.**

Management Comments. The Navy concurred with the recommendation and stated that it intends to obtain compensation for redesign of deficient components during warranty negotiation.

Audit Response. The Navy's comments to Recommendations 1., 2., and 3. are responsive and additional comments are not required. The Navy and General Electric agreed to further revisions of the life limits of the F-404 engine components after the issuance of our draft report. We have revised the report to reflect the new limits.

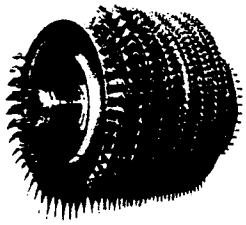
Part III - Additional Information

Appendix A. F-404 Engine and Major Components

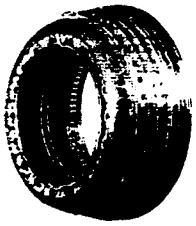


Fan

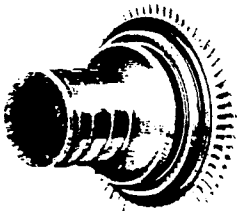
Compressor



Combustor

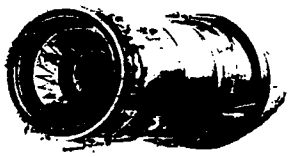


High Pressure Turbine



Low Pressure Turbine

Afterburner



Appendix B. Warranty Remedies for Engines Bought Under Procurement Lot 10 (General Electric Engines)

Life Limited Component	Warranted Life Limit in Cycles[1]	New Life Limit in Cycles[2]	Warranted Cycles Not Achieved (Breached)	Part Cost	No. of Engines Procured	Additional Parts Needed[3]	Reimbursement Required from Manufacturer[4]
Fan Module							
Stg[5] 1 Disk	*	*	*	*	*	*	*
Aft Shaft	**	*	*	*	*	*	*
Total							*

[1] The number of engine cycles that General Electric warranted.
[2] The number of engine cycles currently designated as the component life limit due to component life reduction.
[3] The additional components needed per engine, due to the component life reduction.
[4] The additional expense the Navy will incur due to the reduction in component life.
[5] Stage.

* Contractor confidential or proprietary data has been deleted.

Appendix C. Warranty Remedies for Procurement Lots 12 through 18 (General Electric Engines)

Life Limited Component	Warranted Life Limit in Cycles[1]	New Life Limit in Cycles[2]	Warranted Cycles not Achieved (Breached)	Part Cost	No. of Engines Procured	Additional Parts Needed[3]	Reimbursement Required from Manufacturer[4]
High Pressure Turbine Module							
Disk	*	**	*	*	*	*	*
Total							*

[1] The number of engine cycles that General Electric warranted.
[2] The number of engine cycles currently designated as the component life limit due to component life reduction.
[3] The additional components needed per engine, due to the component life reduction.
[4] The additional expense the Navy will incur due to the reduction in component life.

* Contractor confidential or proprietary data has been deleted.

Appendix D. Warranty Remedies for Procurement Lots 12 and 13 (Pratt and Whitney Engines)

Life Limited Component	Life Limit in Cycles[1]	New Life Limit in Cycles[2]	Cycles not Achieved (Breached)	Part Cost	No. of Engines Procured	Additional Parts Needed[3]	Reimbursement Required from Manufacturer[4]
Fan Module							
Stg[5] 1 Disk	*	*	*	*	*	*	*
Stg[5] 2 Disk	*	*	*	*	*	*	*
Stg[5] 3 Disk	*	*	*	*	*	*	*
High Pressure Combustor Module							
FD[6] Spool	*	*	*	*	*	*	*
Stg[5] 3 Disk	*	*	*	*	*	*	*
High Pressure Turbine Module							
Disk	*	*	*	*	*	*	*
Low Pressure Turbine Module							
FD[6] Air Seal	*	*	*	*	*	*	*
Disk	*	*	*	*	*	*	*
Total							*

1 The number of engine cycles for which Pratt and Whitney built the component to achieve, based on General Electric's design.
2 The number of engine cycles currently designated as the component life limit due to component life reduction.
3 The additional components needed per engine, due to the component life reduction.
4 The additional expense the Navy will incur due to the reduction in component life.
5 Stage.
6 Forward.

* Contractor confidential or proprietary data has been deleted.

Appendix E. Redesign Costs that are Recoupable Under the Provisions of the Warranty with General Electric

Redesigned Component	Cost
Stages 2 and 3 Fan Dovetail	*
Stage 1 Fan Disk	*
Fan Aft Shaft	*
Total	*

* Contractor confidential or proprietary data has been deleted.

Appendix F. Summary of Potential Benefits Resulting from Audit

Recommendation Reference	Description of Benefit	Type and Amount of Benefit
1.	Economy and Efficiency. The Navy can pursue warranty remedies (one time) from General Electric for defective components.	Funds put to better use through reimbursement or a manufacturer credit from General Electric of at least * . An equivalent reduction could then be made in the Defense Business Operating Fund Appropriation 97X4930.NC1A.
2.	Economy and Efficiency. The Navy can pursue warranty remedies (one time) from General Electric for defective components procured from Pratt and Whitney for which General Electric had design responsibility.	Funds put to better use through reimbursement or a manufacturer credit from General Electric of at least * . An equivalent reduction could then be made in the Defense Business Operating Fund Appropriation 97X4930.NC1A.
3.	Economy and Efficiency. The Navy can pursue the recovery (one time) of the costs of redesigning defective engine components.	Funds put to better use. The Navy could recover * of Research, Development, Test, and Evaluation Appropriation 173.1319.

* Contractor confidential or proprietary data has been deleted.

Appendix G. Organizations Visited or Contacted

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition, Washington, DC

Department of the Navy

Naval Air Systems Command, Washington, DC
Naval Air Warfare Center, Trenton, NJ
Naval Aviation Depot, Jacksonville, FL

Defense Agencies

Defense Plant Representative Office, General Electric, Cincinnati, OH
Defense Plant Representative Office, Pratt and Whitney, West Palm Beach, FL

Non-Defense Agencies

National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH
General Accounting Office, Washington, DC

Congressional Committees

Senate Appropriations Committee, Washington, DC

Contractors

General Electric Company, Washington, DC
General Electric Company, General Electric Aircraft Engines, Cincinnati, OH
General Electric Company, General Electric Aircraft Engines, Lynn, MA
United Technologies Corporation, Pratt and Whitney, West Palm Beach, FL

Appendix H. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition and Technology
Deputy Under Secretary of Defense for Logistics
Assistant to the Secretary of Defense for Public Affairs
Comptroller of the Department of Defense

Department of the Navy

Secretary of the Navy
Assistant Secretary of the Navy (Financial Management)
Comptroller of the Navy
Chief of Naval Operations
Headquarters, Naval Air Systems Command
Auditor General, Naval Audit Service

Department of the Air Force

Air Force Audit Agency

Defense Agencies

Director, Defense Contract Audit Agency
Director, Defense Intelligence Agency
Director, Defense Logistics Agency
Director, Defense Logistics Studies Information Exchange
Director, National Security Agency

Non-Defense Federal Organizations

Office of Management and Budget
U.S. General Accounting Office
- National Security and International Affairs Division, Technical Information Center
- National Security and International Affairs Division, Defense and National Aeronautics and Space Administration Management Issues
- National Security and International Affairs Division, Military Operations and Capabilities Issues

Non-Defense Federal Organizations (cont'd)

Chairman and Ranking Minority Member of each of the following Congressional Committees and Subcommittees:

Senate Committee on Appropriations
Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on Defense, Committee on Appropriations
House Committee on Armed Services
House Committee on Government Operations
House Subcommittee on Legislation and National Security, Committee on Government Operations

Part IV - Management Comments

Department of the Navy Comments

THE ASSISTANT SECRETARY OF THE NAVY
(Research, Development and Acquisition)
WASHINGTON, D.C. 20350-1000

05 JAN 1994

MEMORANDUM FOR THE DEPARTMENT OF DEFENSE ASSISTANT INSPECTOR GENERAL FOR AUDITING

Subj: DODIG DRAFT REPORT ON THE NAVY'S EFFORTS TO INVOKE THE PROVISIONS OF WARRANTIES ON ITS F-404 JET ENGINE (PROJECT NUMBER 3LB-5007.01)

Ref: (a) Department of Defense Inspector General memo of 2 November 93, subject as above

Encl: (1) Department of the Navy Response to Draft Audit Report

I am responding to the draft audit report forwarded by reference (a) concerning the Navy's efforts to invoke the provisions of warranties on its F-404 jet engine.

The Department of the Navy concurs with the recommendations. Our detailed response to the audit, including additional clarifications to the report, is provided as enclosure (1).

Nora Slatkin

Copy to:
NAVINSGEN
NCB-53

DEPARTMENT OF THE NAVY RESPONSE
TO
DODIG DRAFT REPORT OF NOVEMBER 2, 1993
ON
THE NAVY'S EFFORTS TO INVOKE THE PROVISIONS OF
THE WARRANTIES ON ITS F-404 JET AIRCRAFT ENGINE
(3LB-5007.01)

Finding:

Although the Navy invoked the warranty provisions to obtain reimbursement for the life it will not achieve from nine defective F-404 engine components, it had not invoked the warranty provisions to obtain compensation (including redesign costs) for other defective components that are covered by warranty. We attribute this condition to a lack of management oversight. As a result, the Navy can seek an estimated * * of additional compensation from General Electric for replacement and redesign of engine components.

Recommendations:

Recommend that the Commander, Naval Air Systems Command:

1. Request compensation from General Electric under the F-404 engine warranty provisions for the engine components procured under lot 10 and lots 12 through 18 that will not meet their warranted life.

Department of the Navy Position:

Concur. However, recommend that "Request" be changed to "Negotiate" since the contracting officer has requested compensation for all components which do not meet the warranty provisions of Contracts N00019-85-C-0129 and N00019-86-C-0247.

2. Request compensation from General Electric for the F-404 engine components procured under lots 12 and 13 from Pratt and Whitney, that will not meet their warranted life, for which General Electric had design responsibility.

Department of the Navy Position:

Concur. The Navy intends to pursue compensation from GE for the engines procured from Pratt and Whitney in Lots 12 and 13.

3. Request compensation from General Electric for funds expended to redesign F-404 engine components.

Department of the Navy Position:

Concur. The Navy intends to obtain compensation for redesign of deficient components during warranty negotiation.

* Contractor confidential or proprietary data has been deleted.

Additional Navy Comments:

Introduction. "From 1976 to the date of the audit, the U.S. Navy procured 1,828 F-404 engines from General Electric and 215 engines from Pratt and Whitney, valued at approximately * * ." The statement should read "From 1976 to the date of the audit, the U.S. Navy procured 1,910 F404 engines from General Electric and 215 engines from Pratt and Whitney, valued at approximately * ."

Background. Paragraph 2. "The Navy procured 18 lots of the F-404 engine. Each lot of engines is a group of engines bought as one item under a contract. General Electric manufactured lots 1 through 18 of the F-404 engines, while Pratt and Whitney manufactured some of the engines in lots 11, 12, and 13." The Navy has procured 17 Lots of the F-404 engine. The advance acquisition contract for Lot 18 (FY94) has been awarded but not yet definitized, and deliveries are not scheduled to begin until April 1995. The quantity of 1,910 referred to in the Executive Summary and the first paragraph of the Background section are the number of engines for Lots 1 through 17 only.

Page 6, Paragraph 1, "Pursuing Reimbursement for Warranty Claims Associated with Defense in the Navy's F-404 Engine." The statement "other defective components that are covered by warranty" may imply that there are additional deficient parts that have not been cited rather than the same engine components from another lot or another vendor. Recommend revising sentence to state that "... it had not invoked the warranty provisions to obtain compensation (including redesign costs) for all defective F-404 engine components that are covered by warranty." Additionally, due to the clarifications provided, " * " has been reduced to * "

Page 6, Paragraph 5, "F-404 Engine." "...requested that General Electric reassess the lives of all F-404 engine components." The statement should read "... requested that General Electric reassess the lives of all critical rotating or life limited F-404 engine components."

Page 7, Paragraph 6, "Components in Lot 10." "However, the letter did not include stage 1 fan disks and aft shafts in 173 engines that were purchased under lot 10." Notifications of defect for these two parts have since been issued under Contract N00019-85-C-0129 for Lot 10. See attachment (a) list of defect letters issued by the contracting officer.

Page 7, Paragraph 7. "Section E.3." should read "Section E.4."

Page 8, Paragraph 1. "The stage 1 fan disk and the aft shaft have been redesigned because the 173 stage 1 fan disks purchased under lot 10 are expected to achieve * engine cycles, or less than half the * that are warranted. Similarly, the aft shafts are expected to achieve only * of the * cycles

* Contractor confidential or proprietary data has been deleted.

warranted."

The words "under Lot 10" should be added after the word "warranted" in the first sentence and added to the end of the last sentance, as cycles warranted differ from engine contract to engine contract.

The correct number of cycles achieved by the stage 1 disk is actually * and not * due to refinement in life calculations. Therefore, * should replace * . This generates the following corrections in Appendix B of the report:

New Life Limit Cycles	*
Warranted Cycles Not Achieved	*
Additional Parts Needed	*
Reimbursement Req'd From Mfr	*

The correct number of cycles achieved by the aft shaft is actually * and not * . Therefore, " * " should replace " * ." This generates the following corrections in Appendix B of the report:

New Life Limit Cycles	*
Warranted Cycles Not Achieved	*
Additional Parts Needed	*
Reimbursement Req'd From Mfr	*

Page 8, Paragraph 2. "...at least * should be pursued..." The correction in the number of cycles for the stage 1 disk and aft shaft (discussed under page 8, paragrapn 1 above) causes the * to become * .

Page 8, Paragraph 3. "...contract number N00019-86-C-0045" should read N00019-86-C-0247. Contract number N00019-86-C-0045 is a Pratt and Whitney contract not a General Electric contract.

Page 8, Paragraph 4. "...the Navy had not notified General Electric of a warranty breach on two components, the high pressure module's aft spool and the high pressure turbine module's disk, in lots 12 through 18 that are not expected to meet their structural life requirements as specified in paragrapn A.7 of the warranty. We estimate that at least * should be pursued from General Electric through the warranty for life lost on the aft spool and the disk (Appendix C)."

The high pressure compressor (HPC) aft spool cycles are currently at * which exceeds the warranty life of * cycles. There is no breach and no need to issue a notification of defect letter. Therefore, the information regarding the HPC Aft Spool should be deleted from Appendix C.

High pressure turbine (HPT) disk life may be reduced to approximately * cycles in early 1994, pending the next interim life update due January 1994. When compared to the

* Contractor confidential or proprietary data has been deleted.

Contract N00019-86-C-0247 warranty limit of * cycles, this yields a breach of * cycles not * cycles as cited in Appendix C of the report. A notification of defect letter was issued to General Electric for the HPT Disk for this contract. (See Attachment (A)). These corrections generate the following changes to Appendix C:

New Life Limit Cycles	>	*
Warranted Cycles Not Achieved	<	*
Additional Parts Needed	<	*
Reimbursement Req'd From Mfr		*

Page 9, Paragraph 1. "...at least * of components ..." Given the corrected information provided to page 8, paragraphs 1 and 3 above, the * becomes * . Appendix D should be corrected.

Page 9, Paragraph 4. "...Navy paid General Electric * (Appendix E) to redesign those engine components under the Component Improvement Program ... ." Redesign of the Stage 3 Fan Vane, cited in Appendix E, at a cost of * is a wear problem not associated with the fan life problems, and is not a warranty breach. Therefore, the stage 3 fan vane costs of * should be deleted from Appendix E, resulting in a revised total of * . The Navy will pursue recovery of the redesign costs for covered components during final warranty negotiations. The use of the Component Improvement Program (CIP) contract to initiate work for the Stage 1, 2 and 3 disks and the aft shaft was due to the safety issues involved. The CIP contract will not be used for any future redesign effort due to a warranty breach.

Page 9, Paragraph 5.: "The Navy's warranties ...components. We ... * ...redesigned. The costs ...engine. To recover the estimated * . the Navy must act to invoke the provisions of its warranties."

Given the corrected information provided for Page 8, paragraphs 1 and 4 above, replace " * " with " * ," and replace the " * " with " * ."

The Navy has invoked its rights under the warranty clause of contracts N00019-85-C-0129 for Lot 10 and N00019-86-C-0247 for Lots 12 through 18 for all known defective engine parts as noted in attachment (a).

Appendices A and G: Concur

Appendices B, C, D, E, and F: Based on the corrected information set forth in our specific response above, Appendices B through F have been revised and are forwarded as attachments (b), (c), (d), (e) and (f).

Final Report Reference

Attachments deleted

* Contractor confidential or proprietary data has been deleted

Appendix H: Partially concur. Recommend deleting the Contractors listed on page 20 from the distribution list until after warranty negotiations are concluded so that the Navy's negotiation position is not compromised.

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