

COMPTROLLER GENERAL OF THE UNITED STATES  
WASHINGTON D.C. 20548

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B-201347

September 27, 1983

The Honorable William Proxmire  
Vice Chairman  
Subcommittee on International Trade,  
Finance and Security Economics  
Joint Economic Committee

Dear Mr. Vice Chairman:

This concerns our review of the Air Force's C-5A wing modification program, which was the subject of our audit report "C-5A Wing Modification: A Case Study Illustrating Problems in the Defense Weapons Acquisition Process" (PLRD 82-38, March 22, 1982).

As you know, a draft of the report included a chapter that responded to your query as to whether the Air Force properly exercised its responsibility for requiring Lockheed-Georgia Company, the C-5A contractor, to assume the financial burden of correcting the wing defect. We omitted the chapter from our final report because of an ongoing review by our Office and the Air Force Office of General Counsel. After careful study of the matter, we conclude that Lockheed was legally obligated to perform a substantial portion of the correction on a cost reimbursement, no fee basis under the C-5A contract. The Air Force, however, did not recognize this obligation; consequently, it awarded Lockheed new contracts to correct the defect and obligated itself to pay fees of about \$150 million.

BACKGROUND

In 1965, the Air Force entered into contract No. AF33 (657)-15053 with Lockheed-Georgia Company for the design, development, testing and production of 120 C-5A aircraft. At the time, the estimated cost for the program was \$3.413 billion, or \$28.4 million per aircraft. By June 30, 1972, the estimated program cost was \$4.426 billion, with the quantity of aircraft to be delivered having been decreased from 120 to 81. Thus, cost per aircraft increased from \$28.4 million to \$54.6 million.

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Because of cost overruns, numerous technical problems, and a dispute concerning the number of aircraft the Air Force was required to order, the Air Force and Lockheed on May 31, 1971, executed Supplemental Agreement 1000 to the basic C-5A contract 15053. The Supplemental Agreement fundamentally restructured the original contract, converting it from a fixed-price incentive contract to a cost-reimbursement, fixed loss contract. The loss was fixed at \$200 million. Additionally, the agreement generally released both parties from claims arising from the contract prior to the execution of the Supplemental Agreement.

In July 1969, a static test failure on the C-5A wing gave the Air Force its first significant indication that serious deficiencies might exist in the wing. The situation was confirmed in subsequent fatigue test failures which indicated that the wing would not meet the contractually specified useful life goal of 20 years or 30,000 service hours. After considerable study of the problem, Air Force officials concluded that the appropriate fix would be an essentially new wing for all the C-5A aircraft. While some parts of the old wing could be used, the inner, center, and outer wing boxes, which make up most of the wing, were to be rebuilt.

In December 1975, the Air Force awarded contract F-33(657)-75-C-0178 to Lockheed. This contract provided for the design of the new wing and the construction of two test articles. In November 1979, the Air Force awarded contract F-33(657)-80-C-0001 to Lockheed for the production and installation of the new wing on 77 C-5A aircraft. The wing modification program, known as "H-mod," is expected to be completed in July 1987 at a cost of about \$1.5 billion, including a contractor profit of about \$150 million.

#### THE AIR FORCE LEGAL OPINION

Prior to awarding the initial H-mod contract, the Air Force sought an opinion from its General Counsel on whether Lockheed legally could be required to perform the work of the H-mod program under a provision of the Supplemental Agreement that requires the contractor to remedy deficiencies at cost with no fee. An Assistant General Counsel concluded, in a memorandum dated November 22, 1974, that Lockheed had no legal obligation to perform the effort on a

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no-fee basis, citing two reasons for this conclusion. First, the Assistant General Counsel asserted that since the 30,000 hour useful life the Air Force desired for the C-5A aircraft was stated in the contract as a goal rather than a requirement, no contract deficiency existed if the goal was not met by the aircraft. Second, the Assistant General Counsel concluded the notice requirements of the Supplemental Agreement had not been met and the contractor could successfully defend a Government demand on that basis alone. In its more recent review of the matter, the Air Force General Counsel proffered a third reason why Lockheed had no obligation to perform the repair at no fee. In his view, any claim by the Air Force concerning the design defect was precluded by a release and waiver of claims clause contained in the Supplemental Agreement.

#### GAO ANALYSIS

We find that, contrary to the Air Force's assertions, the contract contained a firm requirement to continue efforts to repair without fee both the test specimen and production aircraft in the event of a fatigue test failure. Moreover, neither the release and waiver clause nor the notice provisions foreclosed the prospect of remedial action without fee. Consequently, we believe that at the time the Air Force decided to adopt the H-mod plan to correct the wing deficiencies, it could have required Lockheed to perform at least part of the project at cost under the Supplemental Agreement.

#### Service Life and Fatigue Test Specifications

The Air Force reached its conclusion that Lockheed had no firm contractual obligation to supply aircraft with a service life of 30,000 hours on the basis of the following specifications:

"The design goal useful life of the air vehicle shall be twenty (20) years or 30,000 hours of service life with six (6) percent low level flight capability and 12,000 landings \* \* \*". Specification No. CP40002-1B, para. 3.1.2.3. (Emphasis supplied.)

\*\* \* \* the design life goal exclusive of design factors shall be as follows: service life 30,000 Flight hours \* \* \*". Specification No. CP4002-2B para. 3.1.1.1.3.2. (Emphasis supplied.)

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The Air Force contends that the underscored language merely establishes a service life level which is to be "strived for" by the contractor, but which is not a firm requirement. Since there is no requirement concerning service life, in the Air Force's view, the fatigue test failure of the wing does not constitute a deficiency under Part XVI of the Supplemental Agreement, "Inspection of Supplies and Correction of Defects," which requires Lockheed to replace or correct without fee only those supplies or aircraft which are "defective in design, material or workmanship, or otherwise not in conformity with the requirements of this contract."

We agree with the Air Force that the specifications do not establish an absolute requirement to produce aircraft capable of performing for 30,000 service hours or create a warranty that each C-5A production aircraft will actually perform for 30,000 hours. We do not agree, however, that the service life requirement is purely aspirational and that Lockheed was utterly unaccountable for the wing defect. Rather, we believe that certain contract provisions relating to the service life goal clearly set forth Lockheed's responsibilities and obligations in this matter.

The contract requires Lockheed to conduct a structural fatigue test program to verify that the aircraft is capable of meeting repeated loads criteria over the course of its service life. To demonstrate compliance with the 30,000 hour service life goal the contract requires the structure to be tested for four lifetimes, that is, 120,000 test hours. Significantly, the contract sets forth the contractor's responsibility in the event a test article fails during fatigue testing:

"4.1.3.4.2.7.5 Repair of Failures

"4.1.3.4.1.7.5.1 Failures Before 60,000 Hours or 24,000 Landings - In the event that a fatigue failure due to a deficiency in fatigue resistance occurs in one of the qualification specimens during the first 60,000 simulated flight hours or 24,000 simulated loadings, the failure shall be repaired and the testing of the specimen continued. The repair which is installed

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shall be shown by test of a component specimen to have the equivalent of 120,000 simulated flight hours. If the repair is redesigned before being incorporated into the production air vehicle, the redesigned repair shall be shown by test to have the equivalent of 120,000 simulated flight hours. Simple, minor repairs such as stop drilling of cracks may be verified for adequacy on the qualification articles.

"4.1.3.4.1.7.5.2 Failures After 60,000 Hours or 24,000 Landings - If a failure due to a deficiency fatigue resistance occurs after 60,000 simulated flight hours or 24,000 simulated landings have been applied to the fatigue qualification articles, the repair shall be installed on the articles and the testing continued. The repair shall be tested in the manner described above. The Contractor's responsibility for deficiencies in fatigue resistance shall be limited to those occurring during the first 60,000 equivalent flight hours of the full-scale structural fatigue qualification test."  
Specification No. CP40002-2B

Lockheed Category I Test Plan (Document 3-17) which was incorporated by reference in both the initial contract and the Supplemental Agreement contains language similar to this specification, but adds with respect to any failure that occurs before 60,000 test hours:

"[T]wo component test specimens containing the area of the failure will be constructed if the failure area is in a complex structure and the failure cause is difficult to determine. One specimen will be a duplicate of the qualification specimen repair; the other will be of the original configuration. The original configuration will then be fatigue-tested \* \* \*. The repair configuration will be similarly tested to demonstrate that the repair will increase the life of the qualification article sufficient to meet the

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120,000 simulated flight hour goal. On simple structures where the cause of the premature fatigue failure and the test life are easily determined, the control specimen will be omitted. If the production version of the repair is different from the repair tested as described above, a third component specimen, with the production repair incorporated, will be similarly tested to demonstrate a life of 120,000 simulated flight hours. For each repair accomplished on the fatigue qualification articles, the procuring agency will be consulted to determine the necessity of correction to all C-5A aircraft."

Concerning failures after 60,000 test hours, the plan states that Lockheed will repair the test articles and continue testing, but the repair of all other C-5A aircraft will be negotiated.

We believe these provisions clearly establish a firm requirement to repair the test specimen in the event of a test failure in fewer than 120,000 test hours, the equivalent of 30,000 actual hours. Additionally, in the event the specimen fails prior to 60,000 test hours, the equivalent of 15,000 actual flight hours, the contract requires Lockheed not only to repair the specimen, but also to repair similarly all production aircraft if necessary.

Both of the fatigue test articles that Lockheed produced and subjected to fatigue tests failed well before the 60,000 hour level. Wing test article X-998, the primary test article, failed after 24,000 hours and test article X-993, an incomplete article built for the purpose of accelerating the diagnoses on X-998 defects, failed after 30,000 hours. Thus, the test articles and, by inference, the production aircraft, were deficient under the Correction of Defects clause of the Supplemental Agreement in that they were "defective in design" and/or "not in conformity with the requirements of the contract."

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Releases and Waiver of Claims

As the Air Force points out, the Supplemental Agreement was intended to resolve outstanding contract disputes and develop a more effective contractual relationship between the parties. Toward this end, Part VII, "Releases and Waiver of Claims," provides:

"\* \* \* the parties hereby unconditionally waive any rights or remedies for actions or failures to act under Contract AF33 (657)-15053 prior to its conversion under this Supplemental Agreement and unconditionally release each other from liability for all claims asserted or which could arise as a result of said contract prior to its conversion, including but not limited to claims for or relating to changes; terminations; COD directions; \* \* \* implied or express warranties; \* \* \* failure of the Contractor to perform or comply with contract requirements; disagreements reflected in Contracting Officer's letters or directions or in Contractor letters. \* \* \*"

The Air Force contends that despite knowledge by both parties of a design defect in the wing prior to the negotiation of the Supplemental Agreement, there is no discussion of it in the Agreement and there is no reservation which would preserve the Air Force's rights, remedies or claims relating to the defect. Thus, the Air Force concludes that the release would have precluded it from obtaining correction of the defect without fee.

We believe, however, that other provisions of the Supplemental Agreement indicate an intent to reserve the Government's rights concerning the wing defect. Specifically, Part XXXV, "Incorporation of Previously Issued Documents," provides that:

"Notwithstanding the statement on the cover page hereof concerning the supersession of previous documents, and notwithstanding the provisions of Part VII of this Schedule [Releases and Waiver of Claims] the following shall apply:

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"(a) All direction contained in the Contracting Officer Letters and Correction of Deficiency Notices identified in Exhibit 'C' attached hereto and made a part hereof, remains in full force and effect. Such letters and notices \* \* \* shall be deemed to have been issued under this Supplemental Agreement No. 1000."

Exhibit C lists numerous correction of deficiency letters, including letter No. 243, dated May 24, 1971. That letter formally notifies the contractor of the wing problem and requires the contractor to recommend corrective action to meet the contractually specified service life. A problem sheet incorporated in the letter provides the following information:

"CONTRACT REQUIREMENT: CP-40002-2B, para. 3.1.1.1.2 & 4.1.3.4.1.7. 120,000 cyclic test hours and 48,000 landings required to demonstrate fatigue life.

"PROBLEM: Cracks have been discovered on the wing and wing/fuselage interface on X-998 and on X 993 at numerous locations. These cracks are grouped as to type and structural assembly and are listed on the attachment to this sheet. This sheet will be updated as more cracks are discovered.

"EFFECT: The wing does not have the contractually required life at the locations of those cracks.

"CORRECTIVE ACTION RECOMMENDED: Fix the areas on all aircraft to achieve the contract specified life. Develop and install modifications on all aircraft to achieve the contract specified life.

"END ITEMS AFFECTED: Air Vehicle 2 thru 81."

We therefore do not understand the Air Force's assertion that there is no discussion of or reservation concerning the wing design problem in the Supplemental Agreement. The fact is that a document containing

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detailed discussion of the wing deficiency and directing the contractor to remedy the problem was incorporated by reference in the Supplemental Agreement and explicitly excepted from the Release and Waiver provision. We are constrained to interpret the "Incorporation" clause and Letter No. 243 as indicating a clear intent to reserve from the operation of the Release and Waiver clause all rights, remedies and claims relating to the wing defect.

#### Notice and Time Limitations

The 1974 Air Force memorandum states that even if the wing failure constituted a deficiency, the notice requirements of the Supplemental Agreement had not been satisfied and the contractor could have successfully defended a Government demand on that basis alone. The memorandum does not specify which notice requirements have not been met, nor does it detail facts to support the position.

We do not believe that at the time the Air Force decided on the H-mod alternative, an attempt by the Government to secure a correction at no fee would have been foreclosed by failure to meet notice requirements. The scope of the work that Lockheed could have been required to perform, however, was limited by a time limitation contained in the Correction of Defects clause.

The Correction of Defects clause, quoted in part above, sets forth the following notice requirements:

"(c) If it is determined by the Procuring Contracting Officer (PCO) that a deficiency exists in any of the supplies accepted by the Government under this contract, he shall so notify the Contractor, in writing within 45 days of first discovery of the deficiency. The Contractor shall promptly furnish its recommendations and the estimated cost thereof. If the Contractor shall become aware that a deficiency exists in any accepted supplies, it shall promptly communicate such information in writing to the PCO

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together with its recommendations for corrective action and the estimated cost thereof. The information required to be furnished by the Contractor shall be in sufficient detail to enable the PCO to determine what corrective action, if any, shall be undertaken. \* \* \*

"(d) Within 30 days after receipt of the Contractor's recommendations together with adequate supporting data, the PCO will notify the contractor in writing of the corrective action the Government requires. If the PCO determines that the deficiencies shall be corrected, the Contractor shall take the necessary action to bring the supplies and/or data into compliance with the requirements of the contract at the time and place directed by the PCO. \* \* \*"

The requirement in paragraph (c) to provide notice of deficiency is the first provision to come into play. In our view, this provision posed no obstacle to requiring a remedy of the defect since Lockheed performed the fatigue tests on X-998 and X-993 on its own premises. The Government's knowledge of the test was gained through reports on the testing submitted by Lockheed. Clearly, these circumstances are governed by the second sentence of paragraph (c), since it was the contractor that first became aware of the deficiency. Thus, it was Lockheed's duty to communicate the deficiency to the Government together with its recommendations for corrective actions and estimated cost; the Government was not required to provide notice to Lockheed, since the firm itself discovered the deficiency in the first place.

Nonetheless, the Government did provide notice to Lockheed that the wings did not have the contractually required life in Correction of Deficiencies Letter No. 243, dated May 24, 1971, quoted above. We believe the notice was sufficient to disclose the fatigue test inadequacies; indeed, the contractor appeared to regard it as such. Prior to the time it became apparent the fatigue problem resulted from a major design flaw, the contractor submitted

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numerous engineering change proposals to remedy the problems that had arisen. Once the scope of the defect became fully known, Lockheed conducted an extensive study, entitled the Wing Life Improvement Program, under the terms of the Supplemental Agreement. The study was completed in March 1973 and recommended several alternative solutions. We do not believe Lockheed plausibly could have refused to go forward with a correction at that point on a theory of lack of notice of the deficiency.

It is more difficult to determine with certainty, on the basis of the record developed in the course of our review, whether Lockheed could have defended a demand based on the requirement in paragraph (d) to notify the contractor of the corrective action required within 30 days after receipt of the contractor's recommendations. We point out that not only does the 1974 Air Force Assistant General Counsel memorandum fail to set forth the specifics upon which the conclusion concerning notice is based, but the Air Force's more recent review, in which it defends its 1974 determination, does not even mention failure to provide notice as an obstacle to obtaining correction without paying a fee.

We are not aware of any instance after the scope of the defect became fully apparent in which Lockheed supplied a comprehensive recommendation of a correction under the Supplemental Agreement that was in sufficient detail to allow the contracting officer to decide on the needed corrective action or which was supported by adequate data and cost estimates as contemplated by paragraph (d). Thus, it does not appear that the Government would have been barred from requiring correction based on this notice requirement. Moreover, given the complex nature and broad scope of the correction, and the fact that it took years of study and deliberation by Lockheed and the Government to develop a solution to Lockheed's failure to meet contract requirements, it would seem unreasonable to require the Government to evaluate a correction recommendation in 30 days to preserve its right to remedial action.

We conclude that Lockheed's contractual responsibilities were not relieved by noncompliance with the notice requirements of the Correction of Defects clause.

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One other paragraph of the clause, not mentioned by the Air Force, might have operated to limit the scope of Lockheed's responsibility for correction at the time the Air Force settled on the H-mod solution. Paragraph (b) of the clause provides as follows:

"At any time during performance of this contract, but not later than six (6) months (or such other period as may be provided in the Schedule) after acceptance of the supplies or lots of supplies last delivered (except as to aircraft, six months after the acceptance of the aircraft last delivered) in accordance with the requirements of this contract, the Government may require the Contractor to remedy by correction or replacement, as directed by the Contracting Officer, any supplies or lots of supplies which are or were deficient at time of delivery thereof or become deficient within the period stipulated herein. \* \* \* The cost of any such replacement or correction shall be included as an allowable cost hereunder, \* \* \* but no fee shall be payable with respect thereto."

The extent to which this clause would have limited Lockheed's responsibility to repair the production aircraft is difficult to determine. To our knowledge, the Air Force first required Lockheed to remedy the problem in May 1971, and the requirement to repair would reach back to aircraft accepted 6 months prior to that time, November 1970. Under this interpretation, Lockheed would be responsible to repair or replace the test specimen and to effectuate the repair on 59 production aircraft. The fee attributable to this effort under the current H-mod contracts is about \$120 million.

We observe, however, that Lockheed may have fulfilled the May 1971 request for correction with a number of local wing repairs it made before the parties realized (in September 1971) that a major redesign and modification of the wing was necessary. If so, the next request by the Air Force to fix the wing of which we are aware was Correction of Deficiency Letter No. 344, issued in May 1973. (We note that between May 1971 and May 1973 other such requests may have been issued; moreover, requests and direction during

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this period by the Air Force for Lockheed to conduct extensive studies on remedying the problem could be construed as engaging paragraph (b).) With May 1973 as the starting point, Lockheed would have been obligated to repair the specimen and 15 aircraft. The pro rata fee for this effort is approximately \$38.5 million.

#### Effect of H-mod Contracts

In 1975 and 1979, based at least in part on advice from its Office of General Counsel that Lockheed could not be required to repair the aircraft under the C-5A contract, the Air Force awarded Lockheed two contracts to perform the H-mod effort. The contracts substantially altered the obligations and rights of the two parties. The contracts obligated the Government to pay a fee eventually estimated at \$150 million. They also required Lockheed to repair significantly more aircraft than it was previously obligated to repair, committed Lockheed to new inspection procedures to insure against drilling errors in fatigue-critical areas, and created the following warranties which did not exist under the C-5A contract: a 1-year flight test warranty to insure proper reinstallation of components not altered by the modification; a flying hour design warranty to insure the adequacy of tooling and production processes; and a materials and workmanship warranty for 1 year on each aircraft.

#### CONCLUSION

At the time the Air Force decided to proceed with H-mod, it could have required Lockheed to perform a substantial part of the wing modification without fee under the initial C-5A contract and Supplemental Agreement 1000. First, although the basic C-5A contract and the Supplemental Agreement do not contain a warranty that the aircraft will actually perform for 30,000 service hours, the contracts do require Lockheed to perform fatigue tests on the wing-fuselage specimen for 120,000 test hours, the equivalent of 30,000 service hours. Moreover, the contract documents require Lockheed to correct any failure of the test specimen prior to 60,000 test hours and to incorporate the correction in all production aircraft. A design defect caused the wing specimen to fail well before 60,000 test

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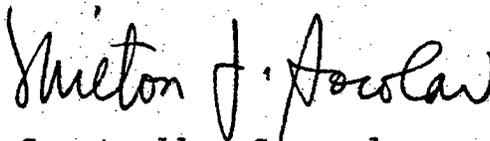
hours. Thus, the test articles and the aircraft were deficient in design and/or not in conformity with contract requirements; consequently, the defect was redressable under the Correction of Defects clause which provides for corrections without fee.

Second, the Release and Waiver clause in the Supplemental Agreement does not affect the obligation to repair at cost since the parties expressly reserved and excepted the wing design defect from the clause.

Third, it does not appear that the Air Force failed to meet contractual notice requirements contained in the Supplemental Agreement that would bar relief on the basis of the deficiency. A time limitation on the correction of deficiencies, however, would have limited somewhat Lockheed's obligation to repair the production aircraft. Nonetheless, it appears that had the Air Force acted promptly after it selected the H-mod alternative, it could have required Lockheed to perform a substantial portion of the effort on a cost-reimbursement, no fee basis.

Nevertheless, by entering new contracts for the repair of the wing, the Air Force obligated itself to pay a fee of \$150 million to Lockheed, and we perceive no legal basis upon which the fee may be avoided.

Sincerely yours,

*for*   
Comptroller General  
of the United States