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Report to the Chairman, Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives

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AIR FORCE LOGISTICS

Procurement of C-5 Crash Damage Kits

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GAO

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National Security and
International Affairs Division

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The Honorable John D. Dingell
Chairman, Subcommittee on
Oversight and Investigations
Committee on Energy and Commerce
House of Representatives

Dear Mr. Chairman:

This report, which was prepared at your request, responds to your questions on the purchase of C-5 crash damage repair kits by the San Antonio Air Logistics Center. It follows our testimony before your Subcommittee, Air Force Procurement of C-5 Crash Damage Kits (GAO/T-NSIAD-89-11, March 22, 1989), and our report on a conflict of interest involving the procurement, Air Force Logistics: Conflict of Interest in Procurement of C-5 Crash Damage Kits (GAO/NSIAD-89-109, April 12, 1989).

As arranged with your Office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 10 days after its issue date. At that time we will send copies to the Director, Office of Management and Budget, and the Secretaries of Defense and the Air Force. We will provide copies to other interested parties upon request.

This report was prepared under the direction of Harry R. Finley, Director, Air Force Issues. Other major contributors to this report are listed in appendix I.

Sincerely yours,

for Bill W. Thurman

Frank C. Conahan
Assistant Comptroller General

Executive Summary

Purpose

In December 1986 and February 1987, the Air Force ordered crash damage kits for the C-5 aircraft at an estimated cost of $69 million from Lockheed Aeronautical Systems Company, the manufacturer of the aircraft. The orders were sole-source, undefinitized orders (i.e., the specific parts, quantities, and prices were not defined).

The Chairman, Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, requested that GAO (1) examine the circumstances leading to the ordering of kits, (2) evaluate the Air Force's justification for acquiring the kits, and (3) review the procurement process, including the pricing of kit parts.

Background

The C-5 is the Department of Defense's primary long-range, high-speed carrier. The Air Force began planning for the acquisition of C-5 crash damage repair kits after extensive damage occurred to the undersides of two C-5As in crash landings in 1983. On July 31, 1983, a C-5A hit the ground short of the runway at a base in Alaska. Another C-5A was damaged in a gear-up landing at a base in California on November 17, 1983. Additionally, an outer wing of a third C-5A was extensively damaged by lightning at a base in Delaware on September 9, 1985.

The San Antonio Air Logistics Center officials who manage C-5 repairs believed that repair of these three damaged aircraft was quicker and less costly because parts were obtained from the ongoing C-5 production line. On April 25, 1986, about 2 years after initial planning started, the requirement for C-5 crash damage kits was established. These kits were to consist of structural parts with long lead times and other parts for use in repair of potential future mishaps. The Air Force has procured similar kits for the C-130 and C-141 aircraft.

Results in Brief

Air Force officials used data from the two crashes and the lightning strike to develop the requirement for the kits. However, these data are insufficient to project the number, timing, and severity of future accidents accurately. The Air Force has no servicewide guidance governing the planning, developing, and buying of crash damage kits. An Air Force regulation specifies that an economic analysis should be made; however, officials did not make such an analysis. The procurement plans were justified on the basis that the kits would reduce the cost and time required for future crash repairs.

The Air Force encountered delays in procuring the kits, which limited the extent of tie-in to the C-5 production line. A tie-in was desired so that cost savings would result from combining orders for the kit parts with production orders for those same parts. There are unresolved questions about the proposed prices of parts and the types of parts. Lockheed's proposed prices reflected a limited tie-in to C-5 production and did not recognize some transfers from excess stock. Also, the kits contain many small parts that are not structural parts with long lead times.

Principal Findings

Requirements Based on Insufficient Data

Data on repairs required as a result of previous C-5A accidents—two aircraft crash landings and one lightning strike to a wing—were used in determining crash damage kits requirements. These accidents do not provide sufficient data for valid statistical projection of the number, timing, or severity of future accidents. The uncertainties of aircraft accidents and the diversities of damage that could result create difficulties in determining requirements.

During congressional hearings in March 1989 on procurement of the C-5 kits, an Air Force official testified that the Air Force was developing a formal policy on crash damage kits.

Economic Analysis Not Made

An economic analysis could have assisted in assessing the validity of the data used by the Air Force in establishing C-5 kit requirements. However, system managers did not make an economic analysis. An Air Force regulation specifies that an economic analysis should be prepared when deciding to commit resources if the total investment will exceed $1 million. In this case, in which data on requirements are insufficient and future costs and benefits are uncertain, an economic analysis would have offered a means of systematically assessing both monetary and non-monetary cost and benefits of potential alternatives.

Delayed Procurement Prevented Full Tie-In

The Air Force's prime cost justification for the kits was that buying the parts through a tie-in to the C-5B production orders would provide parts at about 50 percent of future costs. Air Force planning for the kits began early enough to achieve a tie-in with production. However, more than 2 years passed before the kits were ordered, which prevented the Air

Force from fully achieving its primary goal of a tie-in. Air Force officials stated that work on other programs with higher priorities caused the delay.

The Air Force set a November 30, 1986, target date for submission of the orders to make the production tie-in. Both of the kit orders, however, were submitted after the target date. The price proposals from Lockheed indicated the expected cost reductions were not fully achieved. Air Force officials questioned the limited extent to which the price proposals reflected a tie-in to production orders. Air Force officials advised GAO that in March 1989 they had completed a review of the extent of the tie-in and that the data would be used in negotiations.

Proposed Prices and Types of Parts Being Questioned

Lockheed's proposed prices for the kit parts were substantially higher than those paid for the same parts under the C-5B production contract. The Air Force Plant Representative Office at Lockheed reviewed 18 sample parts and noted that proposed prices did not reflect the fact that some parts were excess C-5B production parts. The analysis showed Lockheed's recorded value for these parts was generally about one-tenth of the price proposed to the Air Force. For example, a shim with a recorded value from the production line of $29.88 had a proposed value of $315.84. In response to these concerns about transfers from production, Lockheed proposed about a $1 million reduction to recognize transfers of excess parts from production.

Although the Air Force's primary justification for the method and timing of the acquisition was to buy structural parts with long lead times during C-5B production runs, the kits include many small items, such as washers, shims, and pads, that are not structural components with long lead times. A cost analyst from the Air Force Contract Management Division, Air Force Systems Command, questioned the type of parts being ordered. After a cursory review of parts descriptions and Lockheed's proposed prices in June 1988, the analyst noted that the Air Force was buying items it may not need and that might be purchased at less cost elsewhere.

Air Force officials believe that ongoing reviews will resolve pricing concerns before contract negotiations are completed. Lockheed officials noted that actual cost data would be provided before negotiations.

Recommendations

GAO recommends that the Secretary of the Air Force direct the Commander, Air Force Logistics Command, as part of the policy development effort for crash damage kits, to formulate servicewide guidance to be used in developing and analyzing the requirements for such kits.

Agency Comments

At the Subcommittee's request, GAO did not obtain official agency comments on a draft of this report. However, the views of directly responsible officials were sought during the course of the work and were incorporated in the report where appropriate.

Contents

Figures

Abbreviations

AFB	Air Force Base
AFPRO	Air Force Plant Representative Office
ALC	Air Logistics Center
DOD	Department of Defense
GAO	General Accounting Office
PIO	provisioned item order

Introduction

The Air Force C-5 (see fig. 1.1) is the Department of Defense's (DOD) primary long-range, high-speed, heavy logistics carrier. It is the only aircraft capable of airlifting cargo up to 265,000 pounds and carrying up to 75 troops for an unlimited range with in-flight refueling. The Air Force bought 81 of the C-5A version, produced in the late 1960s, and 50 of the later C-5B version, started in 1982 and produced from 1985 to 1989. Lockheed Aeronautical Systems Company, located in Marietta, Georgia, built the aircraft.

Figure 1.1: The C-5 Aircraft

In 1983 two C-5A aircraft received extensive damage to their fuselage undersides in separate landing mishaps. On July 31, 1983, a C-5A struck landing approach lights during its approach at Shemya Air Force Base (AFB), Alaska, and hit the ground 212 feet short of the runway (see fig. 1.2), and on November 17, 1983, another C-5A made a gear-up landing at Travis AFB, California (see fig. 1.3). On September 9, 1985, another C-5A received extensive damage when one of its outer wings was struck by lightning at Dover AFB, Delaware (see fig. 1.4).

Figure 1.2: C-5A Damaged at Shemya AFB

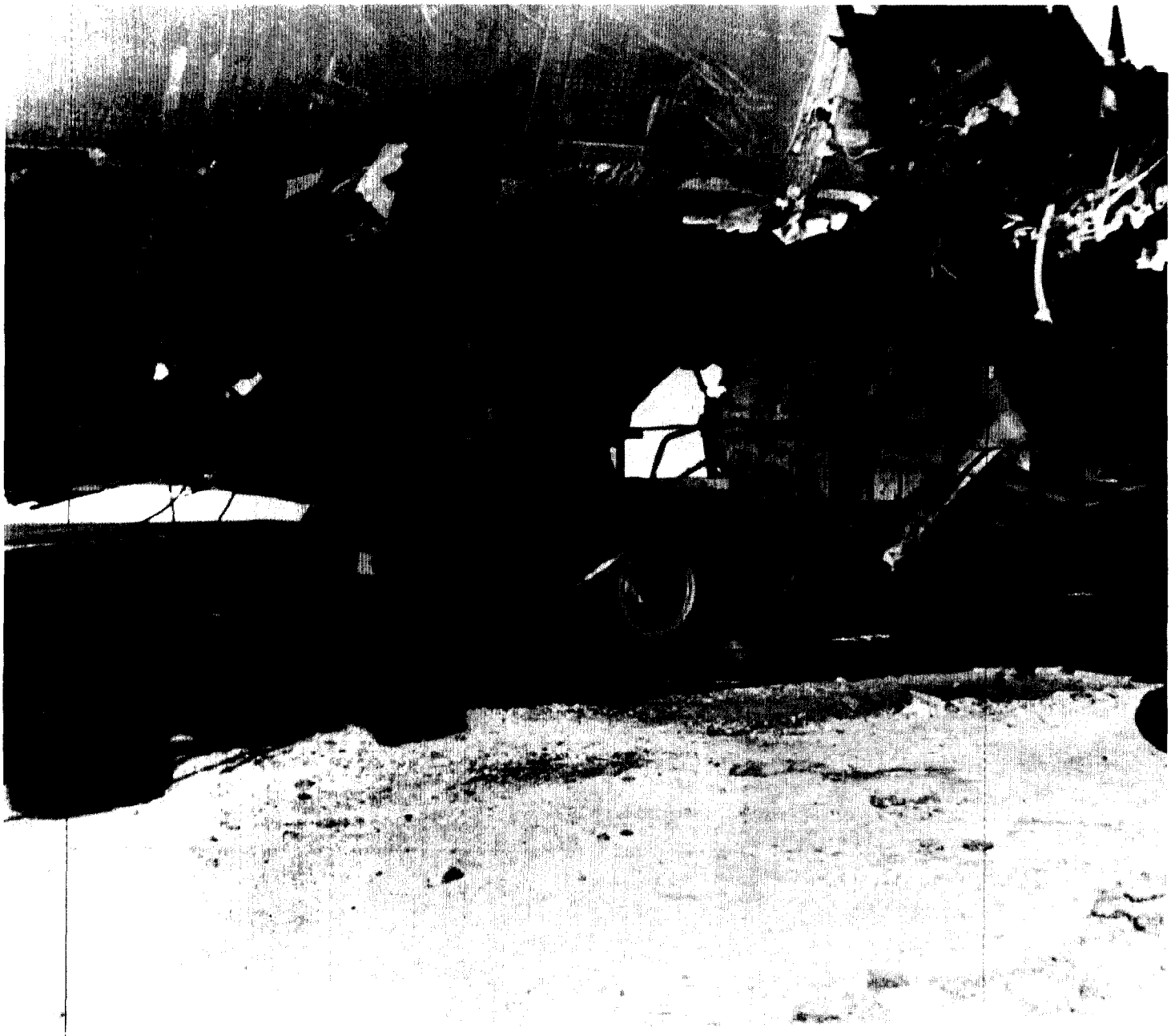


Figure 1.3: C-5A Damaged at Travis AFB

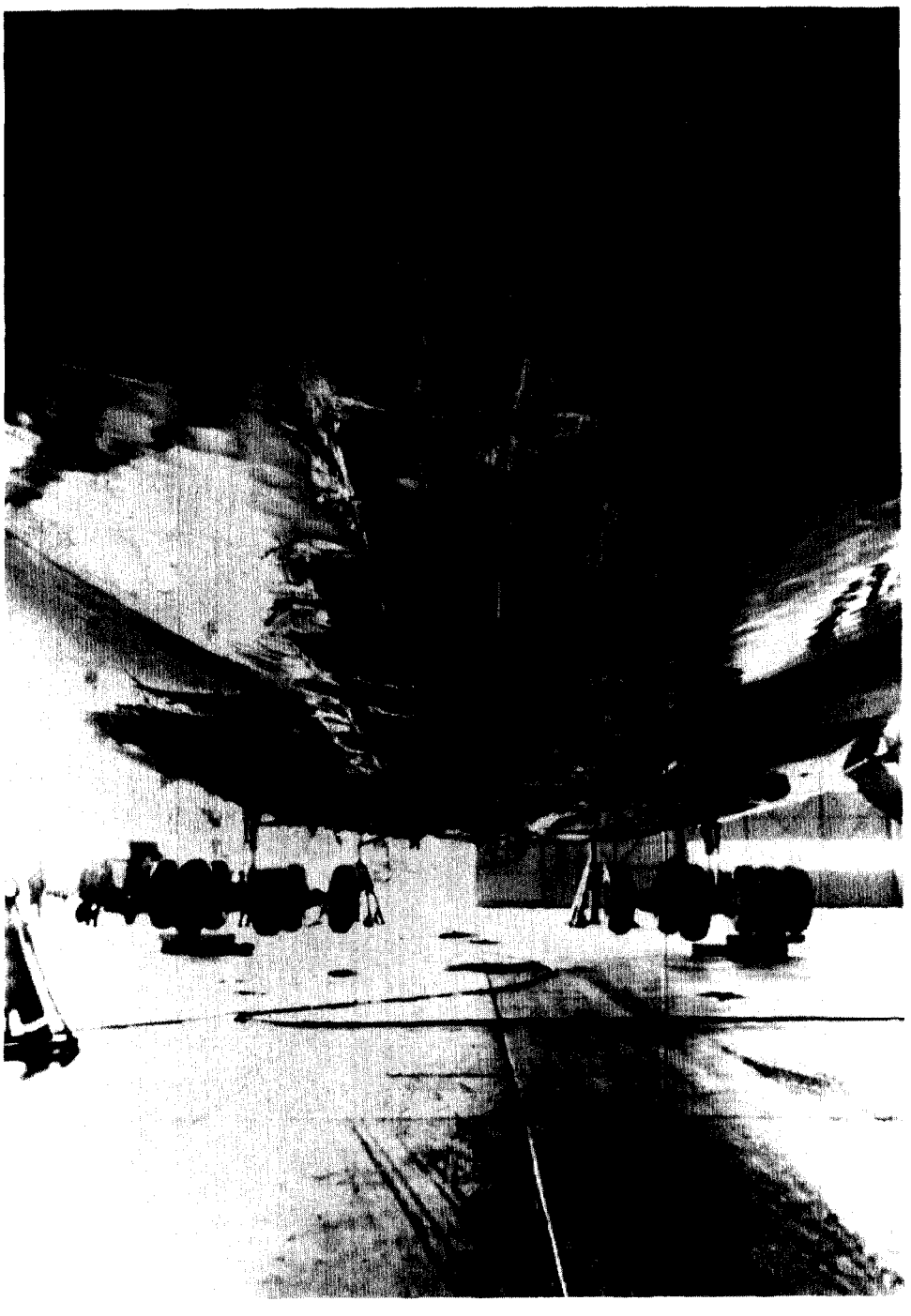
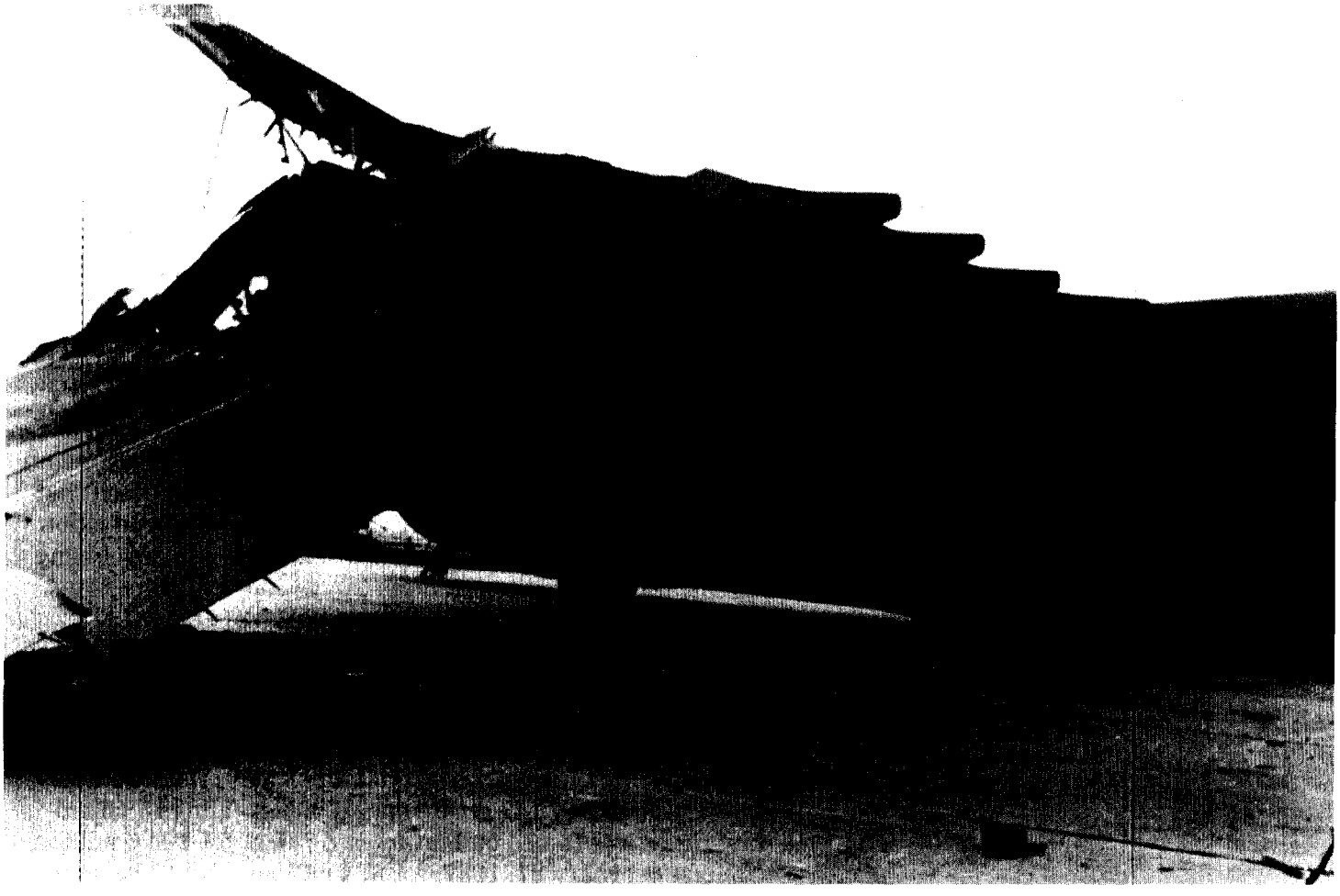


Figure 1.4: C-5A Damaged at Dover AFB



The Air Force repaired the three C-5A aircraft and returned them to service at a cost of about $51 million, which included both parts and labor. Returning the aircraft involved in the landing accidents to service required about 3 years, and returning the one struck by lightning took about 8 months. C-5 system officials said that the cost of parts to repair the three aircraft were significantly lower because the parts were available from the C-5B production line and wing modification program. Also, the officials said structural parts with long lead times were available, which would have otherwise caused extensive delay in returning the aircraft to service.

C-5 system officials at San Antonio Air Logistics Center (ALC) said that the concept of crash damage kits evolved during the repair of these aircraft. They believed time and money could be saved in future repair of C-5 aircraft damaged in similar crashes by buying structural and other nonstock-listed parts with long lead times before the C-5B production line closed and storing them in crash damage kits.

Planning for the acquisition of kits began after the 1983 accidents, but, according to ALC officials, other programs were given higher priority. In February 1984 Lockheed developed preliminary information to be considered by the Air Force. The contractor provided additional information in response to a March 1984 meeting with ALC officials. ALC documents show that an evaluation was underway in September 1984 and that a decision on the acquisition was expected in October 1984. However, an April 1985 memorandum showed that the acquisition decision remained under consideration, although Lockheed had prepared an unsolicited statement of work in December 1984. ALC officials said that work on the C-5A wing modification program and the C-5B production program, which had higher priorities, caused some delay in developing the kit requirements.

Requirements for the crash damage kits were specified in an April 25, 1986, internal ALC memorandum from the Airlift Aircraft Systems Program Management Division to the Resource Management Division. In late 1986 and early 1987, the San Antonio ALC issued undefinitized orders (e.g., the specific types of parts, quantities, and prices were not defined) to Lockheed to buy 147 crash damage kits totaling $68.6 million.[1] The first order was issued on December 8, 1986, for $44.6 million, and the second on February 27, 1987, for $24 million. These kits would repair from two to four aircraft with damage to the underside of the fuselage and two aircraft with damage to outer wings. Lockheed, which had previously identified some of the major components and assemblies in a statement of work, was to further define the kit parts in price proposals before final negotiations.

Although crash damage kits have not been procured for all types of large aircraft, we did identify some previous kit procurements. The Warner-Robins ALC developed requirements and procured kits for C-130 and C-141 aircraft. We did not find evidence that crash damage kits

[1]As of January 1989, the estimated cost of the kits had been reduced to about $54 million and might be further reduced during negotiations.

existed or were planned for other aircraft such as the B-1B, B-52, and KC-135.

Objectives, Scope, and Methodology

In July 1988 the Chairman, Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, requested that we (1) examine the circumstances leading to the ordering of C-5 crash damage kits, (2) evaluate the Air Force's justification for acquiring the kits, and (3) review the procurement process, including the pricing of parts. The Chairman also requested that we review an allegation that conflict of interest laws were violated during procurement of the kits. The potential conflict of interest involved a retired Air Force Colonel who participated in approving kit requirements and was employed by Lockheed after he retired from the Air Force. In March 1989 we testified[2] before the Subcommittee on the status of our review, and in April 1989 we reported[3] to the Subcommittee on the conflict of interest issue.

We obtained available documents setting forth the Air Force's rationale for the kits. We also discussed with Air Force officials the rationale for the kits and the process and data used to establish the requirements. We evaluated the process and determined if the data provided a valid statistical basis for establishing kit requirements. To determine the applicability of any existing regulations covering the procurement, we reviewed the appropriate provisions of the Federal Acquisition Regulation and selected Air Force, Air Force Logistics Command, and ALC regulations. We also discussed the applicability of regulations with Air Force officials and visited the Warner-Robins ALC and the Oklahoma City ALC to determine if similar procurements had been made or were planned for other aircraft systems such as C-130, C-141, B-1B, B-52, and KC-135.

We reviewed and discussed price negotiation procedures with San Antonio ALC and the Air Force contracting officers at Lockheed. To determine the nature and type of parts being procured, we visited the Lockheed plant to discuss manufacturing and pricing procedures and to review selected parts in the kits.

We performed our work from August 1988 through April 1989 in accordance with generally accepted government auditing standards. As

[2]Air Force Procurement of C-5 Crash Damage Kits (GAO/T-NSIAD-89-11, March 22, 1989).

[3]Air Force Logistics: Conflict of Interest in Procurement of C-5 Crash Damage Kits (GAO/NSIAD-89-109, April 12, 1989).

requested by the Subcommittee, we did not obtain official agency comments on a draft of this report. However, the views of responsible agency officials and Lockheed officials were sought during the course of our work, and their comments were incorporated where appropriate.

Requirements Not Based on Thorough Analysis

C-5 system officials at the San Antonio ALC used data from the two crashes and the lightning strike to develop requirements for the crash kits. However, these accidents do not provide sufficient data for valid statistical projections of the number, timing, and severity of future accidents. The Air Force has no servicewide guidance governing the planning, developing, and buying of crash damage kits. Crash kit procurement plans were justified on the basis that the kits would reduce the cost and time of future crash repairs. The officials did not make an economic analysis, as specified by an Air Force regulation.

Computation of Requirements Based on Limited Data

The C-5 system officials used historical C-5A accident experience for computing requirements for the kits. Of the 81 original operational C-5A aircraft, they found that 7 had been involved in major accidents. The Air Force was able to repair and return to service 3 of the 7 (the 2 landings that involved fuselage damage and the lightning strike that involved outer wing damage). Of the 4 C-5As that could not be repaired, 1 was lost in a fire accident at Palmdale, California, in 1970. ALC officials said the fire caused major damage to portions of the lower fuselage. Because the officials believed that the aircraft could have been saved if crash damage kits had been available, they included this accident in the calculation of fuselage kits quantities.

The officials calculated 1,170 total years of service for C-5A aircraft. They projected 1,500 aircraft years for 50 C-5Bs using an average life of 30 years (50 aircraft times 30 average years). They used the ratio of aircraft years to accidents to compute kit requirements:

Number of fuselages requiring repair

$$= \frac{3}{1{,}170} \times 1{,}500$$

$$= 0.0025641 \times 1{,}500$$

$$= 3.846 \quad \text{rounded to } 4$$

Number of outer wing sets[4] requiring repair

$$= \frac{1}{1{,}170} \times 1{,}500$$

$$= 0.0008547 \times 1{,}500$$

$$= 1.282 \quad \text{rounded to } 2$$

[4]Includes both the left and the right wing.

C-5 system officials reasoned that these requirements are conservative because the crash damage kits can be used to support all C-5 aircraft in the Air Force inventory (77 C-5As and 50 C-5Bs).

To facilitate repair of potential damage to the fuselage underside and the outer wing, the ALC and Lockheed divided the fuselage underside into 59 sections (see fig. 2.1) and the outer wing into 3 sections (see fig. 2.2) and developed requirements for modular crash damage kits for these sections.

Figure 2.1: C-5 Fuselage Sections

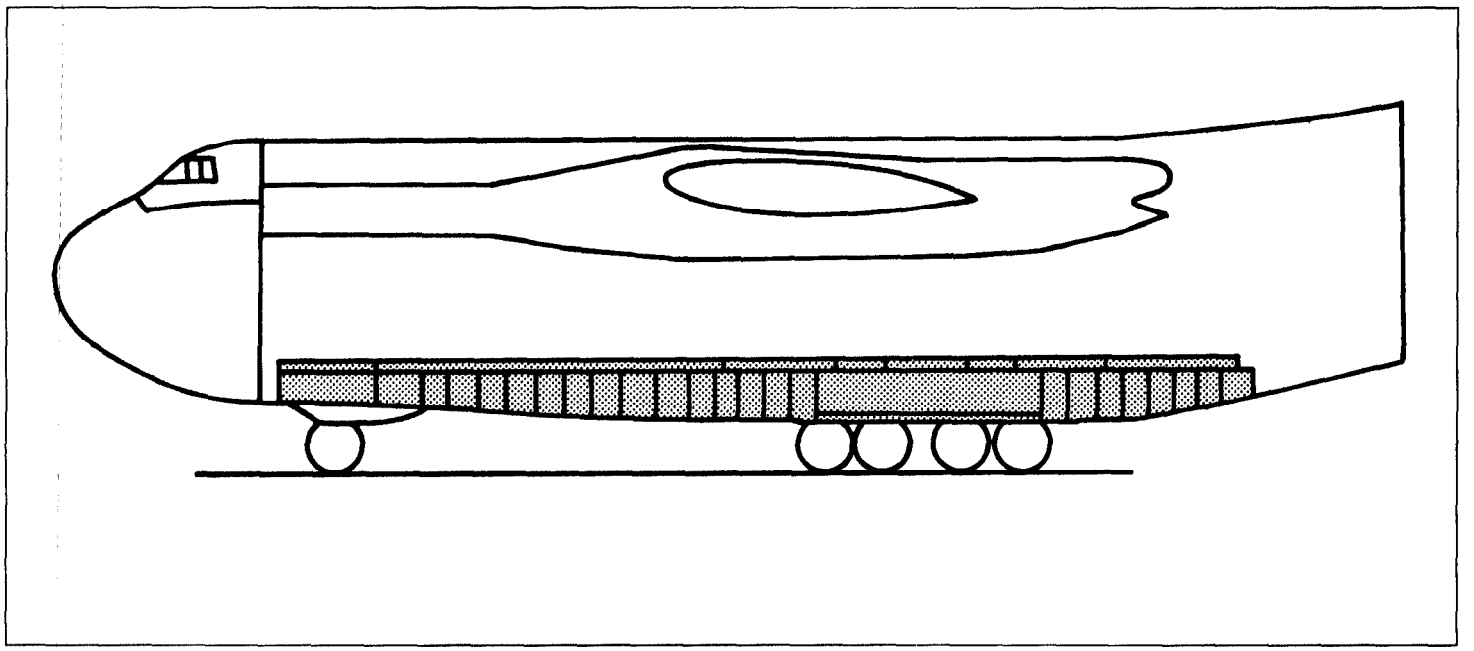
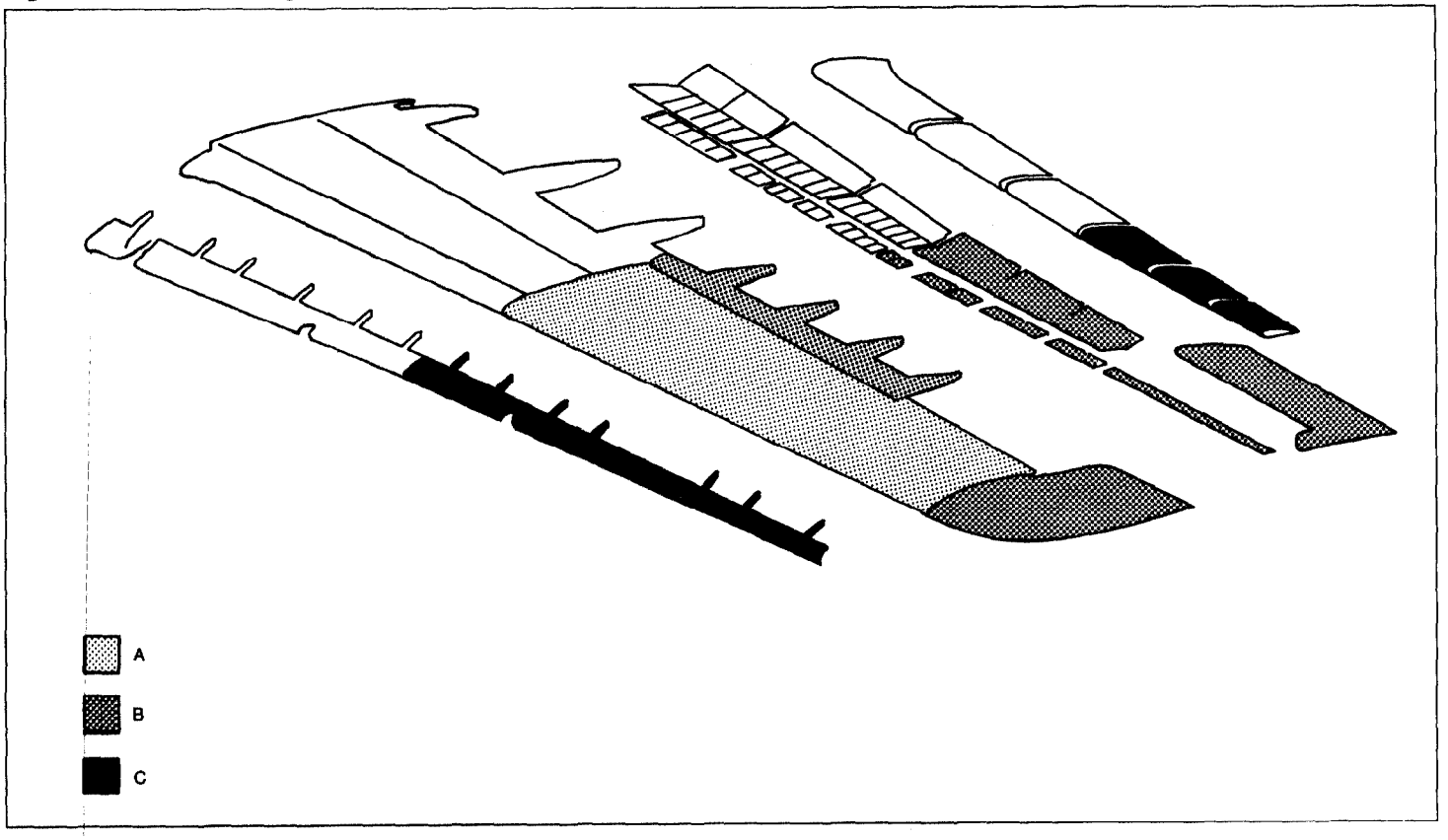


Figure 2.2: C-5 Outer Wing Sections



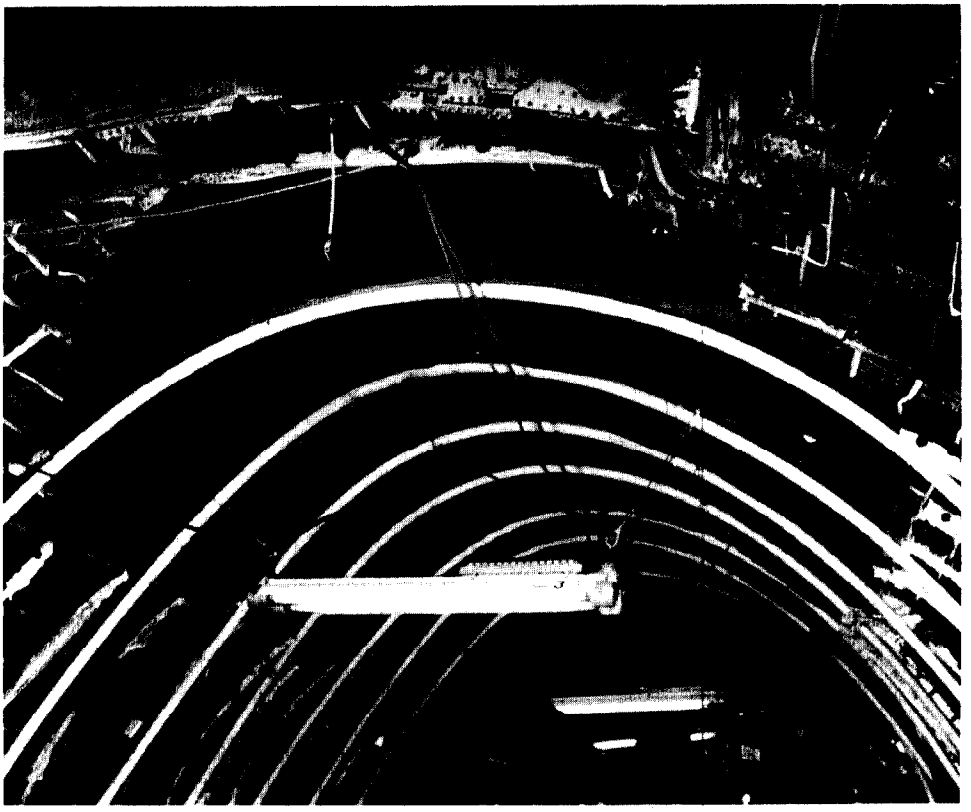
The ALC, due to funding constraints, ordered only two kits for each fuselage section, instead of the calculated four, plus a few additional kits for the front fuselage portion and two of the outer wing kits as calculated. In total, the ALC ordered 147 kits. The kits are designed to supply enough parts to repair two to four aircraft with damage to the underside of the fuselage and two aircraft with both outer wings damaged. Repairs to greater numbers of aircraft would be feasible if only minimal damage existed.

The C-5A accidents, which were the historical experience used to compute kit requirements, included two cases in which crew errors may have been the main contributors and another case resulting from an act of nature. Aircraft accidents are difficult to predict with a high degree of certainty. This, in turn, leads to uncertainty about the future use of the kits. The kits could be either used in a short time or never used. San Antonio ALC officials have stated that spending $50 million to $60

million for C-5 kits was economical when the potential for saving several C-5 aircraft that cost $120 million each is considered.

Even with the kits, parts will not be available if damage occurs out of the designated sections. For example, the kits could not be used to repair upper fuselage damage to a C-5A at Travis AFB. The damage resulted from a fire in December 1988. According to Travis AFB officials, the fire was discovered in the troop compartment of the aircraft when it returned to base after a warning of a problem. They said the fire was extinguished after the aircraft landed. The upper fuselage area was extensively damaged. A 13-feet by 33-feet hole was burned in the top of the aircraft, and other holes were burned in the sides of the upper fuselage. Figure 2.3 shows some of the fire damage to the upper fuselage.

Figure 2.3: C-5A Damaged by Fire at Travis AFB



The C-5 fuselage kits are designed for repairs to the lower fuselage and will be of limited use because the fire damage is well above the designated kit areas. Air Force plans for potential repair of the C-5A were not complete as of April 1989.

Crash Damage Kit Guidance Does Not Exist

The San Antonio ALC specified that the items included in the C-5 kits are to be nonstock-listed items, that is, items that are not normally bought as stock-listed parts. However, the Air Force has no servicewide guidance governing computation of requirements for nonstock-listed items. The Air Force has regulations for computing requirements for insurance items, that is, items with no predicted demands because failure is not predicted through normal usage, but where loss can occur from an accident or act of nature. However, these regulations do not apply to nonstock-listed items. The Air Force has procedures for review and analysis of requirement actions, but these procedures only apply to stock-listed items.

On March 22, 1989, the Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, held hearings on the procurement of the C-5 crash kits. The Air Force Assistant Secretary for Acquisition Management and Policy testified that development of a formal Air Force policy on crash damage kits is being undertaken.

Cost Benefit Not Based on Detailed Analysis

ALC officials did not perform an economic analysis when deciding that the procurement of crash damage kits was justified. According to C-5 officials, they focused mainly on acquiring the parts before the C-5B production line closed. They did not make an economic analysis and justified the procurement on the basis that cost savings would be achieved on the parts through a tie-in to production and that repair of subsequent damaged C-5 aircraft would be faster if parts with long lead times were available.

An Air Force regulation specifies that an economic analysis should be prepared when deciding to commit resources if the total investment will exceed $1 million. In this case, in which data on requirements were insufficient and future costs and benefits are uncertain, an economic analysis would have offered a means of systematically assessing both monetary and non-monetary cost and benefits of possible alternatives. An economic analysis helps to reach conclusions about the soundness of an acquisition, and it could have provided more systematic consideration of whether buying the crash damage kits in advance of future need would be prudent.

Air Force Regulation 173-15, dated March 4, 1988,[5] states that a good economic analysis systematically examines and relates costs, benefits,

[5]The regulation updated and superseded Regulation 178-1, dated December 14, 1979.

and risks of various alternatives. This systematic approach reduces the incidence of serious omissions or the introduction of personal bias. According to the regulation, alternative solutions to problems being studied should be compared by

- identifying systematically the benefits and costs associated with each alternate method of accomplishing missions or functions;
- highlighting the sensitivity of a decision to the values of key variables and assumptions on which decisions are based, including technical, operational, schedule, and other performance considerations; and
- using benefits and costs to compare the relative merits of alternatives as an aid to decisionmaking.

An economic analysis could have focused attention on the validity of the data that the Air Force used in establishing the C-5 kit requirements. Because of the uncertainties associated with future use of C-5 crash damage kits, an analysis would have afforded an opportunity for detailed evaluation of the sensitivity of the analysis to varying assumptions concerning the number, timing, and severity of future C-5 repairable accidents.

After members of the Air Force Secretariat reviewed the status of the C-5 kit procurement, the Comptroller of the Air Force, in July 1988, suggested initiating a stop work order until the need for crash damage kits was thoroughly reviewed and the parts were properly identified. The stop work action was not initiated because the Air Force Logistics Command determined the crash damage kit requirement to be valid. According to the Air Force Deputy Assistant Secretary for Acquisition Management and Policy, in such stop work action the contractor may be entitled to stop and start up costs. Accordingly, a stop work action may not effectively minimize the cost exposure, but could result in increased costs.

Conclusions and Recommendation

The purchase of crash damage kits should be based on a systematic analysis of whether buying the kits in advance of future need is prudent. We recognize that the frequency and timing of aircraft accidents and the extent of resulting damages cannot always be accurately predicted. While the lack of sufficient data for a valid statistical projection does not preclude the potential for a valid requirement, it should necessitate a more rigorous analysis and documentation of requirement data. Air Force guidance should help ensure adequate consideration of the

requirement and an economic analysis to systematically assess possible alternatives.

We believe the Air Force's decision to establish a policy on crash damage kits is a necessary step. We recommend that the Secretary of the Air Force direct the Commander, Air Force Logistics Command, as part of the policy development effort, to formulate servicewide guidance to be used in developing and analyzing the requirements for crash damage kits.

Procurement Issues Include Timing, Method, and Pricing

Delays in the procurement process prevented the San Antonio ALC from fully achieving its primary goal of reducing parts cost through a tie-in of the crash damage kit orders with ongoing C-5B production. ALC officials stated that work on the C-5A wing modification and C-5B production caused delays in developing kit requirements. Air Force questions about the method of procurement and the types of parts being included in the kits, as well as Lockheed's late submission of price proposals, contributed to delays in definitizing the orders.

Delays Impact Tie-In to Production

The Air Force's prime cost justification for the kits was that buying the parts through a tie-in to the C-5B production would provide parts at about 50 percent of future cost. On March 19, 1986, Lockheed notified the ALC that requirements were needed by June 1986 to ensure the manufacture of some parts concurrent with C-5B production.[6] During planning for the kit buy, however, the ALC set a November 30, 1986, target date for submission of the orders to make the production tie-in. We could not determine the basis for this date from either Air Force officials or documents. Both of the kit orders were submitted after the target date—the first order was dated December 8, 1986, and the second was dated February 27, 1987. Both Lockheed and Air Force officials agree that earlier orders would have provided opportunities for a greater tie-in to the C-5B production line.

The Air Force began planning for the lower fuselage kits early enough to achieve a tie-in with production. In February 1984 Lockheed provided preliminary planning information on crash damage kit configuration, and in December 1984 it completed a detailed proposed statement of work listing part numbers and specific aircraft area locations. Also, ALC documents show that in April 1985, and again in November 1985, San Antonio ALC officials considered a request for proposal, an early step in the procurement process. However, funds for the procurement were not requested until April 1986. ALC officials attributed delays in the procurement to the higher priorities of other programs. The nonavailability of funds in April 1986 caused further delays.

According to San Antonio ALC officials, Lockheed would have to combine the kit orders with orders for C-5B production to achieve the complete tie-in. The officials said the tie-in would preclude start-up production cost and decrease overall parts costs by about 50 percent.

[6]The vendors that had produced the main landing gear fairings would not be accepting orders after June 1986. The Air Force considered these to be critical kit parts.

Lockheed's receipt of the kit orders during production would not necessarily ensure a production tie-in because its major effort, for several months after the order, was engineering work devoted to determining the parts and quantities to be supplied. After receiving the two kit orders, Lockheed estimated that more than 40,000 engineering hours, which could cost about $1 million, would be necessary to identify and redesign some of the parts and complete other tasks such as (1) pulling thousands of drawings from C-5 files, (2) redesigning parts without holes or specific cuts, and (3) designing crates for outdoor storage that will occupy about 60,000 square feet of space. Although the engineer in the Air Force Plant Representative Office (AFPRO) at Lockheed recommended a reduction of 5,000 hours because the total amount appeared excessive, the engineer said the effort was the most detailed and complicated project he had seen in more than 15 years of service at the AFPRO. The Defense Contract Audit Agency questioned some of the costs for recurring engineering hours in its audit report and suggested that contract price negotiations not be concluded until resolution of its findings.

Lockheed opened work orders for the kits while the C-5B production line was still in process. Work orders for the first kit order were opened in December 1986, the same month the production line was started for 11 C-5B aircraft. Additionally, the production line for the last 10 C-5Bs, which started in April 1987, was in process several months after Lockheed received the kit orders and until late 1988 when most of the kit orders were being filled.

Lockheed's initial price proposals reflected a limited production tie-in. They showed that projected set-up costs[7] had been reduced by 14 percent to recognize a production tie-in. However, the quoted unit prices generally showed labor, material, and overhead costs for production without regard to C-5B production. Lockheed officials noted that, with limited exceptions, the proposed prices did not include start-up costs. Start-up cost would be in addition to set-up cost and include the cost of obtaining needed equipment and personnel. The officials said that start-up costs would have substantially increased prices.

Later review and analysis by AFPRO officials at Lockheed showed that some kit parts had been transferred from excess C-5B production stocks and that a few other parts had been combined with production orders. AFPRO officials told us that in March 1989 they had completed a review

[7]Set-up costs are defined as the actual cost of putting a machine to work to produce a specific part and are prorated over the total quantity of parts produced.

and determined the extent that Lockheed had achieved a production tie-in. The officials did not provide details on the review because they considered the data to be "negotiation sensitive." However, they stated that the reduction in set-up cost should be greater than that proposed by Lockheed.

Method of Procurement Questioned

Air Force regulations provide that items procured during the provisioning phase[8] of a weapon system should be repair parts needed to support that system for an initial period of service. The San Antonio ALC used two unpriced provisioned item orders (PIO) to procure the crash damage kits on a sole-source basis from Lockheed. Air Force Logistics Command and ALC officials said the use of provisioning orders was appropriate because the items being procured were repair parts.

According to C-5 system officials at the ALC, three options were considered in procuring the kits.

- Option 1. Using a PIO because it could be awarded by November 30, 1986. The cited risks for this option were getting total required funding and obtaining price proposals from Lockheed within 90 days after receipt of the orders.[9]
- Option 2. Using a basic ordering agreement and acquiring the kits over three phases. The cited risks for this option were losing fiscal year 1986 funds and missing the C-5B production tie-in.
- Option 3. Using a combination of options 1 and 2 by using a PIO to acquire outer wing parts and parts with long lead times, and using a basic ordering agreement to obtain the other parts. The cited risks for this option were that it would be more costly, extend definitization time, and delay kit availability.

After the San Antonio ALC issued the PIOs using the first option, the contracting officer at the AFPRO questioned the use of PIOs, stating that the kits were not a result of the provisioning process and that the orders were inconsistent with the provisioning contract. Because the orders did not identify various part numbers to be acquired, the contracting officer, in a letter dated June 3, 1987, said the ALC was buying something, but did not know specifically what. Additionally, the contracting officer said the AFPRO would not be held accountable for definitization

[8]Provisioning is the period when a weapon system is being phased-in from production to the active Air Force inventory.

[9]The 90-day requirement is specified in the provisioning contract.

because there was no opportunity to define the items being bought within the prescribed time frames. On January 25, 1988, after almost a year of debate, the ALC agreed to accept responsibility for negotiation and definitization of the kit orders.

Lockheed's submission of pricing proposals much later than required by the contract and other pricing problems have caused delays in definitizing the orders. In September 1988 Lockheed submitted the last pricing proposal, which the Air Force rejected because of pricing questions. After revisions by Lockheed, the proposal was accepted by the Air Force in December 1988. This was about 20 months later than originally required. The primary reason for the delay was the complexity of the kits, which contain over 6,600 parts.

Concerns About Part Prices and Types of Parts

Lockheed's proposed prices for the kit parts were substantially higher than those paid for the same parts under C-5B production. According to a Defense Contract Audit Agency report, the proposed prices were substantially higher than proposed prices for the same parts under the C-5B production contract because of small quantities in the kit buy. The parts were priced based on the ordered quantities ranging mostly from 1 to 3 parts in the 147 kits instead of more economic buy quantities. For example, Lockheed's proposed unit price for 2 tee assemblies is $425.61 each, but, for a quantity of 7, the proposed price would be $189.38 each.

One of the nine Lockheed price proposals included more than 129 non-stock-listed kit parts that were small items such as washers, shims, and pads (see figs. 3.1 to 3.3). These parts are not structural parts with long lead times. Other parts, such as a panel assembly or end fitting (see figs. 3.4 and 3.5), appear to be more the type of parts the ALC cited in its primary justification. C-5 system officials, however, said it was necessary to procure these smaller parts to ensure availability when needed.

Figure 3.1: Washer

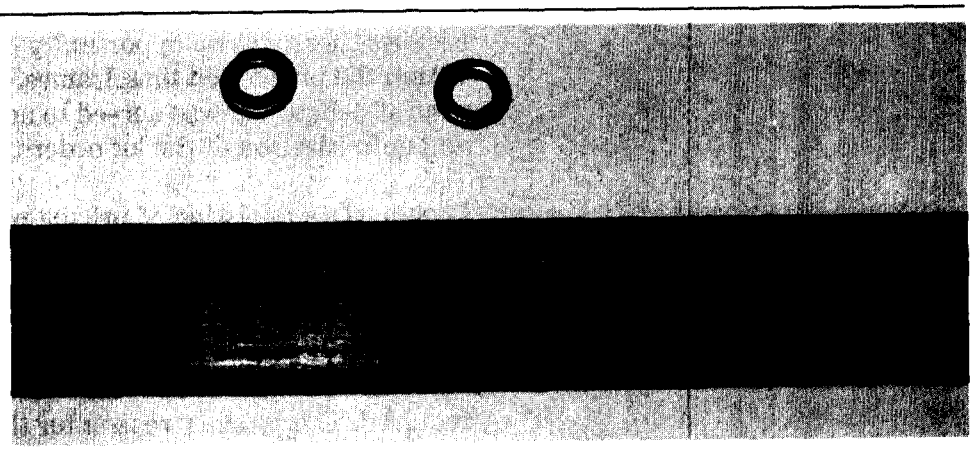


Figure 3.2: Shim

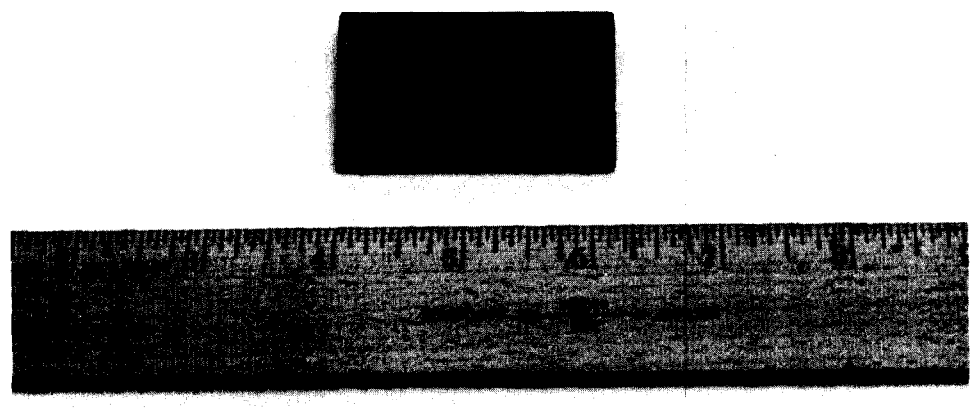


Figure 3.3: Pad

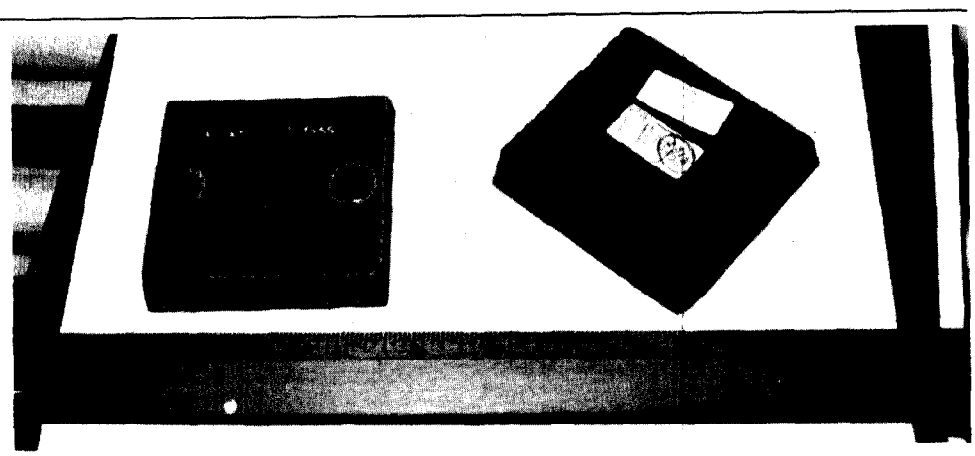


Figure 3.4: Panel Assembly

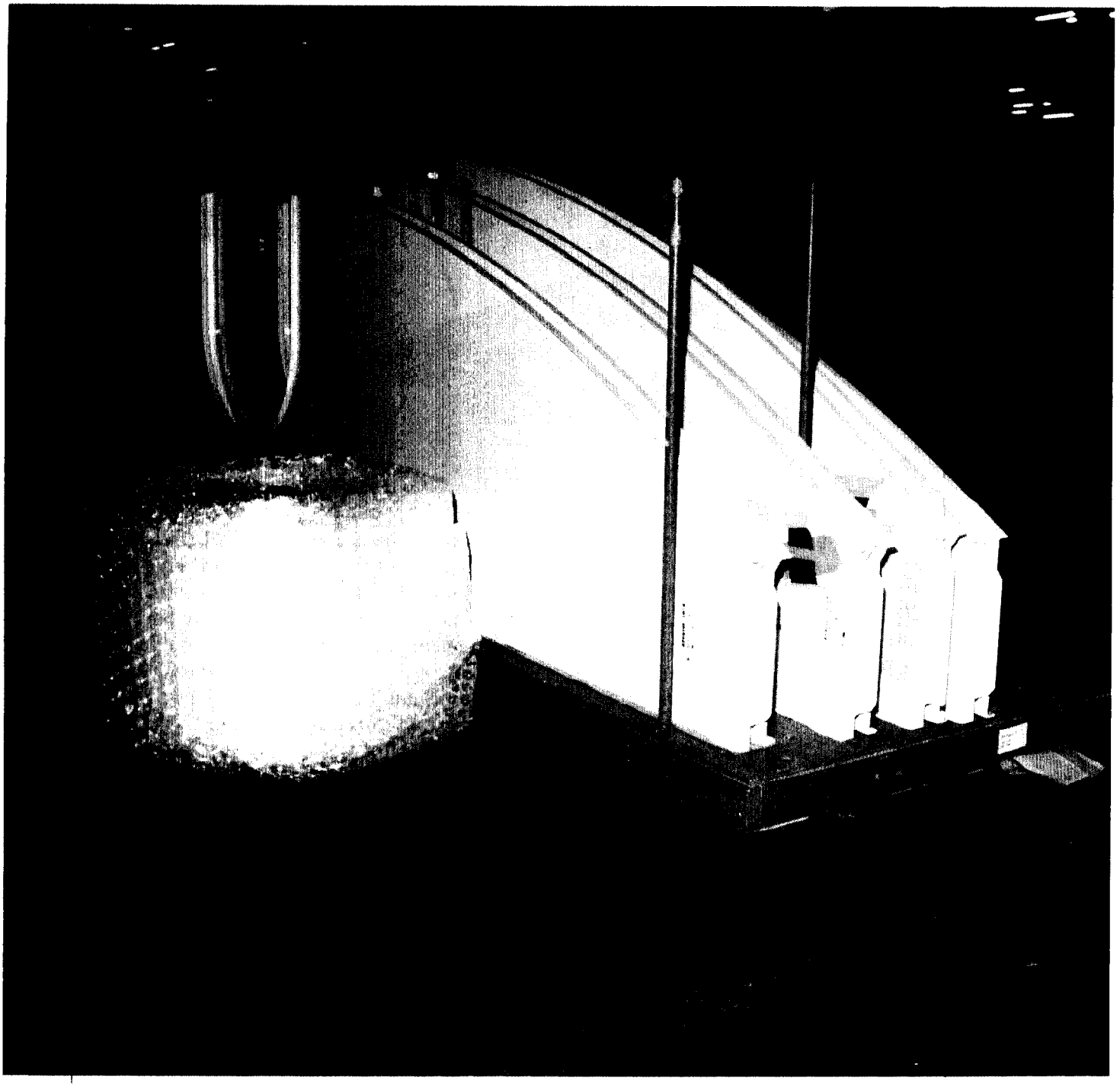
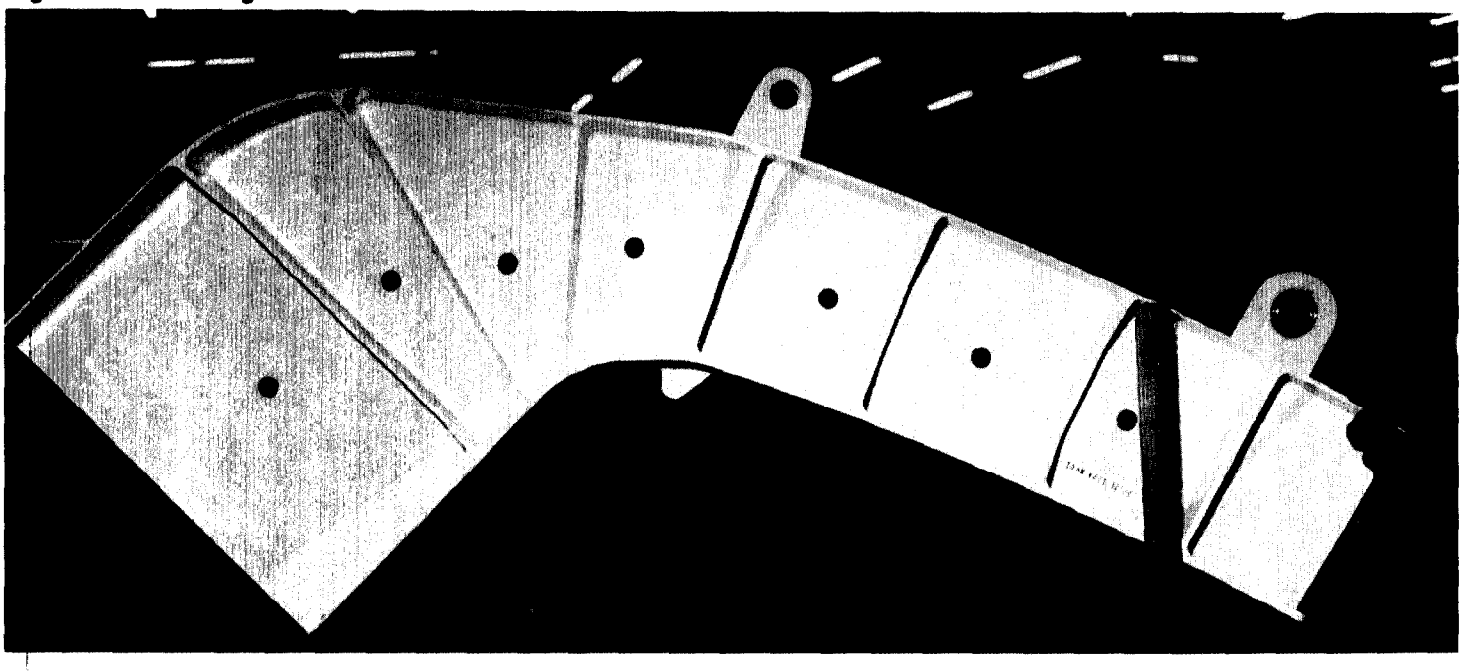


Figure 3.5: End Fitting



An analyst from the Air Force Contract Management Division, Air Force Systems Command, also questioned the type of parts being ordered. In June 1988, after a cursory review of parts description and Lockheed's proposed unit prices, the analyst said there were a number of apparent "horror stories." After reviewing selected parts, the analyst cited examples such as a flat metal plate part, the size of a business card, with a proposed price of $114 and a small angled metal splicer part with a proposed price of $362, both manufactured by Lockheed. The analyst questioned why the Air Force was buying parts such as these from Lockheed in the first place.

The AFPRO, during review and analysis of the price proposals, found that some parts for the kit orders had been transferred from excess C-5B production stocks and that other parts had been actually combined with C-5B production orders, which should result in lower costs. In these cases, however, the AFPRO found Lockheed had not adjusted the price proposals to account for the transfers and questioned the adequacy of the quote for combining kit parts with production. During its review of 18 sample parts, the AFPRO found that kit orders for 8 of the 18 parts had been filled with parts transferred from excess C-5B production parts. Further analysis by AFPRO showed Lockheed's recorded value was about one-tenth of the proposed cost to the Air Force. For example, a

shim with a proposed factory cost of $211.13 and a proposed price of $315.84 to the Air Force had a stock transfer value[10] of $29.88. Another part, a brace with a proposed factory cost of $130.56 and a proposed price of $194.97 had a stock transfer value of $18.51. Consequently, on October 6, 1988, the AFPRO requested that Lockheed determine the magnitude of needed adjustments and update the price proposals accordingly.

In December 1988, in response to Air Force pricing questions, Lockheed proposed a cost reduction of almost $1 million to compensate for the stock transfers. However, Lockheed concluded no adjustment was required for the combined orders because it considered previous reductions resulting from applying less than full set-up costs and other adjustments as adequate compensation.

During our review we also identified parts with differing prices, and it appears that Lockheed based its cost for a part on the quantities in individual kits as opposed to the total numbers of the part in all kits. For example, we observed that 24 identical pads had different proposed unit prices, $52.73 each in one kit for a quantity of 16 and $141.37 each for quantities of 2 in other kits, apparently because they were manufactured on separate work orders. We also observed price variances for the same part listed in different kits and other significant variances in prices for similar parts in different kits based on the quantity ordered. For example, a quantity of 2 shims in one kit was listed at $68.94, whereas a similar shim in another kit with a quantity of 80 was listed at $17.56.

The March 1989 hearings held by the Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, focused attention on these pricing issues. After the hearings, San Antonio ALC officials said they believe the unresolved problems as well as the pricing issues will be corrected and that ongoing reviews by the AFPRO and ALC staff will properly validate prices before final contract negotiations. ALC officials anticipate these processes will not be completed before the end of 1989. Lockheed officials noted that they were continuing to monitor pricing data and that complete updated cost data would be provided to the Air Force before contract negotiations. They believed too much attention was being given to the proposed prices that would be subsequently negotiated.

[10]Stock transfer value is the cost shown in Lockheed's records as the cost from the C-5 production.

Conclusion

The Air Force is continuing to devote significant efforts to ensuring adequate review and analysis of pricing data, and Air Force officials believe the issues will be resolved before contract negotiations. Because of the attention that has been focused on the pricing of parts, we are making no recommendations.

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