BY THE U.S. GENERAL ACCOUNTING OFFICE

Report To The Secretary Of Defense

Logistics Support Costs For The B-1B Aircraft Can Be Reduced

While the Air Force's logistics support planning for the B-1B bomber has been extensive, the inadequacy of the logistics data developed during research and development of the B-1B's predecessor--the B-1A--and the concurrent development and production schedule necessitated by a congressional mandate that the aircraft be operational not later than 1987 have forced Air Force planners to make logistics support decisions before they had sufficient data to support them. This has increased the risk that operating and support costs will be more than they would have been had normal Defense development procedures been employed before starting production. However, GAO has identified opportunities to reduce these costs which should be considered. They are

--combining the purchase of investment spares (components that can be repaired and reused) with the purchase of production components;

--buying spares directly from the manufacturers instead of through the four B-1B contractors;

--reducing the number of bases from four to three; and

--centralizing all avionics maintenance repair at the B-1B airframe and engine depot repair facility and not establishing any repair shops at the planned B-1B bases.

125310

GAO/NSIAD-84-36
SEPTEMBER 20, 1984

030241

Request for copies of GAO reports should be sent to:

U.S. General Accounting Office
Document Handling and Information
Services Facility
P.O. Box 6015
Gaithersburg, Md. 20760

Telephone (202) 275-6241

The first five copies of individual reports are free of charge. Additional copies of bound audit reports are $3.25 each. Additional copies of unbound report (i.e., letter reports) and most other publications are $1.00 each. There will be a 25% discount on all orders for 100 or more copies mailed to a single address. Sales orders must be prepaid on a cash, check, or money order basis. Check should be made out to the "Superintendent of Documents".

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

B-205620

The Honorable Caspar W. Weinberger
The Secretary of Defense

Dear Mr. Secretary:

This report discusses the Air Force's logistics support planning for the B-1B aircraft and how substantial reductions in its life cycle costs can be achieved. It discusses a number of alternatives in procurement, basing, and maintenance which, if adopted, could significantly reduce the operational and maintenance costs of the 100-aircraft B-1B force, over its expected 20-year life.

We initiated this review in response to broad congressional concern about the high cost of the B-1B program and interest in reducing life cycle costs of major weapon systems. This review is an important aspect of our continuing efforts to recommend logistics management improvements in the Department of Defense.

This report contains recommendations to you on pages 22 and 37. As you know, 31 U.S.C. § 720 requires the head of a federal agency to submit a written statement on action taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are also sending copies of this report to the Secretary of the Air Force and to the Director, Office of Management and Budget.

Sincerely yours,

Frank C. Conahan

Frank C. Conahan
Director

D I G E S T

The B-1B aircraft is a multipurpose bomber designed to replace the United States' aged B-52 bomber in the strategic nuclear mission role. It will also be capable of serving as a conventional bomber and as a cruise missile carrier. The Air Force is planning to buy 100 B-1B aircraft.

The B-1B is being developed and produced concurrently so as to meet a congressional mandate that it be operational no later than 1987. The Secretary of Defense has also assured the Congress that the program cost for the new bomber will not exceed $20.5 billion in 1981 dollars.

GAO undertook this review to determine if (1) the assumptions being used to determine the B-1B logistics requirements were reasonable and (2) the aircraft could be effectively supported more efficiently and economically than currently planned. GAO focused its review on the planned B-1B logistics support, basing, and maintenance.

LOGISTICS PLANNING HAS BEEN CONSTRAINED

GAO found that while the Air Force's logistics support planning for the B-1B has been extensive, the inadequacy of the logistics data developed during research and development of the B-1B's predecessor--the B-1A--coupled with the concurrent development and production schedule have forced Air Force planners to make logistics support decisions before they had sufficient data to support them. For example, logistics support analysis, an analytical approach to define operating and support requirements, normally generates detailed logistics support requirements before production begins. However, due to concurrency, this analysis will not be completed in time to influence initial B-1B support decisions. This increases the risk that operating and support costs will be more than they would

have been had normal Department of Defense (DOD) procedures been employed before starting production.

GAO has identified opportunities to effectively provide initial support for the aircraft more efficiently and economically than currently planned. Moreover, opportunities exist to reduce the costs associated with basing and maintaining the aircraft.

COMBINING THE PROCUREMENT OF INVESTMENT SPARES AND PRODUCTION COMPONENTS

Combined purchasing of B-1B investment spares (components that can be repaired and reused) and production components was being planned for only about 15 percent of the initial spares buy. Provisioning officials were not planning to use the procedure to buy any of the replenishment spares following the initial spares buy. However, in 1984 the Air Force changed its plans and used the procedure to order 68 percent of the initial spares buy and 22 percent of the replenishment spares buy. Combining the purchase of the 1985-86 initial and replenishment investment spares with the purchase of production component orders could reduce the cost of these spares and components between 10 and 20 percent through economies of scale. (See p. 17.)

BUYING SPARES DIRECTLY FROM THE MANUFACTURERS

Component breakout--buying directly from the manufacturers versus buying from four B-1B contractors--was not being considered for the purchase of initial or replenishment investment spares. Since the Air Force is not required to buy investment spares from the four B-1B contractors that are not manufactured by those contractors, buying investment spares directly from the manufacturers could result in a savings of 25 percent, which would be in addition to those possible through combined ordering. (See p. 19.)

CONSOLIDATING THE BASING OF TWO SQUADRONS SCHEDULED FOR SEPARATE BASING

The Air Force is planning to deploy 32 aircraft at 1 base, 26 at a second base, and 16 at each of the remaining 2 bases (basing of the 10 aircraft being bought for attrition has not been determined). Consolidating the planned deployment of the 2 separately based 16-aircraft squadrons at 1 main operating base, according to a contractor's study, would not significantly increase facilities costs at the base selected. And elimination of one base could potentially save as much as $78 million in new facility costs, $55 million in support equipment and flight simulator acquisition costs, and about $25 million per year in personnel costs.

GAO believes that deploying some of the strategic alert aircraft at a fourth location (a satellite base) to help ensure survivability and deterrence could mitigate the Air Force's concern that fewer bases would increase the vulnerability of the aircraft. Although costs are associated with satellite basing, a Defense Resource Management Study showed that they should be minimal compared with the savings realized through consolidation. This is because only three of the eight functions provided at a main operating base are needed at a satellite base. (See p. 23.)

CENTRALIZING ALL AVIONICS REPAIR

Operating an intermediate maintenance avionics repair shop at each planned B-1B base will be expensive. Centralizing the avionics repair at the B-1B airframe and engine depot repair facility could reduce the acquisition cost for automatic test equipment and associated program test sets by as much as $85 million and the annual operational cost (personnel and support) by about as much as $15 million. Savings of this magnitude were demonstrated in an Air Force study on eliminating intermediate avionics maintenance shops at F-15 bases and doing all repairs at a depot. (See p. 33.)

RECOMMENDATIONS

Because of the large potential savings, GAO recommends that the Secretary of Defense

--direct the Secretary of the Air Force to use the combined procurement procedure to buy all future B-1B production components and investment spares,

--direct the Secretary of the Air Force to buy all investment spares directly from the manufacturers when quality control will not be jeopardized, and

--evaluate the merits of repairing all B-1B avionics components at the B-1B airframe and engine depot repair facility and not establishing avionics maintenance repair shops at each of the planned B-1B bases.

AGENCY COMMENTS AND GAO'S EVALUATION

DOD provided official oral comments on a draft of this report. In general, DOD did not concur in GAO's findings, conclusions, and recommendations. DOD's comments relating to specific findings and conclusions are discussed in chapter 2 through 5 of this report, where appropriate.

DOD agreed with GAO's recommendation to use the combined procurement procedure to buy all B-1B production components and investment spares. It subsequently used this procedure during fiscal year 1984 to buy 68 percent of its initial spares and 22 percent of its replenishment spares. DOD disagreed that all spares should be bought directly from the manufacturers rather than through the four B-1B contractors, stating that some spares must continue to be procured through the four contractors due to the need for quality control and existing warranties. GAO believes that buying directly from the manufacturers should not affect warranty compliance since the manufacturers ultimately are responsible for this. While the manufacturers are now

responsible to the four B-1B contractors, they would be responsible to DOD if the Department purchased the spares directly from them.

GAO also believes that there is little quality control over spares that is provided by the four B-1B contractors that could not be readily assumed by the Air Force. However, since there may be some, we have modified our recommendation accordingly.

DOD also stated that buying all spares directly from the manufacturers conflicts with GAO's recommendation to use the combined procurement procedure to buy all B-1B production components and investment spares. GAO believes DOD can comply with both recommendations by having the manufacturers combine the production components and spares orders for price negotiations. This procedure of combining production components and spares for pricing is already being used by the Navy for the F/A-18 aircraft.

In a meeting subsequent to the receipt of DOD's comments, Air Force officials explained that they have an aggressive component breakout program. However, since they had just entered into the multiyear contracting process for the production components at about the time they received GAO's draft report, they felt it was critically important to fully integrate spares raw material buying and fabrication with their production component counterparts. Therefore, a decision was made to pursue the combined multiyear effort in order to capture savings that they estimated would approximate $159 million. In the future as they buy more replenishment spares outside of the multiyear contract, appropriate consideration will be given to buying spares directly from the manufacturer.

DOD stated that GAO's proposal on consolidating the planned deployment of two separately based B-1B aircraft squadrons would unacceptably affect the level of deterrence provided by the B-1B. Deterrence and survivability are important national security issues involving military judgments and are primarily the responsibility of DOD. Therefore, GAO is not making a recommendation on the matter. However, because of the opportunities for

Tear Sheet

significant savings from consolidation, this question was raised several times during hearings on the DOD appropriations for fiscal year 1985. Since the issue may be pursued further in subsequent years, GAO is retaining the results of its analysis in this report.

Finally, DOD disagreed with the recommendation to evaluate the merits of centralizing avionics maintenance repair at the depot, stating that technologies to implement such a concept have not yet been fully demonstrated and are too risky for B-1B use as a strategic nuclear deterrence at this time. Moreover, four independent studies have concluded that a centralized B-1B avionics repair facility would cost the same as or more than separate shops at all four planned B-1B bases.

GAO agrees that the technologies to implement such a concept should be fully demonstrated before implementation and should be included in the evaluation called for in the recommendation. However, none of the four studies DOD referred to has evaluated the concept GAO proposes. In all these studies, defective units that could not be repaired at the base were shipped to the Air Force's designated avionics repair facility instead of to a dedicated avionics repair shop at the B-1B airframe and engine depot that GAO is proposing. Moreover, the average turnaround time in these studies was 45 to 60 days, as opposed to the 7 to 10 days' turnaround time Air Force officials stated would be expected if all defective replacement units were shipped to the B-1B avionics depot repair facility on a daily basis.

Contents

		Page
DIGEST		i
CHAPTER		
1	INTRODUCTION	1
	Objective, scope, and methodology	3
2	LOGISTICS SUPPORT PLANNING IS EXTENSIVE BUT MAY NOT MINIMIZE THE B-1B'S OPERATIONAL AND SUPPORT COSTS	5
	Effective logistics support planning is needed to reduce costs and increase readiness	5
	B-1B logistics support planning	6
	B-1B program constraints have impaired logistics support planning	10
	Conclusions	13
	Agency comments and our evaluation	14
3	COMBINING THE BUY OF INVESTMENT SPARES AND PRODUCTION COMPONENTS AND BUYING SPARES DIRECTLY FROM VENDORS COULD SAVE MILLIONS	16
	Savings have been achieved in other DOD programs	16
	Combined procurement procedure should be used to buy all B-1B investment spares	17
	Significant savings can be achieved if the 1985-86 production and spares buys are combined	18
	Investment spares cost could also be substantially reduced through component breakout program	19
	Conclusions	20
	Agency comments and our evaluation	21
	Recommendation	22
4	REDUCING THE NUMBER OF MAIN OPERATING BASES WOULD SIGNIFICANTLY LOWER PERSONNEL AND SUPPORT COSTS	23
	Consolidating aircraft support activities is not a new idea	23
	Significant savings could be achieved by colocating two separately based squadrons	23
	Air Force vulnerability concerns	27
	Conclusions	29
	Agency comments and our evaluation	29

		Page
5	CENTRALIZING AVIONICS MAINTENANCE COULD REDUCE SUPPORT COSTS AND IMPROVE THE QUALITY OF REPAIR	31
	Centralizing avionics maintenance has been proven cost effective	31
	Two-level avionics maintenance has been proposed for all future systems	31
	Centralizing B-1B avionics repairs could produce significant savings	33
	Conclusions	36
	Agency comments and our evaluation	36
	Recommendation	37
APPENDIX		
I	Cost comparison of the B-1B personnel requirements (fiscal year 1983)	38

CHARTS

B-1A to B-1B features	2
B-1B development and production schedule	3
Key B-1B ILS program milestones	9
Sequence of ILS tasks	11
Logistics support analysis	12
Air Force planned basing structure	28
Maintenance concept	32

TABLES

Logistics support acquisition costs	8
Estimated cost of B-1B program, production components, and spares	18
Estimated B-1B cost savings using combined procurement procedure	19
Estimated savings using breakout to buy 15 avionics subsystems	20
Staff requirements comparison	24
B-1B facilities costs	25
Avionics intermediate shop comparison	26
Avionics shop equipment costs	34
Base avionics shop personnel costs	35
Operating costs comparison	35

ABBREVIATIONS

DOD	Department of Defense
GAO	General Accounting Office
ILS	integrated logistics support
LSA	logistics support analysis
SAC	Strategic Air Command
SAIP	Spares Acquisition Integrated With Production

CHAPTER 1

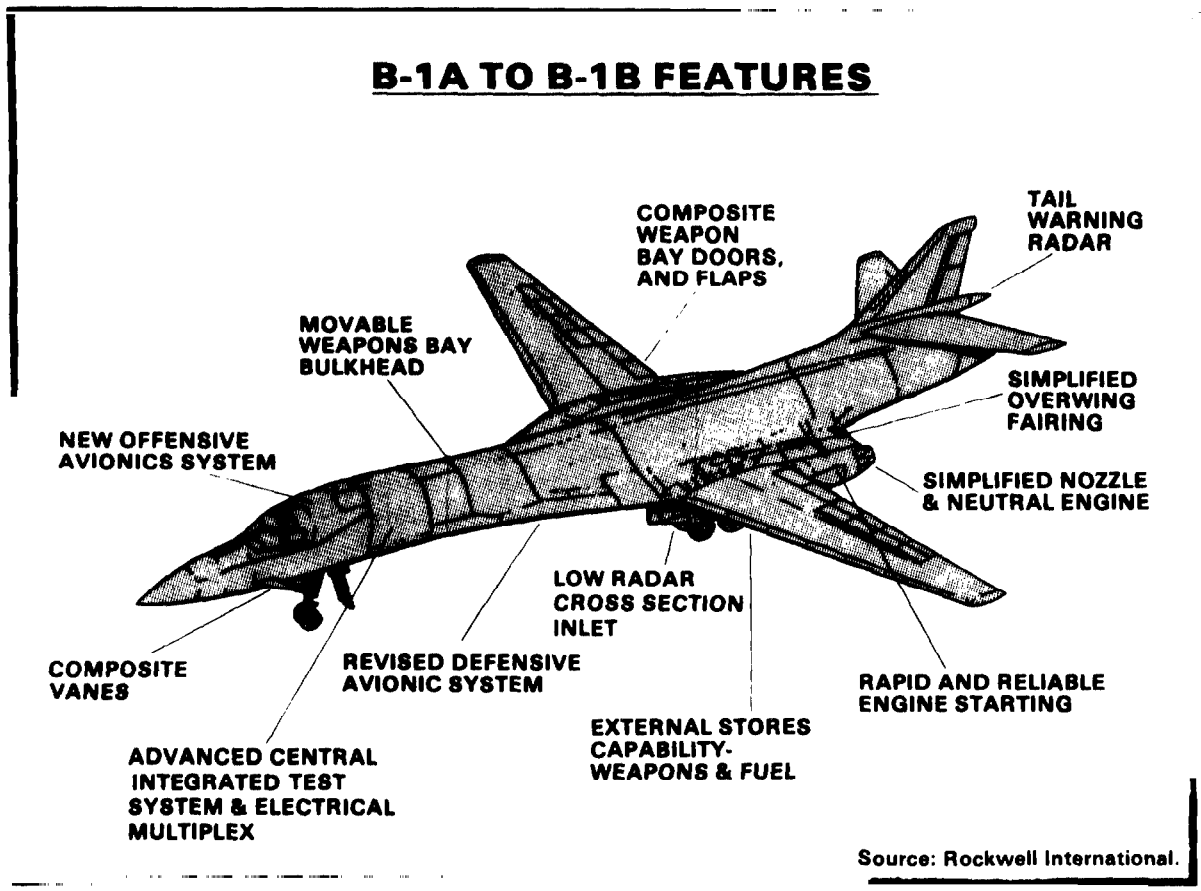
INTRODUCTION

Providing the logistics support to deploy and operate new weapon systems has become a major problem due to rising costs and funding cutbacks. Both the Department of Defense (DOD) and the Congress are especially concerned with the B-1B program because of the concurrent development/production phases and a not-to-exceed $29.5 billion ($20.5 billion in 1981 dollars) program cost imposed by the Secretary of Defense.

The B-1B is being developed and produced concurrently so as to meet a congressional mandate that the new bomber become operational no later than 1987.

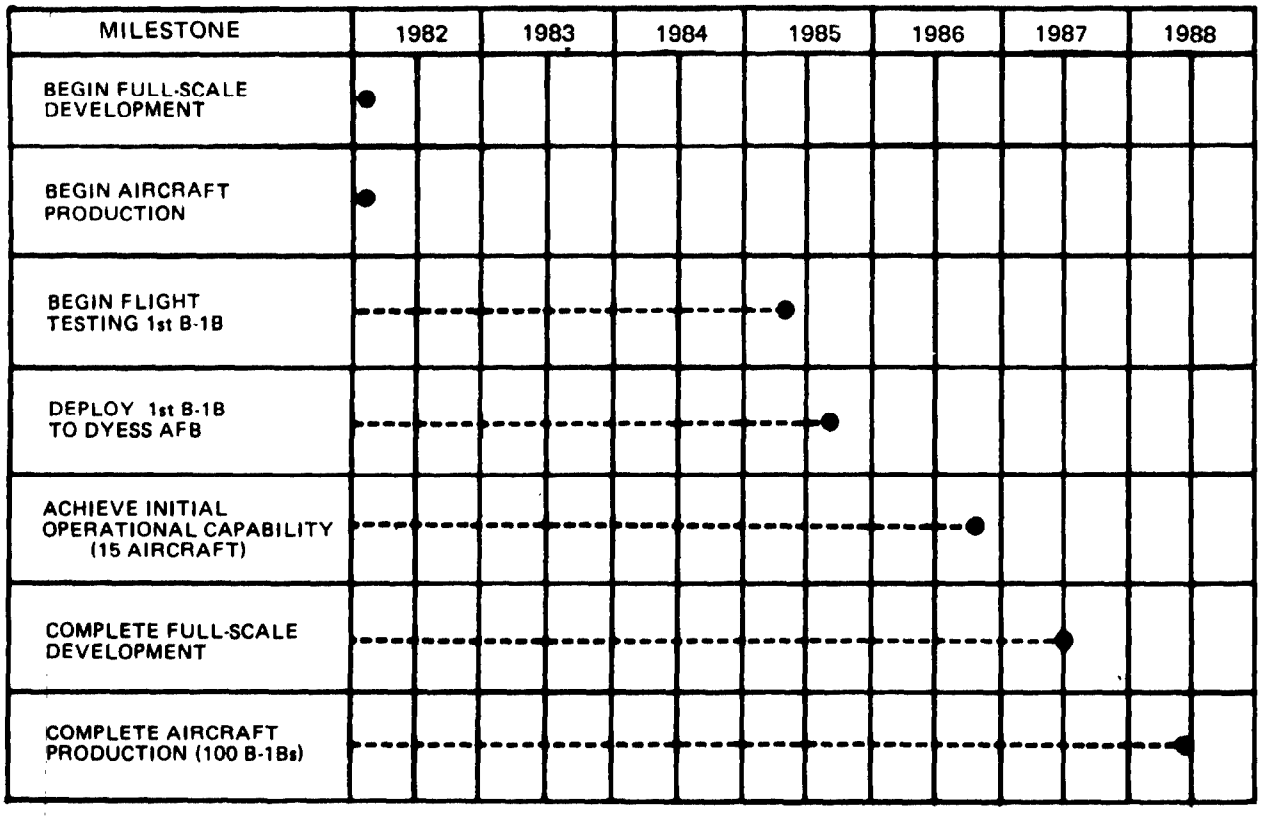
The B-1B aircraft is being developed as a multipurpose bomber to replace the aging B-52 bomber in the strategic mission role. It will also be capable of serving as a conventional bomber or as a cruise missile carrier. While the B-1B will look almost identical to the B-1A, developed and tested in the mid-1970's, it will not be the same airplane. (See drawing on p. 2.) The B-1B design will incorporate some of the Stealth technology to reduce its image on enemy radar, as well as update offensive and defensive avionics systems. The bomber is being built by four contractors--Rockwell International (airframe), Boeing Military Airplane Company (offensive avionics), Eaton Corporation-AIL Division (defense avionics), and General Electric (engines).

Development of the B-1B was started in January 1982, and the first production aircraft is scheduled to begin operational testing in March 1985. The first operational aircraft will be delivered in July 1985 to the Combat Crew Training Squadron at Dyess Air Force Base in Texas.



Current plans call for buying 100 aircraft and modifying 2 prototype B-1A aircraft for additional development testing. The B-1B development and production schedule is presented in the following chart.

B-1B DEVELOPMENT AND PRODUCTION SCHEDULE



OBJECTIVE, SCOPE, AND METHODOLOGY

We initiated our review of the Air Force's logistics support planning for the B-1B aircraft in response to broad congressional interest in assessing the high cost of this program and its logistics support. Our objective was to determine whether (1) the assumptions being used to determine the B-1B logistics requirements were reasonable and (2) the 100-aircraft force could be effectively supported more efficiently and economically than currently planned.

This report is based on our analysis of DOD's integrated logistics support guidance and the Air Force's implementation of it, interviews with Air Force and contractor officials, reviews of records and reports provided by the officials, and reviews of published DOD and GAO reports on the B-1B program and logistics support planning. We made our review at the following locations:

--Headquarters, Department of the Air Force, Washington, D C.

--Headquarters, Strategic Air Command, Offutt Air Force Base, Nebraska.

--Headquarters, Air Force Logistics Command, Wright-Patterson Air Force Base, Ohio.

--B-1B Systems Program, Propulsion, and Flight Simulator Offices, Wright-Patterson Air Force Base, Ohio.

--Oklahoma City Air Logistics Center, Tinker Air Force Base, Oklahoma.

--Air Force Flight Test Center, Edwards Air Force Base, California.

--Rockwell International, Los Angeles, California.

--Boeing Military Airplane Company, Seattle, Washington.

--Eaton Corporation-AIL Division, Deer Park, New York.

--General Electric Engine Division, Evendale, Ohio.

Our review was performed between October 1982 and September 1983. It was performed in accordance with generally accepted government auditing standards. Our estimates of potential cost savings were based on results experienced on other weapon systems and on published DOD and Air Force studies. We did not test, however, the quality of the data and analytical work that formed the basis of the defense studies. During our review, we evaluated (1) the impact of program constraints on logistics support planning, (2) the cost effectiveness of the planned support, and (3) logistics alternatives that could reduce the program cost while maintaining effective support.

CHAPTER 2

LOGISTICS SUPPORT PLANNING IS EXTENSIVE BUT MAY NOT MINIMIZE THE B-1B'S OPERATIONAL AND SUPPORT COSTS

The Air Force's logistics support planning for the B-1B is extensive. However, development/production schedule concurrency have forced Air Force planners to make logistics support decisions before they have sufficient data to support them. This increases the risk that operating and support costs will be more than they would have been had normal DOD development procedures been employed before starting production. Initial logistics support will cost an estimated $4.5 billion. In addition, follow-on operational and support costs, as planned, may exceed $22.8 billion[1] over the B-1B expected 20-year life.

EFFECTIVE LOGISTICS SUPPORT PLANNING IS NEEDED TO REDUCE COSTS AND INCREASE READINESS

The rising cost to operate and maintain new weapon systems throughout their service life increases the need for effective logistics support planning. Minimizing these costs is a major requirement of an effective integrated logistics suport (ILS) program.

To ensure efficient and effective support, DOD requires that an ILS plan be developed for each major weapon system and that it be an integral part of the system development and acquisition plan. DOD's objective is to make sure that weapon system readiness goals are met at the lowest possible cost. According to DOD guidance, ILS support planning should begin at the formulation phase and continue through the system's development, production, and operational phases.

DOD directives state that ILS planning should be structured to (1) meet both peacetime and wartime readiness objectives, (2) identify cost-effective support alternatives, (3) provide the needed support, and (4) optimize the support resources throughout the system's useful life. A comprehensive ILS program should address, among other things

---

[1] The $22.8 billion estimate is based on a September 1982 B-1B program office cost estimate of $9.2 billion (1981 dollars) that was escalated using Air Force cost and planning factors for the period 1988-90 and a constant 5-percent inflation rate through 2007.

--reliability and maintainability,

--spare parts,

--support and test equipment,

--technical data,

--training and training equipment,

--manpower and personnel resources, and

--facilities.

Two key elements within ILS that influence weapon system designs are the logistics support and life cycle cost analysis. The logistics support analysis (LSA) is an analytical tool used to identify logistics requirements, influence design, and assess the achievement of logistics objectives. The life cycle cost analysis provides program officials the means to challenge both design and performance requirements that will drive a system's support costs when it becomes operational.

B-1B LOGISTICS SUPPORT PLANNING

Logistics support for the B-1B is being planned jointly by the four contractors and is being managed by the Air Force program, propulsion, and flight simulator offices. Rockwell is managing the contractor effort and is responsible for

--integrating the overall ILS master schedule,

--developing all organization-level technical orders,

--managing the support equipment development and procurement program,

--developing requirements for contractor support, and

--developing an integrated logistics support analysis data base.

Logistics support needed to deploy the B-1B force will cost more than that being funded as part of the B-1B program. The $118 million ILS planning cost is being fully funded within the program. However, as the following chart shows, only $2.8 billion of the $4.5 billion in logistics support acquisition costs will be funded within the program. Some or all of these types of costs, except replenishment spares, have been included in other weapon system acquisition cost estimates. With respect to replenishment spares, DOD, in response to a recommendation in a

1981 GAO report,[2] agreed that all spares required to field a weapon system should be identified to that weapon system. To do this DOD agreed to redefine initial spares to emcompass all spares required to field a weapon system. This has not been done for the B-1B program.

DOD stated that the B-1B funding practices are consistent with those of other DOD programs. It stated that the department was applying historically consistent budgetary practices. We agree the budgeting procedures used to make the estimates are consistent with those in other programs we have reviewed; however, based on our reviews of Air Force and Navy weapon systems, such as the F-15, F-16, F/A-18, and A-10 aircraft, the funding practices are not.

---

[2]Less Costly Ways to Budget and Provision Spares for New Weapon System Should Be Used (PLRD-81-60, Sept. 9, 1981).

Logistics Support Acquisition Costs

Logistics element	1981 dollars	Then-year dollars[a]
	- - - -(millions) - - - -	
1. Costs within B-1B program		
A. Peculiar support		
Training equipment	$ 169.5	$ 241.7[b]
Technical orders--aircraft	217.4	302.5
Support equipment[b]	1,381.1	1,967.9
Subtotal	1,768.0	2,512.1
B. Initial spares	1,064.1	1,488.2
Total	$ 2,832.1	$ 4,000.3
2. Costs outside B-1B program		
A. Replenishment spares	$ 572.3	$ 926.0[d]
B. Common support equipment	122.8	181.3
C. Flight simulators	300.0	399.2
D. Facilities	163.6	230.0
E. Interim contractor support and depot-purchased equipment maintenance	407.6	597.2[e]
F. Personnel training	173.4	280.9[d,f]
Total	$ 1,739.7	$ 2,614.6
Grand total	$ 4,571.8	$ 6,614.9

[a]Costs through fiscal year 1986.

[b]Costs through fiscal year 1987.

[c]Includes technical orders.

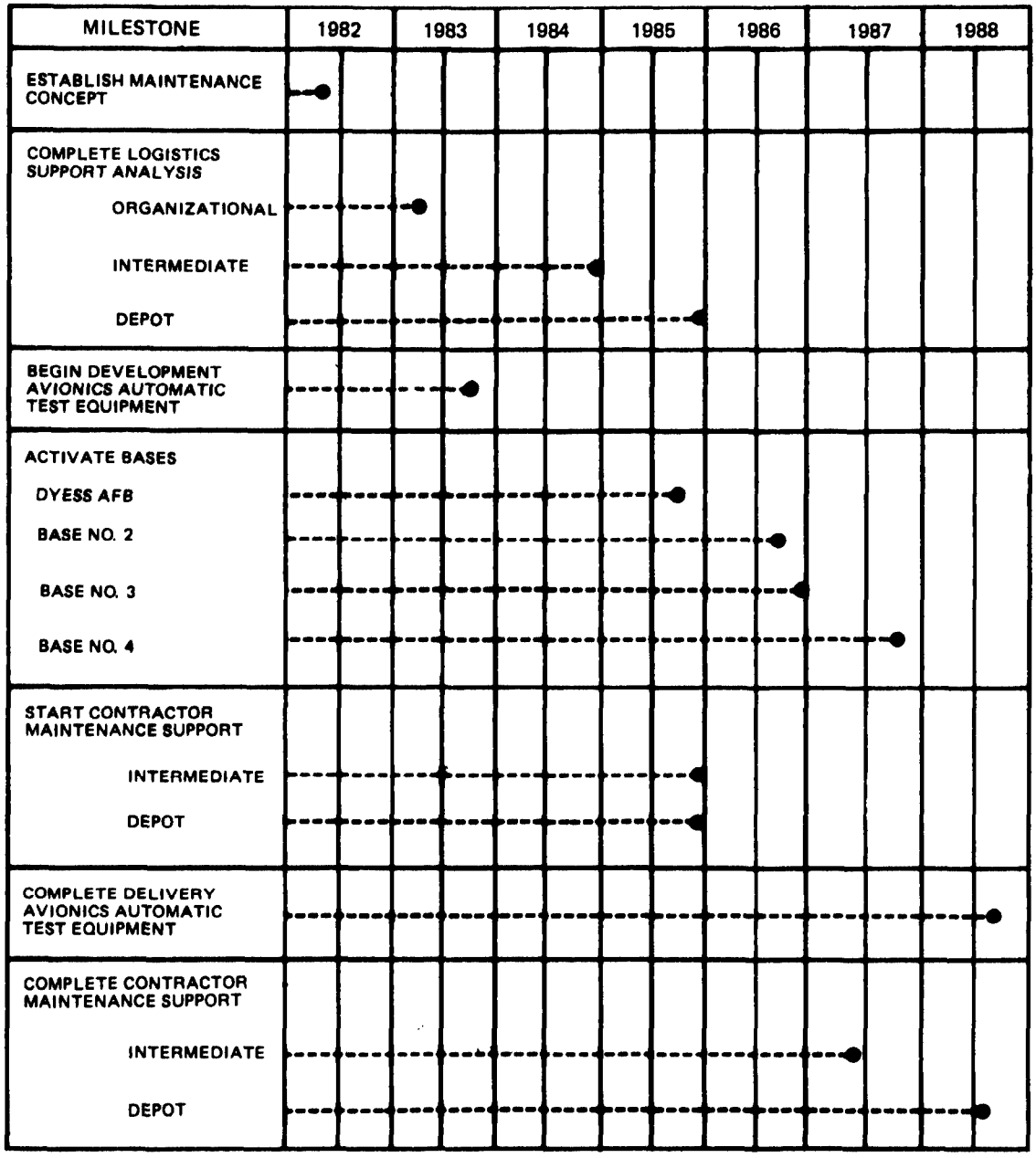
[d]Costs through fiscal year 1989.

[e]Costs through fiscal year 1988.

[f]Assumes first squadron crew available 1 year before initial operational capability.

The B-1B ILS planning effort as currently planned is essentially on schedule. However, it is too early to draw conclusions because major B-1B logistics support events for the development and acquisition of support resources are still in the early stages of implementation. Any slippages could affect the B-1B's readiness and logistics support costs. The following chart shows the present milestones.

KEY B-1B ILS PROGRAM MILESTONES



B-1B PROGRAM CONSTRAINTS HAVE IMPAIRED LOGISTICS SUPPORT PLANNING

The Air Force's logistics support planning for the B-1B aircraft has been hampered by a congressional mandate that the B-1B be operational by 1987, which forced a concurrent development and production schedule, and the lack of B-1A logistics support data. These constraints have prevented the proper sequencing of ILS tasks and impaired the effectiveness of ILS plans.

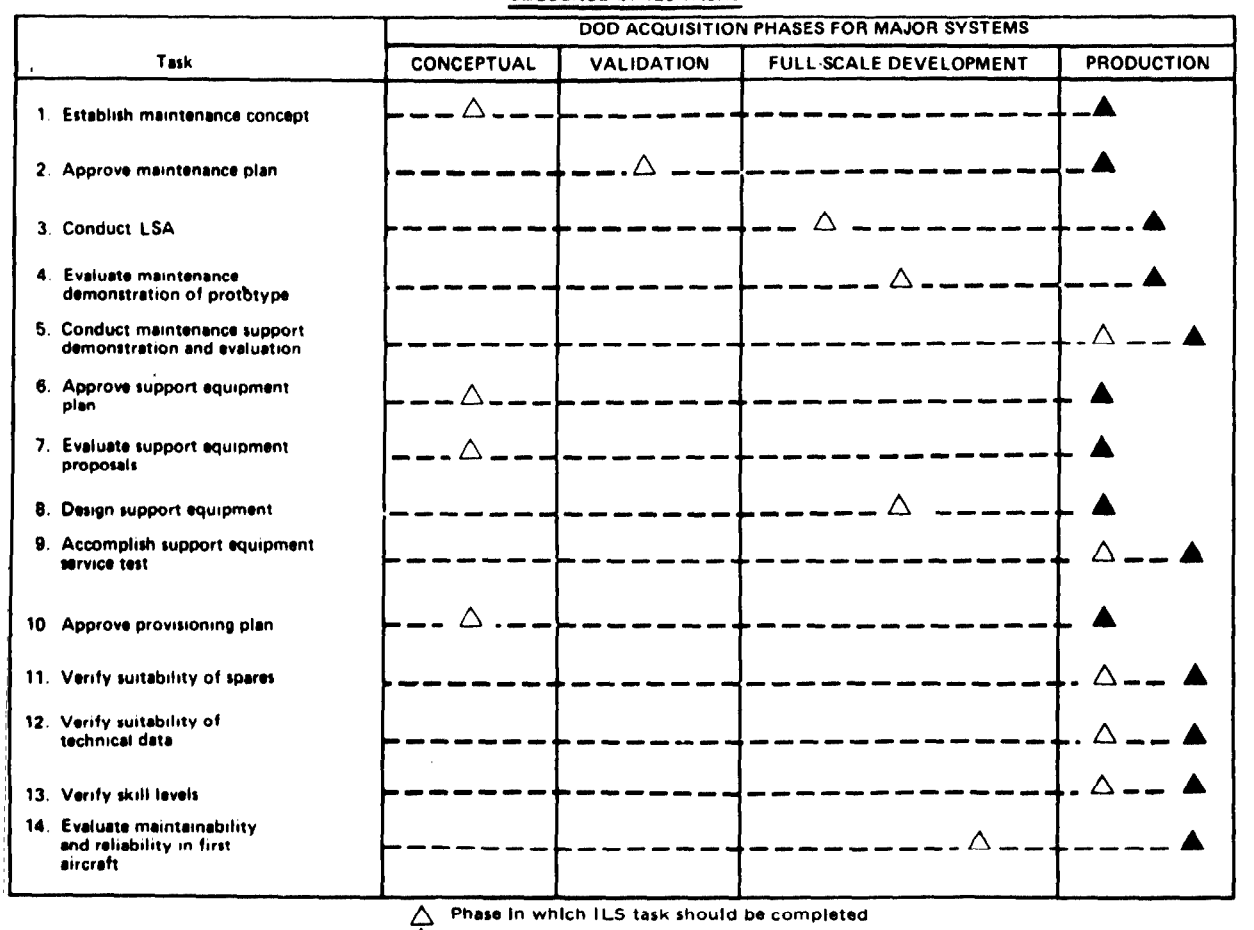
Logistics support planning was deferred during B-1A program

The B-1A program was oriented toward aircraft research and development before it was terminated in 1977. Logistics support planning and development were being deferred until a production commitment was established. Although such a commitment was made in December 1976, the program was terminated in June 1977. Research and development and flight testing efforts continued on the B-1A aircraft after the acquisition program was terminated in 1977, but logistics support activities were minimal. DOD stated that many of the required ILS planning elements were accomplished for the B-1A from 1970 to 1976 but did not indicate which ones. According to our review of Air Force documents and discussions with program officials, most of the data collected was unusable because of design changes to improve performance and incorporate the latest technology.

Normal sequencing of ILS tasks is not possible

According to DOD directives, ILS planning should normally begin during the conceptual phase, or first phase, of the acquisition process and should continue into system operational use. Certain ILS milestones should be met as the operation moves through the different acquisition phases--conceptual, demonstration and validation, full-scale engineering development, production, deployment, and operational use--to ensure the delivery of supportable weapon systems. DOD stated that completing ILS tasks in this sequence was not a requirement prior to the start of the B-1B program. We disagree; the requirement has existed since January 1980, when DOD revised the ILS guidance. However, due to the B-1B program concurrency and accelerated delivery schedules, the program office has been unable to complete these ILS tasks in the normal sequence. As the following chart shows, most of the ILS tasks should have been completed before the production phase.

SEQUENCE OF ILS TASKS

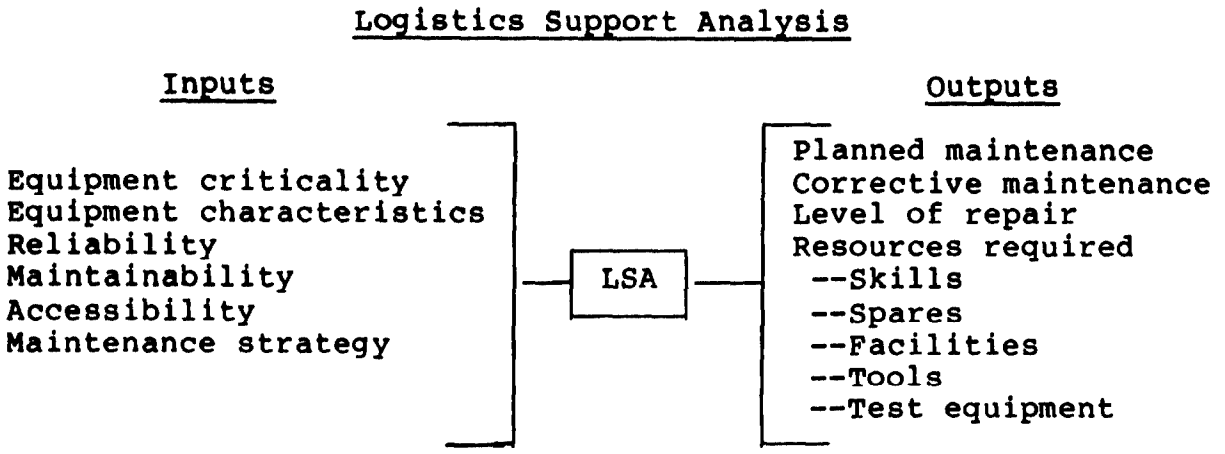


Concurrent development and production of the B-1B constitute the primary reasons for ILS tasks not being completed when needed. Because of this and the need to meet present program milestones, logistics planners have made decisions without complete logistics data. As final logistics support analysis and operational suitability testing results become available starting in late 1984 through 1986, logistics planners may need to change prior decisions. Such actions could (1) require significant changes in design of test support equipment, (2) increase support equipment costs, (3) defer the Air Force's ability to provide avionics maintenance support, and (4) require contractor support longer than the planned 2 years.

Full use of LSA has been prevented

LSA is an integral part of ILS planning. However, contractors' lack of logistics data from the B-1A program and B-1B program concurrency have prevented the completion of LSA in time to influence initial support decisions. LSA provides and maintains information on the performance of all logistics elements and emphasizes their interrelationships through system design and development.

LSA is a systematic, comprehensive analysis conducted throughout a weapon system's acquisition cycle. During this cycle, LSA identifies, defines, analyzes, quantifies, and processes logistics support requirements for maintenance planning, support and test equipment, supply support, transportation and handling, technical data, facilities, and personnel and training. Typical LSA inputs and outputs include:



DOD policy states the LSA process should begin with the conceptual phase of a weapon system and should generate detailed logistics support requirements before production. However, B-1B logistics support requirements, by necessity, are being determined during the production phase. Therefore, most of the ongoing LSA analysis will be used only to validate or correct early support decisions rather than as a basis for logistics support planning. For example:

--Initial maintenance planning for the B-1B may require revision because the engineering studies for determining where and how a system should be repaired have not been completed. Complete economical repair level analysis will not be available until late 1984.

--Design of support and test equipment may require major design changes since the analysis of support and test equipment requirements will not be completed before December 1984. The need for this equipment has forced the Air Force to rely on the electonics industry to determine what kind of avionics test equipment should be developed and procured for the B-1B. Any redesign or changes could defer the Air Force's ability to provide avionics maintenance support and could require contractor support longer than the planned 2 years.

--The number of personnel and skills required to support the B-1B are not being determined by LSA data. According to a Strategic Air Command (SAC) official, B-1B personnel requirements are being based on B-52 historical staffing requirements and on a logistics composite model reflecting the planned employment concept.

Under a normal acquisition process, such as those in the F-15, A-10, and F-16 programs, where a weapon system moves through different development phases before production, LSA would provide the data needed by logistics planners in time to make objective decisions in all support elements. However, because of B-1B program concurrency and the lack of B-1A logistics data, decisions being made by Air Force logistics planners on maintenance, spares provisioning, support equipment acquisition, and staffing requirements may not be the most cost effective.

CONCLUSIONS

B-1B logistics planning has been hampered by DOD and Air Force decisions which deferred the development of logistics support during the B-1A program and a congressional requirement that the B-1B be operational ready no later than 1987. This requirement forced schedule concurrency (i.e., aircraft development and production starting at the same time).

Deferral of the support development for the B-1A has resulted in insufficient logistics data for early ILS planning activities and in particular for LSA. Development and production concurrency has precluded the program office from taking full advantage of needed logistics support analysis and has increased the risk that operating and support costs will be more than they would have been had normal DOD development procedures been employed before starting production. While we are not suggesting that the schedule concurrency imposed on the B-1B program was unnecessary, it has made logistics planners do things in less than optimal ways and increased the risk of higher costs.

To ensure that the B-1B program remains within the $20.5 billion imposed program cost constraints and to reduce the 20-year operating and support costs, the Air Force should consider certain alternatives in procurement, basing, and maintenance which offer significant cost savings and other advantages. These alternatives are discussed in detail in chapters 3 to 5.

AGENCY COMMENTS AND OUR EVALUATION

DOD disagreed that the B-1B logistics support planning has been affected by DOD and Air Force decisions regarding schedule concurrency. DOD stated these risks were thoroughly evaluated before the President directed the program. DOD stated that attention has been focused to reduce the risks by (1) adhering to proven concepts and technologies and (2) limiting initial support acquisitions until sufficient logistics data has been developed. However, we found little support for this. The design of the B-1B avionics has been changed to incorporate the latest technology, which has yet to be proven, and initial support decisions have not been delayed or limited.

DOD disagreed with our conclusions in the draft report that the program funding and schedule concurrency have precluded taking full advantage of LSA and have increased the risk that operating and support costs will be more than they would have been had normal ILS procedures been employed. DOD stated conscious up-front decisions, such as maximizing commonality with existing weapon systems, which we found was not being emphasized, and preplanned interim contractor support, will ensure the B-1B will be supported when fielded.

We agree that the planned use of contractors to provide intermediate and depot support should ensure adequate support for the B-1B when fielded. However, their use does not decrease the risks that operating and support costs may increase because of a lack of LSA data. For example, maximum use of common support equipment is essential if the B-1B program is to remain within its program support equipment funding baseline of $1.4 billion. As of March 1983, the B-1B program office had only evaluated common support items needed for base-level maintenance. Action to evaluate avionics common support equipment availability could not be taken until a special avionics requirement study was completed in October 1983. According to a Rockwell International official, required avionics common support equipment may cost much more and take longer to get since a lot of it may no longer be in the inventory or may be out of production.

Similar cost increases could be experienced in acquiring automatic test equipment for avionics subsystems. B-1B support equipment managers indicated, during our review, that the avionics manufacturers may need more test stations to develop and validate test program sets (software) within the planned 2 years of interim contractor support than the five test stations being planned for the operational B-1B fleet. In this situation, program officials would have to decide whether to buy

the additional test stations or to extend the time periods for contractor support (2 years for intermediate level and 3 years for depot level).

DOD also disagreed with the conclusions in our draft report that the program cost and concurrency constraints had adversely affected the efforts of program officials to reduce the B-1B life cycle cost (this cost includes development, procurement, and operating and support costs for the 100-aircraft force over 20 years) or prevented the implementation of the DOD initiatives to reduce the development and procurement costs of new weapons. DOD stated the Air Force has a strong B-1B life cycle cost program and has aggressively applied the DOD acquisition improvement program initiatives to the B-1B. Because our support was primarily based on discussions and not on any concrete examples of the effect of these problems, we have dropped them from the final report.

CHAPTER 3

COMBINING THE BUY OF INVESTMENT SPARES AND PRODUCTION COMPONENTS AND BUYING SPARES DIRECTLY FROM VENDORS COULD SAVE MILLIONS

The Air Force is planning to spend billions of dollars for B-1B investment spares[1] and production components during fiscal years 1985-86. Based on experiences in other aircraft procurements, the cost of these spares and production items could be reduced between 10 and 20 percent by combining the orders. Further, the Air Force could save more by buying the investment spares directly from the subcontractors, which manufacture the items, rather than through the associate contractors, which charge an add-on cost of over 30 percent to arrange procurements.

SAVINGS HAVE BEEN ACHIEVED IN OTHER DOD PROGRAMS

The combined procurement procedure, called Spares Acquisition Integrated With Production (SAIP) by the Air Force, is a technique whereby orders for spare parts are consolidated with orders for production components so that the contractor achieves one overall production schedule. Industry consolidates orders to reduce unit production costs. Savings are achieved through economies of scale, which avoids costs resulting from separate orders and manufacturing actions.

In our 1981 report on spares provisioning for new weapon systems (see note 2 on p. 7), we reported the Air Force had achieved significant savings using the procedure to buy certain components on the F-15 and A-10 programs and recommended the combined ordering of production components and spares be directed by DOD on all new weapon programs since it involved changing only the way items are procured. In the A-10 program, the Air Force[2] estimated that use of the procedure to buy 364 items had saved $64 million, or about 14 percent. Subsequently,

---

[1]Investment spares (versus consumable spares) are durable and, when unserviceable, normally can be economically restored to a serviceable condition through regular repair procedures. Consumable spares are discarded when they fail.

[2]SAIP Study - Final Report (Air Force Acquisition Logistics Division, Mar. 1980).

the Navy was directed to use the procedure on the F/A-18 program and was estimating savings of 10 to 20 percent. We believe similar levels of savings may be possible on the B-1B because it will use similar types of spares.

Other advantages

Although reducing the cost of investment spares and production components is the key benefit of using the procedure, the method also provides the advantage of part compatibility (configuration control) between production components and spares and improves early support of new systems by enabling more timely delivery of spares. Having spares delivered in the same configuration as those on the aircraft minimizes the need for modifying spares in stock to the current design of the new aircraft being delivered.

COMBINED PROCUREMENT PROCEDURE SHOULD BE USED TO BUY ALL B-1B INVESTMENT SPARES

Initial Air Force planning indicated that the combined procurement procedure would be used for initial provisioning of B-1B high cost spares--about 15 percent of the total buy. However, during 1982, the Air Force did very little in this regard. Provisioning officials (those responsible for identifying and buying spares) did not identify any spares to be bought using SAIP and did not use the procedure to buy any of the fiscal year 1983 initial spares. They stated the procedure had not been used because the contractors had not completed the necessary logistics support analysis data to identify and quantify spares orders. They indicated, however, that SAIP would be used during the fiscal year 1984 initial spares buys. Provisioning officials stated they were not planning to use the procedure to make any of the replenishment spares buys that will be made following the initial spares buys since SAIP was to be used only during initial provisioning.

We believe the combined procurement procedure should be used to buy all investment spares (initial and replenishment) regardless of how requirements are determined, since requirements for the next fiscal year's buy can be adjusted to correct for any overages or shortages. The Air Force decision not to use the procedure to make the fiscal year 1983 spares buy may have resulted in the loss of between $8.3 million and $16.6 million in savings (10 to 20 percent of the $83 million buy) based on experiences achieved on the A-10 and F-15 and projected on the F/A-18.

SIGNIFICANT SAVINGS CAN BE ACHIEVED IF THE 1985-86 PRODUCTION AND SPARES BUYS ARE COMBINED

Full implementation of the combined procurement procedure to buy all initial and replenishment investment spares during fiscal years 1985-86 could substantially reduce the cost of the B-1B program. During this period, the Air Force plans to buy 82 aircraft at an estimated flyaway[3] cost of $13.2 billion. Investment spares to operationally support the aircraft will cost an additional $1.6 billion. The following chart provides a cost breakout by fiscal year.

Estimated Cost of B-1B Program, Production Components, and Spares

	FY 1985	FY 1986	FY 1987	Total
Program data:				
Number of aircraft	34	48	-	82
	----------millions----------			
Aircraft flyaway cost	$6,331.6	$6,896.7	-	$13,228.3
Production components:				
Avionics systems costs[a]	$1,361.3	$1,482.8	-	$ 2,844.1
Investment spares:				
Initial	$ 449.5	$ 191.7	-	$ 641.2
Replenishment	186.6	271.0	458.6	916.2
Total	$ 636.1	$ 462.7	458.6	1,567.4

[a]The production component cost estimate reflects only the estimated cost of the offensive and defensive components. Cost data on the airframe components was not available.

[3]Flyaway cost includes the cost of the aircraft but not the cost of support equipment and spares.

Use of the combined procurement procedure to buy all B-1B investment spares in 1985-86 could save between 10 and 20 percent if the levels achieved on the F-15 and A-10 programs and projected on the F/A-18 program are achieved on the B-1B buys. Based on the planned production buy of avionics components (cost data on the airframe components was not available) and the total spares buy (avionics and airframe), a 10-percent savings on the B-1B would amount to $440 million. A 20-percent reduction would double the projected savings to $880 million.

Estimated B-1B Cost Savings
Using Combined Procurement Procedure

	FY 1985	FY 1986	Total
	- - - - - - (millions) - - - - - -		
10-percent savings:			
Production[a]	$136.1	$148.3	$ 284.4
Investment spares	63.6	92.2[b]	155.8
Total	$199.7	$240.5	$ 440.2

[a]Production savings relate only to the offensive and defensive avionics components for which cost data was available. Cost data on the airframe components was not available.

[b]Investment spares savings for FY 1986 reflect combining the FY 1986 and 1987 replenishment buys to take advantage of the combined procurement procedure.

INVESTMENT SPARES COST COULD ALSO BE SUBSTANTIALLY REDUCED THROUGH COMPONENT BREAKOUT PROGRAM

Component breakout[4] is a program that DOD advocates whenever substantial net cost savings can be achieved and the breakout does not jeopardize the quality or timely delivery of

[4]Component breakout is a program in which a component used in manufacturing an end item which was provided initially under the prime contract is purchased subsequently by the government either through competitive bidding or directly from the manufacturers.

the end item. Recent studies on contractor price markups by the Defense Inspector General indicated DOD could achieve significant savings on procurement of spare parts by buying directly from the manufacturers. According to Air Force program officials, there is nothing in the contracts with the four B-1B contractors that would prevent them from buying investment spares directly from the manufacturers. Sixty subsystems (15 are part of the avionics systems) have been identified for potential breakout. However, the Air Force is planning to procure all spares for fiscal years 1985-86 through the B-1B contractors and pay an add-on markup of 31 to 37 percent on all spares being manufactured by their subcontractors.

A breakout analysis[5] done by the B-1B program office indicated that 25.2 percent or more could be saved on the items identified. For example, if the 15 avionics subsystems (cost data on the airframe subsystems was not available) for the last 82 aircraft were broken out in fiscal year 1985, the Air Force could save about $401 million, as shown below.

Estimated Savings Using Breakout To Buy 15 Avionics Subsystems

	FY 1985	FY 1986	Total
	(millions)		
Production cost: 15 avionics subsystems identified for breakout	$762.3	$830.4	$1,592.7
Expected rate of savings	25.2%	25.2%	25.2%
Estimated savings	$192.1	$209.3	$ 401.4

The estimate did not include using the combined procurement procedure to buy investment spares.

CONCLUSIONS

The Air Force could achieve significant savings by combining the investment spares and production component orders and buying the investment spares directly from the subcontractors that manufacture the items. Use of the combined procurement procedure to

---

[5] B-1B Component Breakout Program (B-1B Program Office Memorandum, Dec. 23, 1982).

buy all investment spares could save 10 to 20 percent if the levels achieved on the F-15 an A-10 programs and projected on the F/A-18 program are achieved on the B-1B buys. Further, the Air Force could save an additional 25.2 percent or more by buying spares directly from the subcontractors, which manufacture the items, rather than through the four B-1B contractors, which charge an add-on cost of over 30 percent to arrange the procurements.

AGENCY COMMENTS AND OUR EVALUATION

DOD generally agreed with our findings and conclusions that significant savings can be achieved by combining investment spares orders with production orders but disagreed that all investment spares should be bought directly from the subcontractors.

DOD stated the combined procurement procedure (called SAIP by the Air Force) would be implemented to take full advantage of opportunities in fiscal year 1984 and beyond. It subsequently used this procedure during fiscal year 1984 to buy 68 percent of its initial spares and 22 percent of its replenishment spares.

DOD disagreed that all spares should be bought directly from the manufacturers rather than through the four B-1B contractors, stating that some spares must continue to be procured through the four contractors due to the need for quality control and existing warranties. GAO believes that buying directly from the manufacturers should not affect warranty compliance since the manufacturers ultimately are responsible for this. While the manufacturers are now responsible to the four B-1B contractors, they would be responsible to DOD if the Department purchased the spares directly from them.

GAO also believes that there is little quality control over spares that is provided by the four B-1B contractors that could not be readily assumed by the Air Force. However, since there may be some, we have modified our recommendation accordingly.

DOD also stated that buying all spares directly from the manufacturers conflicts with GAO's recommendation to use the combined procurement procedure to buy all B-1B production components and investment spares. GAO believes DOD can comply with both recommendations by having the manufacturers combine the production components and spares orders for price negotiations. This procedure of combining production components and spares for pricing is already being used by the Navy for the F/A-18 aircraft.

In a meeting subsequent to the receipt of DOD's comments, Air Force officials explained that they have an aggressive component breakout program. However, since they had just entered into the multiyear contracting process for the production components at about the time they received GAO's draft report, they felt it was critically important to fully integrate spares raw material buying and fabrication with their production component counterparts. Therefore, a decision was made to pursue the combined multiyear effort in order to capture savings that they estimated would approximate $159 million. In the future as they buy more replenishment spares outside of the multiyear contract, appropriate consideration will be given to buying spares directly from the manufacturer.

RECOMMENDATION

We recommend that the Secretary of Defense direct the Secretary of the Air Force to

--use the combined procurement procedure to buy all future B-1B production components and investment spares and

--buy all investment spares directly from the manufacturers when quality control will not be jeopardized.

CHAPTER 4

REDUCING THE NUMBER OF MAIN OPERATING BASES WOULD SIGNIFICANTLY LOWER PERSONNEL AND SUPPORT COSTS

The Air Force could lower B-1B bomber life cycle costs by reducing the number of planned main operating bases from four to three. The Air Force plans to support 2 squadrons at each of 2 bases--32 aircraft at 1 base and 26 at the other--and 1 squadron of 16 aircraft at each of the remaining 2 bases. If the Air Force consolidated the latter two squadrons at a single base, as it plans to do at base number 2, it could lower initial program costs and operating and maintenance costs over the 20-year cycle of the program through economies of scale. Personnel savings alone could amount to $25 million a year. The Air Force's concern that fewer bases would increase the vulnerability of the alert aircraft could be avoided by using satellite bases.

CONSOLIDATING AIRCRAFT SUPPORT ACTIVITIES IS NOT A NEW IDEA

For a number of years, the Congress and GAO have encouraged DOD to consolidate aircraft support activities to improve efficiency, effectiveness, and economy. As the number of aircraft to be supported increases at a base, economies of scale reduce resource requirements.

A Defense Resource Management Study, prepared by the RAND group and dated February 1979, evaluating alternatives for reducing defense support costs, concluded that significant personnel and support savings would be realized by consolidating the basing for B-52 aircraft. But because these aircraft were already based at that time, the Air Force did not adopt the study's recommendations. We believe that this is an opportune time to consider such basing for the B-1B bomber force.

SIGNIFICANT SAVINGS COULD BE ACHIEVED BY COLOCATING TWO SEPARATELY BASED SQUADRONS

The Air Force plan to deploy a squadron of 16 aircraft at each of 2 separate bases will be costly. Colocating the two B-1B squadrons at one main operating base would reduce staffing requirements, simulator equipment, facilities, support and testing equipment, and spare parts.

Colocating the two squadrons would significantly reduce the staffing requirements because of economies of scale. An operating wing must provide a variety of services whether it has one

or two aircraft squadrons. The personnel needed to provide these services represent a "fixed charge" for an operating unit; as additional aircraft are added, they require proportionately less staffing. The following chart illustrates the staffing requirements for one 16-aircraft squadron compared with the additional staff required for a second squadron.

Staff Requirements Comparison

Function	First squadron				Second squadron			
	Officers	Airmen	Civilians	Total	Officers	Airmen	Civilians	Total
					(additional)			
Aircrews	84	-	-	84	84	-	-	84
Wing/base staff	58	99	2	159	5	8	-	13
Maintenance	24	759	16	799	13	429	9	451
Security	5	303	-	308	-	54	-	54
Base operating support	7	170	50	227	3	75	23	101
Total	178	1,331	68	1,577	105	566	32	703

The reduction of 874 positions for the second squadron (1,577 if - based separately versus 703 if colocated) would reduce pay, allow ances, travel, permanent change of station, training, and other costs by about $25 million a year. (See app. I.)

Simulator

The Air Force plans to buy five B-1B flight simulators--one for each of the four bases and an additional simulator for the Combat Crew Training Squadron. Consolidation of the two B-1B squadrons at one base would reduce the requirement by one simulator at a savings of about $37 million, which consists of about $34.8 million for the simulator plus spares and support equipment costing $2.2 million.

Information provided by SAC officials shows that one simulator can handle the proficiency training required of crews and staff for two squadrons. Based on the Air Force's plan to limit the use of their simulators to 16 hours a day, 6 days a week, 48 weeks a year, 4,608 hours a year are available per simulator.

Other time available during the year would be used for maintenance or modification work on the simulator. The planned training requirements for the crews and staff of two colocated squadrons total less than 4,600 hours.

Facilities

The Air Force plans to spend about $244 million of military construction funds to build facilities to support the B-1B deployment, as shown in the following chart:

B-1B Facilities Costs

Base	Planned no. of aircraft	Estimated cost by fiscal year[a] 1984	1985	1986	1987	Total
		(millions)				
Dyess AFB, Texas	26[b]	$8.80[c]	$53.64	$ 14.13	$ -	$ 76.57
#2	32	-	31.59	12.99	-	44.58
#3	16	-	-	44.50	-	44.50
#4	16	-	-	53.93	24.40	78.33
Total	90[d]	$8.80	$85.23	$125.55	$24.40	$243.98

[a]According to SAC officials, these costs are subject to change.

[b]Includes 10 aircraft assigned to the Combat Crew Training Squadron used for training B-1B crews.

[c]Includes other than B-1B costs.

[d]Basing of the 10 aircraft being bought for attrition has not been determined.

According to SAC officials, the need to construct a nuclear storage facility at base #4 was the primary reason why the facilities cost at this base will be higher than that at base #3. Therefore, consolidating the two squadrons at a base that has a nuclear storage facility like base #3 or any of the other potential bases which SAC has identified should cost substantially less than the $78.33 million planned for the facilities at base #4.

Rockwell's B-1B Facilities Requirements Plan shows that increasing the number of aircraft from 16 to 32 does not significantly increase many major facility requirements. However, requirements such as taxiway, apron, hangar, maintenance dock, and base supply warehouse have yet to be determined.

Support and test equipment

Consolidation of the two B-1B squadrons could result in significant savings in avionics support and testing equipment. Current plans are to have an avionics intermediate shop, responsible for testing and repairing avionics components, at each base.

These shops require expensive sophisticated equipment and highly trained technicians. As shown below, consolidation of the two B-1B squadrons would reduce the cost equipment requirements by an estimated $18 million. However, if our recommendation in chapter 5 to eliminate all avionics intermediate shops at base level is adopted, then there would be no savings as the bases would not have any shops to consolidate.

Avionics Intermediate Shop Comparison[a]

Items	Cost of two separately based shops	Cost of consolidating two shops at one base	Difference
	----------millions----------		
Automatic test equipment[b]	$13.24	$12.62	$ 0.62
Dedicated support equipment	5.90	5.35	.55
Spares	4.80	4.66	.14
Interface test adapters	16.00	8.00	8.00
Test program sets	17.62	8.81	8.81
Total	$57.56	$39.44	$18.12

[a]Information is based on Rockwell's B-1B Intermediate Avionics Support Equipment Study (July 1982).

[b]Includes government-furnished automatic test equipment.

Spare parts

Previous studies, including the February 1979 Defense Resource Management Study, have shown that a reduction in spare parts costing several million dollars is possible by consolidating base stockage requirements. The study shows there is a direct savings in spares safety-level requirements and base stocks. The larger workload scale at the consolidated base repair activity can be expected to improve base repair capability so that fewer items need to be sent to the depot for repair. In addition, the number of spare parts needed for insurance or contingency requirements will be reduced because of fewer bases.

Because of the newness of the program, spare parts requirements have not been determined. Therefore, the magnitude of possible spares reductions cannot be estimated at this time.

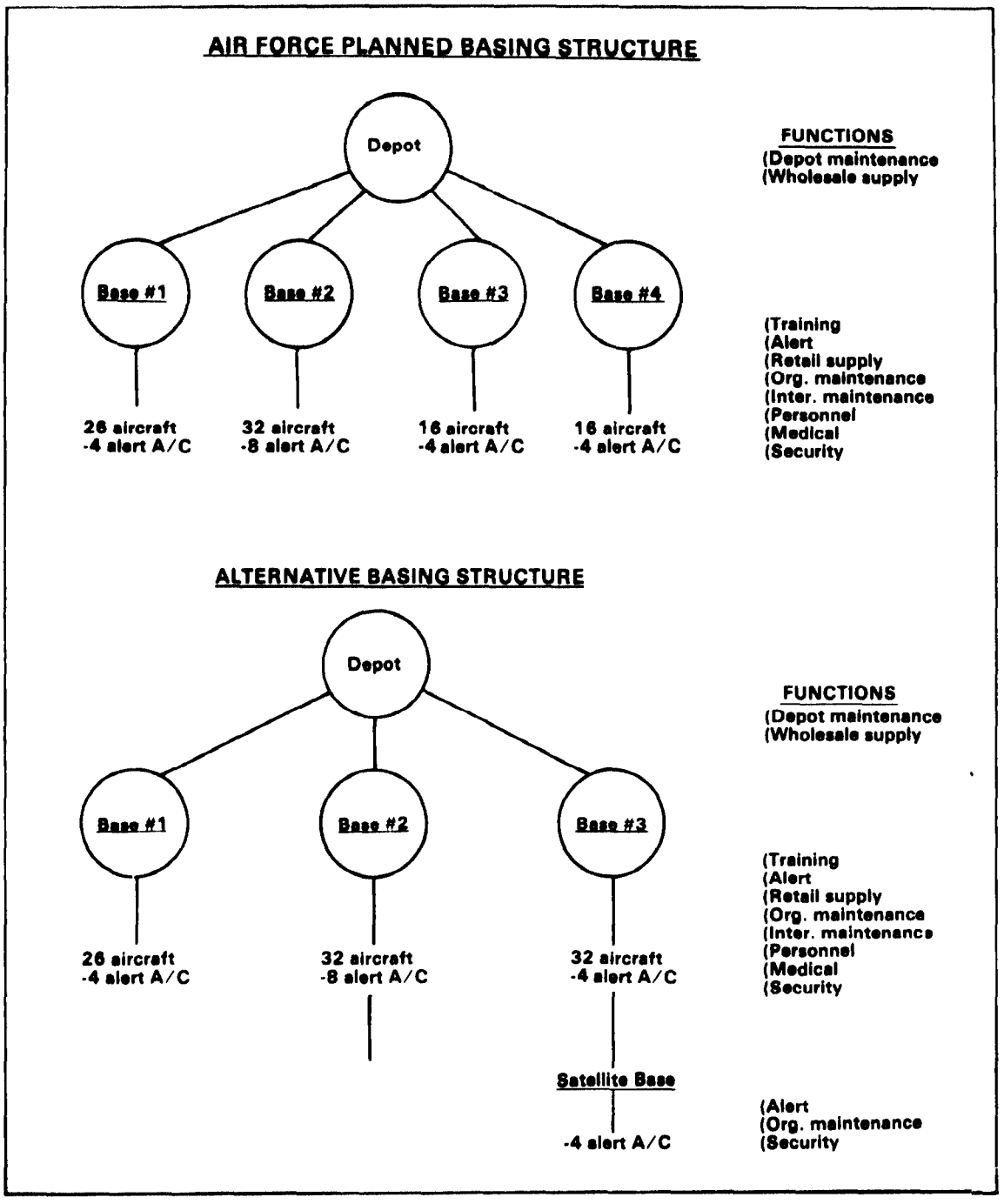
AIR FORCE VULNERABILITY CONCERNS

SAC officials oppose reducing the number of B-1B bases because aircraft on alert would be more concentrated at fewer bases and thus more vulnerable to and less likely to survive a no-warning attack. However, one option to be considered is satellite basing,[1] an option approved by SAC. With part of the alert aircraft at an alternate location, the alert force survivability could remain at least equivalent to the planned Air Force structure because the number of alert aircraft and number of alert bases remain the same.

The Rockwell basing plan shows that 4 of 16 aircraft assigned to a base are on alert at all times. The four alert aircraft are fully fueled and loaded with nuclear weapons, and crews are standing by for takeoff within minutes after notification. The following chart compares the number of assigned aircraft with the number of alert aircraft under the Air Force four-base support plan and the alternative three-base support plan.

---

[1]The satellite base may be any airfield that can be used to arm, fuel, or repair disperse alert aircraft.



By using satellite basing in conjunction with consolidating base #3 and base #4, the number of alert aircraft and the number of bases with alert aircraft remain the same. Since aircraft will be on alert for only 30 days with crews rotated weekly, it should be easy to maintain the alert aircraft at the satellite base. The B-1B is being designed to stand alert, with minimum maintenance, for up to 90 days at a time. Any problems with the alert aircraft, we believe, could be corrected by a mobile maintenance team which SAC plans to maintain at each main operating base.

The Defense Resource Management Study recommended satellite basing for B-52 aircraft to reduce operating and support costs while maintaining mission capability. The study proposed a reallocation of support activities to a limited number of bases while retaining other bases as alert dispersal sites. Under this concept, the number of alert aircraft and bases with alert aircraft remains unchanged; therefore, the vulnerability of the alert aircraft remains equivalent to the existing B-52 basing structure.

The Air Force has not assessed the cost of satellite basing. Although costs are associated with satellite basing, the Defense Resource Management Study showed that they should be minimal compared with the savings realized through consolidation.

CONCLUSIONS

Economies of scale are available to the Air Force by consolidating two squadrons at one base. These economies include savings in personnel, simulator equipment, facilities, support and testing equipment, and spares requirements. Colocating the two squadrons at one base could potentially save as much as $78 million in facilities costs and $55 million in support equipment and flight simulator costs and could lower personnel costs by about $25 million per year.

AGENCY COMMENTS AND OUR EVALUATION

DOD disagreed with our conclusions that the Air Force could significantly lower B-1B bomber life cycle costs by reducing the number of planned main operating bases from four to three. DOD said the savings estimates are overstated since satellite basing of some of the alert aircraft would involve costs similar to those of a main base regarding nuclear storage, facilities, support, and avionics maintenance shops.

DOD's statements conflict with Strategic Air Command documents and the Defense Resource Management Study which show the cost of satellite basing would be minimal since most of SAC's bases have the requirements (nuclear storage, fuel, and security) needed to support deployed B-1B's. Since the B-1B is being designed to stand alert for up to 90 days at a time with little or no maintenance, it will not require the level of maintenance support required by the old B-52, which the Air Force found uneconomical to satellite base.

DOD also stated that the basing concept is inherently part of the requirement and consolidation would unacceptably impact the level of deterrence provided by the B-1B. Deterrence and survivability are important national security issues involving military judgments and are primarily the responsibility of DOD. Therefore, we are not making a recommendation on the matter.

However, because of the opportunities for significant savings from consolidation, this question was raised several times during hearings of the DOD appropriations for fiscal year 1985. Since the issue may be pursued further in subsequent years, we are retaining the results of our analysis in this report.

CHAPTER 5

CENTRALIZING AVIONICS MAINTENANCE COULD REDUCE SUPPORT COSTS AND IMPROVE THE QUALITY OF REPAIR

Centralizing avionics maintenance, rather than having each base independently support its own aircraft, has proven effective for other Air Force weapon systems and should be considered for the B-1B. Centralizing of B-1B avionics repairs at the B-1B airframe and engine depot repair facility could reduce the procurement cost of automatic test equipment and associated component test program sets by as much as $85 million and reduce annual personnel and operating costs by about $15 million.

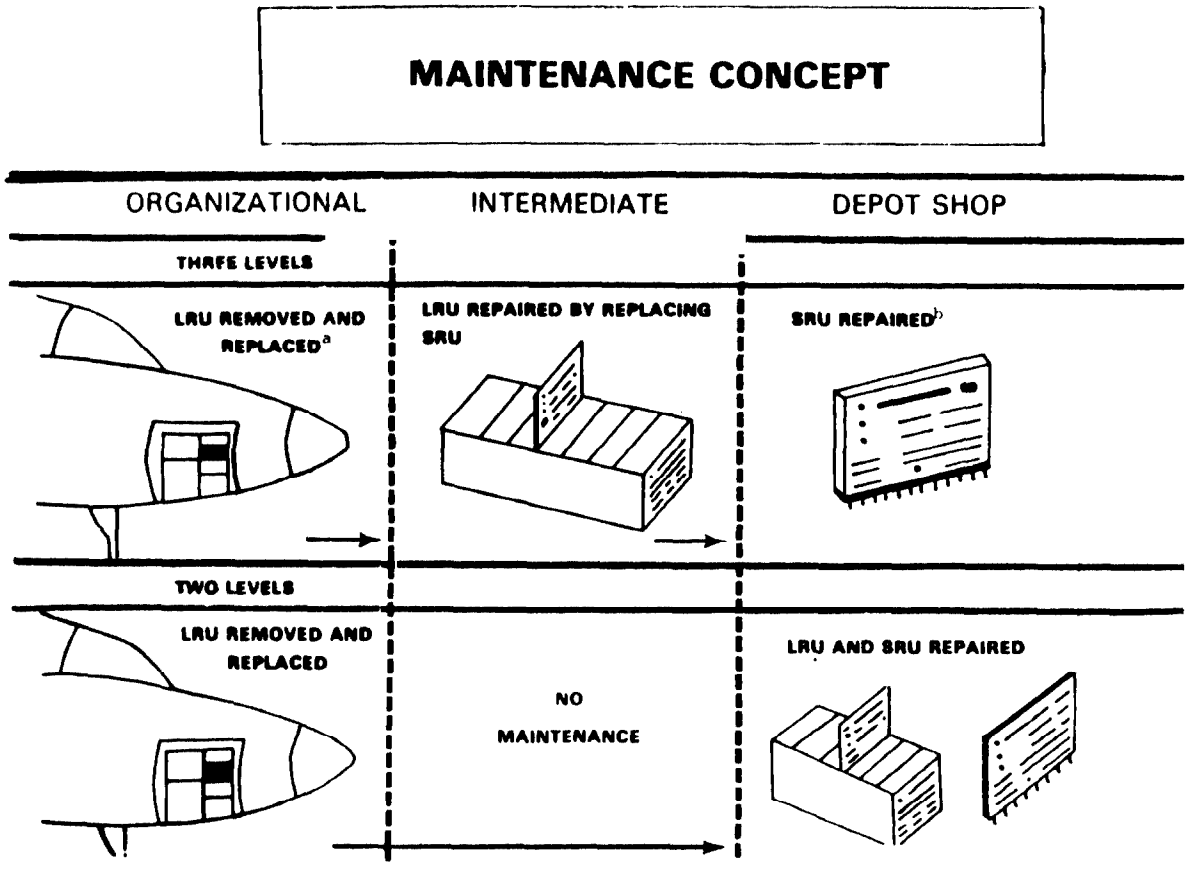
CENTRALIZING AVIONICS MAINTENANCE HAS BEEN PROVEN COST EFFECTIVE

Centralizing avionics repair is not new. It has been used by the Air Force since 1975 to support F-4 aircraft based in Japan, Korea, and the Philippines. The establishment of the centralized F-4 avionics repair facility at Kadena Air Base, Okinawa, Japan, was so successful that the Air Force decided to establish a similar facility in Europe to support deployed A-10 aircraft and in the Pacific to support deployed F-15 aircraft. The Defense Resource Management Study, on supporting A-10 aircraft in Europe, concluded it would produce significant savings in operating and support costs. The study showed that centralization of the A-10 avionics repair would not only reduce costs but would also offer opportunities for improved quality of component repair and a reduction in the percentage of items requiring depot level repair similar to those experienced in the Pacific for the F-4 aircraft. The study stated that centralization of F-4 repair had reduced the not-reparable rate by 20 percent, had improved the quality of repair by 30 percent, and had reduced the number of reparable spares being shipped to the depot by 50 percent. DOD stated the F-4/A-10 examples are not relevant since they were being supported for tactical missions while the B-1B must be supported for a strategic nuclear role. However, we see no relationship of mission roles to where repairs are done.

TWO-LEVEL AVIONICS MAINTENANCE HAS BEEN PROPOSED FOR ALL FUTURE SYSTEMS

A 1980 Air Force study of the current avionics maintenance concept by the Acquisition Logistics Division at Wright-Patterson Air Force Base, Ohio, concluded that the Air Force

should stop repairing avionics components at the base (intermediate) level and use only two-level maintenance for all future avionics systems.



Source: Air Force 1980 Study.

[a]LRU - line replacement unit.
[b]SRU - shop replacement unit

The conclusion was based on a cost-effectiveness analysis of this method to support 12 F-15 units (24 aircraft each) over a 15-year life cycle. The analysis indicated that cost aviodances for support equipment and personnel, in excess of 70 percent, would more than offset the stockage costs of additional spares

to cover the time, normally 60 to 75 days, to ship and repair parts at a depot.

A 1982 Air Force Scientific Advisory Board Study[1] on making greater use of the advanced electronics technology reached the same conclusion. The study found that the use of advanced electronics technology had improved reliability to such a degree that having three levels of avionics maintenance was not cost effective. The study stated new avionics should be designed to allow for two level maintenance. It stated that this was vital because the current avionics intermediate shops are complex and expensive to buy and operate.

CENTRALIZING B-1B AVIONICS REPAIRS COULD PRODUCE SIGNIFICANT SAVINGS

The Air Force is planning to operate an intermediate avionics repair shop at each of the planned B-1B bases. Procurement of automatic test equipment and associated components at the planned four bases will cost an estimated $122 million and over $432 million in personnel and operating costs over a 20-year life cycle. Centralizing the B-1B avionics repair at the B-1B airframe and engine depot repair facility could greatly reduce these costs and could improve the quality of repair since the work would be done by experienced civilian technicians and not by military technicians who generally are less experienced.

Less support equipment would be needed

Centralization of the B-1B avionics repair at a dedicated depot facility should greatly reduce the planned buy of automatic test equipment and associated component test program sets. As we demonstrated in our 1979 report,[2] as the number of aircraft to be supported increases, there is often less than a proportional increase in equipment needs. Base level repair shops are seldom fully used even during wartime. The Air Force study on repairing all F-15 avionics components at the depot versus repairing them at individual bases concluded that elimination of base level avionics repair shops would reduce the

---

[1] The Application of Advanced Electronics to Air Force Systems (Air Force Scientific Advisory Board Ad Hoc Committee, Dec. 1982).

[2] Centralizing Air Force Aircraft Component Repair in the Field Can Provide Significant Savings (LCD-79-409, Mar. 28, 1979).

cost of avionics support equipment by about 70 percent. Assuming B-1B centralization would produce similar economies of scale (Air Force officials indicated B-1B shops will be using equipment very similar to that used at F-15 shops), then the cost of avionics test equipment could be reduced by over $85 million, as shown in the following schedule.

Avionics Shop Equipment Cost[a]

Base	Automatic test equipment	Test program sets	Total
	(millions)		
Dyess AFB	$23.92	$ 8.70	$ 32.62
Base #2	17.84	8.70	26.54
Base #3	27.66	8.70	36.36
Base #4	17.84	8.70	26.54
	$87.26	$34.80	122.06
Projected cost for centralized shop (30%)			36.62
Projected procurement savings			$ 85.44

[a]Information is based on 1983 cost estimates by the B-1B program office.

Personnel costs would be much lower

Avionics maintenance personnel costs are generally directly related to the number of test shops to be operated. This relationship was demonstrated during the F-15 centralization study. It showed that elimination of base level avionics repair shops would reduce personnel costs by about 70 percent, the same reduction rate for support equipment. By centralizing the B-1B avionics repair, personnel costs could, therefore, be reduced as much as $9.1 million annually, as shown in the following schedule, or over $180 million through the projected 20-year life cycle.

Base Avionics Shop Personnel Costs

	Aircraft	Officers	Enlisted	Civilians	Total
Dyess AFB	26	6	197	6	209
Base #2	16	6	148	4	158
Base #3	32	9	258	6	273
Base #4	16	6	148	4	158
Total		27	751	20	798
Air Force cost per individual, FY 1983		$34,361	$15,474	$23,232	-
		----------millions----------			
Total annual cost		$0.93	$11.62	$0.46	$13.0
Projected personnel cost for centralized depot (30%)					3.9
Projected annual savings					$ 9.1

Operating costs would be reduced

Reducing the number of avionics test shops should result in similar reductions in operating costs. Annual operating costs for the B-1B avionics test equipment are being projected by Air Force program officials at around 10 percent of the unit purchase cost. Reducing the quantity of B-1B avionics test equipment through centralization could, therefore, reduce operating costs by about $6.1 million annually or by over $122 million over the projected 20-year life cycle, as the following table shows:

Operating Costs Comparison

	Four B-1B bases	Centralized facility	Savings
	----------(millions)----------		
Avionics shop procurement cost	$ 87.26	$26.18	$ 61.08
Annual operating cost[a]	8.70	2.60	6.10
20-year operating cost	174.00	52.00	122.00

[a]10 percent of procurement cost.

Overall spare parts costs should not rise

Centralization of the avionics repair at the B-1B airframe and engine depot repair facility would require a higher stockage of line replacement units at the bases to compensate for a normal depot repair cycle of 60 to 75 days. The normal cycle usually involves 15 to 16 days' shipping time to and from the depot and 45 to 60 days at the depot awaiting/being repaired. Normally depots do not repair an item as soon as it arrives. They wait to batch process them so as to keep costs down. However, if the repair cycle was reduced to 7 to 10 days, which Air Force officials have indicated would be possible if a daily transportation system between the B-1B bases and the B-1B airframe and engine depot repair facility was provided, then a much lower stock level would suffice. With this in mind, the costs for any additional base stock levels should be more than offset by the savings from not having to stock shop replacement units at each base.

CONCLUSIONS

Centralization of avionics repairs has been proven cost effective for other Air Force weapon systems and should be considered for the B-1B. Centralization of B-1B avionics repairs at the B-1B airframe and engine depot repair facility would improve the quality of repair and could result in significant savings in the procurement cost of automatic test equipment and associated component test program sets and in annual personnel and operating costs.

AGENCY COMMENTS AND OUR EVALUATION

DOD disagreed with our conclusions that centralization of avionics repair should be considered for the 100-aircraft B-1B force. They stated the technologies to implement two levels of maintenance had not yet been fully demonstrated and are too risky for B-1B use at this time. They stated the Air Force had done four studies on centralizing the B-1B avionics repair and concluded there would be little or no cost savings.

We agree that two-level maintenance of avionics systems on today's aircraft has not been fully demonstrated; however, we believe the risks would be minimal if a dedicated avionics repair facility was established at Oklahoma City Air Logistics Center to repair all peculiar B-1B line replacement and shop replacement units. Such a facility, according to Air Force officials, would be able to repair and return all defective line

replacement units to the B-1B bases within 7 to 10 days, if transportation between the depot and B-1B bases was provided daily.

None of the four Air Force studies looked at the concept being proposed. All these studies reviewed the cost effectiveness of centralizing the intermediate avionics maintenance shops at the Oklahoma City Air Logistics Center or at one or two of the B-1B bases. In all these studies, however, depot repair of B-1B shop replacement units was to be done in the normal way--shipped to Warner Robbins Air Logistics Center, which is the Air Force designated avionics repair facility, to be repaired within the normal turnaround time of 45 to 60 days. Our proposal instead envisions using one dedicated depot to do all avionics maintenance for the B-1B, without using any intermediate maintenance shops.

RECOMMENDATION

We recommend that the Secretary of Defense evaluate the merits of (1) repairing all B-1B avionics components at the B-1B airframe and engine depot repair facility and (2) not establishing any avionics maintenance repair shops at each of the planned B-1B bases.

COST COMPARISON OF THE B-1B PERSONNEL REQUIREMENTS (FISCAL YEAR 1983[a])

	--------(millions)-------		
Two squadrons separately based (16 aircraft each)			
Officers' pay and allowance	$13.1		
Enlisted personnel's pay and allowance	44.9		
Civilians' pay	3.1		
Total pay		$61.1	
Permanent change of station (PCS)	2.3		
Base operating support (BOS nonpay)	6.9		
Medical nonpay	1.6		
Acquisition	2.4		
Training	5.6		
Total mission support costs		18.8	
Military retirement	15.3		
Civilian retirement	.6		
Civilian benefit	.2		
Total retirement costs		16.1	
Total costs			$96.0
Two squadrons colocated (32 aircraft)			
Officers' pay and allowance	10.4		
Enlisted personnel's pay and allowance	32.0		
Civilians' pay	2.3		
Total pay		44.7	
PCS	1.7		
BOS nonpay	4.9		
Medical nonpay	1.2		
Acquisition	1.8		
Training	5.0		
Total mission support costs		14.6	
Military retirement	11.2		
Civilian retirement	.5		
Civilian benefit	.1		
Total retirement costs		11.8	
Total costs			$71.1
Savings in personnel which would result through the consolidating of two B-1B squadrons at one base			$24.9

[a]SAC headquarters prepared the cost comparison.

24492

AN EQUAL OPPORTUNITY EMPLOYER

UNITED STATES
GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE,$300

POSTAGE AND FEES PAID
U. S. GENERAL ACCOUNTING OFFICE

THIRD CLASS