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Review Of BLU-63/B Bomblet Program B-173803

Department of the Air Force

**BY THE COMPTROLLER GENERAL
OF THE UNITED STATES**

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JAN. 14, 1972



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

B-173803

JAN 14 1972

R Dear Mr. Stubblefield:

2 This is to reply to the August 1, 1971, letter from you and Representative Donald D. Clancy, expressing concern over continued procurement of BLU-63/B bomblets in view of the technical, production, and cost problems that had been encountered. You asked that we review the BLU-63/B program, especially the Air Force decision to replace the BLU-26/B bomblet with the BLU-63/B. 35

The details of our review are provided in the enclosure. Our basic findings regarding the BLU-63/B program are as follows:

1. Serious production problems have been encountered by the initial BLU-63/B producer, and the contractor still is having trouble meeting specifications. Deliveries of BLU-63/Bs from the second producer are scheduled to begin in January 1972. The time needed to resolve BLU-63/B production problems may not be a critical factor, since Air Force inventory data indicates that the supply of BLU-26/B bomblets will be adequate to meet presently forecast needs through December 1972. The forecast was made, however, prior to the increased bombing activity that took place during December 1971.
2. Price was the primary factor influencing the selection of the contractor for initial production. The proposals of four other contractors were rated higher, technically, than the proposal of the winning contractor.

We believe that the new contractor should have been required to successfully produce a limited number of the BLU-63/B bomblets, to develop any necessary changes in the drawings and specifications before beginning volume production.

3. Although the Air Force operational-type tests of production items are not completed, results to date have

revealed certain deficiencies affecting reliability of the new item. In our opinion, these deficiencies are serious. We are unable to conclude whether they will or can be overcome.

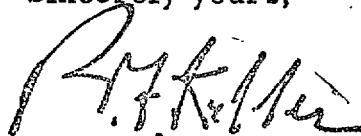
4. We believe that, on the basis of test results published to date, the BLU-63/B potentially is slightly more effective than the BLU-26/B. On the basis of a comparison of prices under the first two BLU-63/B production contracts with the most recent prices for BLU-26/Bs, the BLU-63/B is a somewhat cheaper item. We believe that it will continue to be slightly cheaper than the BLU-26/B, since it is at the beginning of its production learning curve whereas the BLU-26/B is far into its learning curve. In reaching this conclusion we have made allowance for the fact that the price agreed to by the first BLU-63/B producer is probably very low and may not permit a profit. The price probably cannot be expected to be much, if any, lower in a follow-on buy from this producer.

The enclosure containing the details of our investigation is being provided to Representative Clancy. It is being furnished to Representative Charles E. Wiggins at his request.

We have not obtained formal comments from the Department of the Air Force, but we have informally discussed the factual matters set forth in the enclosure with Air Force representatives.

Sincerely yours,

[Deputy]



Comptroller General
of the United States

Enclosures - 15

C| The Honorable Frank A. Stubblefield
House of Representatives

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ABBREVIATIONS

ADTC	Armament Development and Test Center
DCAS	Defense Contract Administration Services
OT&E	operational test and evaluation
Pre-OT&E	pre-operational test and evaluation

REVIEW OF BLU-63/B BOMBLET PROGRAM

CHAPTER 1

INTRODUCTION

The General Accounting Office (GAO) reviewed the Air Force program to procure BLU-63/B bomblets to fulfill future requirements heretofore served by BLU-26/B bomblets.

Both bomblets are about the size of baseballs (see fig. 1, p. 2, and fig. 2, p. 3) and are similar in function. Both are submunitions designed for use as part of a larger munition. These are primarily used as cluster bombs, clamshell-like dispensers filled with several hundred bomblets. When the dispensers are dropped from an airplane, they open and release the bomblets. (See fig. 3, p. 4.) The bomblets scatter and, depending on the bomblet fuse, explode on impact or at random-time intervals up to an hour or more after impact.

The BLU-26/B uses shrapnel of steel balls, and the BLU-63/B uses shrapnel of steel fragments. The BLU-26/B metal parts are made using die-cast aluminum to form the matrix for a hemisphere with aerodynamic flutes containing the steel balls. The aerodynamic flutes catch the airstream to spin the bomblet so that it arms while it is falling. The two hemispheres are joined with a crimp strap to form the ball-like bomblet. (See fig. 1, p. 2.)

The BLU-63/B metal parts are made by using a steel-stamping process in which flat sheet steel is taken through a rolling press and is scored in diamond-like shapes. The scored steel is stamped into hemispheres which form the fragmenting steel inner shell. The inner shell is encased in a stamped-steel cover which has aerodynamic flutes and a crimp flange which is used to join the two hemispheres to form the ball-like bomblet. Both types of bomblets must be loaded with an explosive charge and a fuse before the two hemispheres are joined together. (See fig. 2, p. 3.)

We reviewed pertinent documentation on development, pricing, contract award, production, contract administration,

FIGURE 1 BLU-26/B

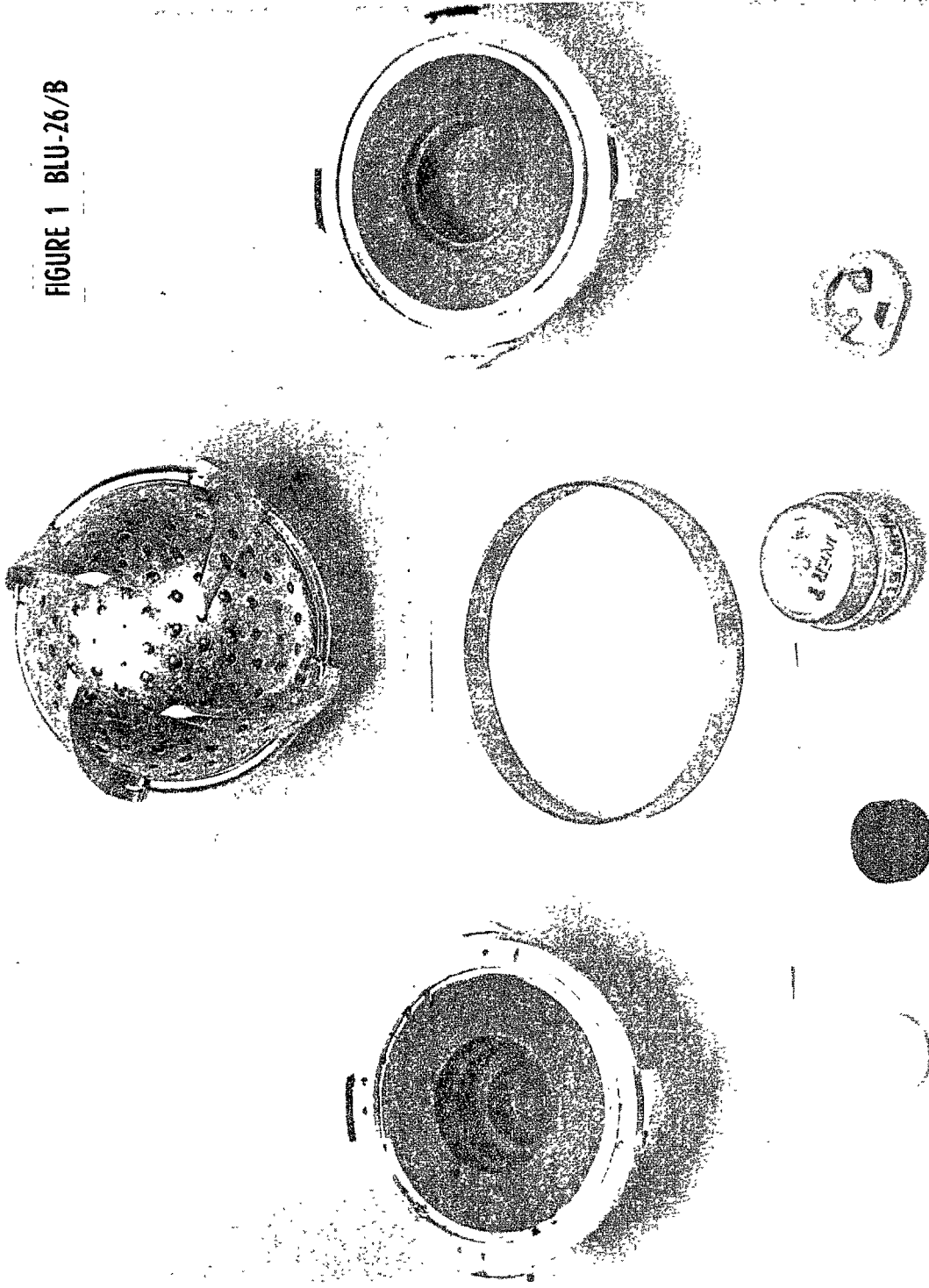
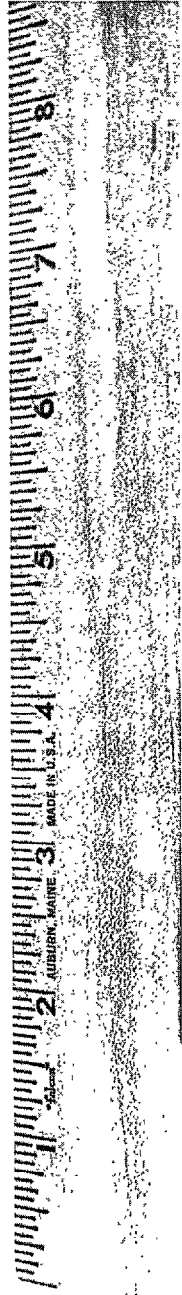
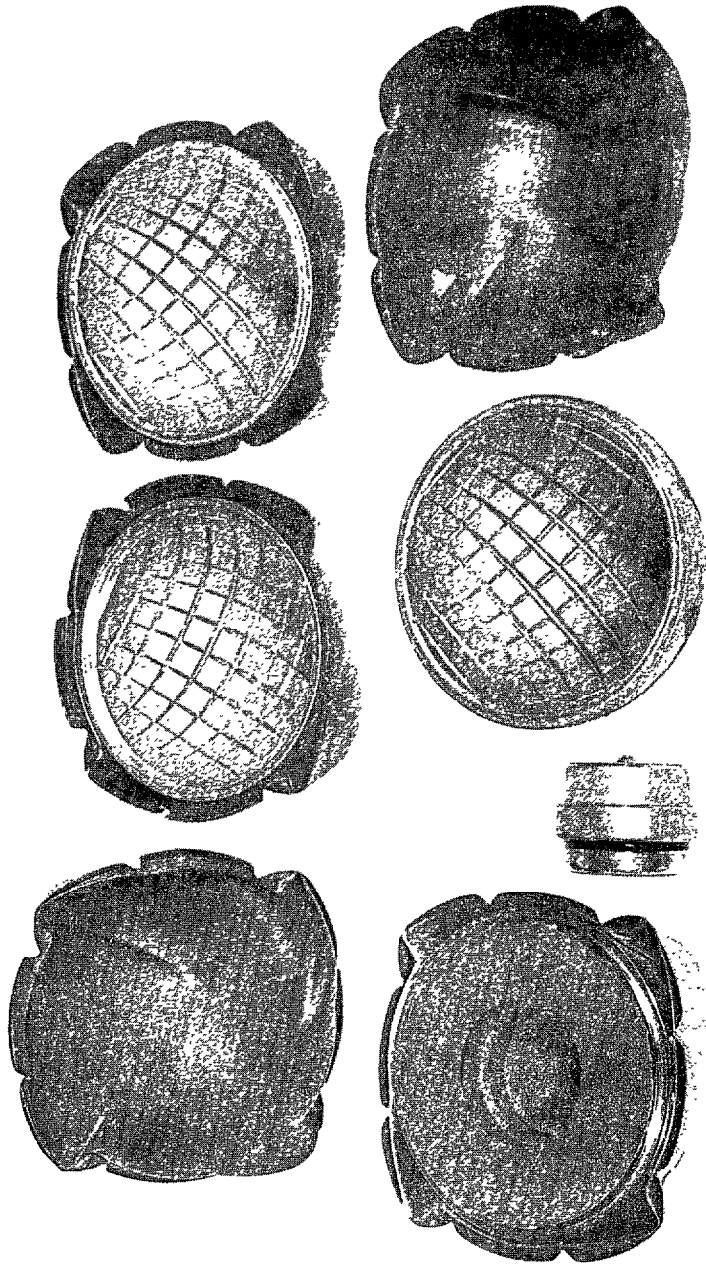


FIGURE 2 BLU-63/B



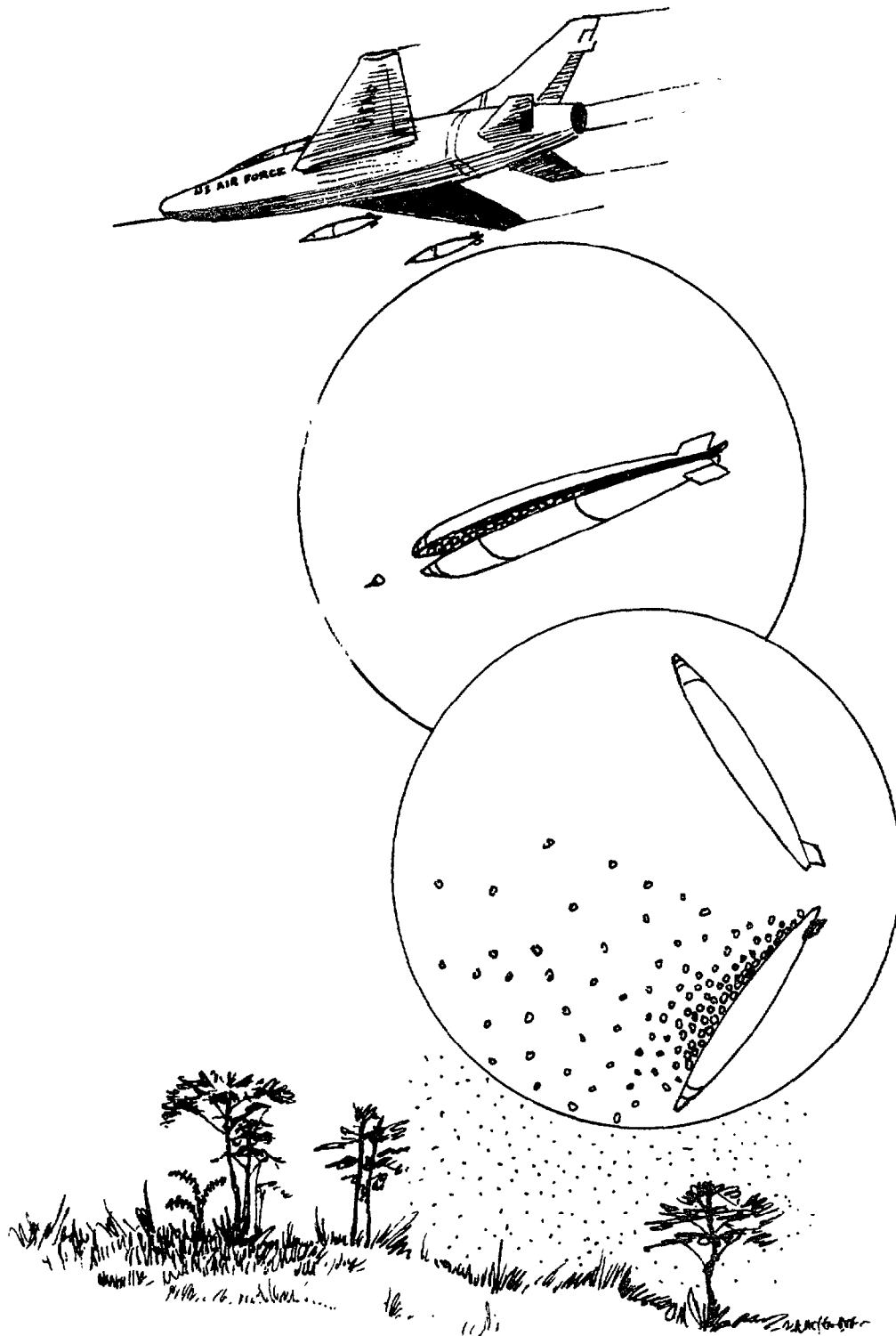


FIGURE 3 SUU-30/B DISPENSING SEQUENCE

testing, and inventory status. The major part of this review was performed at the Air Force Armament Development and Test Center (ADTC), Eglin Air Force Base, Florida, and at the Ajax Hardware Manufacturing Company, City of Industry, California. ADTC is a field command of the Air Force Systems Command and is responsible for the development of Air Force munitions as well as for awarding production contracts for these items until development and testing are complete. Ajax Hardware Manufacturing Company was awarded the first production contract for BLU-63/Bs. Review work at ADTC was completed on November 19, 1971, and at Ajax on September 29, 1971.

We obtained information from the Army's Picatinny Arsenal, Dover, New Jersey; Hoffman Electronics Corporation, El Monte, California; Honeywell, Inc., Hopkins, Minnesota; Avco Corporation, Richmond, Indiana; and Ogden Air Materiel Area, Ogden, Utah. We met with representatives of Systems Command Headquarters, the Air Force Chief of Staff, the Secretary of the Air Force, and the Office of the Secretary of Defense.

CHAPTER 2

DEVELOPMENT OF THE BLU-63/B

REASON FOR DEVELOPMENT

Development of the BLU-63/B bomblet began late in 1966 following receipt by ADTC of an unsolicited proposal from the Avco Corporation on September 9, 1966. Avco proposed a replacement item for the BLU-26/B bomblet that would be more effective and less expensive. The Air Force accepted the proposal primarily because of anticipated steel-ball and tooling shortages needed to make the BLU-26/B.

By message dated September 14, 1966, the Air Force Chief of Staff directed the Air Force Systems Command to initiate development of the scored bomblet (BLU-63/B), provided that it could be shown to be more effective and cheaper. The Chief of Staff directed Systems Command, as quoted below, not to go into production with the new bomblet unless greater effectiveness could be demonstrated.

"*** Current version of BLU-26/B is a highly reliable item with excellent incendiary side effects. If stamped bombs do not present same effects, these bombs may not be suitable replacements for die cast BLU-26/B bomb. AFSC [Air Force Systems Command] should not initiate production or procurement of any stamped replacement for the BLU-26/B until reliability and effectiveness is completely proven and validated with statistical samples of adequate size to demonstrate better effectiveness ***"

ADTC negotiated a development contract with Avco, effective December 1, 1966. In June 1969 Avco completed work under the contract which had a final value of about \$244,000.

In May 1967 the Air Force Armament Laboratory at ADTC decided that the BLU-26/B could be produced in adequate quantities to meet production requirements. Nonetheless, development of the BLU-63/B was continued in anticipation of providing a more effective bomblet for use against materiel targets, especially anti-aircraft artillery sites which

were to be one of the bomblet's primary targets. To make the bomblet more effective against these sites, bomblet fragment weight was increased almost 50 percent during development. With increased fragment weight and with higher fly-off velocities due to a greater volume of explosive, the BLU-63/B was expected to result in greater effectiveness.

In March 1969 the Systems Command had indications that BLU-26/B output was again reaching total production capacity and requested ADTC to investigate alternatives to meet BLU-26/B-type bomblet requirements.

A cost study dated March 14, 1969, prepared by ADTC for the Systems Command showed that it would have been more economical to have increased steel-ball production capacity to meet BLU-26/B bomblet production needs than to have facilitated a new contractor to produce the BLU-63/B. The study showed that there would have been savings in BLU-26/B production costs as well as in loading, assembling, and packing costs. Systems Command personnel were unable to advise us of the consideration given to this study.

DEVELOPMENT TESTING

BLU-63/B development testing included wind-tunnel, static-fragmentation, and flight tests. Wind-tunnel tests were conducted to establish an exterior shape that would provide the best aerodynamic characteristics. Static-fragmentation tests, i.e., detonation of live bomblets in test arenas, were made to provide data on fragment size and velocity for use in calculating bomblet lethality against personnel and materiel targets. The Air Force flight tested BLU-63/B and BLU-26/B bomblets (but not against targets) to compare aerodynamic characteristics, ground-pattern size and shape, and dud rates.

In flight-testing the BLU-63/B, two SUU-30A/B dispensers and 12 CBU-27A/B canisters were filled with quantities of BLU-63/B and BLU-26/B bomblets and were released to open at varying altitudes. Since the two types of bomblets were contained in the same dispensers and canisters, their test results could be compared directly.

The tests showed that, for similar release conditions, the BLU-63/B had a lower dud rate (fuse-nonfunction rate), produced dispersal patterns which were similar but more evenly distributed than those of the BLU-26/B, and tended to break apart on ground impact at dispenser-opening altitudes below approximately 1,000 feet.

The comparison tests indicated that the BLU-63/B could not survive satisfactorily surface impact at high velocity as well as the BLU-26/B could. Of 261 BLU-63/B bomblets recovered after being dropped from a SUU-30A/B dispenser traveling at about 850 feet per second when the dispenser opened at an altitude of 1,074 feet, 106 bomblets, or 41 percent, broke in half upon impact on a sandy, grass-covered area. The breakups were attributed to crimp failure. No impact failures were reported among the 400 BLU-26/B bomblets recovered from the same dispenser.

The number of BLU-63/B bomblet breakups noted among those released from the SUU-30A/B dispenser which opened at an altitude of 1,579 feet while traveling at a speed of about 850 feet per second was not significant. The fewer breakups noted from this release were attributed to the dispenser's opening at a higher altitude which gave the bomblets more time to slow down before impact.

No impact failures were reported for bomblets released from another type of container, the CBU-27/B canister. These bomblets also fell on a grassy, compacted sand and clay test range.

The BLU-63/B bomblets that broke in half on impact had a single crimp to hold the cover sections together. In attempting to increase bomb-separation strength by 50 percent, the single crimp was modified to a double crimp. Recent pre-operational test and evaluation (pre-OT&E) conducted at Eglin Air Force Base showed, however, that production units with the double crimp could not satisfactorily survive high-velocity impact on an asphalt surface or on a soft, grassy surface. (See p. 31.)

We were advised that the significance of bomblet breakup was dependent on the type of fuse used in the bomblet. Breakup is not considered a problem if an impact fuse

is used, since detonation occurs before breakup. It is a serious problem if a time-delay fuse is used. We were advised by the BLU-63/B Program Officer and by Systems Command personnel that the Air Force had no defined requirements at that time for using a time-delay fuse with the BLU-63/B.

ADTC attributed the lower BLU-63/B dud rates at lower dispenser-opening altitudes, demonstrated by the comparison tests, to its apparent ability to achieve the necessary spin rate for arming faster than the BLU-26/B. No testing was performed at higher opening altitudes where the bomblets have more time to arm.

Other tests do not show that the BLU-63/B arms faster than the BLU-26/B under all conditions. Spin-acceleration tests conducted during the period January to March 1968 at the Arnold Engineering Development Center showed the BLU-63/B arming time to be dependent on bomblet speed and yaw angle.

COMPARATIVE EFFECTIVENESS

BLU-63/B effectiveness against five targets was calculated by Avco on the basis of the fragmentation data obtained from the static-fragmentation tests described above.

BLU-26/B effectiveness previously had been calculated by Honeywell, Inc., the developer of the BLU-26/B, on the basis of fragmentation data obtained from static-fragmentation tests conducted during BLU-26/B development. In Honeywell's tests seven BLU-26/B bomblets were detonated in test arenas which measured not only fragment velocity and distribution but also the capability of bomblet steel balls to perforate different metals at varying distances. The Army's Picatinny Arsenal statically detonated 11 additional BLU-26/B bomblets to measure initial fragmentation velocity.

The results of a comparison of BLU-63/B and BLU-26/B effectiveness data indicated that the BLU-63/B was somewhat more effective against materiel targets but somewhat less effective against personnel targets. An Air Force officer from the Office of the Air Force Chief of Staff advised us that his office did not accept ADTC's conclusion that the BLU-26/B was more effective against personnel targets. He stated that ADTC's conclusion was determined by the fact that BLU-26/Bs fall over a somewhat wider area than do BLU-63/Bs when dropped from the same altitude. He indicated that the BLU-63/B was clearly more effective than the BLU-26/B when effects at the point of impact were the basis for comparison. He indicated that a wider bomblet impact pattern could be achieved easily by releasing them at a slightly higher altitude.

BLU-63/B target effectiveness was not demonstrated by aircraft releases of live bomblets against target items during development. Such releases were to take place during operational test and evaluation (OT&E) of the CBU-58/B¹ munition which began in October 1971 at ADTC. The ADTC Development Engineer for the BLU-63/B project stated that the

¹The CBU-58/B cluster bomb is a SUU-30A/B dispenser filled with BLU-63/B bomblets.

bomblet had not been flight tested during development to demonstrate target effectiveness because of the large quantity of bomblets that would have been required and because of the high unit cost of development bomblets.

The BLU-26/B bomblet was flight tested during its development to measure target effectiveness. From December 1965 through February 1966, about 20,000 live BLU-26/B bomblets were released against a simulated surface-to-air missile fire control center, F-86 aircraft, simulated gun emplacements, manikins, and other target items.

During the period October 1969 to May 1970, ADTC performed a study to determine the relative effectiveness of selected munitions, including the BLU-63/B and BLU-26/B, against trucks and truck cargoes. Munition effectiveness against trucks for specified release conditions was calculated on the basis of bomblet fragmentation and pattern data. No bomblets were statically detonated against trucks to measure their relative effectiveness. Bomblet effectiveness against truck cargoes consisting of 76 mm antiaircraft ammunition, fuels, foodstuffs, and clothing, however, was measured by static bomblet detonations against these cargoes contained in trucks.

The CBU-58/B cluster bomb was calculated to be somewhat more effective against trucks than the CBU-24/B cluster bomb.¹ The tests showed:

1. That the BLU-63/B was better at penetrating 76 mm cartridges and causing them to catch on fire and explode but that neither bomblet fragment was able to penetrate 76 mm warheads.
2. That neither bomblet caused any significant damage to foodstuffs or clothing.
3. That the BLU-26/B was better at igniting such fuel items as gasoline.

¹The CBU-24/B is a SUU-30A/B dispenser filled with BLU-26/B bomblets.

In July 1968 the Armament Laboratory considered the possibility of statically detonating BLU-63/B bomblets against operational trucks to determine bomblet effectiveness against such targets. A preliminary test plan provided for detonating bomblets against a truck, jacked up with the engine running and the drive engaged, and for testing truck performance after bomblet detonation. The plan also provided for timing mechanics who were putting the truck back in running order and for assessing damage to truck cargo consisting of troops (manikins) and ammunition.

The proposed test to determine BLU-63/B effectiveness against operational trucks, however, was never conducted. We were advised by a former Armament Laboratory engineer on the BLU-63/B program that the test was not conducted because the number of such static detonations required to establish the statistical significance would have been prohibitive.

A primary justification for continued development of the BLU-63/B was to provide a more effective bomblet against anti-aircraft artillery sites. A weapons effectiveness study made by the Rand Corporation for the Southeast Asia Projects Division in the Office of the Air Force Deputy Chief of Staff for Research and Development, however, showed that the bomblet would not have been an effective munition against hardened anti-aircraft artillery sites. The Southeast Asia Projects Division indicated to us that it was not in the organizational chain which would decide the fate of the BLU-63/B and that it would not have known of the impending award.

The Rand Corporation concluded in its report issued in April 1970 (which was 2 months prior to the award of the first BLU-63/B production contract) (see p. 14) that BLU-26/B and BLU-63/B bomblets delivered by the AGM-79A, AGM-12E, or CBU-24/B would be effective against unprotected personnel but not against an anti-aircraft gun itself. The report pointed out that intelligence information indicated that the North Vietnamese had taken a variety of means to harden anti-aircraft artillery installations against bomblets.

CHAPTER 3

PRODUCTION OF BLU-63/B BOMBLETS

In March 1969 ADTC advised Systems Command Headquarters that flight tests using the BLU-63/B bomblet in various types of dispenser systems had been successfully completed and that arena tests¹ had been completed. Systems Command Headquarters then advised the Air Force Chief of Staff that the BLU-63/B was considered to be ready for production from an engineering standpoint.

In July 1969 the Chief of Staff established the initial production requirement for the BLU-63/B. It was to be used in a new bomb, the CDU-22/B cluster bomb. The Chief of Staff's rationale was that the CDU-22/B would provide an improved antimateriel capability.

On October 22, 1969, ADTC issued a request for proposal to industry for 11.6 million BLU-63/B bomblets to be procured with fiscal year 1970 funds.

In November 1969 the Chief of Staff for the first time announced an intent to replace the BLU-26/B with the BLU-63/B. The stated bases for this decision were the characteristics of the item and its potentially lower cost. In the same month he directed that the request for proposal be amended to provide for additional BLU-63/B bomblet quantities for fiscal years 1971 and 1972 for use in replacement of the BLU-26/B in the CBU-24/B and the CBU-49/B² programs. On December 12, 1969, ADTC issued an amended request for proposal for a multiyear procurement of 42 million bomblets

¹ Arena tests involve detonation of bomblets in a confined space (arena) for the purpose of ascertaining such things as the velocity and dispersal patterns of fragments.

² The CBU-49/B is a SUU-30A/B dispenser filled with BLU-26/B bomblets with M-224 time-delay fuses. Actually the BLU-26/B bomblet with a M-224 time-delay fuse is called a BLU-59/B.

consisting of 11.6 million, 11.2 million, and 19.2 million bomblets for fiscal years 1970, 1971, and 1972, respectively.

In December 1970 the Chief of Staff canceled the CDU-22/B program and provided for the application of all programmed BLU-63/B bomblets to the CBU-58/B program.

ADTC has negotiated two firm fixed-price contracts for about 66 million BLU-63/B bomblets. On June 1, 1970, Ajax Hardware Manufacturing Corporation was awarded a 3-year firm fixed-price contract to produce 42 million BLU-63/B bomblets for \$12,085,778, or \$0.28775 a unit. Contract changes have increased the contract price to \$12,486,943, or \$0.29731 a unit, as of October 22, 1971. This amount does not include a claim of \$390,000 which involves a dispute as to the thickness of material or another claim for \$1.2 million arising from the Government's alleged failure to provide adequate drawings and specifications to Ajax on a timely basis. (See p. 22.) The first of these claims has been rejected by the contracting officer; however, a notice of appeal has been filed with the Secretary of the Air Force. The second claim is being evaluated by the BLU-63/B Contracting Officer.

In October 1970 the Chief of Staff required that a second source producer of BLU-63/Bs be established because of the scope of programs using the new bomblet. The result of this direction was the award to Hoffman Electronics Corporation of a letter contract to produce 23,750,600 units over a 2-year period for \$8,312,710, or \$0.35 a unit. The letter contract was dated April 7, 1971. The definitized contract, which was mailed to Hoffman on October 1, 1971, provided for Hoffman to start deliveries by January 1972.

ADTC has awarded military interdepartmental purchase requests to the U.S. Army Munitions Command, Joliet, Illinois, and has contracted with the Pace Company, Division of AMBAC Industries, Inc., Memphis, Tennessee, to load, assemble, and package about 41 million of the 66 million bomblets in SUU-30A/B dispensers. ADTC plans to place additional purchase requests with the Army to load the remaining 25 million bomblets in the near future.

Information concerning the basis for selection of Ajax and Hoffman as the production contractors, their compliance with the contractual delivery and manufacturing requirements, and various other matters concerning production of BLU-63/B bomblets follows.

AJAX CONTRACT

Basis for selection

Ajax was awarded a contract for 42 million BLU-63/B bomblets because its proposed price was lowest among the firms whose technical proposals were considered to be acceptable and because, on the basis of a preaward survey, it could comply with the production requirements of the request for proposal.

Of 136 firms solicited, 24 submitted technical proposals. An ADTC technical evaluation group rated seven of these firms as acceptable on the basis of several factors, including engineering approach, technical organization, and technical equipment and facilities necessary to accomplish the effort. None of the 17 remaining firms were considered further for the procurement.

The final unit prices proposed by the seven acceptable firms for the procurement averaged \$0.51253 and were as follows. The firms are listed in descending order of merit on the basis of ADTC's evaluation of their technical proposals.

<u>Firm</u>	<u>Proposed unit price</u>
Amron	\$0.4204
Avco Corporation	0.75006
Olin Corporation	0.47278
Honeywell, Inc.	0.51942
Ajax Hardware Manufacturing Company	0.28775
Lee Metal Products Company	0.28732
Harvey Aluminum, Inc.	0.85000

Amron's technical proposal was rated as highest, partly because it indicated a very high probability of success in producing the item. The evaluation group pointed out that Amron had produced a type of grenade quite similar to the BLU-63/B at a rate of 400,000 a month.

Avco Corporation's technical proposal was rated as second highest. The evaluation group noted that Avco had a superior understanding of the production problems involved as

a result of experience gained in producing 14,000 bomblets during the development program.

Ajax Hardware's proposal was considered technically acceptable because it indicated a good approach to producing the bomblet. The evaluation group noted that the experience of Ajax in producing the BLU-26/B and the basic manufacturing techniques, equipment, and facilities employed by the contractor were applicable to the production of the BLU-63/B. The evaluation group noted, however, that Ajax's proposed production technique for fabricating the inner shell, referred to as a coining operation,¹ had only been proven on soft tooling and that the contractor would probably need two or three 300-ton presses for this operation rather than one as indicated in its technical proposal.

Lee Metal Products' proposal was considered to be technically acceptable because it provided a very good approach to producing the BLU-63/B bomblet. The evaluation group noted, however, that Lee had had limited experience on similar production programs and had no facility currently available to be used in producing the BLU-63/B.

Although four other firms were ranked higher as to technical acceptability, only Ajax and Lee were considered for award of the procurement because their proposed unit prices were lowest.

Lee, whose final proposed unit price was \$0.0043 less than Ajax's, would have received the award if the preaward survey conducted on the firm had been satisfactory. The survey rated Lee as unsatisfactory in technical capability, production capability, plant facilities and equipment, quality assurance capability, and ability to meet the required delivery schedule. The survey revealed that Lee did not have an existing facility and that it had had no previous experience in operating a production facility or in metal fabrication production.

¹This concept involved forming the lips of the fragmentating hemispheres by stamping, rather than by machining.

A similar preaward survey conducted on Ajax proved satisfactory and resulted in Ajax's getting the award. The survey conducted by the Defense Contract Administration Services (DCAS), Pasadena District, Pasadena, California, in April 1970 rated Ajax as satisfactory in technical capability, production capability, plant facilities and equipment, quality assurance capability, and ability to meet the required delivery schedule.

In rating Ajax's production capability, quality assurance capability, and performance record, the preaward survey team evaluated Ajax's performance in producing the BLU-26/B bomblet, which was considered similar to the BLU-63/B. The survey team noted that Ajax's performance on BLU-26/B contracts for the past year had been satisfactory.

A team comprised of a Systems Command industrial specialist, an ADTC mechanical engineer, and the ADTC Program Manager for the CBU-58/B program concluded that Ajax could satisfactorily produce the BLU-63/B bomblet in accordance with the provisions of the request for proposal but that problems could occur if Ajax's coining concept proved unsatisfactory and if the company had to resort to machining the hemisphere mating joints. The team believed that Ajax's alternate machining concept, if adopted, would require extensive checkout and redesign but felt that machining would not be necessary since Ajax's coining concept had been proven on prototype tooling.

On March 26, 1970, Ajax and ADTC representatives agreed to a contract price of \$12,085,778, or \$0.28775 a unit, for 42 million units having a delivery schedule as follows.

	<u>1971</u>			<u>1972</u>	<u>1973</u>
			Mar.	Jan.	Jan.
<u>1970</u>			to	to	to
<u>Dec.</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Dec.</u>	<u>Dec.</u>	<u>Mar.</u>
(millions)					
Monthly rate	<u>0.3</u>	<u>0.6</u>	<u>1.1</u>	<u>1.6</u>	<u>1.6</u>
Cumulative total	<u>0.3</u>	<u>0.9</u>	<u>2.0</u>	<u>18.0</u>	<u>42.0</u>

Traditionally in the munitions industry, the company that develops a new product also receives the first production contract. Concern over possible award of the procurement to a firm other than Avco was stated as follows in a letter dated August 20, 1969, from the Acting Chief of the Dispenser Division, Air Force Armament Laboratory, to the Bombs and Mines Division, Deputy for Acquisition (since renamed Deputy for Procurement and Production), ADTC.

"*** BLU-63/B metal parts have not yet been manufactured in the production quantities now being considered. It is anticipated that there may be problems encountered in setting up a production line capable of delivering the required quantities of suitable metal parts.

"6. It is expected that AVCO Ordnance Division, because of experience gained during the development program, and since they have already successfully fabricated metal parts for the BLU-63/B, would be more capable of solving any problems and of effecting a smooth transition from development to production than any other potential manufacturer.

"7. This office highly recommends, therefore, that the above facts be given serious consideration during the selection of contractor(s) for the initial production of BLU-63/B metal parts."

We found that ADTC had prepared BLU-63/B unit price estimates of \$0.375 and \$0.380 to gauge the reasonableness of the proposed prices. The BLU-63/B Contracting Officer indicated that, in his opinion, Lee Metal Products was inexperienced and that its price seemed unreasonably low. He also stated that he could not explain how Ajax was able to propose a unit price as low as \$0.28775.

The BLU-63/B Contracting Officer said that, when the Ajax contract was awarded, the management philosophy was to make the award to the offeror who (1) proposed the lowest price, (2) was technically acceptable, and (3) received a satisfactory preaward survey and that the degree of technical acceptability did not matter. He stated that this

philosophy had changed and that more consideration currently was being given to each offeror's relative technical acceptability in making awards.

Compliance with manufacturing
and delivery requirements

Ajax's contract provided that, before production costs could be allocated to the contract for the purpose of progress payments, the contracting officer approve the contractor's first article. The contract provided that the Government could witness first-article-approval tests if it elected to do so.

The contract also provided that the contractor forward his first-article-approval test report to ADTC within 140 calendar days from the date of the contract, or by October 18, 1970, and that the contracting officer notify the contractor of his decision within 15 calendar days from the time that he received the report.

Additional information on first-article approval, production deliveries, and deviations from specifications, is as follows.

First-article approval

First-article approval which should have been granted by about November 2, 1970, was not granted until May 18, 1971, or about 7 months later.

During the period May 10 to 13, 1971, ADTC representatives visited the Ajax plant and found the first articles produced by Ajax to be acceptable and released them for production. On May 18, 1971, the contracting officer granted Ajax first-article approval on the basis of the visit. The contractor's first-article test report was completed on May 27, 1971.

A report dated May 24, 1971, prepared on the Ajax visit showed that the ADTC representatives considered the first article to be acceptable and Ajax to be ready for production despite several problem areas.

We were advised by both Ajax and DCAS quality assurance employees that the 100 units used in first-article testing were manufactured on Ajax production equipment as required by the contract. We found no evidence to the contrary.

Production deliveries

After first-article approval was granted on May 18, 1971, Ajax encountered production problems and failed to make deliveries on time even though the contracting officer permitted Ajax to manufacture bomblets to tolerances that were less stringent than those originally required under the contract. The delivery schedule subsequently was revised twice.

The basic contract provided for deliveries to be completed by April 15, 1973. The current schedule provides for deliveries to be completed by January 31, 1974, or 9-1/2 months later. As of October 31, 1971, Ajax deliveries were about 145,000 more than the total required under the latest schedule but were 12.4 million less than required by the original contract schedule.

The Air Force accepted responsibility for an initial 138-day extension on the basis that the drawings furnished Ajax, which had been prepared by the BLU-63/B development contractor, did not adequately portray the bomblet flute contour. The contract price was increased by \$28,665 for Ajax to revise the drawings and by \$400,000 additional for the contractor to produce bomblets in accordance with the revised drawings. Ajax subsequently filed claim for \$1.2 million additional to cover the costs of delays arising from the deficient drawings. (See p. 14.)

Ajax was unable to make deliveries in accordance with the amended schedule so it was revised again to extend the final delivery by another 153 days. As consideration, the cancellation date for the Air Force to fund the third-year buy of 19.2 million units was extended from August 31, 1971, to February 29, 1972, and the contract price was reduced by \$25,000.

On May 25, 1971, DCAS, at the instruction of the contracting officer, advised Ajax that its inability to comply with the revised contract delivery schedule was endangering performance and that, if the condition was not corrected within 10 days, the Government might terminate the contract.

By memorandum dated June 11, 1971, Ajax advised DCAS that the main bottleneck was the machine-facing operation on the hemispheres and that Ajax hoped to be on schedule within 60 days if planned alternatives worked out.

During the period August 10 to 13, 1971, the BLU-63/B Program Manager visited the Ajax plant to survey the production facilities and reported, in a memorandum dated August 16, 1971, that none of the five pieces of equipment used by Ajax to machine the hemisphere interlock were in operation and that Ajax was continuing to investigate coining the interlock as a possible solution. He reported that in the meantime subcontract sources were machining the parts for Ajax. He reported also that Ajax's assembly line appeared to be in an overall state of disrepair and that a series of breakdowns, equipment deficiencies, and Ajax's inability to consistently produce acceptable parts had severely limited production.

An ADTC official advised us that Ajax had not been able to make deliveries on schedule because of incorrect drawings and specifications furnished by the Air Force and because of Ajax's inability to develop the necessary production capacity. He advised us also that many of the bomblets produced by Ajax were being rejected. (See p. 27.)

We were advised by the BLU-63/B Contracting Officer that, if Ajax did not meet the current delivery schedule, he would definitely consider terminating the contract due to default.

Production deviations

To ease production problems the contracting officer has permitted Ajax to deviate from contractual requirements in producing the BLU-63/B bomblets. As of September 17, 1971, the Air Force had approved six deviations or waivers as follows.

<u>Deviation or waiver number</u>	<u>Description</u>	<u>Approved by Air Force</u>	<u>Quantity authorized</u>
0217-1	Flute contour deviation	5-13-71	1,000,000
0217-2	Assembly flush tolerance: +0.004 in. to -0.008 in.	7-22-71	250,000
0217-2a	Same as 0217-2 above	7-29-71	50,000
0217-3	Adhesive bond, pull test	7-29-71	100,000
0217-5	Assembly flush tolerance: +0.008 in. to -0.010 in.	8-24-71	600,000
0217-6	Adhesive bond, pull test	8-24-71	123,000

Through September 17, 1971, all units delivered to the Air Force were accepted with one or more deviations or waivers to the contract specifications. This includes 100 first-article units which were accepted with the flute contour deviation. The contracting officer stated that he had consulted with technical employees prior to accepting the deviations or waivers and that he did not believe BLU-63/B performance would be affected adversely. BLU-63/B performance by means of operational tests and evaluation, however, has yet to be fully demonstrated.

Technical and production problems

We reviewed with Ajax and DCAS officials problems experienced in the production of the BLU-63/B. Following are the principal problems identified.

Assembly flush tolerance

The Air Force drawings specify that the location of the hemisphere edge or interlock base to the cover flange of the male and female assemblies be within a tolerance of 0.0 inch to 0.004 inch. The contractor informed us that problems with equipment used in the manufacturing process had caused some of the flush-tolerance problems; however, more importantly, Ajax believed that the tolerance requirement was unrealistic, if not impossible to meet. On July 20, 1971, Ajax requested a deviation of +0.010 inches to -0.012 inches in the flush-tolerance level. At the time of our review, the Air Force had not approved this request. The DCAS quality assurance representative also believed that the assembly flush-tolerance requirement would have to be relaxed; otherwise there was little chance that Ajax could successfully complete the contract within the current delivery schedule.

Flute contour design

Within a short period of time after the award of the Ajax contract, Ajax advised the Air Force that design data furnished for the cover flutes contained errors. As a result the Air Force furnished the contractor with revised data in September 1970; however, this data was also found to contain errors.

In December 1970 Ajax was directed by contract change order to prepare the necessary data, which included changing the radius of the flute leading edge from 0.060 inch to 0.040 inch. This resulted in the Air Force's issuing revised drawings in March 1971. In April 1971 a contract modification was issued which extended the original delivery date for the first-article test report and the start of production deliveries by 204 days and 138 days, respectively. The Air Force acknowledged responsibility for these delays due to the failure to provide the contractor with adequate drawings on a timely basis.

Hemisphere facing

To machine the hemisphere surface to form the interlock, Ajax acquired five specially designed facing machines. These machines were found to be unreliable. As a result Ajax has subcontracted this machining operation since June 1971. Currently Ajax has a subcontract with Z-D Products, Costa Mesa, California, for machining 18 million bomblets at a unit price of \$0.03100.

Adhesive

An adhesive is used to bond the cover to the hemisphere. The contract specification requires the bond to be sufficient to withstand a separation force of 300(+ 20) pounds. Ajax officials stated that pull-test failures and adhesive (glue) on the cover and interlock surfaces were problems primarily caused by the equipment used to dispense the adhesive. The equipment was found to be unreliable in dispensing a precise amount of adhesive. Ajax was in the process of installing new dispensing equipment and clamps to hold the cover and hemisphere together during the curing process to better ensure that a good bond was achieved.

Asphalt painting

Improper timing of the asphalt paint spray with the spinning movement of the fixture on the assembly line causes the coating of asphalt paint on the interior surface of the hemisphere to be too thin. This results in a significant number of rejections. The contractor advised us that the problem had been corrected by the installation of spray and timing equipment previously used in the production of the BLU-26/B bomblet.

Contractor and DCAS comments

Ajax officials were generally optimistic about their ability to deliver the BLU-63/B in accordance with the current contract delivery schedule; however, this is dependent on the Air Force's relaxing the existing flush-tolerance requirement. DCAS officials indicated that under optimum conditions, including the change in flush-tolerance requirements, the contractor probably could meet the schedule.

BLU-63/B rejections

The technical and production problems at Ajax have been reflected in the end-item rejection rates. During the period June through September 17, 1971, the contractor rejected 33.7 percent of all end-items it inspected. Ajax officials stated that none of the rejected items had been scrapped. Rejected assemblies with minor defects are often reworked and reinspected. These reworked items usually pass both Ajax and DCAS reinspection.

DCAS has a resident quality assurance representative assigned to Ajax whose responsibilities include verifying the contractor's compliance with approved procedures contained in the test plan and performing end-item inspection prior to acceptance for delivery to the Air Force. From each batch of 5,600 male or female assemblies submitted for Government acceptance, the DCAS quality assurance representative selects a sample of 200 assemblies for testing. The tests performed are the same as the contractor's end-item inspection. Of a total 119 batches inspected by the quality assurance representative, 46 batches, or about 38.7 percent, were rejected. The following table shows the reasons for the rejections.

	<u>Batches rejected</u>	<u>Percentage</u>
Major defects:		
Flush tolerance	16	34.8
True position	8	17.3
Pull-test failure	1	2.2
Minor defects--visual characteristics	<u>21</u>	<u>45.7</u>
Total	<u>46</u>	<u>100.0</u>

In addition, eight other pull tests conducted by the quality assurance representative resulted in items being rejected; however, the total quantity of items rejected could not be determined readily. We noted, however, that about 200,000 assemblies had been accepted by the Air Force on waivers after samples failed the pull test.

We were advised by Ajax officials that none of the DCAS rejected assemblies had been scrapped. Rejected assemblies with minor defects involving asphalt underspray or adhesive on the cover surface normally are resprayed or touched up and later are submitted for DCAS reinspection. The rejected assemblies with major defects are being retained pending the establishment of an assembly rework program. These units were not acceptable for delivery under approved waivers or deviations to contract specifications.

The Air Force recently has established visual standards for use as acceptance criteria for the asphalt paint and glue operation. We were advised by DCAS quality assurance representative employees that these standards would result in the acceptance of some assemblies which previously had been rejected.

We noted that Ajax had scrapped about 40,600 covers and hemispheres which had been rejected during the in-process manufacturing inspections. These rejections primarily were due to machining and plating defects.

As of September 28, 1971, Ajax had accepted 1,525,077 machined male and female hemispheres from Z-D Products and had rejected 117,000 hemispheres because some items had an oversized or undersized interlock condition. We were advised by an Ajax official that Z-D Products was sorting the rejected units to remove any defective items and that it would resubmit the remaining hemispheres for Ajax inspection and acceptance. Z-D Products had returned 9,200 defective hemispheres to Ajax as of September 28, 1971. We were advised by an Ajax official that these items would be scrapped.

Comparison of BLU-26/B and
BLU-63/B bomblet prices

In a briefing given to Congressmen Frank A. Stubblefield and Donald D. Clancy on May 13, 1971, the Air Force projected a savings of about \$3 million, or \$0.05 a unit, by procuring the 65.8 million BLU-63/B bomblets now under contract rather than an equivalent quantity of BLU-26/Bs. We estimated a savings of about \$1.5 million, or \$0.024 a unit, which was less than half the Air Force estimate of potential savings. Our estimate is based on data available during our fieldwork and does not include the following items which could narrow the savings even more.

1. The investment in Government-owned BLU-26/B tooling, plus the attendant storage and/or disposal costs of these tools which will result from a termination of BLU-26/B production. According to the Air Force, this tooling cost \$6 million. Most of it was purchased in the mid-1960's.
2. About \$208,000 in added costs through October 1, 1971, at the Army loading facility at Milan, Tennessee, due to delays in delivery of BLU-63/B metal parts from the manufacturer.
3. Two claims by the BLU-63/B contractor, totaling \$1.6 million, that are still pending.

The details of our cost estimate for BLU-26/B metal parts and of our comparison of this cost with BLU-63/B prices negotiated under the first two BLU-63/B production contracts are presented below. Figures shown are on a unit basis.

	<u>BLU-26/B</u>	<u>BLU-63/B</u>	<u>Difference</u>
Hemispheres	\$0.214	-	-
Steel balls	0.115	-	-
Crimp strap	<u>0.011</u>	-	-
Total	<u>\$0.340</u>	\$0.316 ^a	\$0.024

^aThis figure covers cost of both inner and outer hemispheres. Steel balls and crimp straps are not utilized on the BLU-63/B. The figure shown is the average unit price for the two BLU-63/B manufacturers and includes contract modifications to date.

In regard to the ultimate cost to the Government of these two bomblets, it appears that the BLU-63/B would have more potential for reductions in production cost. This is the conclusion of people we have talked with who are experienced in the munitions industry.

The largest manufacturer of the BLU-26/B started with a unit price of about \$1.12 in 1965 and 1966 and by 1971 was down to about \$0.21. This price reduction was the result of such factors as efficiencies gained through production experience and spreading the cost of capital investment over larger product quantities.

Another factor which lowered the overall price was the reductions in steel-ball prices which were achieved through increased tolerances and relaxed specifications. According to industry sources further price reductions may be effected on the steel balls.

The potential for further reducing the production cost of the BLU-26/B is difficult to assess, but it does not appear that it would be substantial.

The Army indicated that, except for costs occasioned by late delivery of bomblets, the costs of loading, assembling, and packing BLU-63/B bomblets was approximately the same as for BLU-26/Bs.

Performance testing of Ajax production units

As mentioned previously the Army is loading BLU-63/B bomblets into dispensers to form CBU-58/B cluster bombs. Performance data on Ajax production bomblets, from tests conducted by the Army as part of its CBU-58/B effort and from pre-OT&E and OT&E of the CBU-58/B conducted at Eglin, indicate the possibility of bomblet deficiencies.

Army tests of an initial sample revealed nonconformance of bomblet parts with applicable drawings and specifications and inability of the bomblet to withstand the necessary pull force to survive impact; however, such deficiencies were not noted in tests of a second sample. Pre-OT&E and OT&E tests have shown bomblet breakup and dud rates for dispenser function altitudes of 1,000 feet and higher to be in excess of

5 percent which, according to the CBU-58/B Program Manager, is the Air Force's BLU-63/B performance goal. Personnel in the Office of the Air Force Chief of Staff indicated that, contrary to what the BLU-63/B Program Manager had told us, the official Air Force altitude performance goal was 1,500 feet rather than 1,000 feet. At 1,500 feet breakage rates and dud rates are less than at the lower altitude.

Army tests

The Air Force requested the Army to produce 5,955 CBU-58/B cluster bombs at a price of \$1,243,404, or \$208.80 each. Deliveries were scheduled to begin in July 1971 and to be completed by December 1971. The purchase request also provided \$31,000 for testing samples of BLU-63/B bomb-lets. The tests to be conducted included the (1) quality-conformance test, (2) bomblet-function test, (3) air-jet test, (4) arena test, (5) fuse-safety test, (6) pull test, (7) composition test, (8) radiograph test, and (9) specific-gravity test. The test samples included 200 live, 50 inert, and 50 dummy BLU-63/B units.

The CBU-58/B Program Manager advised us that the radiograph test had been dropped because it would not determine if there were voids in the BLU-63/B explosive after it had been cast.

The Army reported that the specified bomblet samples had been tested and that they had passed the bomblet-function, fuse-safety, composition, and specific-gravity tests but that they had failed the pull and quality-conformance tests. The report showed, however, that a second sample passed the pull and quality-conformance tests. Results were not shown for the air-jet and arena tests. The report noted that a final evaluation of the sample tested could not be made until these two tests had been conducted.

Pre-operational test and evaluation

Pre-OT&E of the CBU-58/B munition currently is being conducted by ADTC to establish its flight characteristics prior to the Tactical Air Command's OT&E. Part of the pre-OT&E objective is to determine BLU-63/B fuse-functioning and fuse-breakage rates. Available test data show the

bomblet to have a fairly low dud rate but a high breakage rate. By contrast, Tactical Air Command's OT&E, which is also currently being conducted, shows the bomblet to have a high dud rate. (See p. 33.)

We were advised by the CBU-58/B Program Manager that pre-OT&E had begun on August 16, 1971, and that it had not been completed as of November 30, 1971. He advised that through November 15, 1971, 30 CBU-58/Bs had been flight tested--six with live bomblets and 24 with live-fused, inert main charge bomblets.

Pre-OT&E was originally scheduled to have begun on July 1, 1971, and to have been completed by October 15, 1971. During pre-OT&E 42 CBU-58/Bs were to have been flight tested--six with live bomblets and 36 with live-fused, inert main charge bomblets.

Of 30 CBU-58/Bs flight tested, two dispensers failed to function and, as of November 15, 1971, test results were not available for two. For four bombs for which test data were available, the dispensers opened at altitudes of less than 1,000 feet.

Test data for 16 CBU-58/Bs with dispenser-opening altitudes above 1,000 feet showed a low bomblet dud rate¹. Of the CBU-58/Bs, 14 contained inert bomblets; the average breakage rate for these bomblets was quite high. About 78.6 percent of the bomblets were released over an asphalt surface, and the breakage rate for these bomblets was even higher than the average. The breakage rate for the remaining bomblets released over a sandy, grassy area was considerably lower.

On November 11, 1971, the most recent pre-OT&E flight test, six CBU-58/Bs with inert bomblets were released with dispenser-opening altitudes above 1,000 feet. We were advised by the CBU-58/B Program Manager that the breakage rate for the bomblets which were released over a sandy, grassy area was considerably lower than the rate experienced earlier for drops over the same type of surface. He stated

¹Quantified dud rates and breakage rates are classified.

that, in his opinion, the lower breakage rate was due to these bomblets' being crimped differently from bomblets released in previous tests. The CBU-58/B Program Manager advised us that data from the test still were being analyzed and that he did not know what the bomblet dud rate was for the test.

Operational test and evaluation

OT&E is currently being conducted by the Tactical Air Command at Eglin to determine operational suitability and effectiveness of the CBU-58/B munition when employed with the F-4 aircraft in a tactical environment. Specific objectives include an evaluation of the functional reliability of the bomblet and an investigation of the effectiveness of the CBU-58/B munition against selected tactical targets.

We were advised by the CBU-58/B Program Manager that OT&E, which began on October 12, 1971, was expected to be completed during December 1971. During OT&E 60 CBU-58/Bs were to be flight tested--24 with live bomblets and 36 with live-fuse, inert main charge bomblets.

We were advised by the CBU-58/B Program Manager that through November 15, 1971, 16 CBU-58/Bs with live bomblets had been flight tested--six on October 12, 1971, and 10 more on October 27, 1971. He advised us that three of the CBU-58/B munitions released in the first flight test were duds due to dispenser-fuse malfunctions. He stated that one dispenser had opened below an altitude of 1,000 feet and that the bomblet dud rate was high, as could be expected. The dud rates for the two remaining CBU-58/Bs which opened at altitudes of 1,471 feet and 1,634 feet, were lower but were still higher than the rates noted in pre-OT&E. According to the program manager, the Tactical Air Command and ADTC considered these dud rates to be too high. We were told that the Tactical Air Command was contemplating suspending further OT&E testing until ADTC completed all pre-OT&E testing. Results of the October 27, 1971, tests were not available to us as of November 15, 1971.

The Deputy for Procurement and Production, ADTC, told us that he did not agree with the CBU-58/B Program Manager that the dud rates experienced in OT&E were too high for

releases at an altitude of about 1,000 feet. He said that the bomblet impact-detonating fuse was not designed to function for bomblet releases below 2,000 feet and that he believed that the BLU-63/B dud rate would be below 5 percent for releases at an altitude of 2,000 feet.

One of the ADTC BLU-63/B development engineers told us, however, that there were no altitude restrictions on the BLU-63/B impact fuse. He said that, as long as the bomblet achieved the spin rate necessary to arm the fuse, the fuse should function upon impact regardless of the bomblet release altitude.

We were advised by the Assistant Deputy for Procurement and Production, ADTC, that the high breakage rate of the BLU-63/B upon impact would preclude the use of a time-delay fuse with the bomblet.

Plans have been made to release CBU-58/B munitions containing live BLU-63/B bomblets against a target array consisting of operational trucks with engines running, fuel in tanks, and the like; however, as of November 15, 1971, these tests had not been made and no OT&E target effectiveness data were available.

Added CBU-58/B production costs and
delayed deliveries due to bomblet shortage

By message dated September 23, 1971, the U.S. Army Munitions Command, Joliet, requested ADTC to increase the purchase request covering the loading of the bomblets by \$145,000 to cover added costs resulting from slippage of CBU-58/B production caused by the lack of BLU-63/B bomblets. The message also noted that personnel actions to terminate 175 people as of September 30, 1971, would result in an additional cost of \$63,000.

We were advised by the CBU-58/B Program Manager that the purchase request would be amended to provide for the \$145,000 additional production costs and that the Army would absorb the \$63,000 personnel cost. He stated that he did not anticipate any further increases in CBU-58/B production costs due to delays in delivery of Ajax bomblets.

The delivery schedule contained in the purchase request for Army loading provided for the delivery of 3,555 CBU-58/Bs through October 1971 and of 2,400 more during November 1971, for a total of 5,955 units. We were advised that through October 1971 the Army had only produced 422 CBU-58/Bs and that the anticipated delivery completion date had been extended to February 1972 due to the lack of bomblets from Ajax.

HOFFMAN CONTRACT

In February 1970 the Air Force Systems Command authorized ADTC to seek a second-source producer for BLU-63/B bomblets. ADTC considered eight of the 18 proposals subsequently received to be technically acceptable. One of the eight proposals, however, was from Ajax which was declared ineligible since it had received the initial BLU-63/B production award.

Award of a contract to Hoffman Electronics for multi-year procurement of 17,500,000 BLU-63/B bomblets was anticipated because its proposed price was the lowest among the seven technically acceptable firms. In July 1970, however, the requirement for a second-source producer was canceled by the Air Force Chief of Staff.

In October 1970 the Chief of Staff reimposed the requirement for a second-source producer of BLU-63/B bomblets. The basis for this requirement was the increased scope of end-item programs using the BLU-63/B. As a result of this direction, a second request for proposal was issued in December 1970. Proposals were requested from the seven firms whose technical proposals previously had been determined technically acceptable under the first request for proposal. These seven bidders were given the opportunity to modify and/or augment their previous proposals. In addition, requests for proposal were issued to five other firms upon their request.

Hoffman was chosen winner of the competition on April 7, 1971. The letter contract awarded on that date was for 23,750,600 bomblets. The award was based on a "best buy" concept. That is, factors other than a low price were considered in making the contract award.

An ADTC evaluation plan provided that prospective contractors be ranked in order of relative merit as determined by a weighted assessment of certain factors. An ADTC ad hoc advisory group established a list ranking the factors contained in the evaluation plan by importance. The group's factor ranking was as follows: (1) production approach, (2) qualifications, (3) past performance based on Air Force experience, and (4) cost and/or price.

Of the 12 firms solicited for proposals, six submitted technical proposals. The final unit prices proposed by the six firms for the procurement averaged \$0.43127 per unit. The individual unit prices submitted by the six firms are as follows.

<u>Firm</u>	<u>Proposed unit price</u>
Z-D Products	\$0.344
Hoffman Electronics Corporation	0.3500
Amron	0.3799
Honeywell, Inc.	0.42654
Murdock	0.4521
Batesville Manufacturing Company	0.63508

According to the ADTC evaluation panel, Hoffman's proposal indicated a very thorough plan as to the manufacturing process, special technical factors, and production planning required for production of the BLU-63/B bomblet but showed that the current facilities owned by Hoffman were not adequate. The panel noted, however, that a detailed plan for the construction of adequate space and the acquisition of special machines and equipment within an acceptable time frame was provided. The panel noted also that Hoffman had limited experience in punch-press operations and that, although they had produced ordnance items, they had not been produced at the rate required for the BLU-63/B.

Z-D Products' proposal provided limited details as to its proposed manufacturing process; the panel noted that the details that were given did not seem realistic.

The panel noted that Amron's proposal indicated many problem areas in its manufacturing approach. The panel noted also that Amron's proposal stated a need for a 150-ton press but that its equipment list showed its largest press to be 105 tons.

The panel noted that the Honeywell proposal revealed many unacceptable manufacturing processes and that the processes were described in general terms and with few details. The panel noted also that Honeywell's production plan reflected a development approach rather than an intent to produce.

The panel noted that the Batesville proposal revealed no details on the scoring of hemisphere material, manufacturing processes, or design of tools or holding fixture for machining the interlock.

The panel noted that Murdock's proposal revealed possible problem areas in the manufacturing process and outlined a complete setup within 6 months, which was not realistic.

An exception to the evaluation panel findings was taken by one panel member. The panel member, who is the BLU-63/B configuration manager, felt that the evaluation was too negative concerning Batesville, Amron, and Honeywell and

was too positive concerning Hoffman. He noted that there was a high-risk factor in selecting Hoffman due to inexperience of key employees who were electronics oriented and that the firm had to acquire floor space and all equipment and machines. He noted also that Hoffman's proposed facilities acquisition and production schedule was not realistic.

A composite rating for the six firms considering all evaluation factors was prepared. We were advised by the BLU-63/B Contracting Officer that not much consideration had been given to past performance in developing the composite ratings because the panel was unable to obtain a sufficient amount of performance information on the firms. The composite ratings for the firms are listed below in descending order of merit.

<u>Firm</u>	<u>Composite rating</u>
Hoffman Electronics Corporation	72.0
Z-D Products	53.5
Amron	53.2
Honeywell, Inc.	51.2
Batesville Manufacturing Company	33.0
Murdock	30.1

Z-D Products, Hoffman, Honeywell, and Amron were considered to have been in a competitive range from both technical and price standpoints, and negotiations were conducted with these firms. During negotiations each contractor was given the opportunity to supplement, change, and/or fully explain his written technical proposal.

Although Z-D Products proposed the lowest price, the award was made to Hoffman, which had proposed the second lowest price, because the firm was judged to have the best technical proposal and highest overall rating.

A preaward survey rated Hoffman as being satisfactory in technical capability, production capability, performance record, and ability to meet the required delivery schedule. The survey showed that Hoffman did not have adequate plant facilities and equipment and that it planned to expand its

building and acquire the necessary equipment to produce the BLU-63/B. The survey team noted that Hoffman had firm quotations for the construction of the building and all material and machinery required for production.

A letter contract was awarded to Hoffman effective April 7, 1971, for 23,750,600 units at \$0.35 a unit for a total price of \$8,312,710. Of this amount, \$1,021,895 was for capital equipment. The contract provided for deliveries to begin in January 1972 and for the final delivery to be made in March 1973.

As of September 16, 1971, Hoffman had nearly completed construction of an addition to its existing facility for the production of the BLU-63/B. Major items of equipment were being installed; however, a majority of the production equipment needed was not yet on hand.

The contractor indicated that there were no significant problems foreseen in the successful completion of the contract. DCAS officials advised us that Hoffman's schedule for equipment installation and checkout was very tight and that it could cause the contractor to extend the first-article delivery schedule date, should any significant problem arise.

The contracting officer stated that, as of October 21, 1971, Hoffman had met or exceeded all the milestones for obtaining the equipment needed to start production. He stated that he could foresee no problems at the present time regarding Hoffman's ability to meet the contract requirements.

Bomblet performance tests are required under the Hoffman contract. This requirement was not provided for in the Ajax contract. The contracting officer stated that one of the reasons for including performance tests requirements in the Hoffman contract was that the Air Force had been experiencing trouble with the Ajax contract. He advised that as of November 11, 1971, Hoffman had not been authorized to deviate from the contract production requirements.

CHAPTER 4

INVENTORY OF BLU-26/B BOMBLETS

An important aspect of the Air Force decision to stop production of the BLU-26/B bomblet in favor of the BLU-63/B was the number of BLU-26/Bs in inventory. The BLU-26/B bomblet is used in two cluster bombs--the CBU-24/B and the CBU-49/B. These bombs are similar except for differences in bomblet fuses. Each bomb contains approximately 670 bomblets.

As of October 30, 1971, Air Force inventory data showed that 53,500 CBU-24s and 27,600 CBU-49s were on hand. These figures included all units in the Air Force, worldwide. Projected inventories as of December 31, 1972, are 14,158 CBU-24s and 19,418 CBU-49s. This projection takes into consideration remaining deliveries on order and expected usage rates. The increased bombing activity that took place during December 1971, however, could dramatically alter the Air Force's projection.

An Air Force official stated that the inventory of CBU-24/B bombs on hand was considered sufficient to meet its Southeast Asia requirements for a considerable period of time.¹ The inventory of CBU-49/Bs is sufficient to meet its requirements for an even longer period. Current Air Force plans require that almost all end-item munitions using BLU-63/B bomblets be placed in war-reserve stocks rather than be used in combat operations.

¹Period of time is classified.

CHAPTER 5

CONCLUSIONS

DEVELOPMENT OF THE BLU-63/B

The BLU-63/B appears to be marginally more effective than the BLU-26/B against materiel targets, except fuel-item targets.

During development the effectiveness of the BLU-63/B was determined through static detonations and effectiveness calculations and not through hard test data obtained by live drops against actual targets as was done with the BLU-26/B.

The BLU-63/B was developed, in part, as a weapon to be used against antiaircraft artillery sites. ADTC had information prior to entering production on the BLU-63/B, however, showing that the BLU-63/B would not be effective against hardened antiaircraft artillery sites observed in Vietnam.

BLU-26/B and BLU-63/B bomblets tested under identical conditions revealed that the BLU-63/B had a lower dud rate, especially at low dispenser-function altitudes, but that the BLU-63/B could not survive impact at the lower dispenser-opening altitudes. Bomblet breakup is not a problem when impact-type fuses are used, since detonation will occur prior to breakup. According to the Air Force it would be a serious problem if random delay-type fuses were used.

AWARD OF PRODUCTION CONTRACTS

The award to Ajax was based on its having submitted the lowest price. Four firms whose chances of production success appeared greater, on the basis of their technical proposals, were not called in by ADTC to negotiate the procurement.

We believe that the new contractor should have been required to successfully produce a limited number of the BLU-63/B bomblets to develop any necessary changes in the drawings and specifications before beginning volume production.

The award to Hoffman was based on a combination of relative technical acceptability and price. Although technical acceptability was given greater consideration in the selection of the second-source contractor, the ability of Hoffman to meet the technical and delivery requirements of the contract is still to be proven.

AJAX PRODUCTION PROBLEMS AND DELIVERY DELAYS

Ajax continuously encountered production problems and, prior to the latest schedule revision, had failed to make deliveries on time. In our opinion, the contractor's ability to meet the existing delivery schedule will depend, to a great extent, on the resolution of problems cited above, in particular the assembly flush-tolerance requirement. All Ajax units delivered to the Air Force through September 17, 1971, have been accepted with one or more deviations or waivers to the contract specifications. Since operational-type testing is not complete, the ultimate effect of these deviations and waivers on BLU-63/B performance is yet to be determined.

Delays in deliveries of bomblets from Ajax have caused significant delays in CBU-58/B production and in added CBU-58/B production costs amounting to \$208,000.

TESTS OF PRODUCTION UNITS

Pre-OT&E and OT&E test results, which were about 71 percent and 27 percent complete, respectively, as of November 15, 1971, indicate that the Air Force might not be able to achieve a 5-percent dud rate and a 5-percent breakage rate for BLU-63/B releases at an altitude of 1,000 feet, which, according to the CBU-58 Program Manager, is the BLU-63/B performance goal.

URGENCY OF NEED FOR BLU-63/Bs

BLU-63/B bomblets may not be urgently required for some time due to the quantities of BLU-26/Bs available depending on the rates at which the bomblets are used.