



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

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Dear Senator Proxmire:

This is in reply to your letters of February 2 and May 10, 1972, concerning a suggestion made by Colonel Elmer F. Smith, USAF (Retired) to use Minol II as explosive fill in Air Force M117 (750 pound) and MK82 (500 pound) bombs. The questions you raised concern economies available through the use of Minol II; the suitability of this fill in terms of its storage life, handling characteristics, and effectiveness; and the Air Force's consideration of Colonel Smith's suggestion.

We examined management decisions made by the Air Force concerning the use of Minol II. We reviewed pertinent records and discussed the case with representatives of the Offices of the Air Force Deputy Chiefs of Staff for Systems and Logistics and for Personnel, the Office of the Air Force Judge Advocate General, the Office of the Assistant Secretary of Defense (Installations and Logistics), the Office of the Chief of Naval Operations, and the Department of Transportation. We also considered the Air Force's reply, dated February 23, 1972, to your letter to the Secretary of the Air Force regarding Colonel Smith's suggestion.

The information we obtained concerning the first eight questions in your letter of February 2, 1972, is summarized in the enclosure to this report. Questions 9 and 10 of that letter and the 10 additional questions in your letter of May 10, 1972, relate to a disagreement regarding the Air Force's consideration of Colonel Smith's specific suggestion and incentive award, rather than to management decisions concerning the use of Minol II. Incentive awards of this type are made entirely at the discretion of the employing agency. It is not within the purview of this Office to render opinions relating to cases of this nature. Therefore, we have not provided specific information in response to these questions.

The Office of the Air Force Judge Advocate General has informed us that an individual dissatisfied with any finding of the Incentive Awards Board would have the right to petition the Secretary of the Air Force for relief. The Secretary has

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authority to review and approve or disapprove the Board's findings. His decision would be determinative and conclusive within the Air Force and the Department of Defense.

Formal comments of the Departments of Defense and Air Force were not obtained regarding the contents of this report. We plan to make no further distribution of the report unless copies are specifically requested, and then we shall make distribution only after your agreement has been obtained or public announcement has been made by you concerning the contents of the report.

Sincerely yours,



Deputy Comptroller General
of the United States

Enclosure

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The Honorable William Proxmire
United States Senate

INFORMATION RELATIVE TO QUESTIONS CONTAINED IN
SENATOR PROXMIRE'S LETTER DATED FEBRUARY 2, 1972

Question 1

How much money has been saved by the use of Minol II as the explosive fill in M117 bombs between November 1970 and February 1972?

Air Force documents indicate that savings of approximately \$8.75 million should result from the substitution of Minol II for Tritonal in M117 bombs produced during the period November 1970 through February 1972. This saving is a projection based on the assumption that all Minol II-filled bombs produced through February 1972 will be used by the end of fiscal year 1972. But if the bombs are not used, offsetting costs could be incurred due to problems in storing Minol II-filled bombs. (See question 2.)

Minol II is composed of TNT (40 percent), ammonium nitrate (40 percent), and aluminum powder (20 percent). Tritonal contains TNT (80 percent) and aluminum powder (20 percent). The projected savings result from the fact that the ammonium nitrate used in Minol II is less expensive than the TNT it replaces.

The savings calculated by the Air Force seem reasonable, assuming the timely consumption of all Minol II-filled bombs. Information obtained from the Air Force indicates that any offsetting costs, incurred in altering production facilities to accommodate Minol II, were insignificant in relation to these potential savings.

Question 2

How much additional money would have been saved if Colonel Smith's recommendations on Minol II had been implemented on January 1, 1970 (instead of November 1970), for both the M117 and the MK82 bombs (to February 1, 1972)?

Documents we reviewed indicate that, beginning late in 1969, Colonel Smith and others within the Air Force Headquarters staff became interested in the possibility of using Minol II for economy reasons in M117 and MK82 bombs. The Air Force had used Minol II previously, beginning in May 1968, as

an emergency measure to conserve TNT supplies needed to meet explosive fill requirements in support of Southeast Asia. When equilibrium between the supply of and the demand for TNT was restored in 1969, the Air Force resumed loading with Tritonal (their preferred fill for M117 and MK82 bombs).

During the first use of Minol II in MK82s and M117s, difficulties arose in the storage of the bombs, especially in tropical environments, because exposure at high temperatures resulted in expansion of the explosive fill, causing inert materials, used to line the bomb cavity, to ooze through joints in the bombs. This oozing, called extrusion, did not make the bombs hazardous to handle, but, before they could be used, the material had to be cleaned off the bombs by field personnel.

Problems with storing Minol II-filled bombs contributed to the Air Force's cautious approach when deciding, during 1970, whether to use Minol II again--this time for economy reasons. It was felt that a sudden cessation of bombing activities in Southeast Asia would render large quantities of bombs, then in the pipeline between the ammunition plants and users in Southeast Asia, excess to the Air Force's immediate combat requirements. Officials were concerned that, if this occurred, the savings in material costs realized by using Minol II could be more than offset by increased maintenance costs involved in storing the bombs. Also, the degree to which the bombs might become hazardous to handle, as a result of long-term storage, was not known. Therefore, the possibility existed that, if a bombing halt occurred, Minol II-filled bombs might have to be destroyed, which would result in a financial loss that the Air Force estimated would far exceed potential savings.

Because of the financial risk which the Air Force felt would be entailed in a return to the use of Minol II, a study of the matter was made within the Air Force Headquarters staff. The study resulted in a recommendation, subsequently approved within the Department of the Air Force, to use Minol II only in M117 bombs produced for immediate use. The Office of the Secretary of Defense agreed in September 1970 to the use of Minol II; however, we were informed that administrative and production leadtimes delayed the resumption of Minol II loading of M117s until early in November 1970. The Air Force did not resume loading the MK82 with Minol II.

In our opinion, the study conducted by the Air Force was needed to determine the degree of financial risk involved in the use of Minol II in order to achieve economies in bomb production costs. Although the approval process for the resumption of the use of Minol II appears to have been somewhat lengthy, we have no basis for concluding that the Air Force could have reverted to Minol II sooner.

Question 3

What were the results of the Army's accelerated-life tests on Minol II-filled bombs?

An Army technical report, dated January 1971, on accelerated and desert storage tests of Minol II-loaded M117 bombs concluded generally that such bombs, when subjected to accelerated storage by varying their environmental temperature and humidity under controlled conditions, would extrude non-explosive materials. However, no hazards relative to handling or using the bombs result from this extrusion.

After the start of the accelerated-storage tests, the Army, at the request of the Air Force, designed a more comprehensive program, the Residual Shelf Life Program, to provide knowledge of the storage capability of M117 bombs loaded with either Minol II or Tritonal. The primary objective was to determine if Minol II could be adopted as an alternate for Tritonal (the standard explosive load) for long-term storage.

Under this program, bombs have been, and continue to be, subjected to natural environmental exposure in various extreme environments--arctic, tropic, and desert. Periodically they are withdrawn for sensitivity testing and to determine if any degradation of the explosives or metal parts has occurred. Modifications have been made to some of the bombs in an attempt to prevent extrusion. During the tests the performance of these "improved" bombs is being compared with that of bombs of standard configuration.

According to an interim status report prepared by the Army, the tests completed by November 1971 had shown, among other things, that:

1. Measurable growth of Minol II explosive filler occurs in hot environments; however, the combined effect of

improvements made in some of the bombs had prevented extrusion in these environments for 2 years at the time of the report.

2. The standard production-type Minol II-loaded bomb increases in sensitivity to impact after exposure in hot environments; however, the improved configuration bombs can be stored for periods of 6 months to 1 year (depending on the test location) without any increase in sensitivity that could be considered hazardous to handling, shipping, or using the bombs.

The status report indicates that completion of the program is expected by June 1974. Although more significant developments could occur later in the program, the report states that it can be projected that one of the improved Minol II-loaded bombs will not have an extrusion problem and will be safe to store, handle, and use for a 5-year period after loading.

Although the improvements made to the M117 were made only to a limited number of bombs for testing purposes, we attempted to obtain comparative cost information on the improved versus the unimproved bombs. The Air Force provided data, based on limited procurements, which showed that the net cost of the improvements offset most of the cost advantage gained by using Minol II. We did not attempt to determine what the improvements would cost if the improved bombs were procured in large quantities.

Question 4

How much could have been saved if Minol II had been used as the explosive fill for bombs delivered under the military assistance program during the period November 1970 to February 1972?

On the basis of data obtained from the Air Force, it appears that no M117 bombs were delivered under grant aid or service-funded military assistance programs during the period November 1970 to February 1972. MK82 bombs, however, which since 1969 have been loaded with Tritonal, were delivered under military assistance programs during this period. We attempted to determine why Minol II had not been used as the explosive fill in these bombs.

Air Force officials told us that the reason Minol II has not been used since 1969 in MK82 bombs is related to the intensity of management control which would be needed to insure the timely use of the bombs. The Air Force has viewed tight management controls over Minol bombs to be necessary because of their short shelf life.

Techniques most recently used in managing Minol II-loaded M117s have included specialized reporting and accounting procedures and transportation routings. These techniques have been facilitated by the fact that the M117 is loaded, assembled, and packed at a single location and has only one user--the Strategic Air Command.

The MK82, on the other hand, is loaded at more than one location and is used by many widely dispersed Air Force units, making it difficult, in the view of officials we contacted, to insure adequate feedback data for use in controlling pipeline quantities. These officials expressed the belief that the cost of management procedures, required if MK82s were loaded with Minol II, would more than offset any savings in material costs achieved by using this cheaper fill.

In addition to their reservations regarding the use of Minol II in MK82 bombs, Air Force officials indicated that it has been their general policy not to provide bombs loaded with Minol II under military assistance programs. When bombs are provided under such programs, they told us, there is generally an uncertainty as to how soon they will be used. Supplying Minol II-filled bombs under such circumstances, they said, might result in logistics problems and in dissatisfaction on the part of the recipient.

Because of the reasons discussed above, we have not attempted to determine the amount which might have been saved if bombs delivered under military assistance programs from November 1970 to February 1972 had been loaded with Minol II.

Question 5

What would be the projected savings if Minol II were used in the M117 and MK82 bombs for the remainder of fiscal year 1972 and the first 6 months of fiscal year 1973 for the Air Force, Navy, and military assistance program?

Air Force

In January 1971 the Air Force directed that the explosive fill used in M117 bombs be reverted, effective February 1, 1972, from Minol II to Tritonal. The reason for this decision, according to officials we contacted, was a concern over possibly having to store Minol II-filled bombs, because of the then-declining trend in Southeast Asia sortie rates of the Strategic Air Command (the only user of M117s). The increase in M117 utilization, which has occurred since February 1972 in Southeast Asia, caused the Air Force in April 1972 to direct that Minol II once again be used in M117 bombs. As a result of this decision, it is anticipated that loading of M117s with Minol II will begin in July 1972.

If there had been no interruption in the Air Force's use of Minol II in M117 bombs, we estimate that additional savings of about \$3.4 million would have been achieved by July 1, 1972. We project that, if all M117s now expected to be produced between July 1 and December 31, 1972, are loaded with Minol II and used promptly, the Air Force will save about \$6.4 million in explosive fill costs.

Air Force reasons for not loading MK82 bombs with Minol II since 1969 are discussed under question 4. We have not computed a projected savings for use of Minol II in MK82 bombs.

Navy

Navy officials informed us that Minol II is not used by the Navy because, in its present form, it is not considered safe for storage aboard aircraft carriers. The Navy's concern for safety in this case stems from the extrusion problems experienced by the Air Force in Southeast Asia and demonstrated in Navy tests of Minol II-filled bombs. Because of the proximity of crew quarters to the ships' magazines where explosives are stored and the necessity of handling ordnance on rolling and pitching vessels, the Navy has regarded Minol II as being a potential hazard to the safety of its ships' crews and thus has not approved its use aboard ship.

Because of the Navy's position regarding the storage of Minol II-filled bombs aboard ship, we have not attempted to project the amount of money which might be saved by its use of this explosive.

Military assistance program

Air Force reservations regarding the use of Minol II in bombs delivered under military assistance programs are mentioned in our answer to question 4. Because of these reservations, we have not attempted to project savings which might, in other circumstances, be achieved by using Minol II-filled bombs for this purpose.

Question 6

Have there been any handling accidents involving Minol II-filled bombs? If so, where and what were the circumstances?

We found no evidence of accidents involving Minol II-filled bombs for which the sensitivity of the explosive fill was identified as a cause. Responsible Army and Navy officials informed us that there have been no serious fires or explosions resulting from the use of Minol II in the production of bombs at the Cornhusker Army Ammunition Plant or the Crane or McAlester Navy Ammunition Depots. These are the only facilities at which Minol II has been loaded on a production basis. The Air Force, which is and has been the only user of Minol II-filled bombs, stated that there have been no reported accidents involving Minol II-filled bombs which resulted in loss of life, disability, personal injury, or property damage exceeding \$100.

Accidents, including at least one explosion and fire, have occurred in the transportation of Minol II-filled bombs. Investigations by the military services and the Department of Transportation, however, have not indicated that the use of Minol II was the cause.

Question 7

What have been the pilot reports on the effectiveness of Minol II versus Tritonal bombs by SAC and TAC pilots?

Air Force sources informed us that there have been no pilot reports from SAC units indicating any difference in effectiveness between Minol II and Tritonal. The difficulty in preparing such reports, these sources said, would stem from the delivery parameters, such as the altitude of the aircraft at time of delivery, and from the fact that both Minol II- and Tritonal-filled bombs are delivered at the same time by the same aircraft.

We were informed that TAC has not delivered any M117s loaded with Minol II. Since November 1970, only M117 bombs have been loaded with Minol II.

Question 8

Have the bomb damage assessments by intelligence agencies noted any difference in effectiveness between the two bomb fills?

Air Force officials informed us that there have been no bomb damage assessments by intelligence agencies which have noted differences in the effectiveness of the two bomb fills. Air Force documents indicated that none of the key performance characteristics of the MK82 or M117 bombs are degraded by the use of Minol II. Blast and fragmentation data show that the two fills are essentially equal in effectiveness.