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REPORT BY THE
COMPTROLLER GENERAL
OF THE UNITED STATES

FUTURE PROCUREMENTS OF ARMY'S
COPPERHEAD PROJECTILE SHOULD
BE CONTINGENT ON IMPROVEMENTS
IN PERFORMANCE AND RELIABILITY

D I G E S T

Copperhead, a laser-guided, antiarmor projectile launched from 155-mm. howitzers, entered limited production this year. It is a \$1 billion program. The Army plans to procure over 44,000 rounds by 1986 at an estimated average cost of over \$22,000 per round. (See p. 1.)

Army officials continue to maintain that Copperhead will provide the artillery with an unprecedented antiarmor capability. However, like all weapons which depend on laser guidance, Copperhead's effectiveness hinges on a laser designator operator's ability to keep the target in sight and focus the laser beam on the target. The projectile's seeker can then home on the reflected energy.

VISIBILITY IS A FACTOR

In a European combat environment, good visibility conditions would more often than not be unattainable. Adverse weather, obstructed terrain features, and certain other obstructions can be expected to restrict opportunities for launching Copperhead. In live firings conducted during operational testing under a variety of conditions, Copperhead hit the target in 29 of 71 attempts. For those firings conducted in obstructive conditions, the results showed that the probability of destroying a target with a single Copperhead round was considerably lower. (See pp. 8 to 12.)

RESPONSE TIME MAY BE CRUCIAL

Tests up to this point provide little insight into the effectiveness to be anticipated from Copperhead against moving targets. The Army estimates that two-thirds of the targets on the battlefield will be moving. To successfully attack them would require a fast response

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time, starting with the forward observer's detecting the target and ending with the projectile's hitting it.

The Army would like this response time to be no more than 106 seconds. An Army analysis of moving targets in a European environment found that the probability of maintaining the necessary line-of-sight decreases as the response time is lengthened because the target may become obscured or move out of Copperhead's maneuverability area. In live firings during operational tests, the response time for preplanned missions far exceeded the response time desired by the Army. For missions that were not preplanned, it was still greater. (See pp. 3 to 7.)

DEVELOPMENT IMPROVEMENTS

Two developments may help raise Copperhead's performance to more acceptable levels. A modified seeker, expected to significantly improve Copperhead's performance in smoke, was tested in February 1980 with good results. Also, digital equipment under development, designed to provide more rapid data transmission and target data computations, is expected to reduce Copperhead's response time. (See pp. 6 and 12.)

RELIABILITY STILL UNCERTAIN

Copperhead's reliability in both operational and development tests were so low that the Secretary of Defense directed initial procurement to be limited to a rate of 200 per month. The Army's reliability requirement is 91 percent. The Secretary has required the Army to bring the reliability level up to at least 80 percent before the procurement rate could be increased. Army estimates of Copperhead's reliability as demonstrated in testing ranged from 45 to 72 percent, based on varying criteria applied by different Army evaluators. The principal reliability problems were discovered during tests in which Copperhead was subjected to shock and vibration. The deficiencies were related to an electrical

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cable, wing failures, and the stabilizing sensor. (See pp. 13 to 15.)

CONCLUSIONS

Copperhead's greatest contribution promises to be its precision accuracy, which should permit the Army to score many more first round hits against stationary targets than it can with existing artillery munitions. But, its ability to respond in the expected European environment must improve sufficiently to also permit better success against moving targets. If Copperhead remains useful only against stationary targets and then only in conditions of good visibility, the question arises as to whether the Army would still need the full programed quantity of over 44,000 projectiles.

The Secretary of Defense has appropriately limited the current rate of procuring Copperhead pending the resolution of its reliability problems. GAO believes that the Department of Defense should also make future procurements of Copperhead conditional upon its showing improved effectiveness against moving targets.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense

- continue limited production of Copperhead until it has demonstrated an ability to achieve a response time that would improve its performance against moving targets and has attained the required level of reliability and
- reassess the need for procuring the total Copperhead quantity currently programed if such responsiveness and reliability are not demonstrated.

AGENCY COMMENTS

GAO discussed the issues in this report with Department of Defense officials associated with the management of the Copperhead program and

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provided them with a draft of this report for comment. They agreed with GAO's conclusions and recommendations. Their suggestions for improving the report's technical accuracy have been incorporated as appropriate.