

DOCUMENT RESUME

05222 - [B0685602]

Air Force Requirements for Electronic Warfare Operational Test and Training Equipment. PSAD-78-83; E-163058. March 1, 1978. 14 pp. + appendix (1 pp.).

Report to Rep. George H. Mahon, Chairman, House Committee on Appropriations; by Elmer B. Staats, Comptroller General.

Issue Area: Federal Procurement of Goods and Services:

Procurement of Only Needed Quantities of Goods (1901).

Contact: Procurement and Systems Acquisition Div.

Budget Function: National Defense: Department of Defense - Procurement & Contracts (058).

Organization Concerned: Department of the Air Force.

Congressional Relevance: House Committee on Appropriations;

House Committee on Armed Services; Senate Committee on Armed Services. Rep. George E. Mahon.

Authority: Air Force Regulation 57-1.

The fiscal year 1978 Air Force budget estimate included \$16.5 million for procurement of threat simulators and related equipment to upgrade its operational test, evaluation and training equipment and ranges. These improvements were intended to provide a realistic training environment in which to train aircrews. Findings/Conclusions: There is no question of the overall need to improve Air Force operational ranges or the attempt to achieve greater realism in training aircrews. However, the Air Force should improve the information it presents to congressional decisionmakers who must act on appropriations request for the program. In the case of threat simulators and related equipment, much more is involved than just the procurement of specific pieces of equipment. Documents indicate a 5-year total program cost estimated at \$694 million, but because the Air Force followed the traditional budget approach which fragments the program into segments financed by multiple appropriations, its presentation to the Appropriations Committee may not have focused attention on the magnitude of the total program. Recommendations: The Secretary of the Air Force, in presenting future fund requests for operational range improvements, should give congressional decisionmakers a comprehensive picture of what the moneys are for, why they are needed, and how they are to be spent. (RRS)

5602

REPORT BY THE

Comptroller General

OF THE UNITED STATES

Air Force Requirements for Electronic Warfare Operational Test and Training Equipment

This report to the House Committee on Appropriations discusses the planned expenditures of about \$700 million for Air Force operational test and training equipment and range improvements.

GAO recommends that the Air Force give congressional decisionmakers a comprehensive picture of what future moneys are for, why they are needed, and how they will be spent.





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

B-163058

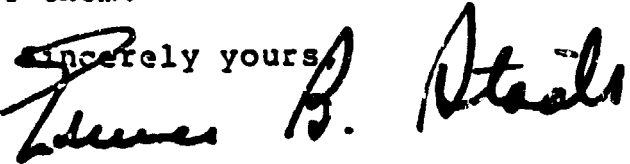
The Honorable George H. Mahon
Chairman, Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

This is the report you requested on the Air Force's system of determining requirements for certain types of electronic warfare threat simulators and related equipment.

At your request, we did not take the additional time to obtain written agency comments. The matters covered in the report, however, were discussed with agency officials and their comments are incorporated where appropriate.

As agreed with your office, we are sending copies of this report to the Acting Director, Office of Management and Budget; the Secretary of Defense; and the Secretary of the Air Force. Copies will also be available to other interested parties who request them.

Sincerely yours,


Comptroller General
of the United States

D I G E S T

The Air Force requested funds in the fiscal year 1978 Presidential budget for upgrading its operational test, evaluation, and training equipment and ranges. These improvements were intended to provide a realistic training environment in which to train aircrews. There apparently is no question in the minds of Defense officials that such training is essential and would significantly enhance the combat capability of U.S. forces.

GAO found:

- Earlier Air Force proposals for improving and integrating selected ranges in the western United States were denied by the Congress. (See p. 3.)
- Concern was expressed by some of the attendees at an Air Force meeting held to establish priorities for program requirements. Equipment desired was identified, but the plan did not provide the rationale needed to justify fully the funding for those requirements. (See p. 9.)
- This program includes more than just the procurement of electronic equipment. Multiple appropriations are involved, which include major budget categories such as Other Procurement; Research, Development, Test, and Evaluation; Aircraft Procurement; Military Construction; Operations and Maintenance; and Military Personnel. When all aspects of this program are considered, the total cost for the 5-year period ending fiscal year 1983 would be almost \$700 million. The equipment portion of the program would be about \$500 million. (See pp. 11 to 13.)
- The Air Force is updating its radar warning receivers and electronic

countermeasures equipment that it installs in operational aircraft to enable the equipment to react against certain known threats; however, there is some risk that the modifications may not be successful. (See p. 13.)

RECOMMENDATION

GAO recommends that the Secretary of the Air Force, in presenting future fund requests for operational range improvements, give congressional decisionmakers a comprehensive picture of what the moneys are for, why they are needed, and how they are to be spent. (See p. 14.)

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ABBREVIATIONS

COR	Continental Operations Range
DOD	Department of Defense
GAO	General Accounting Office
GOR	General Operational Requirement
OSD	Office of the Secretary of Defense
ROC	Required Operational Capability
TAC	Tactical Air Command

CHAPTER 1

INTRODUCTION

The Chairman, House Committee on Appropriations, in Report No. 95-451, on the Department of Defense (DOD) fiscal year 1978 appropriations, asked us to assess the system by which the Air Force identifies training and associated equipment requirements related to electronic warfare threat simulators. These simulators are installed at Air Force electronic warfare training ranges to train aircrews.

The fiscal year 1978 Air Force budget estimate included \$16.5 million for procurement of threat simulators and related equipment. In fiscal year 1977, the Air Force budgeted \$31.4 million for this program and the Congress approved the entire amount. Subsequently, there was a reprogramming of \$4.2 million so that only \$27.2 million remained in the fiscal year 1977 program. Furthermore, the listing of specific pieces of equipment to be procured changed dramatically.

When asked to explain these changes, the Air Force supplied the Committee information which raised questions as to whether the Air Force was giving proper management direction to the program. The Committee's Surveys and Investigations Staff also raised questions about management in a report on a threat simulation system. As a result, the Committee recommended denial of the \$16.5 million budgeted for fiscal year 1978.

FUNCTION OF THREAT SIMULATORS

Electronic warfare threat simulators reproduce and transmit the same type of signals that would be transmitted by hostile radar-controlled surface-to-air missiles or anti-aircraft guns. The signals transmitted by the simulators are picked up by radar warning receivers in our aircraft. These receivers alert the aircrew that they are in danger of being destroyed unless they take immediate counteraction. The counteraction could include such things as dispensing chaff to confuse the enemy's radar, activating electronic countermeasures to jam the enemy's radar, maneuvering the aircraft to avoid being hit, or aborting the mission.

In order to achieve realism in operational testing of equipment and training modern aircrews for combat,

it is not enough to simply fly to the target area, drop bombs or fire air-to-surface missiles, record the score, and go home. Modern aircrews must learn to do all of the above while using electronic warfare tactics to defend against hostile actions. If not, chances are they will not survive long enough to get to the target and home again in a real war. This need for realism in training is one of the reasons for the Air Force's requirement for electronic warfare threat simulators and range improvements.

CONTINENTAL OPERATIONS RANGE CONCEPT REJECTED

DOD and the Air Force made a number of studies in the early 1970s. These studies identified the need for a range where operational testing and training could be conducted in a more realistic environment. The Air Force, in response to this need, developed a concept known as the Continental Operations Range (COR). COR was to provide:

- A range facility that would permit operational test and evaluation of equipment and strike-sized air warfare elements in a realistic combat environment.
- Large land and airspace areas where unconstrained exercises could be conducted to train aircrews in a realistic but simulated combat environment and to evaluate tactics, performance, and capabilities of the people and their equipment.
- A combat-like environment for selected development tests and evaluations which could not be accomplished at existing research and development ranges.

The COR concept provided for improving and integrating three existing range complexes located in the western United States. The range complexes are (1) Tactical Fighter Weapons Center located at Nellis Air Force Base, near Las Vegas, Nevada, (2) Wendover-Hill-Dugway ranges near Salt Lake City, Utah, and (3) Fallon Naval Air Station near Reno, Nevada.

The COR concept also involved the addition of threat simulators, instrumentation, communications, and ground targets so that strike-sized air forces could be tested against large-scale, multi-defended areas. Joint exercises with the Army and Navy were also suggested. The estimated costs for COR were \$208 million. The estimate excluded operation and maintenance costs. Completion of COR was contemplated for 1982.

The Surveys and Investigations Staff of the House Appropriations Committee conducted a review of COR and submitted its report to the Chairman on May 13, 1974. The report identified the following problems:

- A lack of coordination within the Air Force and a lack of Army and Navy stated requirements for such a facility, which suggests that a triservice range was not probable.
- A deficiency in detailed user requirements; there was no documented plan setting forth what was going to be done at COR, how, when, and by whom.
- Evidence that COR could be much more expensive than initial estimates.

The Air Force requested Other Procurement appropriation funds for COR in fiscal year 1974. That request was denied by a congressional conference committee after the House committee recommended denial and the Senate committee recommended restoration of the funds. As part of the fiscal year 1974 supplemental request, the Air Force again requested funds for COR and the conference committee again denied the request after the House committee recommended denial and the Senate committee recommended restoration.

During March and May 1974, subcommittees of the House and Senate Appropriations Committees held hearings on the fiscal year 1975 DOD appropriations. In August 1974, the House and Senate reports were issued. The House report recommended denial of all fiscal year 1975 funds associated with COR. The Senate report recommended restoration of COR funds. A conference report issued on September 18, 1974, upheld the denial of COR funds proposed by the House.

Although funding for COR was denied, the Air Force continued to believe there was a valid need for improving its operational training and test ranges by providing a more realistic combat environment. (See pp. 7 and 8.)

SCOPE OF REVIEW

We made our review during the period August 1977 to January 1978. We visited Headquarters, Tactical Air Command, Langley Air Force Base, Virginia, and the Armament Development and Test Center, Eglin Air Force Base, Florida. We also interviewed Air Force officials of Headquarters, U.S. Air Force, Pentagon; Air Force Systems Command, Andrews Air Force Base, Maryland; and Air Force Logistics Command,

Wright-Patterson Air Force Base, Ohio. We examined requirements supporting documents in the Air Force's files.

CHAPTER 2

REQUIREMENTS PROCESS IN THE AIR FORCE

SYSTEM FOR DETERMINING REQUIREMENTS

Air Force Regulation 57-1 provides that an operational requirement may be recognized, stated, and forwarded by any echelon of the Air Force or DOD. Air Force organizations recognizing an operational deficiency or need and proposing corrective action must coordinate a statement of the requirement with the other commands that will ultimately use or be affected by the proposed capability. This statement is called a Required Operational Capability (ROC). Official recognition of a requirement begins with the preparation and submission of the ROC to Air Force Headquarters.

ROCs should go through a review process within the command recognizing the need, before approval and submission to Air Force Headquarters. In each command there is an office assigned responsibility for controlling the processing and submission of ROC proposals. An action officer is assigned the responsibility for preparing the ROC, guiding it through the various reviews and evaluations by the headquarters staff, and incorporating pertinent decision matters into the final document. Review within the command headquarters consists of examination and evaluation of the ROC by working groups, panels, and command staff. The commander of either the Strategic Air Command or the Tactical Air Command has the final authority within his command to approve proposed ROCs for submission to Air Force Headquarters dealing with electronic warfare threat simulators which are the subject of this report.

At Air Force Headquarters, the Deputy Chief of Staff for Research and Development receives the ROCs. A program officer is selected to be the sponsor of the ROC while it is being considered at Air Force Headquarters. It is the program officer's responsibility to see that debate and advocacy within the Air Force and outside the Air Force are brought to the attention of the decisionmakers.

The first step in processing the proposed ROC is for the program officer to obtain an evaluation by the Headquarters Air Staff. The program officer must develop a position regarding the ROC and defend its validity or recommend rejection or modification. In some instances,

the program officer may ask coordinating commands for comments. Coordination should be completed within 90 days.

After coordination with the Air Force Headquarters, the program officer submits and defends the ROC before a Requirements Review Group. After a review and evaluation of the proposed ROC, the group can recommend validation, rejection, or return of the ROC to the program officer for additional information.

If the proposed ROC is not for a major weapon system--as in the instance of electronic warfare simulators--approval by the Requirements Review Group constitutes validation of the ROC. Now the ROC is considered an approved program which must compete for funds against other valid Air Force programs.

The program officer, in an effort to obtain funding, presents the program to the Air Staff Board, whose members include the Director of Programs, the Budget Director, the Director of Operational Requirements and Development Plans, and the Director of Personnel Planning. The board has committees and panels staffed by specialists. All programs submitted for board consideration normally are reviewed first by the appropriate panel. The board considers the panel's comments, then develops and submits its recommended budgeting dollar level to the Air Force Vice Chief of Staff, who is Chairman of the Air Force Council, the next higher review level.

The Air Force Council considers the recommended budgeted dollar level of the board and accepts it or suggests changes. The Council's recommendation is submitted to the Chief of Staff for his consideration. If the Chief of Staff approves, the program budgeted dollar level is submitted to the Secretary of the Air Force for approval. The Secretary of the Air Force makes the final decision within the Air Force on the proposed budget for the program.

Each year the Office of the Secretary of Defense (OSD) solicits Air Force programs to be entered in the Planning, Programming, and Budgeting System. The Air Force responds with recommendations for the Joint Force Memorandums and provides its Program Objective Memorandum to OSD. After review of the Air Force proposals, OSD issues Program Decision Memorandums, which form the basis for the budget submission to the Congress and subsequent updating of the DOD Five-Year Defense Plan.

CHAPTER 3

AIR FORCE GOALS FOR OPERATIONAL

RANGE IMPROVEMENTS

THE VALIDATION OF ROC 305-76

According to the Air Force, the document supporting the request for appropriated funds to acquire electronic warfare threat simulators and related range equipment is ROC 305-76 (Revised), dated December 6, 1976, "Improvements To Tactical Air Force Ranges." The Air Force's statement of need and operational capabilities is summarized under the following side captions.

Statement of need

The Air Force believes tactical air forces require realistic training ranges, with targets and threats closely resembling the postulated combat environment. Tactical air force training ranges are one of the cornerstones of the aircrew's capability to accomplish the tactical air mission on short notice throughout the world. Combat experience supports the premise that realistic training improves the survivability and effectiveness of the aircrews.

Southeast Asia data showed the probability of survival and the mission effectiveness increased markedly as aircrews became familiar with the combat environment. A significant decrease in aircraft losses and improved mission results could be expected after the aircrews flew over ten combat missions.

Although realistic training cannot remove the unexpected from the combat equation, highly trained aircrews quickly adjust to meet the changing threat.

Besides training aircrews, realistic training environments provide continuing opportunities to analyze tactics as well as command and control procedures. Comprehensive operational testing, realistic training, and effective evaluation of combat techniques cannot be accomplished on poorly equipped ranges. According to the Air Force, current tactical ranges suffer from many deficiencies. These deficiencies can be summed up in the following categories:

- Inadequate realistic threat simulation.
- Range area limitations.
- Lack of range instrumentation.
- Electromagnetic emanation limitations (interference with TV and radio signals).
- Encroachment on land, water, or airspace.
- Inadequate real-time all weather/night control.
- Inadequate range communications.

In order to develop the ranges to the degree required, an orderly, comprehensive range improvement program must be instituted to provide the necessary capability in an acceptable period of time.

Statement of required operational capabilities

Since weapon systems' capabilities and combat skills must ultimately be developed and evaluated in actual flight situations, the Air Force believes that their tactical air forces require range facilities which will:

- Permit operational test and evaluation in a realistic combat environment.
- Provide capability for conducting large-scale exercises to evaluate and train combat flying units under realistic combat conditions.
- Provide realistic conditions, including visual cues for routine flying training.
- Provide a capability to monitor, reconstruct, debrief the aircrew, and evaluate precisely both single and multi-aircraft operations, which include surface-to-air, air-to-surface, and air-to-air ordnance exchanges aided by computer simulation with real-time scoring and information feedback.
- Provide range surveillance necessary for range, mission, and traffic control as well as safety of operation.
- Provide an ongoing program to keep pace with changing enemy threat developments.

COORDINATION WITHIN THE AIR FORCE

On April 14, 1976, the Commander, Tactical Air Command, transmitted ROC 305-76 to Air Force Headquarters. However, he did not provide the applicable range management plans because they were in the final stages of publication. The range management plans provide details on proposed equipment needed to fulfill the required operational capability. In the coordinating comments on the ROC, during the summer of 1976, several Air Force activities stated that, while the requirement appeared valid, constructive comments or meaningful evaluations could not be provided because they had not received the range management plans.

On August 10, 1976, a meeting was convened at Air Force Headquarters to establish priorities for the fiscal years 1977 and 1978 operational range requirements and the requirements for fiscal years 1979 and beyond. Representatives from the Tactical Air Command presented the requirements for their command as well as those for the tactical air forces in Alaska, Europe, and the Pacific. Representatives from each of the following organizations presented their individual requirements

- Strategic Air Command;
- Air Defense Command;
- Air Force Logistics Command; and
- Air Force Test and Evaluation Center.

The attendees expressed their opinion that ROC 305-76 should be validated. However, Air Force Headquarters personnel expressed concern that the range management plans identified equipment desired but did not provide the rationale needed to fully justify the funds needed to fulfill the requirements. They stated that additional information was needed concerning the numbers and different types of radars, threat simulators, and other related equipment and the objectives to be achieved by obtaining this equipment. They also needed information on training requirements, the numbers of training sorties to meet these requirements, and the locations where training was to be conducted.

This lack of detailed data was the same type of deficiency reported by the Surveys and Investigations Staff of the House Appropriations Committee in May 1974 when they reviewed the COR. (See p. 3.)

On November 20, 1976, the Commander, Tactical Air Command, provided additional supporting information for operational range requirements. He stated that the range improvement program had taken on a new dimension in the last 2 years. What was initially a program to upgrade the range at Nellis Air Force Base had grown to encompass all Air Force operational ranges.

On December 8, 1976, the Air Force Headquarters program officer recommended that ROC 305-76 be validated. The estimated total program cost for equipment in the 5-year period ending fiscal year 1983 for the tactical air forces was \$502.1 million. The recommendation did not reflect any adverse comments from other Air Force commands. In summarizing other related considerations, the program officer wrote:

"The Air Force originally pursued the Continental Operations Range (COR) to satisfy its requirements. When the Congress recognized the Air Force requirements but did not fund COR, the Air Force was forced to undertake improvement of its already existing ranges to meet its needs. This ROC was submitted after-the-fact in order to provide a basis independent of COR documentation for the Air Force Range Improvement Program."

The following table shows the total program cost baseline estimated as of December 8, 1976, for the 5 fiscal years ending 1983.

Total Program Cost Estimate

(millions)

<u>Commands</u>	<u>Fiscal years</u>					<u>Total</u>
	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	
Tactical air forces (note a)	\$120.9	\$101.7	\$102.0	\$109.6	\$67.9	\$502.1
Strategic Air Command (note b)	24.4	41.9	36.4	31.6	16.5	150.8
Air Defense Command (note b)	<u>1.5</u>	<u>1.5</u>	<u>1.5</u>	<u>1.5</u>	<u>.3</u>	<u>6.3</u>
Total	<u>\$146.8</u>	<u>\$145.1</u>	<u>\$139.9</u>	<u>\$142.7</u>	<u>\$84.7</u>	<u>\$659.2</u>

a/ROC 305-76 includes Tactical Air Command, U.S. Air Force Europe, Pacific Air Force, and Alaskan Air Command.

b/A ROC had not been prepared for these items.

On January 18, 1977, the Requirements Review Group validated ROC 305-76 at a cost baseline of \$502.1 million for equipment. While the \$156.8 million for the Strategic Air Command and the \$6.3 million for the Air Defense Command were included in the total program cost estimate, separate documentation for these requirements had not been prepared. When we asked why separate ROCs had not been prepared for the Strategic Air Command and the Air Defense Command, Air Force representatives advised us that a new ROC, including all Air Force operational range improvement requirements, was being prepared. As of February 10, 1978, that Air Force-wide ROC was being coordinated with affected commands. In the future, the ROC will be called a General Operational Requirement (GCR).

MULTIPLE APPROPRIATIONS
ARE INVOLVED

The Air Force operational range improvement program includes more than just the procurement of electronic warfare threat simulators and range instrumentation. Multiple appropriations are involved which include major budget categories such as: 3080--Other Procurement; 3600--Research, Development, Test, and Evaluation; 3010--Aircraft Procurement; 3300--Military Construction; 3400--Operations and Maintenance; and 3500--Military Personnel.

In the table on page 12, we have summarized the costs of the total program to the extent data was available.

Estimated Program Cost By Budget Category
Fiscal years 1979-83

<u>Budget category</u>	<u>Amounts</u> (millions)
<u>3080--Other Procurement</u>	
Acquisition of electronic warfare threat simulators, range operation control communications, air traffic control, and safety equipment and test instrumentation.	\$564.3
<u>3600--Research, Development, Test and Evaluation</u>	
Necessary research, development, and testing of the systems before procurement.	<u>a/74.9</u>
<u>3010--Aircraft Procurement</u>	
Procurement of electronic equipment "pods," which are attached to aircraft training with the air combat maneuvering instrumentation (ACMI) system.	<u>a/20.0</u>
<u>3300--Military Construction</u>	
Site preparation, road construction, and building modifications required by the program.	<u>a/5.9</u>
<u>3400--Operations and Maintenance</u>	
Day-to-day costs of operating and maintaining equipment, excluding military personnel costs.	<u>a/23.3</u>
<u>3500--Military Personnel</u>	
Pay and allowances for the military personnel required by this program.	<u>a/ 5.4</u>
Total	<u>\$693.8</u>

a/Does not include estimated amounts that may be needed by the Strategic Air Command and the Air Defense Command.

As the table shows, when all aspects of this program are considered, the total cost for the 5-year period ending fiscal year 1983 probably is almost \$700 million.

COMPATIBILITY OF GROUND THREAT
SIMULATORS WITH AIRBORNE EQUIPMENT

As mentioned in chapter 1, the effectiveness of aircrew training depends not only on the signals generated by the threat simulators, but also on the equipment in the aircraft. If the radar warning receivers do not alert the aircrews, no amount of threat simulation can be effective. Furthermore, if the signal is received and the aircrew has no electronic countermeasure to use against the threat, the value of threat simulators is also degraded. Therefore, the acquisition of compatible simulators, receivers, and countermeasure equipment is important.

A prior GAO report 1/ and a set of Air Force briefing charts on the status of equipment installed on some operational aircraft suggests that all threat signals cannot be received. There are some signals that our radar warning receivers should be able to receive, but the capability has yet to be demonstrated in actual operations. To demonstrate this capability, ground threat simulators are needed. The same is true for certain types of countermeasure equipment. While modifications are being made on radar warning receivers, the Air Force has not yet fully solved the problem of modifying all of its electronic countermeasure equipment to make them fully effective. Therefore, there is a degree of risk that the modifications may not be successful.

1/"Review of Tactical Air Defense Suppression Programs,"
(SECRET), PSAD-77-81, March 3, 1977.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATION

CONCLUSIONS

We do not question the overall need for improving Air Force operational ranges, which includes threat simulators and related equipment, and the attempt to achieve greater realism in training aircrews. Such training should increase the aircrew's chances of survival in actual combat. We believe, however, the Air Force can improve the information it presents to congressional decisionmakers who must act on appropriations requested for this program. We believe that a comprehensive explanation should be provided showing--as clearly as possible--all the related costs and plans for utilization of the facilities.

In the case of the threat simulators and related equipment, much more is involved than just the procurement of specific pieces of equipment. Air Force documents indicate a 5-year total program cost estimated at \$694 million. Because the Air Force followed the traditional budget approach which tends to fragment the program into segments financed by multiple appropriations, its presentation to the Committee on Appropriations may not have focused attention on the magnitude of the total program.

RECOMMENDATION

We recommend that the Secretary of the Air Force, in presenting future fund requests for operational range improvements--which include electronic warfare threat simulators and related equipment--give congressional decisionmakers a comprehensive picture of what the moneys are for, why they are needed, and how they are to be spent.

LIST OF RELATED GAO REPORTS

"GAO Staff Study on the Continental Operations Range,"
February 1975

"Review of Tactical Air Defense Suppression Programs,"
(SECRET), PSAD-77-81, March 3, 1977

"Mission Budgeting: Discussion and Illustration of the
Concept in Research and Development Programs,"
PSAD-77-124, July 27, 1977