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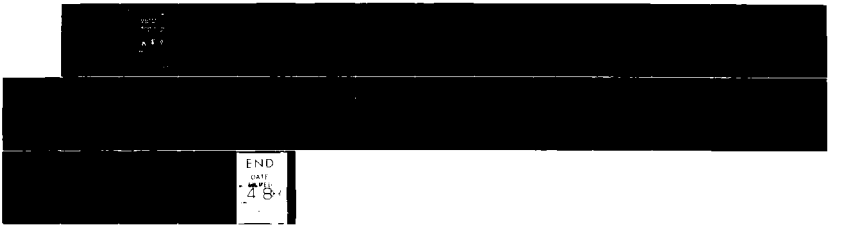

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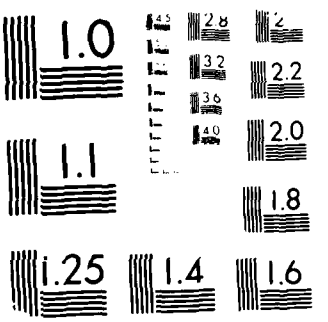

MICROCOPY RESOLUTION TEST CHART

United States General Accounting Office

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GAO

Report to the Secretary of Defense

February 1988

ELECTRONIC WARFARE

Multiple Developments of Costly Threat Simulators

GAO/NSIAD-88-63

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-206548

February 1, 1988

The Honorable Frank C. Carlucci
The Secretary of Defense

Dear Mr. Secretary:

We testified at an October 1987 hearing before the Subcommittee on Legislation and National Security, House Committee on Government Operations on the Department of Defense (DOD) program for acquiring threat simulators. (See app. I.) These simulators are intended to imitate Soviet air defense weapon systems, including surface-to-air missiles and guns.

Our testimony focused on the

- need to prevent the services from paying to develop simulators for a particular threat more than once and
- acquisition of simulators which misrepresent threat systems and thus adversely affect testing of major U.S. weapon systems and training of U.S. forces.

Multiple Developments of Simulators for the Same Threat

Rather than developing a simulator for a particular threat once and producing it in sufficient quantities to meet their needs, the Army, Air Force, and Navy are paying contractors for multiple developments of simulators for the same threat. Substantial costs could be avoided by strengthening DOD controls to preclude the multiple developments.

The multiple developments are occurring in simulator programs for so-called emitter-receiver-processors (ERP)[1] and emitters.[2]

We found in ERP programs, for example, that since 1980 the Army and Navy each has acquired a simulator for the Soviet SA-6 air defense system while the Air Force has acquired two. The cost of these four simulators was $31.9 million. Two SA-6 simulators had already been developed before 1980. Thus, the services have paid for the development of six different SA-6 simulators. The total cost associated with the multiple

[1]ERPs incorporate all elements of a radar system, including the emitter, receiver, and associated signal processor and thus are intended to represent the total functional capability of radars associated with Soviet surface-to-air missile and gun systems.

[2]Emitters provide only electronic emissions or signals intended to match those of threat radars.

ERP developments completed or planned since January 1980 exceeded $560 million.

Similarly, in emitter programs, we found 13 different simulators for the SA-6, 10 simulators for another threat, 12 for another, and so on. In total, we found that two or more simulators were acquired or planned since January 1980 for 23 threat systems at a cost exceeding $600 million. The multiple developments are occurring mainly within the Air Force.

The services believe that their separate developments are justified because the simulators are of different designs and were acquired at different times to meet their unique requirements. While different designs may sometimes be warranted to meet unique requirements, we believe that the differences could be accommodated by varying the designs around the same basic simulator components, for example, the antenna and transmitter. Alterations, such as making the simulator mobile or not mobile, do not, in our opinion, justify separate development efforts. We also believe that with proper coordination and planning, the services should be able to predict their collective needs so that they could be met through a single development program.

We believe that the multiple ERP developments were caused by (1) a perceived lack of authority within DOD for managing the services' simulator programs and (2) a desire by the services to manage and control their separate programs and the attendant resistance to joint-service efforts.

The Joint Executive Committee on Air Defense Threat Simulators, called EXCOM, and its agent committee called Crossbow-S, have attempted to encourage cooperation among the services.[3] But, these efforts have not yet resulted in an effective joint program. New EXCOM and Crossbow-S charters have been proposed to more specifically define their roles and responsibilities. The proposed EXCOM charter clearly identified the EXCOM as the DOD decision authority for simulator programs. But, the services strongly opposed the new charters because of the authority which would have been vested in the Committees, and the issue remains unresolved.Regarding the emitter programs, we found an apparent management void at the DOD level. EXCOM and Crossbow-S representatives said that they had concentrated management efforts on the major ERP

[3]DOD established the EXCOM in 1983 to manage its simulator program. EXCOM is supposed to review and approve simulator programs and related resource commitments. Crossbow-S is supposed to accomplish the coordination of simulator programs as EXCOM's agent.

programs and were not adequately staffed to oversee emitter programs. In view of the widespread multiple developments in emitter programs, especially in the Air Force, control over the requirements definition process is needed to preclude repetitive development of simulators for the same threats.

Duplication in simulator programs may further proliferate if planned acquisitions of simulators by the Director of Operational Test and Evaluation are not carefully controlled.

Simulators Misrepresent Threats

Simulators which significantly misrepresent threat systems are being used to test the effectiveness of U.S. weapons and to train pilots in how to combat hostile systems. The potential consequences in combat could be serious.

Of 46 different simulators examined,[1] we found that 35 deviated substantially from intelligence estimates of the threat characteristics. The simulators' deviations involved technical characteristics of the associated radars which affect the system's range, accuracy, and resistance to countermeasures, and thus the overall effectiveness of the air defense system.

The faulty simulators are being used to test important systems, such as the ALQ-161 jammer which provides self-protection for the B-1B bomber. They are also being used in training such as Green Flag, the Air Force's main electronic combat training exercise.

The results of testing U.S. systems and training pilots could be different if the simulators used more closely resembled the threat systems.

The faulty simulators are being acquired, at least in part, because of weak internal controls within the services. The Army and Navy do not have a sufficient separation of responsibilities for the acquisition, testing, and acceptance of simulators. Decisions to accept simulators with known deficiencies were made by officials responsible for their development without any required review by or approval from potential users. A similar situation existed in the Air Force.

[1]The 46 simulator systems included those fielded since January 1980 and those in development for which characteristics had been determined.

We also noted that DOD was not overseeing the acquisition process to assure adequate simulator quality.

Recommendations

We recommend that the Secretary of Defense

- assure that the EXCOM and Crossbow-S or other appropriate DOD elements execute responsibility and authority for centrally managing simulator programs to provide for timely identification and consolidation of simulator requirements and for disapproval of programs representing unwarranted development;
- require the services to strengthen internal controls over simulator acquisitions by segregating responsibilities for development, testing, and acceptance of simulators as valid representations of the threat; and
- assign to an appropriate DOD element the responsibility for monitoring the quality of simulators acquired and participating in the acquisition process as necessary to assure the adequacy of simulators.

Objective, Scope, and Methodology

The objective of our review was to examine whether DOD was effectively controlling and coordinating its threat simulator program to (1) prevent duplication in acquisitions by the military services and (2) assure that simulators acquired were adequate for their intended use.

We focused on Army, Air Force, and Navy programs for air defense threat simulators completing development since January 1980 and those planned for the future. In evaluating these programs, we also considered those simulators that were already available. We examined program acquisition plans, requirements documents, intelligence estimates of threat capabilities, test and evaluation reports, and other records bearing on our objectives. We discussed the duplication in simulator developments, the adequacy of simulators in representing the threat, and other matters with DOD and service representatives responsible for managing the simulator programs. We did not request official DOD comments on this report. Our review was conducted in accordance with generally accepted government auditing standards from June 1986 to August 1987.

The head of a federal agency is required by 31 U.S.C.720 to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the

report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Chairmen of the above Committees and the House and Senate Committees on Armed Services. Copies are also being sent to the Director, Office of Management and Budget.

Sincerely yours,

Frank C. Conahan
Assistant Comptroller General

Testimony on the Department of Defense Threat Simulator Program

United States General Accounting Office

GAO

Testimony

For Release on
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October 21, 1987

Department of Defense Threat Simulator Program

Statement of
Richard Davis
Associate Director
National Security and International Affairs Division

Before the
Legislation and National Security Subcommittee
of the
Committee on Government Operations
United States House of Representatives

GAO/T-NSIAD-88-3

Mr. Chairman and Members of the Subcommittee:

I am pleased to appear before you today to discuss our review of the Department of Defense (DOD) threat simulator program. In a June 5, 1986, request, the Chairman asked us to examine whether DOD is effectively controlling and coordinating this program to (1) prevent duplication in the acquisition of simulators by the military services and (2) assure that simulators acquired are adequate for their intended use. Our review focused on those simulators intended to imitate Soviet air defense weapon systems, including surface-to-air missiles (SAMs) and guns.

BACKGROUND

Soviet air defense systems pose a potential threat to the aviation elements of the Air Force, Navy, and Army. These Soviet systems include numerous land-based SAMs, referred to as the SA-3, SA-4, SA-6, and so on. They also include naval variants of land-based SAMs, such as the SA-N-6 and SA-N-7, as well as assorted gun systems. Many of the systems have radars which are used to detect and track target aircraft and, in some cases, to guide the missile to the target or direct gunfire.

As a part of the effort to contend with this potential threat, the military services acquire simulators of the Soviet weapons. One important use of these simulators is to test the effectiveness of

our electronic warfare equipment developed to counter the Soviet systems. For example, the capability of our aircraft self-protection jammers to deceive or otherwise interfere with Soviet radars is tested against the simulators. Simulators are also used to test the capability of aircraft radar warning receivers (RWRs) to alert U.S. pilots that they have been detected by a Soviet radar-controlled weapon. Finally, simulators are used to train pilots in an environment that resembles realistic combat conditions.

Simulators acquired by the services are classed on the degree to which they duplicate the threat systems. For example:

-- Some simply provide electronic emissions or signals intended to match those of threat radars and are commonly called emitters.

-- Others incorporate all elements of a radar system, including the emitter, receiver, and associated signal processor and thus are intended to represent the total functional capability of a threat radar. These are called emitter-receiver-processors (ERPs).

-- Still other simulators are not only functionally representative of the threat, but are built to look like the actual threat system.

THE SERVICES ARE PAYING FOR
THE DEVELOPMENT OF SIMULATORS
MORE THAN ONCE

Mr. Chairman, our review showed that DOD needs to strengthen its controls over the services' simulator programs to prevent the services from paying contractors to develop simulators for a particular threat more than once. Substantial costs could be avoided if simulators were designed and developed only once and then produced in sufficient quantities to meet the needs of all services. DOD has taken some measures to encourage cooperative efforts by the services; however, these measures have not been fully effective.

Table 1 shows the number of times the services paid contractors to develop simulator systems for the same threat.

Table 1: Number of Times Services Developed ERP Simulators

Threat system	ERPs developed since 1/80 or planned			Available as of 1/80	Total simulators	Cost[a] (millions)
	Army	Air Force	Navy			
SA-3/ SA-N-1	-	-	3	4	7	$40.5
SA-4	1	1	-	1	3	14.0
SA-6	1	2	1	2	6	31.9
SA-8/ SA-N-4	1	2	1	-	4	27.8
SA-10/ SA-N-6	-	1	2	-	3	182.0
SA-11/ SA-N-7	1	-	2	-	3	47.2
SA-15/ SA-N-9	1	-	1	-	2	97.2
BARLOCK[b]	-	1	1	1	3	11.5
FLAT FACE[b]	1	-	1	2	4	13.8
KITE SCREECH[b]	-	-	2	-	2	5.5
LONG TRACK[b]	1	2	-	1	4	34.0
THIN SKIN[b]	1	-	1	1	3	10.1
TOP STEER[b]	-	-	2	-	2	45.6
Total						$561.1

[a]The costs shown pertain to those simulators completing development since January 1980 or planned for the future. Costs of simulators already available as of January 1980 were not determined.

[b]The North Atlantic Treaty Organization (NATO) code names for radars used with Soviet air defense systems.

Our review was focused on simulators acquired since January 1980 and those to be acquired. However, in evaluating these acquisitions and to gain more insight into the extent of duplication, we also considered those simulators that were already available. For example, since January 1980, the Army and Navy each has acquired a simulator for the SA-6 while the Air Force has acquired two, costing $31.9 million. Meanwhile, two SA-6 simulators had already been developed. Therefore, the services paid to develop six different SA-6 simulators.

Table 2 shows examples of emitter simulators developed more than once. The multiple developments are occurring almost exclusively within the Air Force.

Table 2: Number of Times Services Developed Emitter Simulators

Threat system	Emitters acquired since 1/80 or planned			Available as of 1/80	Total simulators
	Army	Air Force	Navy		
SA-2	-	3	-	5	8
SA-3/ SA-N-1	-	5	-	9	14
SA-6	-	6	-	7	13
SA-8/SA-N-4	1	8	1	6	16
FIRE CAN[a]	-	3	-	7	10
FLAP WHEEL[a]	-	5	-	7	12
GUN DISH[a]	1	6	-	6	13
LONG TRACK[a]	-	3	-	2	5
MUFF COBB[a]	-	2	1	-	3
OWL SCREECH[a]	-	2	1	3	6

[a]NATO code names for radars used with Soviet air defense systems.

We found that two or more emitter simulators were acquired or planned since January 1980 for 23 threat systems. We could not associate a simulator cost to individual threat systems because the simulators can represent more than one threat, and the services did not keep records on the simulator cost applicable to each threat. However, the cost associated with these emitter programs since January 1980 was about $602.4 million.

Mr. Chairman, I would like to point out that the simulators differ in appearance and other characteristics. In particular, the Army's are designed to look like Soviet systems whereas the Air Force's and Navy's are not. However, the simulators were independently designed and developed to imitate the same threat systems.

This situation is similar to that found during our recent review of Air Force and Navy RWRs on which we testified before this Subcommittee earlier this year. Our work on RWRs showed that the Air Force and Navy were acquiring several different RWRs to accomplish the same function against a common threat.

The services believe that their separate developments are justified because the simulators are of different designs and were acquired at different times to meet their unique requirements. We disagree that separate developments were justified. While we do not dispute that different designs may

sometimes be warranted to meet unique requirements, we believe that the differences could be accommodated by varying the designs around the same basic simulator components. The components of a threat radar simulator, such as the antenna and transmitter, should be the same. Alterations, such as making the simulator mobile or not mobile or making it look like the threat, does not, in our opinion, justify separate development efforts.

We also disagree that the different timing of service requirements justifies separate development efforts. Obviously, threat systems are deployed at discrete points in time. With proper coordination and planning, the services should be able to predict their collective needs such that they could be met through a single development program. We believe that substantial costs could be avoided if simulators were designed and developed only once and then produced in sufficient quantities to meet the needs of all services.

EFFECTIVE DOD OVERSIGHT OF
SIMULATOR DEVELOPMENTS IS MISSING

Regarding the major simulator programs involving ERPs, we believe the multiple developments of simulators stem from a combination of two factors: (1) a perceived lack of authority within DOD for managing the services' simulator programs and (2) a desire by the services to manage and control their separate programs and the

attendant resistance to joint-service efforts. Regarding the emitter programs, we found an apparent management void at the DOD level and a need to improve the Air Force's requirements definition process.

In March 1983, DOD established the Joint Executive Committee on Air Defense Threat Simulators, commonly called the EXCOM,[1] to manage its simulator program. Among other things, the EXCOM is supposed to review and approve simulator programs and related resource commitments. Another committee, called the Crossbow-S, is supposed to accomplish the coordination of simulator programs as an agent of the EXCOM.

We discussed the multiple developments in ERP programs with the Chairmen of the EXCOM and Crossbow-S. They were aware that multiple developments existed but considered it outside their authority to disapprove service programs or reduce service budgets to eliminate these efforts.

In late 1986, DOD prepared new proposed charters for the EXCOM and Crossbow-S to more specifically define their roles and responsibilities. The proposed EXCOM charter clearly identified

[1]The EXCOM is composed of representatives from the Office of the Secretary of Defense [Research and Engineering (Test and Evaluation); Command, Control, Communication and Intelligence; Operational Test and Evaluation; and Strategic Aeronautical and Theater Nuclear Systems] the military services and the Defense Intelligence Agency.

the EXCOM as the DOD decision authority for all simulator programs with the specific function of reviewing and approving threat simulator resources to be included in the Five Year Defense Plan. Among other things, the Crossbow-S would be responsible for reviewing the services' threat simulator requirements and resolving duplications or referring the issue to the EXCOM. However, the services strongly opposed the proposed new charters because of the authority which would have been vested in the Committees. This issue has not been resolved to date.

Despite the uncertainties about the Committees' authority, the EXCOM and Crossbow-S have attempted to encourage cooperation among the services. In 1984, the EXCOM approved a Crossbow-S plan for the acquisition of various simulators. For each simulator program, the plan designated a lead service and provided that other services having a need for the simulator participate with the lead service in a common program to satisfy those needs. However, this plan has not been effectively enforced and has not yet resulted in an effective joint program.

Problems were encountered in attempting to implement this plan. For example, in its 1984 simulator program plan, the Crossbow-S designated the Army as the lead service in acquiring a simulator for the Soviet SA-11, an advanced air defense system. The three

services were to agree on a common program to meet requirements, including those for the SA-N-7, the naval variant of the SA-11. Army and Air Force officials signed the agreement, but Navy officials did not. Navy officials told us that a lack of knowledge about the threat system caused deferral of the Navy program. Yet, the Navy has independently acquired a simulator for the SA-N-7 and is currently developing another.

The opportunity for a cooperative joint program between the Air Force and Army also appears lost despite the written agreement. First, the Air Force reallocated its SA-11 simulator funds to another program. Then, the Army awarded a contract for only the Army's SA-11 simulator needs. The Army did not include an option in the contract for Air Force needs because the Air Force had not informed the Army of its needs. Later, the Air Force provided funds to the Army to initiate its SA-11 simulator acquisition, but the Army has not done so because of a lingering dispute with the Air Force over the appropriate type of contract to award.

The Air Force has insisted that the Army award a fixed-price type contract while the Army has maintained that a cost-type contract is appropriate.

A similar opportunity for an effective joint effort has been lost in the case of the SA-12 simulator program. The Crossbow-S plan designated the Air Force as the lead service for this program and

provided that the Army would participate with the Air Force in a joint effort. The Army then established a low priority for its SA-12 simulator and made no plans to acquire it. However, the Soviet SA-12 is to replace the SA-4 for which the Army has a simulator. In addition, test requirements show that the Army needs a SA-12 simulator to test several of its major systems such as the Army tactical missile system and the ALQ-136 jammer which is used on the APACHE and COBRA helicopters. In fact, test requirements for a SA-12 simulator are almost as great as those for the SA-11 simulator which the Army is acquiring.

The Air Force has attempted unsuccessfully to obtain Army participation in a joint program and is therefore acquiring its SA-12 simulator independently.

Another opportunity has been lost on the simulator programs for the SA-10 and its naval variant, the SA-N-6. Even though these systems appear to be virtually the same, the Air Force is developing a SA-10 simulator while the Navy has a separate program for the SA-N-6 simulator.

DOD has not established any oversight of emitter simulator programs. Representatives of the EXCOM and Crossbow-S told us that they had concentrated management efforts on the major ERP simulator programs and were not adequately staffed to oversee emitter programs.

We found widespread multiple developments in emitter simulator programs within the Air Force. In fact, as mentioned previously and shown on Table 2, the multiple developments in emitter programs are occurring almost exclusively within the Air Force. In our opinion, control must be established over the Air Force's requirements definition process to preclude repetitive development of simulators for the same threats.

I'll cite one of several examples to illustrate my point. The missions of the Air Force's Strategic Air Command are characterized by long duration flights where multiple threats could be encountered throughout the penetration run. To train its aircrews, the Air Force developed a simulator with the capability to transmit numerous threat radar signals but whereby all signals came from a single point on the training range. After deploying this simulator at a cost of $61.8 million, the Air Force decided that it did not realistically represent the threats to the Strategic Air Command aircrews. Accordingly, the Air Force established the requirement for another simulator which would represent many of the same threats but which would enable spreading the threat signals out over the training range. The Air Force is now acquiring this simulator at an additional estimated cost of $196.6 million.

MORE DUPLICATION POSSIBLE

We identified one final but significant matter which could contribute to additional duplication if not carefully controlled. Toward the end of our review, we learned that DOD has plans for the Director of Operational Test and Evaluation to begin acquiring simulators. According to the budget documents, the "capability to conduct valid Operational Test and Evaluation (OT&E) does not exist today for many systems." DOD has requested $93 million for fiscal year 1988 and plans to request $138 million for fiscal year 1989. With these funds, the Director of Operational Test and Evaluation plans to acquire simulators for the Soviet SA-8, SA-10, SA-11, and SA-12.

While we do not disagree with the need for these simulators, the services already have or are developing one or more simulators for each of these threats. Unless it is adequately coordinated another simulator acquisition activity added to the existing service acquisition activities could further proliferate the duplication.

SIMULATORS MISREPRESENT
THREAT SYSTEMS

Simulators being acquired are often inadequate for their intended purpose. The simulators misrepresent threat systems in significant ways and thus adversely affect the testing of major U.S. weapon systems and the training of U.S. forces. This, in turn, could have potentially serious consequences in combat.

We examined 46 different simulators, both ERPs and emitters, and compared their characteristics to current intelligence estimates of the threat characteristics. We found that 35 of the simulators deviated substantially from the intelligence estimates.

In our evaluation of the simulators, we considered technical features of the associated radars which affect the system's range, accuracy, and resistance to countermeasures, and thus the overall effectiveness of the air defense system. These included characteristics such as

-- radar power which affects the range at which a radar can "see" the target and its capability to see through jamming;

-- frequency agility which refers to a radar's ability to change frequencies within its operating frequency band and which could make the radar more difficult to jam;

-- radar beam size which influences the system's ability to detect targets as well as the system's accuracy; and

-- pulse repetition frequency which refers to the number of pulses the radar generates per second and which affects range, accuracy, and susceptibility to countermeasures.

We found different types of deficiencies in comparing simulator characteristics to the threat characteristics. For example, the radar power of one Air Force simulator, intended to test electronic warfare equipment, was only about one-third of the threat's power and was thus substantially less capable. Another simulator's ability to change frequencies rapidly was much less than the threat's and was therefore more vulnerable to electronic countermeasures.

Similarly, an Army simulator's radar power was less than one-half of the threat's power. This, and other characteristic differences affecting its capability to operate against electronic countermeasures, rendered it misrepresentative of the real threat.

Navy simulators also misrepresented the threats. For example, one simulator's radar had about one-third of the threat radar's power, while another simulator could not operate on the same frequencies and significantly differed in other features.

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A representative of DOD's Director of Operational Test and Evaluation agreed that the simulators generally do not represent the threat.

FAULTY SIMULATORS COULD DISTORT TEST RESULTS OF MAJOR SYSTEMS AND TRAINING EFFECTIVENESS

Testing is a vital aspect of the weapons acquisition process. Testing enables evaluation of a weapon's performance effectiveness to include such issues as whether it will defeat or neutralize specific threat systems. Testing is supposed to ensure DOD decisionmakers and the Congress that defense systems will perform as intended before key decisions on their acquisition.

Similarly, training military forces is vital. The military services strive to train its forces under conditions resembling combat as realistically as practical.

We found that many weapon systems were being tested against simulators that did not adequately represent the threat and that U.S. pilots were being trained against them.

Table 3 lists some important systems tested against the simulators.

Table 3: Systems Tested Against Deficient Simulators

System	Mission
Air Force:	
ALQ-161 Jammer	Self-Protection for B-1B Bomber
ALQ-131 Jammer	Self-Protection for F-16 and other aircraft
ALQ-135 Jammer	Self-Protection for F-15 aircraft
ALR-56C RWR	Threat Warning for F-15 aircraft
ALR-69 RWR	Threat Warning for F-16 aircraft
Navy:	
ALR-45F RWR	Threat warning for A-6 and other aircraft
ALR-67 RWR	Threat warning for F-14, F/A-18 and other aircraft
ALQ-126B Jammer	Self-Protection for F-14, F/A-18 and other aircraft
Army:	
ALQ-136 Jammer	Self-Protection for AH-64 (APACHE), and AH-1 (COBRA) Helicopters
Special Electronic Mission Aircraft	Intelligence and Electronic Warfare

We reviewed related test and evaluation reports to determine what allowances were made for differences between the simulators and the real threat. We found that in most cases, the reports did not disclose the differences. In some cases, the reports mentioned simulator limitations in general but made no attempt to describe the deficiencies, their significance, or the possible effect on the test results. The deficiencies, if noted at all, appeared to have been dismissed in evaluating the weapon's potential effectiveness.

For example, the ALQ-131 jammer is to provide self-protection for several Air Force aircraft, including one of its front-line fighters, the F-16. To accomplish this function, the ALQ-131 is supposed to be capable of deceiving or otherwise interfering with various radars used to control SAMs and air defense gun systems.

In evaluating the ALQ-131's capability, the Air Force tested it against several simulators which were supposed to represent specific Soviet systems. However, each of these simulators varied from the related threat in significant ways. For example, one simulator differed from the threat in power and other technical characteristics to the extent that it did not resemble the threat in tracking technique and a number of other functions. The ALQ-131 test report did not mention the simulator deficiencies but did reach conclusions about the ALQ-131's effectiveness.

Similarly, the Navy's ALR-67 RWR is supposed to alert F A-18 aircraft pilots that they have been detected by a radar-controlled weapon. To evaluate the ALR-67's operational effectiveness, the Navy tested its performance against some simulators, eight of which varied substantially from the related Soviet systems in radar power, pulse repetition frequency, or other characteristics.

The test report mentioned the simulators in a general way as a test limitation but did not mention specific simulator deficiencies or how they might have affected the ALR-67's performance. Yet, conclusions were reached regarding the system's potential effectiveness. Performance effectiveness conclusions based on tests with deficient simulators could be quite different if the simulators had more closely resembled the threat.

Deficient simulators were also being used to train U.S. pilots. An example would be the Air Force's Green Flag exercises held at the tactical fighter weapon center range. Green Flag is a training exercise in which tactical fighter units participate to assess and improve their capability to combat hostile air defense systems. Through the use of threat simulators, Green Flag is supposed to provide an arena for aircrews to practice tactics in a simulated combat environment and is the Air Force's main electronic combat training exercise.

We examined a 1987 Green Flag exercise in which the Air Force, Army, Navy, Marine Corps, and British Royal Air Force participated. Our purpose was to identify the threat simulators used and determine whether differences between the simulators and real threat were considered. We found that many of the deficient simulators identified in our review were used in the training.

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Our review of training reports showed that deficiencies in the simulators were not considered. This, in our opinion, could result in false indications of force effectiveness. For example, one Air Force simulator varied substantially from the threat in several technical characteristics such as power, antenna beam width and scan pattern, signal processing, and the ability to change frequencies rapidly. These differences would lessen the simulator's chances of detecting a target aircraft and would make it more susceptible to being effectively jammed than the real threat. However, a pilot might successfully evade or neutralize the simulator whereas the results could be different against the real threat.

ABSENCE OF EFFECTIVE INTERNAL CONTROLS CONTRIBUTED TO FAULTY SIMULATORS

The services were acquiring faulty simulators, at least in part, because of weak internal controls within the services.

Within the Army and Navy there was not a sufficient separation of responsibilities for the acquisition, testing, and acceptance of simulators. Essentially, a single organization in each service had responsibility for the total process with no effective oversight or related checks and balances. Decisions regarding the acceptability of simulators with known deficiencies were made by officials responsible for their development. Potential users

of the simulators, such as the operational testing community, were not required to review or approve such decisions.

For example, while developing a simulator to replicate the Soviet SA-8 System, the Army Missile and Space Intelligence Center (MSIC) learned that intelligence estimates on which the simulator design was based had changed significantly. Rather than initiating design changes, the MSIC decided to continue developing the faulty design because of time and cost considerations. Subsequently, MSIC accepted two of the simulators from the contractor at $5 million each and furnished them to the user with known deficiencies. The simulators were in use for four years when MSIC decided to spend an additional $3.1 million to correct the deficiencies noted earlier in the development program. The modifications have yet to be validated that they clearly resemble the threat.

We found a similar situation in the Air Force. Although Air Force procedures provided for the independent testing of simulators, the decisions regarding the adequacy of the simulators and whether deficiencies would be corrected rested with the organization responsible for simulator development. We believe the acquisition process could be strengthened by establishing proper internal controls to provide some measure of independence to the development and testing of simulators and related decisions regarding their acceptability.

We also observed that DOD was not overseeing the acquisition process to assure adequate simulator quality. In view of the cost and quality of simulators acquired by the services and the importance of simulators in testing and training, such oversight seems desirable.

ACTIONS REQUIRED

To prevent the services from paying for the development of simulators more than once and to assure that simulators acquired are suitable for their intended purpose, we believe the Secretary of Defense should

-- assure that the EXCOM and Crossbow-S or other appropriate DOD element executes responsibility and authority for centrally managing simulator programs to provide for timely identification and consolidation of simulator requirements and for disapproval of programs representing unwarranted development,

-- require the services to strengthen internal controls over simulator acquisitions by segregating responsibilities for development, testing, and acceptance of simulators as valid representations of the threat, and

-- assign to an appropriate DOD element the responsibility for monitoring the quality of simulators acquired and participating in the acquisition process as necessary to assure the adequacy of simulators.

Mr. Chairman, this concludes my testimony. I would be pleased to answer any questions you or Members of the Subcommittee may have.


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