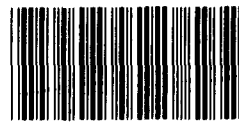


March 1990

COMMUNICATIONS ACQUISITION

Issues Involving Army's Single Channel Ground and Airborne Radio System



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**National Security and
International Affairs Division**

B-146858

March 20, 1990

The Honorable Daniel K. Inouye
Chairman, Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable John P. Murtha
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives

As you requested, we have evaluated the Army's Single Channel Ground and Airborne Radio System (SINGARS) program. Our objective was to assess whether the Army's revised acquisition strategy adequately addresses congressional concerns about the risks involved in the Army's prior plans to increase production of these ground and airborne radios before an operational test. This report discusses the revised SINGARS acquisition strategy and the Army's efforts to reduce production risk of both ground and airborne radios.

Background

SINGARS is the Army's next generation of very high frequency combat radios. The Army expects to spend \$6.5 billion to field 351,000 ground radios and 14,000 airborne radios by fiscal year 2004. The other military services are expected to spend \$418 million for 42,000 ground radios.

Production contracts were initially awarded on a competitive basis to ITT Corporation for ground radios in 1983 and a sole-source basis for airborne radios in 1985. ITT Corporation initially produced a ground version with an external or non-integrated communications security (non-ICOM) device. However, in 1988, ITT Corporation began to produce a version with an integrated communications security (ICOM) feature that the Army expects will provide greater operational reliability and effectiveness. Also, in 1988, the Army awarded General Dynamics Corporation a second-source production contract for ground ICOM radios with options for additional radios. Unlike the ground ICOM radio, the airborne ICOM radio does not embed the communications security function in the receiver/transmitter but in a separate component.

Results in Brief

In response to congressional concerns in July 1988 that a large number of radios were scheduled for production by the ITT Corporation before operational testing was completed, the Department of Defense (DOD) and the Army took several steps between June and August 1989 to reduce program risk. For the ground ICOM radio, the Army (1) slowed the production rate until a successful operational test, (2) rescheduled operational testing to occur 9 months earlier than previously planned, and (3) planned to defer exercise of the next production option for 12,375 radios until successful completion of the test. These changes reduced much of the risk associated with the Army's former plan.

The Army further reduced risk by making similar changes to its airborne acquisition strategy. The Army minimized risks by deferring the option until after the operational test is completed. DOD and Army officials said that the Army will not make a full-rate production decision until the radio successfully demonstrates performance and reliability requirements in the June 1990 test.

Modified Strategy Reduces Risk on Ground Radio Production

The Army's acquisition strategy until June 1989 was to contract for 22,000 ICOM ground radios by May 1990 and hold an initial operational test and evaluation in March 1991. However, before the award, House and Senate authorization committees expressed concerns, in their fiscal year 1989 conference report, about Army plans to increase ICOM radio production before performing an operational test and obtaining certification of operational reliability.

In response, on June 14, 1989, the Under Secretary of Defense for Acquisition limited ICOM ground radio production to about one-half of the planned rate of 1,375 radios per month until various conditions are met. The Army also revised its test and evaluation strategy by scheduling an operational test of the ICOM ground radio for June 1990, nearly 9 months earlier than previously scheduled.

However, because of the accelerated test schedule, the Army will test an earlier production version of the radio that is not contractually required to meet the 1,250-hour reliability criterion. Army officials said, however, that the radio tested must fully meet the reliability and other criteria in operational testing or the Army will not increase production or exercise the next option of the ICOM ground radio contract scheduled for November 1990.

New Strategy Reduces Risk to Airborne Radio Acquisition

As in the revised ground radio acquisition strategy, the operational test to justify initiating full-rate production for the airborne radio has been accelerated by 9 months to June 1990. The Army will not proceed with full-rate production until the radio meets reliability and other criteria and is approved by the Defense Acquisition Board. The Army deferred exercise of the next option, option 3, until November 1990, by which time the test, evaluation, and production decision should be completed.

The decision to delay option 3 until November 1990 could incur up to \$11.6 million in stretch-out costs. However, the Army decided to delay the option to conform with DOD guidance for testing before buying. The Army will be negotiating these stretch-out costs before the exercise of option 3 and expects the final cost figure to be lower.

Conclusions

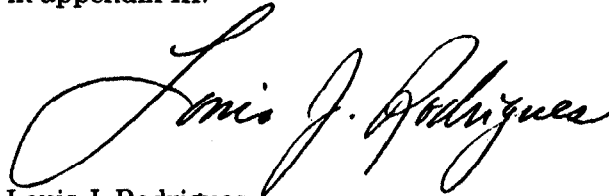
Limiting production of ground radios has considerably reduced the risk associated with the prior acquisition strategy. Army officials have stated that they will not enter full-rate production until the ground radio fully meets reliability and other test criteria.

The Army has also reduced the risk in the airborne radio acquisition strategy by conducting an operational test earlier than originally planned and deferring the exercise of production options. Furthermore, Army officials have stated they will not enter full-rate production unless the airborne radio meets the reliability and other test criteria.

Appendix I discusses the results of our review in more detail. The objective, scope, and methodology of our review are set forth in appendix II.

We discussed a draft of this report with DOD and Army officials and included their comments where appropriate. As agreed with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 10 days from the date of the letter. At that time, we will send copies to the Secretaries of Defense and the Army and to interested parties and make copies available to others upon request.

Please contact me at 275-4841 if you or your staff have any questions concerning the report. Other major contributors to this report are listed in appendix III.

A handwritten signature in cursive script that reads "Louis J. Rodrigues". The signature is written in black ink and is positioned above the printed name and title.

Louis J. Rodrigues
Director, Command, Control, Communications,
and Intelligence Issues

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Abbreviations

DOD	Department of Defense
ICOM	integrated communications security
SINGARS	Single Channel Ground and Airborne Radio System

Risks Reduced With the SINCGARS Acquisition Strategy

Background

SINCGARS is the Army's next generation of very high frequency combat radios. The infantry, armored, artillery, and airborne forces will use these radios. The Army expects to spend \$6.5 billion to field 351,000 ground radios and 14,000 airborne radios by fiscal year 2004. The other military services expect to spend \$418 million for about 42,000 ground radios with more than 80 percent of these radios going to the Marine Corps.

The Army approved the requirement for the radios in 1974, and awarded production contracts with options for additional radios to the ITT Corporation for ground radios and airborne radios in 1983 and 1985, respectively. In 1988, the Army awarded General Dynamics Corporation a contract for additional ICOM ground radios.

Radios on Contract

Of the 365,000 radios the Army plans to buy, three contracts have been awarded with options to buy up to 76,970 radios, as shown in table I.1.

Table I.1: Contract Quantities for SINCGARS

Contract	Number of Radios ^a			Comments
	ITT Ground	ITT Airborne	General Dynamics Ground	
Basic	650	150	400	ITT radios are non-ICOM.
Option 1	3,200	720	1,725	ITT radios are non-ICOM.
Option 2	8,250	1,200	10,375	ITT ground option is for 6,250 non-ICOM and 2,000 ICOM radios.
Option 3	16,000	1,800	16,500	ITT ground option is for 6,375 non-ICOM and 9,625 ICOM radios.
Option 4	16,000	N/A ^b	N/A ^b	
Total	44,100	3,870	29,000	

^aAll radios are ICOM models unless otherwise stated.

^bN/A = Not applicable.

Five options remain to be exercised: option 4 of the ITT ground radio contract, option 3 of the ITT airborne radio contract, and all three options of the General Dynamics ground radio contract.

Ground Radio

The ITT ground radio contract with four options is for as many as 44,100 radios—16,475 are versions with an external or non-ICOM device and 27,625 are versions with ICOM internal to the radio. In 1984, ITT Corporation began developing the ICOM model while producing the non-ICOM model. The ICOM radio is expected to be lighter and more reliable

than the non-ICOM version and provide greater operational effectiveness and reliability.

Non-ICOM Ground Radio

In 1985, the non-ICOM radio failed to meet reliability specifications during first article testing. As a result, radio production was delayed about 27 months. The Army corrected the reliability problems for the vehicular and fixed station versions of the non-ICOM ground radio. In 1989, the Director of Operational Test and Evaluation certified the non-ICOM ground radio operational reliability.

However, ITT's non-ICOM backpack version did not meet the operational reliability threshold and was not certified. Beginning in November 1989, additional field testing of the non-ICOM backpack radio was done to demonstrate that the problems were corrected. Test results are being evaluated and a final report is expected in early 1990.

ICOM Ground Radio

In May 1988, ICOM radio production began under option 2 of ITT's ground radio contract along with non-ICOM radios. (See table I.1.) The Army exercised option 3 in June 1989, including ICOM and non-ICOM radios. ITT will only produce ICOM ground radios after option 3. The ICOM radio is a major design change from the non-ICOM radio since, of 15 modules, 6 modules were modified and 2 new modules were added in the ICOM radio. The options were part of a firm fixed-price contract with specific exercise dates and prices. Changes to any exercise date would affect cost and schedule.

Second-Source Ground Radio

The Army's acquisition strategy included a second-source production contract to obtain competitive pricing, technological improvements, and an increased production base. In 1988, the Army selected General Dynamics as its second source and awarded it a basic contract with three options for as many as 29,000 ICOM ground radios. General Dynamics' radios are strictly ICOM ground radios that are to look and perform like the ITT version even though their internal parts are not interchangeable. The Army plans to exercise General Dynamics option 1 of the contract in September 1990.

Airborne Radio

The ITT Corporation's airborne radio contract with options for additional radios is for 3,870 radios—870 non-ICOMs and 3,000 ICOMs. Airborne non-ICOM radios consist of two units separate from the receiver/transmitter: one is for the communications security function and the other is for the data rate adapter function, which allows interoperability with other Army equipment by varying the rates of data input. The ICOM

version combines the two functions into one unit external to the receiver/ transmitter. This design is different from the ground ICOM radio where the communications security function is embedded in the receiver/transmitter.

Airborne ICOM development began in 1987 and airborne ICOM receiver/transmitter production began in 1989. The first delivery of production ICOM receivers/transmitters will be from contract option 2 in May 1990. These units will be used for operational testing in June 1990. Production of the ICOM data rate adapter is to begin with option 3 in November 1990.

Fiscal Year 1990 Budget Reduction

In November 1989, House and Senate Appropriations conferees reduced the Army's fiscal year 1990 request for the SINGARS program from \$158.7 million¹ to \$80 million. They specified \$30 million for the second-source General Dynamics ground radio and \$30 million for the ITT airborne radio. The conferees did not specify use of the remaining \$20 million. Although, the Army had requested funding for the ITT ground radio to exercise option 4 in May 1990, the exercise is now scheduled for fiscal year 1991.

Modified Strategy Reduces Risk on Ground Radio Production

The Army has restructured its SINGARS ground radio acquisition strategy to reduce program risks. This restructuring occurred because of congressional and DOD Inspector General concerns about the risks of entering full-rate production of ITT Corporation's ICOM radio before operational testing. The new strategy involves (1) a lower rate of production until a successful operational test is completed and (2) accelerating the test schedule by 9 months. Because of these changes, fewer production radios than previously planned will be produced before operational testing.

However, because of the accelerated test schedule, the Army will test an earlier production version of the radio rather than the full-production version. Although the earlier production units are not contractually required to meet the 1,250-hour reliability criterion, Army officials said that they will not enter full-rate production until that reliability criterion and other test criteria are met.

¹The Army's budget request was initially higher but was reduced for the antidrug program.

Prior Acquisition Strategy

The Army's acquisition strategy until June 1989 was to exercise option 3 of ITT's ground radio contract in May 1989 and option 4 in May 1990 for a total of 22,000 ICOM radios. The Army had scheduled an initial operational test and evaluation for March and April 1991, after exercise of these options, using option 3 production ICOM ground radios for the test.

On May 12, 1989, the Under Secretary of Defense for Acquisition authorized the exercise of option 3. However, the Army revised its acquisition strategy in response to concerns raised by the DOD Inspector General and the Congress. The DOD Inspector General issued a report on May 16, 1989, which stated that option 3 was full-rate production and should not be exercised until (1) the ICOM radio undergoes operational testing and (2) Director, Operational Test and Evaluation certifies its operational effectiveness and suitability for combat. Then on May 24, 1989, the Director, Operational Test and Evaluation reported that he could not certify the ITT ICOM ground radio because it did not meet the 1,250-hour criterion for operational reliability during a limited early user test. Congressional authorization committees expressed concerns over the exercising of options 3 and 4 without an operational test. In addition, they believed that program restructuring was needed.

**Revised Acquisition
Strategy**

In response to congressional and DOD Inspector General's concerns, on June 14, 1989, the Under Secretary of Defense for Acquisition limited ITT option 3 ICOM ground radio production to 730 radios per month, or about one-half the planned quantity of 1,375 ICOM radios per month. Further, the Under Secretary specified that the reduced production rate could not be exceeded until (1) the Army successfully completed operational testing and evaluation, (2) the Director, Operational Test and Evaluation certified the operational suitability and effectiveness of the radios, and (3) the Defense Acquisition Board approved it.

The Army revised its test and evaluation strategy to comply with the Under Secretary's actions. The revised strategy calls for operationally testing 175 ICOM ground radios in June 1990, nearly 9 months earlier than previously scheduled. Table I.2 compares the major changes between the previous and current acquisition strategies.

**Appendix I
Risks Reduced With the SINGARS
Acquisition Strategy**

Table I.2: Comparison of Army's Previous and Current Acquisition Strategies for ITT Corporation ICOM Ground Radios

Event	Previous		Current	
	Quantity	Date	Quantity	Date
Option 3 exercise	9,625	6/89	9,625	6/89
Monthly production rate	1,375		730	
Option 4 exercise	12,375	5/90	12,375 ^a	11/90
Operational test		3/91		6/90
Additional radios under contract before operational test	22,000		9,625	

^aOf the 16,000 ground radios available under option 4, the Army plans to buy 12,375.

Army Assessment of Risk in Early Testing

Under the new test schedule, the Army will test radios that are not contractually required to meet the reliability requirement of the option 3 radios. Because the test schedule was moved to June 1990, the only radios available to test are the ICOM initial production radios from option 2 instead of the later production radios from option 3 as planned. Option 3 radios are more likely to meet reliability requirements than those from option 2. This is because the option 2 initial production radios to be tested are only contractually required to meet a 985-hour reliability requirement instead of the 1,250 hours required beginning with option 3. For this reason, the Army had planned to use the later production option 3 radios for operational testing.

Some Army and Office of the Secretary of Defense officials are concerned that there may be some technical risk with using earlier production radios than those intended for the operational test. For example, Army Operational Test and Evaluation Agency officials stated that the radios to be tested are not the later production radios that the Army had planned to test and field, and problems could occur when using the earlier production radios. The risk is that further testing could be required if the radios do not meet the 1,250-hour reliability criterion.

However, Army officials are confident that option 2 ICOM radios will not only exceed the 985-hour contractual requirement but also exceed the 1,250-hour reliability criterion during production reliability acceptance testing. They based their optimism on completed developmental, pilot production, and initial production reliability acceptance test results. According to an Army program official, initial production reliability acceptance test results demonstrated over 1,500-hour reliability. This is based on testing at the contractor's facilities and not field testing. Army

program officials assured us that they would not go to full-rate production and would defer option exercises unless the 1,250-hour reliability requirement is fully met during the June 1990 operational test.

The Army deferred option 4 of the ITT ground radio contract to November 1990. According to an Army program official, the Army will negotiate any stretch-out costs before the exercise of option 4.

New Strategy Reduces Risk to Airborne Radio Acquisition

In the summer of 1989, the Army made changes to its airborne radio acquisition strategy to reduce risk. However, in February 1990, the Army again revised its acquisition schedule and deferred the airborne contract option by about 9 months. Although this change will result in stretch-out costs, the Army decision was based on a DOD policy of testing before buying.

Strategy Reduces Risk

In August 1989, in line with its change to the ground radio test schedule, the Army revised its airborne acquisition strategy by accelerating the operational test to June 1990, nearly 9 months earlier than previously scheduled. The Army still planned to exercise production option 3 as scheduled in February 1990, which would have occurred before the test. Subsequently, the Army decided to award a contract in February 1990 for long lead items only and defer exercising the actual production of option 3 until November 1990 after the test.

The Army also considered deferring the entire option 3 exercise but decided against it to maintain production line continuity and avoid incurring \$5 million to \$10 million in projected stretch-out costs. In February 1990, the Army decided to defer the entire option 3 to November 1990. Although this decision could incur up to \$11.6 million in stretch-out costs, the Army decided to delay the option to conform with DOD guidance for testing before buying. The Army will be negotiating these stretch-out costs before the exercise of option 3 and expects the final cost figure to be lower.

Army Addresses Remaining Risk

While some risks remain in the new acquisition strategy, the Army does not plan to make a full-rate production decision until the airborne radio successfully passes an operational test. According to program officials, the scheduled June 1990 operational test will use a production ICOM receiver/transmitter with developmental communications security and data rate adapter components in one package.

**Appendix I
Risks Reduced With the SINGARS
Acquisition Strategy**

Using a developmental prototype of a key component for the operational test could increase risk that the radios will not meet the required reliability criterion. This could result in the need for further tests before entering full-rate production. However, this is the only equipment available for the test since a complete production version will not be available until option 3 radios are delivered. Deliveries would begin in May 1991 under the long lead item approach compared to January 1992 under the latest plan.

DOD and Army officials said that the Army will not make a full-rate production decision until the radio successfully demonstrates performance and reliability requirements in the June 1990 operational test and the Director, Operational Test and Evaluation certifies that the airborne radios are operationally effective and suitable. An Operational Test and Evaluation official told us that such certification would not only depend upon a successful June 1990 test, but also on using suitable radio models for the test that are representative of the production model. As a result of this strategy, the Army will defer buying the 1,800 radios available under option 3 until after the test.

Objective, Scope, and Methodology

Our objective was to determine whether the Army's revised acquisition strategy adequately addresses congressional concerns about the Army's prior plans to increase production before an operational test is made. We focused our work on the test and acquisition strategies, and the risks associated with both the ground and airborne radio programs.

During our review, we interviewed officials knowledgeable of the SINGARS program and reviewed documents at numerous DOD and Army organizations. We visited the Army Communications-Electronics Command, Fort Monmouth, New Jersey; U.S. Army Operational Test and Evaluation Agency, Alexandria, Virginia; and DOD's Director, Operational Test and Evaluation and the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence, Washington, D.C. In addition, we observed an experimental field test at Fort Hood, Texas, and visited ITT's production facilities at Fort Wayne, Indiana.

Our review was performed from August 1988 to August 1989 in accordance with generally accepted government auditing standards.

Major Contributors to This Report

**National Security and
International Affairs
Division, Washington,
D.C.**

**Howard R. Manning, Assistant Director
Edward J. George, Jr., Assignment Manager**

**New York Regional
Office**

**Donald F. Lopes, Regional Management Representative
Edwin B. Griffin, Evaluator-in-Charge**

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