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BY THE U.S. GENERAL ACCOUNTING OFFICE

## Report To The Secretary Of Defense

**AD-A142 168**

### Army's Decision To Begin Production Of The High Mobility Multipurpose Wheeled Vehicle Was Premature

The Army's decision to award a full-scale production contract was premature in view of reliability problems disclosed in the operational tests. Also, using a multiyear contract presupposes that the system's design is stable. Additional operational testing should have been performed before large sums of production dollars were committed.

The design of the High Mobility Multipurpose Wheeled Vehicle was not stable as evidenced by the numerous design changes being made to the first production vehicles to correct hardware problems experienced during prototype testing.

The Department of Defense believes it had sufficient basis for awarding the contract.

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JUNE 12, 1984



UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

NATIONAL SECURITY AND  
INTERNATIONAL AFFAIRS DIVISION

B-214579

The Honorable Caspar W. Weinberger  
The Secretary of Defense

Dear Mr. Secretary:

This report discusses the development, testing, and contract award of the Army's High Mobility Multipurpose Wheeled Vehicle. In view of the low operational reliability test results and the instability of the vehicle's design, we have questioned whether the production award was prudent.

We made our review as a part of our continuing assessment of the Army's development of combat support vehicles.

This report makes recommendations to you on page 9. As you know, 31 U.S.C. § 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs no 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; the House and Senate Committees on Armed Services; and the Secretaries of the Army, the Navy, and the Air Force.

Sincerely yours,

A handwritten signature in cursive script that reads "Frank C. Conahan".

Frank C. Conahan  
Director

GENERAL ACCOUNTING OFFICE  
REPORT TO THE SECRETARY  
OF DEFENSE

ARMY'S DECISION TO BEGIN  
PRODUCTION OF THE HIGH  
MOBILITY MULTIPURPOSE WHEELED  
VEHICLE WAS PREMATURE

D I G E S T

The High Mobility Multipurpose Wheeled Vehicle (HMMWV) was developed to replace a portion of the family of tactical vehicles used by the Army, the Air Force, and the Marine Corps. The vehicles being replaced range in size from 1/4- to 1-1/4 tons and include the M151 and M247 utility trucks, the M880 and M561 cargo trucks, and the M792 ambulance.

Because of the urgent need for the HMMWV, the Army accelerated its acquisition from a planned 7-year period to 5 years and compressed the testing schedule from 14 months to 5 by conducting development and operational testing concurrently. The vehicle's development began in July 1981. In March 1983, at the conclusion of a competitive development program involving three competitors, the Army awarded a \$1.2 billion multiyear production contract to AM General Corporation of Detroit, Michigan (subsequently acquired by the LTV Corporation of Dallas, Texas). The contract is to run for 5 years and calls for the production of 55,000 vehicles. (See pp. 1 and 2.)

GAO reviewed the HMMWV program to determine whether test results reasonably supported the production decision.

GAO believes that the Army's decision to award a full-scale production contract was premature in view of reliability problems disclosed in the operational tests and that additional operational testing should have been performed before large sums of production dollars were committed. The HMMWV did display improved performance capabilities compared with the vehicles it is replacing in areas such as speed, mobility, and cargo capacity. The vehicle also did well in some aspects of reliability in its development tests, coming close to and, in some cases, exceeding the reliability requirements. In operational

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testing, however, the HMMWV fell short by a wide margin of achieving reliability requirements due to many hardware malfunctions. The vehicle attained an average of only 82 mean miles between unscheduled maintenance actions - corrective actions that could not wait for normally scheduled maintenance - versus a requirement of 320. Similarly, it achieved an average of only 367 mean miles between mission failures versus a requirement of 1,300. Mission failures are of a type so serious as to render the vehicle incapable of continuing its mission without repair. (See pp. 3 and 4.)

#### ARMY ATTRIBUTED LOW RELIABILITY RESULTS TO EXCESSIVE VEHICLE SPEEDS

In the development tests, the HMMWV was put through a series of tests in an attempt to verify how well the vehicle met performance specifications. The tests were conducted under conditions in which the vehicles were driven by experienced test drivers and speed was controlled. Also, the vehicles were maintained by skilled mechanics using fully equipped maintenance facilities. In operational testing, the HMMWV was put through a series of tests to determine the vehicle's effectiveness and reliability in a combat environment using troops as drivers. In addition, the vehicles were maintained by regular Army mechanics working under field conditions.

In recommending production despite the low reliability achieved in operational testing, HMMWV program officials attributed the vehicle's bad showing largely to excessive cross country speeding by the drivers rather than to inherent serious defects in the vehicles. However, no evidence existed to support or refute this contention since the vehicles had no metering devices to record driving speeds. Program officials also cited as a reason for the low reliability scores the fact that maintenance during the operational tests was performed by lesser skilled mechanics than are generally used in development testing, where the HMMWV's scores were much higher. (See pp. 4 to 6.)

#### LACK OF DESIGN STABILITY DID NOT JUSTIFY USE OF A MULTIYEAR CONTRACT

The use of a multiyear contract presupposes that the system's design is stable. The design

of the HMMWV was not stable as evidenced by the numerous design changes being made to the first production vehicles to correct hardware problems experienced during prototype testing.

GAO does not believe the Army was in a good position to properly evaluate the HMMWV's design stability and approve the use of a multiyear contract, since neither the testing nor the evaluation of the test results had been completed by October 1982 when the Assistant Secretary of the Army for Research, Development, and Acquisition granted his approval.

The fact that the Army approved the HMMWV for production in the face of the poor reliability results in operational testing indicates, in GAO's opinion, a breakdown in the acquisition process. It was not until after the production contract was awarded that the low reliability scores achieved in operational testing became known at higher levels in the Office of the Secretary of Defense and the Army. This is attributable largely to a Department of Defense decision, made early in the development program, not to designate the HMMWV as a major system even though its production cost was estimated to exceed \$1 billion, one of the criteria frequently cited for designating weapon systems as "major systems." According to the Department, the decision was made to field an urgently required vehicle in 5 years rather than in 7 years as originally planned.

Having been designated a nonmajor program, the HMMWV did not require a review by either the Army Systems Acquisition Review Council or the Defense Systems Acquisition Review Council, the two high level councils that review the progress of major weapon systems at the most critical decision points. Rather, the production decision was made by a lower level In-Process-Review board made up of representatives from the services.

Although the urgent need to replace some of the vehicles now in the inventory and the good performance attributes of the HMMWV argued for starting production, these were countered by the low reliability scores in the operational tests which, in GAO's opinion, posed a considerable risk. Should the government now elect to modify or terminate the contract, the long-term production and financial commitments

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of AM General and its subcontractors render such action more difficult and expensive. (See pp. 7 and 8.)

ARMY MAY INCUR ADDED EXPENSE TO CORRECT DEFICIENCIES IDENTIFIED IN FOLLOW-ON TESTS

The first vehicles produced are to undergo 7 months of initial production tests, beginning about July 1984. These tests will enable the Army to assess the numerous modifications AM General has made to the production vehicles. The initial production tests are to be conducted under test conditions comparable to the development tests completed in 1982.

Under the terms of the production contract, initial production testing will be conducted by the government on vehicles it has randomly selected to validate the ability of the vehicles to meet specification requirements. AM General is to assume the cost of any additional modifications that the initial production tests may show are still necessary to bring the vehicle into conformance with contract specifications.

The follow-on operational tests are scheduled to run from about September through November 1984. These were ordered after a review of the 1982 operational test results by both the Director, Defense Test and Evaluation, in the Office of the Under Secretary of Defense for Research and Engineering and by the Army's Deputy Under Secretary for Operations Research. Both officials were concerned with the low reliability scores. The contractor bears no contractual obligation to correct any deficiencies that may be revealed in the follow-on operational tests. (See pp. 6 to 8.)

To avoid the possibility of drivers proceeding at higher than warranted speeds, the Army planned to control course speeds in the upcoming operational tests to more closely approximate the stresses put on the vehicles during development testing. GAO believes operational testing should be conducted in an environment that closely simulates actual field operating conditions and that speed constraints should not be imposed that would invalidate such testing. Controlling test course speeds might preclude the Army's obtaining a valid indication of the HMMWV's reliability.

## CONCLUSIONS

The risks involved in the acquisition of the HMMWV were too great to justify entering the vehicle into production and particularly, awarding a multiyear contract. The poor results revealed in the operational tests about its reliability and maintainability indicated that a more conservative course of action should be followed to allow for additional testing before proceeding to production. Regardless of the outcome of the follow-on tests, the procurement of the HMMWV appears inconsistent with sound procurement principles, which the Department of Defense has fostered and promoted to guide procurement officials in the acquisition of weapon systems. Starting HMMWV production in the face of the uncertainty about its reliability as indicated by the operational test results and awarding a multiyear contract when the system still required significant design changes, run contrary to sound procurement practices.

In addition, the follow-on operational tests should be run under simulated field conditions without speed constraints. To do otherwise, so far as GAO could determine, would represent a departure from normal test procedures applied to operational testing of vehicles.

## RECOMMENDATIONS

To ensure that the HMMWV's operational reliability can be properly evaluated, GAO recommends that the Secretary of Defense direct the Secretary of the Army to conduct the follow-on operational testing in an environment that closely simulates actual field conditions and that does not impose constraints that would invalidate such testing

GAO also recommends that the Secretary of Defense emphasize to all DOD procurement agencies the need to be certain of an item's design stability before entering into multiyear production contracts.

## AGENCY COMMENTS AND GAO'S EVALUATION

DOD concurred with GAO's recommendations. DOD advised GAO that the follow-on operational tests would be done under field conditions and that no speed constraints would be imposed other than to ensure that the vehicles are

operated at speeds judged safe. In addition the Director, Defense Test and Evaluation will monitor the test and assess the results. Also, DOD stated that a reaffirmation by the Secretary of Defense of the policy for a stable design before the use of a multiyear contract is a continuing effort.

DOD did not agree that awarding the HMMWV contract was premature, or that the design was not sufficiently stable to warrant a multiyear contract. It had concluded based on its extensive analysis of the vehicle's failures, that the failures were normal and within the state of the art, for which the contractor could develop adequate corrections. DOD believed that the cost advantage associated with a multiyear award as opposed to single year awards outweighed the risk associated with the corrections to be made.

GAO believes that the design changes needed to correct the test deficiencies were too many and too significant to justify the award of a multiyear production contract. The Marine Corps operational test report that recommended a follow-on operational test prior to the commitment of major quantities of production dollars tends to support GAO's conclusion.

In discussing the report with GAO, DOD officials said that they had made no calculations to support the estimated cost savings. Instead, they relied on a standard 7 percent saving DOD had estimated to be generally achievable under multiyear contracting.

DOD had some additional comments on GAO findings and conclusions which are dealt with in chapter 4 of the report.



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## ABBREVIATIONS

DOD	Department of Defense
GAO	General Accounting Office
HMMWV	High Mobility Multipurpose Wheeled Vehicle
TACOM	Army Tank-Automotive Command

## CHAPTER 1

### INTRODUCTION

The High Mobility Multipurpose Wheeled Vehicle (HMMWV) is a joint service program under which the services--the Army, the Air Force, and the Marine Corps--are replacing a portion of their existing 1/4- to 1-1/4-ton family of tactical vehicles, including the 1/4-ton utility truck (M151), the 1/2-ton utility truck (M247), the 1-1/4-ton cargo trucks (M880 and M561), and the 1-1/4-ton ambulance (M792). The Army has prime responsibility for developing, testing, and procuring the vehicles. The HMMWV will use a common chassis to accommodate different configurations, such as the utility truck, the weapons carrier, the ambulance, and the communications carrier. The weapons carrier and the utility versions were the two types tested in operational and development testing.

### ACCELERATED ACQUISITION STRATEGY

The HMMWV's schedule originally called for a 7-year acquisition program. However, to meet an early fielding requirement, the Army adopted a strategy for the HMMWV program calling for the acquisition to progress from start to initial fielding in about 5 years.

The accelerated schedule was adopted because (1) a large proportion of the 1/4- to 1-1/4-ton fleet being replaced had reached the end of their useful lives and (2) an early fielding date was necessary to meet requirements for the Rapid Deployment Force.

Consistent with the desire to accelerate the program, the Office of the Secretary of Defense

- designated the program "nonmajor" instead of "major" as is normally required for procurement programs whose estimated costs exceed \$1 billion, thus replacing the Defense and Army Systems Acquisition Review Councils' oversight with a lower level In-Process-Review board made up of representatives of the services and
- compressed the testing schedule from 14 months to 5 months by conducting development and operational testing at the same time.

The Army awarded prototype development contracts on July 1, 1981, to three firms--AM General Corporation of Detroit, Michigan; General Dynamics Land Systems, Incorporated, of Warren, Michigan; and Teledyne Continental Motors of Muskegon, Michigan. Each contractor was required to build 11 prototype HMMWVs. Development and operational testing required 2 months longer than originally planned. The development testing began in April 1982 and was completed in November 1982, and operational testing began in June 1982 and was completed in September 1982. Development testing was conducted by the Army Test and Evaluation Command at Aberdeen Proving Ground, Maryland, and at Yuma Proving Ground, Arizona. Operational testing was managed by the Army Operational Test and Evaluation Agency and was conducted by the Combat Developments Experimentation Command at Fort Hunter-Liggett, Camp Pendleton, and the Navy amphibious base in California. After the tests, each contractor was required to include in its production proposal modifications to correct deficiencies identified.

In March 1983, AM General was awarded a \$1.2 billion multiyear production contract to produce about 55,000 vehicles over 5 years. AM General was acquired by the LTV Corporation of Dallas, Texas, in September 1983.

#### OBJECTIVES, SCOPE, AND METHODOLOGY

We began our review in May 1983 and completed it in January 1984. We did this review to determine whether the results from the development and operational tests of the HMMWV justified placing the vehicle into production under a multiyear contract.

We interviewed officials and examined test data and other documents at the Army and Marine Corps Headquarters; the Army Tank-Automotive Command (TACOM); the Army Test and Evaluation Command; the Army Materiel Systems Analysis Activity; the Army and Marine Corps Operational Test and Evaluation Agencies; and the Office of the Director, Defense Test and Evaluation, in the Office of the Under Secretary of Defense, Research and Engineering.

Our review was made in accordance with generally accepted government auditing standards.

## CHAPTER 2

### TESTS REVEALED THAT HMMWV DID NOT

#### MEET RELIABILITY CRITERIA

In testing, the HMMWV demonstrated improved performance over the vehicles it is replacing in several important areas, such as speed, acceleration, cross-country mobility, and cargo capacity. However, the vehicle experienced frequent hardware breakdowns and fell short of two key reliability requirements by wide margins in operational testing. The Army's decision to award a full-scale production contract, in our opinion, was premature in the face of the vehicle's low reliability scores. After the contract award, the Army decided to conduct a follow-on operational test.

Achieving an acceptable level of reliability is critical to the success of any new system. If a vehicle's availability is significantly reduced because of frequent maintenance, much of the benefit of its improved performance can be lost.

#### RELIABILITY TEST SCORES COMPARED WITH REQUIREMENTS

The reliability test scores for AM General's vehicles are shown below. In development testing, the vehicles were driven a combined total of about 74,300 miles and, in operational testing, about 21,600 miles.

The HMMWV was to travel at least 320 mean miles between unscheduled maintenance actions - corrective actions that could not wait for normally scheduled maintenance.

<u>Type of vehicle</u>	<u>Number of vehicles tested</u>	<u>Mean miles driven between unscheduled maintenance actions</u>		
		<u>Development testing</u>	<u>Operational testing</u>	<u>Requirement</u>
Utility	2	170	105	320
Weapons carrier	3	93	71	320
Both types	5	107 <sup>a</sup>	82 <sup>a</sup>	320

<sup>a</sup>Represents average for the five vehicles calculated by dividing the total miles driven by the total number of unscheduled maintenance actions.

Both the utility vehicles and weapons carriers experienced frequent hardware breakdowns during operational and development testing. Mean miles traveled between unscheduled maintenance actions were well below the requirement. In operational testing, the five vehicles tested averaged only 82 mean miles between unscheduled maintenance actions or about 26 percent of the requirement.

The HMMWV was also to travel at least 1,300 mean miles between mission failures, defined as failures of a type so serious as to render the vehicle incapable of continuing its mission without repair. In this category, there was a wide disparity in the development and operational test scores.

<u>Type of vehicle</u>	<u>Number of vehicles tested</u>	<u>Mean miles driven between mission failures</u>		
		<u>Development testing</u>	<u>Operational testing</u>	<u>Requirement</u>
Utility	2	2,702	521	1,300
Weapons carrier	3	1,108	300	1,300
Both types	5	1,337 <sup>a</sup>	367 <sup>a</sup>	1,300

<sup>a</sup>Represents average for the five vehicles calculated by dividing the total miles driven by the total number of mission failures.

HMMWV program officials attributed the large difference in the operational and development test scores for mean miles between mission failures to differences in test conditions and the types of driving to which the vehicles were subjected. As to the types of driving, we found no evidence that drivers had abused the vehicles since they had no metering devices to record driving speeds.

In development testing, experienced military and civilian test drivers and skilled mechanics were used and the testing was conducted under controlled speed limits. Under these conditions, the utility vehicle exceeded the requirement by a wide margin and the weapons carrier almost met it. In contrast, in operational testing, using drivers and mechanics less skilled than those used in development testing and without speed constraints, both versions fell far short of the requirement. The vehicles averaged only 367 mean miles, or about 28 percent of the requirement.

Operational test results were evaluated by the Army's Operational Test and Evaluation Agency and the Marine Corps' Operational Test and Evaluation Activity. When they assessed the overall results of the HMMWV's operational testing, both

concluded that although the vehicle possessed the desired performance characteristics, it was not yet suitable for fielding principally because of its low reliability and the difficulty of maintaining it. Marine Corps evaluators further suggested that the vehicle undergo additional operational testing before committing major amounts of production dollars. Nevertheless, the Army awarded the contract without further testing because it believed the proposed fixes of the deficiencies identified in the tests were adequate to correct the problems.

#### Examples of hardware deficiencies contributing to low reliability scores

Army test evaluators identified subsystem hardware deficiencies resulting in low reliability which required subsequent modifications.

Several deficiencies involved the engine's cooling system. The HMMWV's radiator was subject to clogging in dusty and sandy environments. Another deficiency was the proximity of the transmission and engine oil cooler to the radiator, which made cleaning the radiator difficult.

AM General proposed several modifications to the cooling system. TACOM engineers concluded, however, that some of the modifications added complexity and vulnerability to the system and would increase reliability risks and the maintenance burden.

Another problem affecting reliability concerned the air induction system. Testing indicated that this system allowed dirt and water to enter the engine. TACOM's engineers cited this as a serious problem during cross-country operations (which account for 40 percent of the vehicles' proposed operational use) where the air intake location is vulnerable to dust and mud thrown up by the front tires and to water contamination during shallow water fording.

The vehicle also experienced engine problems which the engineers attributed to air leaks in the fuel system. While this problem was apparently addressed in the production proposal which AM General submitted before contract award, TACOM engineers were concerned that even with the proposed modification, the potential for system air leaks still existed.

Other major causes of the HMMWV's unfavorable reliability scores included

- excessive tire failures,

- frequent power steering pump and power brake malfunctions,

- excessive brake pad deterioration,
- numerous electrical system failures,
- excessive suspension and shock absorber problems,
- weapons station design and storage problems, and
- frequent frame and body cracks and body mount damage.

ADDITIONAL OPERATIONAL TESTING  
DIRECTED BY HIGHER COMMAND

Both the Director, Defense Test and Evaluation in the Office of the Secretary of Defense, and the Army Deputy Under Secretary for Operations Research, after reviewing the 1982 test results, concluded that the modifications planned to improve the vehicle's reliability should undergo additional operational testing. However, this was not decided until after the production contract was awarded. As a result, the option of delaying the award until this additional operational testing could be performed was no longer possible. The Deputy Under Secretary attributed the difference in reliability between development and operational testing as due largely, if not entirely, to the difference in the severity of the two tests. He noted that development test course speeds were controlled while operational test course speeds were not controlled but, rather, were dictated by the test drivers' judgment.

As a result of the Deputy Under Secretary's findings, the Army ordered a 90-day operational test starting about September 1984 at Fort Hunter-Liggett using production vehicles. This was the site of the first round of operational testing. However, after this decision was made, the Army decided that drivers will receive additional driver training and will be instructed to observe certain speeds over the cross-country portions of the test course, rather than exercise their own judgment as to safe speeds, as was the case in the 1982 operational tests.

While we concur with the need for additional driver training to ensure the vehicles will be driven safely, we believe operational testing should be conducted in an environment that closely simulates actual field conditions and that speed constraints should not be imposed that would invalidate such testing. So far as we could determine, the speed constraints represent a departure from the normal Army procedures governing the operational testing of vehicles.

### CHAPTER 3

#### LACK OF DESIGN STABILITY SHOULD HAVE

##### PRECLUDED MULTIYEAR AWARD

The numerous hardware problems experienced during testing and the extensive design modifications being made to correct them means that the Army's use of the multiyear contracting technique poses a substantial risk.

Under the multiyear contract which was signed to cover a 5-year period for about 55,000 vehicles, significant amounts of contractor and subcontractor funds are initially tied up in purchases to meet the long-term commitment. In this type of contract, if the government were to terminate the work, termination costs would be high. Under a single year contract, termination costs would be lower since the contractors need not make advance purchases to cover their requirements for such long periods of time. Should the government elect to terminate the multiyear contract, the long term production and financial commitments of AM General and its subcontractors render such action more difficult than if the contract had been for 1 year with renewable options.

##### MODIFICATIONS TO HMMWV REVEALED LACK OF DESIGN STABILITY

One prerequisite for a multiyear contract is that the system design be stable. Design stability diminishes the prospect of a retrofit program. The HMMWV prototype design lacked this stability, as evidenced by the extensive modifications being made to the production vehicles to correct hardware deficiencies attributed to the prototype design. Included among the numerous modifications were

- shortening the chassis frame,
- modifying the tires,
- changing the exhaust system,
- modifying the engine accessory drive pulleys and mounting brackets,
- redesigning the front axle half shafts,
- redesigning the front prop shaft,
- modifying the torque converter ratio,
- changing the axle ratio,



- redesigning the air cleaner inlet system,
- relocating the engine,
- relocating the radiator,
- redesigning the radiator fan,
- redesigning the venting system,
- modifying the suspension springs and spring seats, and
- modifying the shock absorbers and mounts.

Development test officials informed us that because of the extensive modifications being made to the prototype HMMWV, the production vehicles would be significantly different from those tested during the earlier prototype testing.

The modifications, including the vehicle's ability to meet contract specifications, are to be assessed during a 7-month initial production test scheduled to begin in July 1984. The test is to be conducted by the government at Aberdeen Proving Ground, under test conditions comparable to those that prevailed when the development tests were held there in 1982. AM General, under the terms of the production contract, is to assume the cost of any additional modifications that the test may show are still necessary for the vehicle to meet contract specifications. On the other hand, the contractor has no contractual obligation to correct deficiencies revealed in the follow-on operational tests to begin in September 1984. What action the Army might take in the event the operational test results are unsatisfactory is unclear.

Multiyear contract approved  
before ascertaining design stability

When it approved a multiyear contract for the HMMWV, the Army was lacking specific information to properly evaluate its design stability. The Assistant Secretary of the Army for Research, Development and Acquisition approved use of the multiyear contract on October 1, 1982, a month before testing was completed. Preliminary evaluations of the test results by the test evaluation agencies were not completed until December 1982. AM General's detailed design modifications were not submitted with its production proposal until November 22, 1982.

## CHAPTER 4

### CONCLUSIONS, RECOMMENDATIONS, AGENCY

#### COMMENTS, AND OUR EVALUATION

#### CONCLUSIONS

The risk of going into production before the HMMWV's reliability under operational tests conditions had been proven was compounded by the award of a multiyear contract. The poor reliability results and potential maintenance problems revealed in the operational tests dictated that a more conservative course of action should have been followed to allow for additional testing before proceeding to production. Regardless of the outcome of the follow-on tests, the procurement of the HMMWV appears inconsistent with sound procurement principles which the DOD has fostered and promoted to guide procurement officials in the acquisition of weapon systems. Starting production in the face of uncertainty about the vehicle's reliability as indicated by the operational test results and the awarding of the multiyear contract when the system still required significant design changes run contrary to sound procurement practices.

In addition, the follow-on operational tests should be run under simulated field conditions without speed constraints. To do otherwise would represent a departure from normal test procedures applied to operational testing of vehicles.

#### RECOMMENDATIONS

To ensure that the HMMWV's operational reliability can be properly evaluated, we recommend that the Secretary of Defense direct the Secretary of the Army to conduct the follow-on operational testing in an environment that closely simulates actual field operating conditions and that does not impose speed constraints that would invalidate such testing.

We also recommend that the Secretary of Defense emphasize to all DOD procurement agencies the need to be certain of an item's design stability before entering into multiyear production contracts.

#### AGENCY COMMENTS AND OUR EVALUATION

DOD provided us formal oral comments on our draft report. Their comments and our evaluation follow.

DOD concurred with our recommendations. DOD advised us that the follow-on operational tests would be done under field conditions and that no speed constraints would be imposed other

than to ensure that the vehicles are operated at speeds judged safe. In addition, the Director, Defense Test and Evaluation, will monitor the tests and assess the results. Also, DOD stated that a reaffirmation by the Secretary of Defense of the policy for a stable design before the use of a multiyear contract is a continuing effort.

DOD did not agree that awarding the HMMWV contract was premature, or that the design was not sufficiently stable to warrant a multiyear contract. DOD stated that extensive study of the test results as well as analysis of the correction to the problems disclosed in testing preceded the HMMWV production decision. The failures were understandable problems, and were therefore all within the state of the art. A high level of confidence was evident to the decision makers that the recommended fixes would be adequate and would not adversely affect the production hardware. DOD believed that the cost advantage associated with a multiyear award as opposed to single year awards outweighed the risk associated with the corrections to be made.

In our opinion, the design changes to correct the test deficiencies were too many and too significant to award a multiyear production contract. The Marine Corps' operational test report, which recommended that a follow-on operational test should be conducted prior to the commitment of major quantities of production dollars tends to support this conclusion.

Also, in discussing the report with us DOD officials said that they had made no calculations to support the estimated multiyear cost savings but relied on a standard 7-percent savings DOD had estimated to be generally achievable under multiyear contracting.

DOD also stated that the contractor's shakedown tests, which must be successfully concluded before the Army would accept the vehicle demonstrated the adequacy of most of the corrections the contractor had made since the 1982 tests.

We found, however, that problems in the shakedown period were serious enough to cause the contractor to fall behind in its initial production. This, in turn, caused a delay in the start of initial production testing from April to July 1984. The Army is currently negotiating revisions to the delivery schedule with the contractor.

As to the designation of a system as major DOD pointed out that not all systems whose production cost is estimated to

exceed \$1 billion have to be designated major systems. The HMMWV was regarded as basically an "off-the-shelf" low risk item. These factors led to the decision to withhold the major designation from it. The HMMWV acquisition was accelerated in order to fill an urgent requirement. To have subjected it to reviews reserved for major systems would have prolonged its procurement, according to DOD.

Since the HMMWV was classified as a nonmajor system, this precluded high level Army and Office of the Secretary of Defense approvals prior to its entering production. In our opinion, their evaluations may have required that additional operational testing be included under the production contract. In view of the decision to have a follow-on operational test, this appears likely.

DOD did not agree that the Army was not in a good position to approve the use of a multiyear contract in October 1982, prior to the completion and analysis of the testing. DOD commented that only the concept of a multiyear contract was approved in October 1982 and that since the contract was not awarded until March 1983, the test results were available for evaluation prior to the award.

Since the contractor's proposal was based on a multiyear buy in accordance with the Army's acquisition plan for the HMMWV, it is obvious the Army had always intended to award a multiyear contract. However, in view of the operational test results and subsequent design changes, we do not believe that the results justified entering into a multiyear production contract.