



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

PROCUREMENT AND SYSTEMS
ACQUISITION DIVISION



LM107898

B-164497(1)

OCTOBER 27, 1978

The Honorable Tom Harkin
House of Representatives

Dear Mr. Harkin:

In response to your May 17, 1978, letter, we are answering questions relating to the development of the Microwave Landing System (MLS). We are also including information on costs requested by your office on August 29, 1978. In developing the enclosed answers, we posed some of your questions directly to the Federal Aviation Administration (FAA) officials and discussed other related matters with Bendix Communications Division officials and Mr. Alexander Winick.

MR. WINICK'S POSSIBLE
CONFLICT OF INTEREST

Mr. Winick retired from FAA on December 31, 1974, and consummated an agreement for consulting work with the Mitre Corporation on January 15, 1975. On January 23, 1975, he was appointed as an advisor to the FAA MLS Executive Committee formed to consider selection between the Time Reference Scanning Beam and the Doppler systems, and ended his advisory role in February 1975.

We cannot be sure that a potential conflict of interest existed due to Mr. Winick's concurrent employment with Mitre and his appointment as advisor to the MLS Executive Committee. Nevertheless, we consider the arrangement to be unusual. We discussed the matter with the former chairman of the committee. He told us that Mr. Winick's contribution to the committee was insignificant over the short period that the committee was in existence. According to the chairman, Mitre had been serving as a consultant and an advisor to FAA, a role similar to that of Mr. Winick's; therefore, no conflict of interest actually occurred.

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Mr. Winick was approached by Bendix after the committee's work was completed. He signed a consulting agreement with Bendix on March 6, 1975, to provide advice on international civil aviation matters. That agreement was terminated in September 1975 because Mitre was concerned about the appearances of a possible conflict of interest and preferred he not be associated with an MLS equipment contractor. FAA advised us that Mr. Winick had no knowledge of the Bendix interest in his services until after completion of the committee's work. Mr. Winick attested to the reasons for his termination of the Bendix agreement. He told us that this is the normal policy for Mitre's consultants to follow.

We examined the Bendix file on Mr. Winick and found the file contained a copy of the company's agreements with him. Documents in the file, together with a letter from Mr. Adams, vice president, Bendix Communications Division, confirmed that Mr. Winick's relationship as a consultant was terminated on September 19, 1975, at the request of Mitre. We found no other documents in the Bendix files concerning Mr. Winick.

WORLD PROMOTION

Since the need for Time Reference Scanning Beam (TRSB) demonstrations came after the beginning of the fiscal year, no specific appropriation request was made by FAA for promotion funds. A separate account within FAA's operations appropriations account provided accounting for promotion of TRSB. Funds for promotion were reprogrammed from operations appropriation resources. Included in TRSB demonstration costs were those of aircraft operation owned by FAA, National Aeronautics and Space Administration (NASA), and the United States Air Force (USAF). NASA and Department of Defense/USAF were totally reimbursed by FAA for their portion of the TRSB promotion demonstration.

ECONOMIC CONCESSIONS

FAA told us that no economic concessions were made by FAA or any U.S. Government representative to foreign states to secure TRSB votes. We found no evidence contradicting FAA's position.

COST ESTIMATES

Original research and development estimates for MLS were \$58.5 million for FAA, \$30.7 million for DOD, and \$1.7 million for NASA. FAA now estimates its program will cost about

\$112.6 million, and the DOD and NASA programs are estimated to cost \$65 million to \$75 million and \$4.6 million, respectively--about \$90 million to \$100 million more than the amount originally requested. The DOD estimate includes about \$27.1 million for support of the FAA effort, and the remaining \$38 million to \$48 million is for research and development work peculiar to the military.

The subject of MLS program costs is treated more fully in a recent GAO report to the Congress entitled, "Status of the Federal Aviation Administration's Microwave Landing System," (PSAD-78-149, October 19, 1978). The report provides a perspective for making judgments on cost estimates.

FAA told us that the Navy and the Marine Corps are purchasing 81 ground systems at a unit cost of about \$100,000 with an option to purchase 78 airborne sets at about \$30,000 each.

IS TRSB READY TO BE
BUILT AND INSTALLED?

FAA told us that the Small Community and Basic (Narrow) TRSB configurations are ready for production. The Basic (Wide) configuration, however, requires further development to be accomplished in the fiscal years 1978-80 time frame.

There are two possible courses of action for the initial production and procurement of the Small Community and Basic (Narrow) TRSB configurations. FAA can use the limited production option under its existing Bendix and Texas Instruments contracts or proceed with a competitive procurement. FAA believes the limited production option affords delivery in a shorter time. No decision has been made on which procurement approach to use for the initial production; however, FAA anticipates subsequent procurements to be competitive.

There is no great sense of urgency for MLS production that would warrant using the existing limited production option. In our opinion, a competitive procurement should be used.

INTERNATIONAL CIVIL AVIATION
ORGANIZATION/ALL WEATHER
OPERATIONS PANEL COST ESTIMATES

The cost estimates submitted by FAA to the International Civil Aviation Organization/All Weather Operations Panel

(ICAO/AWOP) experts were founded on 1976 prices, assumed production quantities, and the designs proposed to ICAO. FAA told us that these estimates will have to be revised on the basis of actual production quantities, the rate of inflation, and possible technological advances, during planning and budgeting for future implementation. In its June 1978 revised national plan for development of MLS, FAA concluded that it was premature to fix implementation plans then and, in fact, offered 10 possible strategies for implementation. We therefore believe that the ICAO/AWOP cost estimates likely will not be met.

HAZELTINE CORPORATION
CONTRACT

FAA told us that a contract could have been negotiated with Hazeltine Corporation to continue testing of the COMPACT antenna beyond February or March 1977. The COMPACT networks used in the first array were of a prototype quality and not representative of conventional design practice. In spite of such limitations, FAA stated the test objective was achieved, and further testing would not have been worthwhile.

We reviewed FAA's contract with Hazeltine for the development of a Small Community COMPACT TRSB system. It is a firm fixed price contract. Payment is being made upon delivery and acceptance of the contract items.

The COMPACT network (circuit) was initially conceived and developed by Hazeltine, during 1975, using its own resources. It holds a patent for the COMPACT network. Hazeltine development costs could be viewed as an investment presumably necessary for the company to penetrate a potentially lucrative market; these costs could be recoverable from future sales. Thus retroactive compensation, in its true sense, would not be paid. If future sales of its system are sufficient, Hazeltine will ultimately recover its development costs.

TECHNICAL EFFECTIVENESS
OF TRSB

In April 1978, ICAO recommended adoption of TRSB as the MLS international standard. The current instrument landing system has several limitations that TRSB is expected to overcome. We believe that the TRSB technique will be adequate

for an aircraft to determine its position relative to the runway. How well this can be accomplished will be a function of how the design is translated in production. Therefore, until production quantities of the TRSB are produced, we are not able to comment on the TRSB technical effectiveness. We are unable to compare the cost efficiency of TRSB development with other programs because of the uncertainties in the current TRSB cost benefit study.

AMSCAN ANTENNA SYSTEM

FAA believes the design and performance goals for the AMSCAN antenna were met by Texas Instruments. The cost goals for the overall phase III contract were not met as a result of cost growth. The original contract price of \$7,434,000 has now increased to \$9,248,869, an increase of \$1,814,869. Cost overruns by the contractor account for \$1,380,000 of the increase. The remaining \$434,869 is attributable to changes in the scope of work required under the contract.

BENDIX ANTENNA PREFERENCE

Bendix has not renounced the Rotman lens approach and, in fact, said it would be prepared to build additional systems if requested because there could be cost advantages in using the Rotman lens in narrow coverage systems. Bendix recommended the phased array antenna as part of MLS instead of the Rotman lens because

- the use of several complicated components of the Rotman lens in relatively small quantities results in high antenna costs;
- technology advances in array implementation techniques could make the cost of lens and phased array techniques comparable; and
- the use of one antenna configuration for all FAA requirements simplifies training, documentation, and provisioning.

CALSPAN CORPORATION, MITRE, AND LINCOLN LABORATORIES CONTRIBUTIONS

In general, FAA told us that supporting contractors contributed in the areas of systems analysis and simulation, contributions which were difficult to quantify in

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an absolute sense. We agree. FAA also told us that the:

- Results of contractor technical reports very often have been incorporated in MLS specifications.
- Benefits of the supporting contracts are "captured" in the MLS program documentation and are available to the Government and to the MLS community in general.

FLIGHT TRIALS

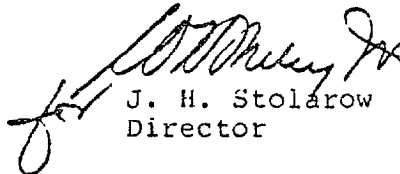
According to FAA, the USAF T-39 flown at Buenos Aires, Argentina, contained a large amount of equipment which restricted its carrying capacity in both weight and volume. Since the purpose of the flights was to demonstrate MLS and not flight trials (data collection), recording equipment was removed from the aircraft to allow an additional observer on each flight. In Buenos Aires, the NASA 737 aircraft collected data, and this data was reported to ICAO. The T-39 aircraft did not participate in MLS demonstrations at John F. Kennedy Airport, New York.

ICAO has selected the TRSB MLS as the future international standard for instrument landing systems; therefore, we do not plan to look at the German Doppler Landing System.

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The agency has reviewed this report and found it to be a fair representation of the facts. Should you desire additional information, please let us know. Copies of this report are being furnished to the Secretary, Department of Transportation, and to the Administrator, Federal Aviation Administration.

Sincerely yours,


J. H. Stolarow
Director