STATEMENT OF JOHN KERN, DEPUTY DIRECTOR OF FLIGHT OPERATIONS, FEDERAL AVIATION ADMINISTRATION, BEFORE THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION, AND MATERIALS, CONCERNING AREA NAVIGATION, STOL AIRCRAFT, AND MICROWAVE LANDING SYSTEMS. JULY 24, 1984.

Mr. Chairman and Members of the Subcommittee:

I am John Kern, FAA's Deputy Director of Flight Operations. With me today are Marty Pozesky, Director of the Program Maintenance and Engineering Service, and Will Reazin, Manager of the Air Traffic Procedures Division. We are pleased to appear before you to discuss area navigation systems (RNAV), Short Takeoff and Landing (STOL) operations, and Microwave Landing Systems (MLS).

The FAA has had a long involvement with the subject of STOL operations. In fact, as far back as 1961, the FAA published the second report of Project Hummingbird which examined the possibility of producing steep-gradient aircraft with vertical and short takeoff and landing (V/STOL) characteristics. That report concluded that present technology could produce STOL aircraft but that development would depend largely upon a more extensive use of low altitude terminal area airspace and close-in and in-town small size landing areas.

Before going further, let me define what it is we mean by a STOL aircraft. A STOL aircraft is an aircraft with a certified

performance capability to execute approaches along a glide slope of 6 degrees or steeper and to execute missed approaches at a climb gradient sufficient to clear a 15:1 missed approach surface at sea level. By that, I mean for every fifteen feet of horizontal distance on a missed approach, a STOL aircraft must be able to climb sufficiently to clear an object an additional foot in height. A STOL runway is one which is specifically designated and marked for STOL aircraft operations, and designed and maintained to specified standards.

Following the Project Hummingbird report in 1961, the FAA has continued work on STOL operations. Operational evaluations have been conducted of several different aircraft during this time, and a variety of efforts undertaken to define appropriate standards for STOL operations. Thus far, however, only one aircraft has been certificated in the U.S. for STOL operations, and that is the DeHavilland DHC-7 (referred to as the Dash 7) which was certificated for STOL operations in 1973. Since October 1983, Ransome Airlines has been authorized to conduct RNAV/MLS/STOL operations into Washington National Airport using the Dash 7. An MLS/STOL runway approach has also been in effect at Valdez, Alaska, since October 1982.

We have in progress a new STOL test program to develop Terminal Approach Procedures (TERPS) data using the new MLS. This

program was developed cooperatively by DeHavilland, Transport Canada, and the FAA. We will be using a Dash 7 aircraft for the test, and will be executing straight-in and offset approach courses as well as different approach angles up to 8 degrees to develop appropriate data. The program also calls for developing data on missed approaches. We will also assess a variety of other terminal manuevering procedures: STOL MLS departures--both straight out and offset, MLS turn reversals based on MLS guidance and Precision Distance Measuring Equipment, and MLS shuttle patterns. Our preliminary system check out flight test is scheduled for this fall, and our data collection flights will be run next Spring. Data processing is scheduled for Summer of 1985, with analysis of that data being completed by October 1985. We expect to have draft TERPS criteria developed by January 1986.

During the early years of development of STOL, the emphasis was placed on operation of the aircraft from city center to city center. Today, it appears that STOL shows more promise in its ability to augment the existing airspace at present airports, permitting increased utilization of these airports as demands on the present system increase.

I would like to take a few minutes now to bring you up to date on our MLS program. In January of this year a contract was

awarded to the Hazeltine Corporation for the production of the first 208 MLS's. This award culminates several years of extensive research and development by both national and international organizations and signals a new era in precision landing systems.

In the United States, it is envisioned that 1250 Microwave Landing Systems will be in operation by the year 2000. The MLS implementation program will take advantage of the increased reliability of digital electronics systems together with the reduced costs of those systems to provide the capability for all weather service at most MLS equipped airports. Designed to minimize the economic impact to the users of the system as well as protect the FAA's capital investment, the transition from ILS to MLS will be gradual. This will be accomplished by installing the first systems in networks to maximize user benefits. These networks are organized for the most part around major hub airports along flight routes of commuter operations in order to provide expeditious service to all the users. Some initial collocations (ILS alongside MLS) will be necessary. These joint installations are expected to coexist for several years, permitting a sensible time period for airborne equippage by the aviation community.

Beginning in early 1986, the 208 systems of the Hazeltine contract will be installed over a 3-year period. In addition

to producing the MLS, the contractor will be responsible for providing site preparation and survey, installation and equipment checkout, preliminary flight inspection and engineering support. Included in the contract is an option for training. Another key feature that will be provided is a Reprocurement Data Package (RDP) which is intended to facilitate the final two MLS procurements by standardizing designs and equipment configurations. The RDP will provide comprehensive design specifications and technical schematic diagrams that will assure standard components and elements for full MLS hardware. This will ensure benefits in operating and maintaining the system as well as training the essential technicians to reduce the life cycle costs. This commonality of design and equipment is consistent with the major theme of the NAS Plan and is in concert with the FAA's 1980's maintenance concept.

While all MLS's will have standardized features, six antenna options are available which will permit each system to be tailored to particular operational requirements, multipath environment, and runway length. The flexibility of these antenna options allows individual airport operators and the users to satisfy the precise operational need of their respective airports and aircraft.

Of considerable interest but not part of the MLS contract is the issue of MLS avionics development and availability. In

this area the Radio Technical Commission for Aeronautics (RTCA) has two special committees charged with the responsibility of preparing minimum operational performance standards (MOPS) for precision DME and RNAV avionics. These essential avionics standards will be available well in advance of industry/user requirements to assure quality receivers are available at moderate costs to the operators. In addition, Aeronautical Radio, Inc. (ARINC) which develops Technical Standard Orders (TSO's) for avionics equipment is mounting an effort to provide these important standards for air carrier designs. Currently, there are two manufacturers producing commercial grade receivers in a price range of $8,000-$10,000. It is anticipated that general aviation avionics will cost $2,000 each when equipment is mass produced. Naturally, the greatest impetus for MLS avionics availability will be the deployment of ground systems and demonstrated benefits to the users.

An on-going program intended to demonstrate these benefits is the FAA Service Test and Evaluation Program (STEP). The STEP program utilizes prototype hardware derived from the early R&D effort. These systems are installed at a number of sites including Washington National Airport, and Clarksburg, West Virginia. Agreements were reached with Ransome and Wright (previously Aeromech) Airlines who conducted regularly scheduled commercial operations among these locations. In

exchange for the benefits to these users, the FAA obtained essential feedback on operational systems.

Essentially, the STEP program was designed to facilitate the transition from R&D to operations by providing real world experience. The program has worked well in this regard.

As implementation of MLS nears, other demonstration programs have been initiated by the FAA to provide the users with necessary procedural information and operational experience.

In this regard, the Flight Inspection and Terminal Approach Procedures Program (FI/TERPS) is intended to develop the criteria (procedures, standards and tolerances) needed in the operational phase when systems are commissioned in January 1986. The program is diverse in scope, including 28 individual projects for aircraft of differing flight characteristics and different flight procedures varying in complexity from standard straight-in approaches to segmented and curved approaches. Criteria are also being developed for departures and missed approaches as well as for special landing environments including those for helicopters.

Supporting the FI/TERPS program is the National Prototype Demonstration Heliport Program. This program is dedicated specifically to testing various applications of MLS and

rotorcraft to develop standards and criteria and evaluate new technologies. The FAA Administrator has selected four communities to participate in these evaluations. Operational MLS systems will be installed and tested at the following heliports: Indianapolis, Indiana; Los Angeles, California; New Orleans, Louisiana; and New York, New York.

Of special interest to the major commercial airlines is the joint FAA/USAF Flight Test Program. This program is a joint effort to develop and evaluate MLS instrument and approach procedures for Category D aircraft including long haul commercial air carriers, strategic airlift aircraft and strategic bombers.

In a similar fashion, we are planning to conduct a user program to demonstrate the advantages of MLS in an operational environment. This program differs from the STEP program mentioned earlier in that the ground systems will be production equipment built to FAA's specifications. The FAA's Eastern and New England Regions are cooperating in planning this effort and have interested two potential users: Eastern Airlines and Peoples Express. Eastern plans to use two of its A-300 aircraft which will provide additional input for the development of standards and procedures for wide-bodied aircraft and Peoples Express plans to utilize five of its

aircraft in the program. The locations which would provide benefits to these users include LaGuardia, New York; Boston, Massachusetts; and Newark, New Jersey.

While these programs focus primarily on commercial users operating large aircraft, a similar project that emphasizes general aviation participation is planned for Richmond, Virginia, in 1985. An MLS ground station will be installed on runway 02. It is intended that 20 to 30 MLS airborne receivers will be loaned to various persons who operate into the Richmond airport to demonstrate the advantages of MLS to this significant segment of the community.

Lastly, the FAA program provides for the overall management and implementation of MLS within the entire United States. This includes satisfying Department of Defense (DOD) requirements. In addition to the 1250 civil MLS systems, 326 MLS ground stations will be procured under the FAA contract to meet military needs. DOD will implement MLS at a pace consistent with the civil sector and has designated the U.S. Air Force as the lead service for DOD implementation.

MLS is moving into the implementation phase and will introduce a new era in the capabilities for approach and landing. The underlying goal of providing an all-weather capability for essentially all IFR-equipped airports is now within reach and

by the end of the decade all-weather operations should become routine. MLS has all of the essential features necessary to support the goals of the NAS Plan for safety, capacity, productivity, and economy in the approach and landing function, and to support the growth of aviation well into the next century.

Before closing, let me briefly touch on the subject of RNAV. RNAV is a method of establishing points of reference for pilots. In some cases, navigation aids such as VORs are used to supply a signal to update the receiver. This is accomplished by airborne RNAV equipment which sets these points in terms of distance and degrees from the VOR. Thus, an approach to a STOL runway, for example, can be designed with waypoints to guide the pilot to turn or descend without guidance from air traffic control. Because the aircraft can utilize a stub runway, which is different from the runway used by conventional traffic, in some cases it is possible to design an approach which does not mix with the stream of conventional traffic, thus alleviating controller workload. RNAV can also be used in conjunction with MLS.

As I mentioned earlier, at Washington National, we have been utilizing an RNAV/STOL and an RNAV/MLS/STOL approach on a test basis since October 1983. This has been a successful demonstration of the combination of these technologies and procedures and FAA is continuing to examine further means of

refining these techniques to see if they can be applied to other environments. We will be pleased to keep the Subcommittee advised of the results of our efforts in these areas.

It is clear that STOL, MLS, and RNAV can all play a role in increasing the future capacity of our Nation's existing airport structure, but they do not represent a panacea that will solve future capacity problems. We must continue to develop and refine our ATC procedures and technology, and importantly to foster the development of additional runway capacity.

That completes my prepared statement. We would be pleased to respond to your questions now.