STATEMENT OF WARREN C. SHARP, DIRECTOR OF THE AIRWAY FACILITIES SERVICE, FEDERAL AVIATION ADMINISTRATION, BEFORE THE SUBCOMMITTEE ON GOVERNMENT ACTIVITIES AND TRANSPORTATION, COMMITTEE ON GOVERNMENT OPERATIONS, OCTOBER 19, 1976

Mr. Chairman and Members of the Subcommittee.

I am Warren C. Sharp, Director of the Airway Facilities Service. Appearing with me today are Jerry Thompson, Chief of the Automation Engineering Division in the Airway Facilities Service; and Kenneth Patterson, Assistant Chief of the Air Traffic Division, Great Lakes Region. We are pleased to appear before you today to discuss with you the subject of radar display interruptions.

At the outset, let me state that I will attempt to approach this subject in a general manner and in as non-technical a fashion as possible. I should point out, however, that this is a very complex subject which is not always susceptible to simplified treatment.

The primary air traffic system presently used in 20 centers nationwide is a technology intense, interrelated system comprised of radar, computers, visual displays, air/ground communications equipment, and the like. Since I believe it necessary to have a fundamental knowledge of the automated Radar Data Processing (RDP) system in order to understand system interruptions, I would like for Mr. Thompson to briefly discuss the structure of the system.

Now that you have had a brief description of the system, I would like to define what we mean by "interruptions" so that we will be talking

about the same thing. For purposes of this hearing, we can break system interruptions into two basic categories: momentary interruptions and system outages. Momentary interruptions are those which last for less than one minute and result in blank or frozen radar displays. Normally, when a momentary interruption occurs, the scope either blinks for a few seconds or data is frozen on the scope for a matter of seconds. On the other hand, system outages are interruptions that last over one minute and can result in complete loss of data to the visual radar displays. In this case, broadband radar display is available for use.

System interruptions occur in all centers and can be either scheduled or unscheduled. Naturally, unscheduled interruptions are those we will focus on today. I would be less than frank if I did not state for the record that we are not aware of any possible way in which unscheduled interruptions can be reduced to zero. This is just not technologically feasible with so complex a system upon which so many demands are placed. What we have done is eliminate any diminution of safety when these interruptions occur. However, this doesn't mean that we are satisfied with the current level of interruptions that are being experienced. On the contrary, we are taking aggressive actions--short and long-term--which I will outline later, that are designed to substantially reduce the number of system interruptions.

Unscheduled interruptions are primarily caused by hardware (equipment) failures and software problems. The system continuously monitors itself in order to detect these abnormalities. The system is designed to prevent presentation of erroneous data to the controller. Consequently, when the system detects erroneous data which could mislead the controller, it results in correction of that data with no interruptions or it flushes that data from the system by inducing a "startover." In a startover, the system analyzes the problem, corrects the problem, recovers, and presents the correct data to the controller. Startovers normally require less than 10 seconds but, dependent on the problem which needs to be corrected, may exceed this time-frame. Rarely would a startover reach the status of an outage.

In some instances, the system attempts to startover but is unable to correct itself. This would then require manual intervention to correct the problem. Most often this would result in an outage.

A point I would like to emphasize here is that a startover is itself a beneficial aspect of the system since it (1) corrects erroneous data and (2) reduces the length of time that would otherwise result from manual intervention to correct the problem. From the standpoint that it is not technologically possible to reduce errors to zero, startovers, while sometimes aggravating, do avoid the adverse consequences that could otherwise arise from presenting erroneous data to the controller.

Allegations have been made that system interruptions pose a hazard to aviation safety. This is simply not the case. While to those unversed in the air traffic system, interruptions might raise concerns about safety, in reality the system, itself, as well as air traffic procedures, are designed to accommodate interruptions without derogating safety.

As I previously stated, momentary interruptions generally last only for a few seconds. In this connection, I should note that radar data shown on a controller's display is only updated every 10 to 12 seconds. The effect of a momentary interruption is therefore negligible. The concerns with momentary interruptions then, are essentially that: (1) they are a source of aggravation to the controller which, if unchecked, could damage system credibility, (2) an increasing number of momentary interruptions is generally a prelude to increased system outages, and (3) they signify errors within the system that should be corrected.

System outages last longer than momentary interruptions and therefore require different actions than momentary interruptions. When a system outage occurs, the controller switches to broadband radar--our backup system--to continue tracking or controlling the aircraft he is concerned with. Broadband radar was the system used in all centers until 1974 when we began switching to our present Radar Data Processing system. There is nothing hazardous in our use of broadband radar; in fact, this is the system used by controllers during those hours of the day when our

primary system is undergoing maintenance, or certification. If broadband radar were to fail, we still have another back-up system available to control traffic. This is achieved through the use of flight progress strips, which results in "manual control" of aircraft. Manual control is the most basic form of air traffic control that we use and was the only system available for use prior to the introduction of broadband radar.

The basic impact from using broadband radar rather than RDP or manual control rather than broadband is a loss of efficiency in the system. RDP has a number of automatic features which free the controller from performing tasks required with broadband. Therefore, delays may occur when broadband is used rather than RDP. Similarly, broadband is significantly more efficient than manual control of traffic. For one thing, manual control dictates substantially greater separation standards between aircraft than does broadband or RDP for which separation standards are essentially the same. By imposing greater standards for separation, the impact is inconvenience in the form of delays caused by less efficiency in the system.

The central point is that various contingencies which might arise have been previously considered and have been accommodated by system design and air traffic procedures to prevent the derogation of aviation safety.

I would like to turn briefly to Mr. Kenneth Patterson for a more in-depth discussion of the air traffic control considerations.

As stated earlier, the FAA is taking affirmative steps to lower the number of errors that occur within the system in order to reduce system interruptions. We have increased the emphasis on reducing system interruptions and will continue to stress management awareness of the problem. For example, in July 1976, teams of engineers investigated problems at three centers (including Indianapolis). As a result of this investigation, one change in power input equipment has already been made and additional modifications to the hardware have been installed in all 20 centers.

Mr. Thompson recently chaired a three-day conference of sector managers at our National Aviation Facilities Experimental Center at Atlantic City, New Jersey, in order to take a critical look at system interruptions and the actions necessary to reduce them. Through sessions such as this, we hope to be able to approach the problem in a manner consistent with regional concerns and with key input from regional personnel.

We have implemented a new reporting scheme to track interruptions and to provide a better management information vehicle for follow-up corrective actions. We have also initiated procurement of additional test equipment for improved troubleshooting of the system. This equipment should be available by the end of the year. Moreover, a group of headquarters and regional representatives is being formed to categorize and track outages through to their resolution.

In the short-term, we believe that the best payoff will result from increased management emphasis on maintenance of the system. I want to stress that I don't believe that we have done a bad job in this area. Rather, I think that as an agency we can do better.

We intend to provide our facilities with improved test equipment in the next couple of years and improved maintenance diagnostic software will be provided in 1978. We plan to supplement our present expert trouble-shooting team from headquarters with additional teams--possibly located in the regions. We are also looking at ways to improve technician proficiency through appropriate revisions in agency training practices.

Improved lightning and surge protection should be installed at all centers before the 1978 lightning season. Improved electrical grounding, bonding, and shielding guidelines should be available in draft form by the end of 1976. These actions will result in reduced outages induced by power input problems.

We are exploring all avenues in our attempt to reduce system interruptions. We believe that we can improve our track record and we intend to do just that. I want to emphasize again, however, that the complexity of the system, and the interdependency of the components of the system, do not lend themselves to simplistic solutions. The bases on which an error can enter the system or be generated within the system are almost without

limits. Unless great care is taken when resolving specific errors, new errors may be induced creating a necessity to identify their causes and to develop actions necessary to resolve them.

We have discussed some of the problems we experience with the RDP system. I would like to close with a different tack. This system is the best system in use in the world. We are proud of this system and of its capabilities. Nevertheless, there are ways system performance can be improved and we are aggressively taking the steps necessary to do that. I don't want to ignore one last ingredient in the formula--the professional quality of our air traffic controllers who have demonstrated their capability to cope with equipment problems and do their job well.

Mr. Chairman, that concludes my prepared statement. My associates and I will be pleased to answer questions that you or members of your Subcommittee may have.