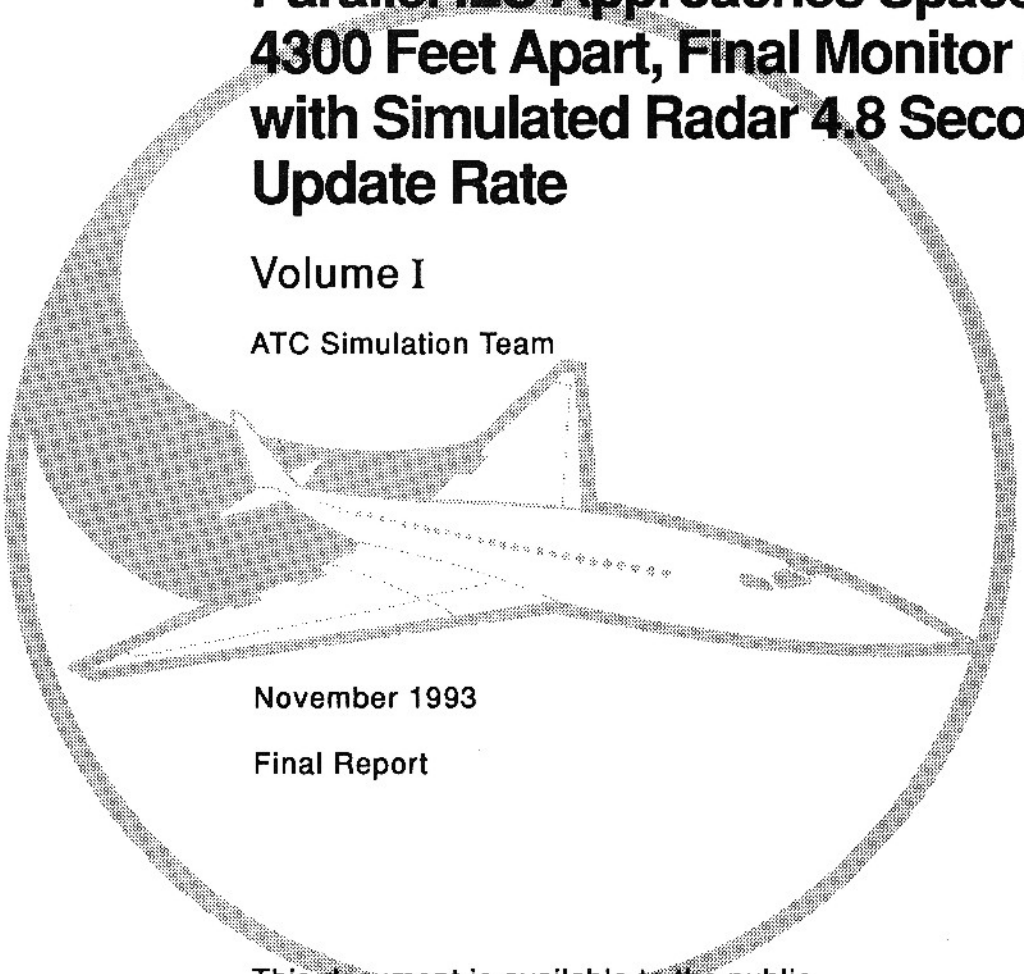
DOT/FAA/CT-92/16, I

**FAA Technical Center**
Atlantic City International Airport,
N.J. 08405

# Evaluation of Triple Simultaneous Parallel ILS Approaches Spaced 4300 Feet Apart, Final Monitor Aid with Simulated Radar 4.8 Second Update Rate

## Volume I

ATC Simulation Team



November 1993

Final Report



U.S. Department of Transportation
**Federal Aviation Administration**

**Technical Report Documentation Page**

| 1. Report No. | 2. Government Accession No. | 3. Recipient's Catalog No. |
|---|---|---|
| DOT/FAA/CT-92/16, I | | |

| 4. Title and Subtitle | 5. Report Date |
|---|---|
| Evaluation of Triple Simultaneous Parallel ILS Approaches Spaced 4300 Feet Apart, Final Monitor Aid with Simulated 4.8 Second Radar Update Rate, Volume I | November 1993 |
| | 6. Performing Organization Code |
| | 8. Performing Organization Report No. |
| 7. Author(s) Richard E. Ozmore | ACD-340 |
| 9. Performing Organization Name and Address<br>CTA INCORPORATED<br>2500 English Creek Avenue<br>Suite 1000<br>Pleasantville, NJ 08232 | 10. Work Unit No. (TRAIS) DOT/FAA/CT-92/16, I<br>11. Contract or Grant No. DTFA03-89-C-00023 |
| 12. Sponsoring Agency Name and Address<br>U.S. Department of Transportation<br>Federal Aviation Administration<br>Research and Development Service<br>Washington, DC 20591 | 13. Type of Report and Period Covered<br>Test Report<br>May 1991 - June 1992<br>14. Sponsoring Agency Code ARD-100 |

15. Supplementary Notes
Authors: G. Yastrop, L.W. Bensel, T. Fischer, R. Jones, R. Luongo, E. Neiderman, and K. Reardon

16. Abstract

**This study evaluated the ability of controllers to monitor approach traffic during instrument meteorological conditions using a real-time, interactive, air traffic control simulation. The airport configuration consisted of triple parallel runways spaced 4300 feet apart with even thresholds and a field elevation of 600 feet. A radar system with a 4.8 second update rate and 2 milliradian accuracy was simulated. Controllers used Final Monitor Aid displays. Use of the term "Break" as a replacement for "Immediately" during a blunder situation was also tested.**

**The simulation measured controller performance by analyzing the smallest slant range miss distance, closest point of approach, between blundering aircraft and evading aircraft. Data were also collected concerning aircraft No Transgression Zone entries as well as false breakouts.**

**Controller and pilot questionnaire responses indicated that the use of the term "Break" was unnecessary. The Multiple Parallel Approach Program Technical Work Group and the participating controllers concluded that the simulated approach operation would be safe and viable using current technology radar sensors and the Final Monitor Aid displays.**

| 17. Key Words | 18. Distribution Statement |
|---|---|
| Simultaneous Parallel ILS, ILS Approaches, Real-Time Simulation, Air Traffic Control, Final Monitor Aid | This document is available to the public through the National Technical Information Service Springfield, VA 22161 |

| 19. Security Classif. (of this report) | 20. Security Classif. (of this page) | 21. No. of Pages | 22. Price |
|---|---|---|---|
| Unclassified | Unclassified | 90 | |

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# EXECUTIVE SUMMARY

This study is part of an on-going effort to evaluate plans for increasing air traffic capacity and to evaluate the feasibility of using multiple simultaneous parallel Instrument Landing System (ILS) approaches. The objective of this study was to evaluate the ability of controllers who were experienced with multiple parallel approach operations to handle approach traffic during Instrument Meteorological Conditions (IMC) to a proposed triple parallel runway airport configuration, using a real-time, interactive, air traffic control (ATC) simulation. It should be kept in mind that, like the output of all experimental evaluations, the results of this study should not be extrapolated to situations which contain variables other than those tested in this study.

The proposed configuration consisted of triple parallel runways spaced 4300 feet (ft) apart. The generic airport had a field elevation of 600 ft. A radar system with a 4.8 second (s) update rate and 2 milliradian accuracy was simulated. The Final Monitor Aid (FMA) (high resolution color display equipped with the controller alert system hardware/software used in the precision runway monitor system) was used for the final approach monitor position. The air traffic consisted of both flight simulators and computer-generated aircraft which emulated turbojets, turboprops, and propeller driven aircraft.

Simultaneous parallel ILS approaches were simulated with controllers monitoring traffic on the final approach localizers. To challenge the system, scenarios were developed to create conflicts between aircraft. Blunders were generated by having some of the simulated aircraft deviate from the localizer by either 20 or 30 degrees. Furthermore, 70 percent of the blundering aircraft simulated a total loss of radio communication (NORDO) with the controllers. This simulation also tested the effectiveness of the word "BREAK" as a replacement for the word "IMMEDIATELY," when urgent instructions were issued during a blunder situation.

The central issue in the study was the ability of the controllers to maintain distance between a blundering aircraft and aircraft on adjacent parallel approaches. Two questions were addressed:

1. Would the controllers be able to maintain the test criterion miss distance of 500 ft between aircraft?

2. Do the controllers, technical observers, the Multiple Parallel Technical Work Group (TWG), and other Federal Aviation Administration (FAA) management observers agree that the operation of this proposed triple simultaneous parallel ILS approaches is acceptable, achievable, and safe as simulated?

The results indicated that controllers were able to resolve 99.7 percent of the conflicts in the simulation. Of the 290 conflicts, only one conflict resulted in aircraft violating the criterion miss distance of 500 ft. The controllers stated that the FMA enabled them to effectively resolve blunders. They concluded that triple simultaneous parallel ILS approaches with runway centerlines spaced 4300 ft apart would be a "safe and viable operation" using current technology radar systems and the FMA.

In response to the Airline Pilots Association's (ALPA) request to use the term "BREAK" in the evasive maneuver instead of the term "IMMEDIATELY," six of eight controllers did not like the use of the term "BREAK." One controller thought the term was unnecessary. The controllers believed the use of the term "BREAK" in simultaneous approaches would be uncharacteristic for its normal definition in controller phraseology. The majority of the pilots also agreed the term "BREAK" would not be a practical replacement for the term "IMMEDIATELY." Their reasoning was the term "BREAK" is already used by controllers to indicate a break in communications, therefore, the additional meaning of the term "BREAK" may result in confusion.

Total system error (TSE) is the difference between the path the aircraft flies and the intended path. This may be expressed as a statistical combination of all sources of navigation error including navigation signal source, propagation, airborne system, and flight technical error (FTE). For this simulation, TSE was evaluated with two measures: frequency of No Transgression Zone (NTZ) entries that were not the result of a blunder or a breakout, and percentage of false breakouts.

Of the 486 approaches flown by flight simulators, there were 18 (3.7 percent) NTZ entries. Of the 2374 triple approaches flown by computer-generated aircraft, there were 30 (1.0 percent) NTZ entries. False breakouts occurred when an aircraft was vectored off an approach for reasons other than a conflict. False breakouts occurred with 127 (4.4 percent) of all aircraft that were not involved in a blunder.

The TWG, comprised of individuals from the Office of System Capacity and Requirements, Air Traffic, Flight Standards, Aviation System Standards and Operations personnel, participated in the simulation and evaluated the simulation findings. Based upon the TWG's understanding of daily air traffic operations, the knowledge and skills of controllers, and the contingencies that must be accounted for, the TWG determined that the triple simultaneous parallel ILS approach operation spaced at 4300 ft is acceptable using the FMA and the simulated airport surveillance radar (ASR) system with a 4.8 s update rate.