Session XI. Regulation, Certification and System Standards

N93-14857

In-service Evaluation of Wind Shear Systems
Capt. Sam Shirck, Continental Airlines
Good Afternoon Ladies and Gentlemen

This was our first bite of the windshear apple! A Continental Flight from Denver to Houston, August 7, 1975. Fortunately in this accident there was no loss of life, others have been far less so.

Following this occurrence, a comprehensive study was undertaken by Continental Airlines Flight Operations to establish procedures to prevent a re-occurrence of this type of accident. Text and simulator training were developed and employed shortly thereafter.

FAA mandated windshear training is now required, low level windshear alerting systems have been installed at some airports, terminal doppler weather reporting systems have been installed at two airports with 40 or more coming soon, since this accident.

Reactive windshear systems, the best answer industry had at the time, have been installed on many aircraft and are now required on all aircraft being delivered.

N88777 encountered a strong microburst tailwind component of over 60 knots just at rotation. In our mind, the present reactive windshear systems, by themselves, will not prevent this type of accident. TDWR and LLWAS will not be installed at all airports that are subject to these microburst phenomena. Therefore, an advanced warning system, predictive, if you will, is required for the safety of our passengers.
We have worked over the past two years with Bendix, Collins, Westinghouse, and Dr. Pete Sinclair of CSU to find a solution to the windshear problem that is cost effective and provides the margin of safety required. With the able assistance of the FAA aircraft certification office in Long Beach we have modified three aircraft in our fleet, 1 737-300 and 2 A-300's, to assist the vendors in data collection. The 737 was delivered from Boeing with a Sunstrand Mk V GPWS/WS system; it has been modified by adding another Sunstrand Mk V. Dr. Sinclair's IR unit, a modified Collins WXR-700 weather radar system, and an optical disk recording system. The A-300 aircraft have similar modifications, one featuring a modified Bendix RDR-4A radar and the other a Westinghouse MODAR 3000 system. Each aircraft has the Sunstrand reactive system installed to furnish a base line for windshear correlation. All windshear information is transparent to the flight deck and normal operating procedures are unaffected. Because of comprehensive windshear avoidance procedures developed by the FAA and NASA, and employed by our airline, no significant shears have been encountered. However, an enormous amount of data has been collected to aid in ground clutter reduction and moving target discrimination in the approach and departure areas.

Recent meetings with the FAA, NASA Langley, and the vendors make us feel that the windshear solution is at hand. We intend to proceed under the 5256 exemption and feel certification of a predictive windshear system will be possible in the mid 1993 time frame.
We would now like to present some display and alerting scenarios that the predictive systems will provide.

1) Landing- windshear detected 1.5 miles or more from aircraft.
2) Landing- windshear detected 1.5 miles or less from aircraft.
3) Takeoff- windshear detected prior to V1 within 5 miles.
4) Takeoff- windshear detected after V1 within 1.5 miles.
5) Takeoff- windshear detected after V1 1.5 to 5 miles

These efforts have been possible because of a true and abiding commitment to safety by Bendix, Collins, Sunstrand, Westinghouse and Dr. Sinclair.

We would like to express our appreciation for the advice, assistance and encouragement we've received from Dr. Bowle's group at NASA Langley. When it's dark in the tunnel it's nice to have someone not only have a candle, but to light it to show the way.

Thank you for your attendance.
CONCLUSIONS
- AIRCRAFT - BELOW 1500 FT. ON FINAL
- WX - WINDSHEAR WITHIN 5NM

ALERTS
- LAMP - WINDSHEAR AHEAD
- AURAL - ATTESON/CHIME
- DISPLAY - WINDSHEAR ICON YELLOW/BLACK
  POP UP IS OFF TO WX/WS MODE

PILOT ACTION
- AS REQUIRED POTENTIAL TO MANEUVER AND AVOID
- REPORTS WS TO ATC
- NEGOTIATE AVOIDANCE AND/OR MANEUVER
-CONDITIONS-
  • AIRCRAFT - BELOW 1500 FT. ON FINAL
  • WX - WINDSHEAR WITHIN 1.5NM

-ALERTS-
  • LAMP WINDSHEAR AHEAD
  • AURAL "WINDSHEAR AHEAD" 1 REPEAT
  • DISPLAY WINDSHEAR ICON RED/BLACK POP UP IS OFF TO WS MODE

-PILOT ACTION-
  • GO AROUND
  • REPORTS WS TO ATC

1500 FT. AGL
1.5NM
5NM
- CONDITIONS -
  - AIRCRAFT - END OF RUNWAY TO V.
  - WX - WINDSHEAR WITHIN 5NM

- ALERTS -
  - LAMP - WINDSHEAR AHEAD
  - AURAL - "WINDSHEAR AHEAD" 1 REPEAT
  - DISPLAY - WINDSHEAR ICON RED/BLACK POP UP IS OFF TO WS MODE

- PILOT ACTION -
  - RTO - "WINDSHEAR AV VD. 5 KEBEAVS"
  - REPORTS WS TO ATC

- NAV - ENCON: BE WINDSHEAR BEYOND 1.5NM 5NM
- CONDITIONS -
  - AIRCRAFT - BEYOND $V_t$
  - WX - ENCOUNTERED WINDSHEAR

- ALERTS -
  - LAMP
  - AURAL* "WINDSHEAR AHEAD" 2 REPEATS *
  - DISPLAY NONE

- PILOT ACTION -
  - WTARP
  - REPORTS WS TO ATC

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Vertical Velocity Indicator

$V_t$  1.5NM  5NM
-CONDITIONS-
  - AIRCRAFT - TAKEOFF ROLL BEYOND $V_t$
  - WX - WINDSHEAR BETWEEN 1.5NM AND 5NM

-ALERTS-
  - LAMP  [WINDSHEAR AHEAD]
  - AURAL* "WINDSHEAR AHEAD" 1 REPEAT *
  - DISPLAY WINDSHEAR ICON YELLOW/BLACK
    POP UP IS OFF TO WX/WS MODE

-PILOT ACTION-
  - TO MAX POWER
  - NOTIFY ATC
  - AVOID WS

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Continental Airlines

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