527 370

SUMMER 1988 TDWR MICROBURST ANALYSIS*

Mark W. Merritt
MIT Lincoln Laboratory
Lexington, MA 02173

N91-11701

p 12

ABSTRACT

The Terminal Doppler Weather Radar (TDWR) testbed system was operated during the months of July–August 1988 in a live operational demonstration providing microburst (and related weather hazard) protection to the Stapleton International Airport in Denver, CO. During this time period, the performance of the detection system was carefully monitored in an effort to determine the reliability of the system. Initial performance analysis indicates that the microburst detection component of TDWR satisfies the basic performance goals of 90% probability of detection and 10% probability of false alarm.

An in–depth study of the system performance, based on analysis of both dual–Doppler radar observations and surface mesonet measurements, is in progress to provide a detailed understanding of the observability of microbursts by the radar, the ability of the algorithms to detect microbursts observed by the radar, and the timeliness and accuracy of the microburst alarms provided to operational users.

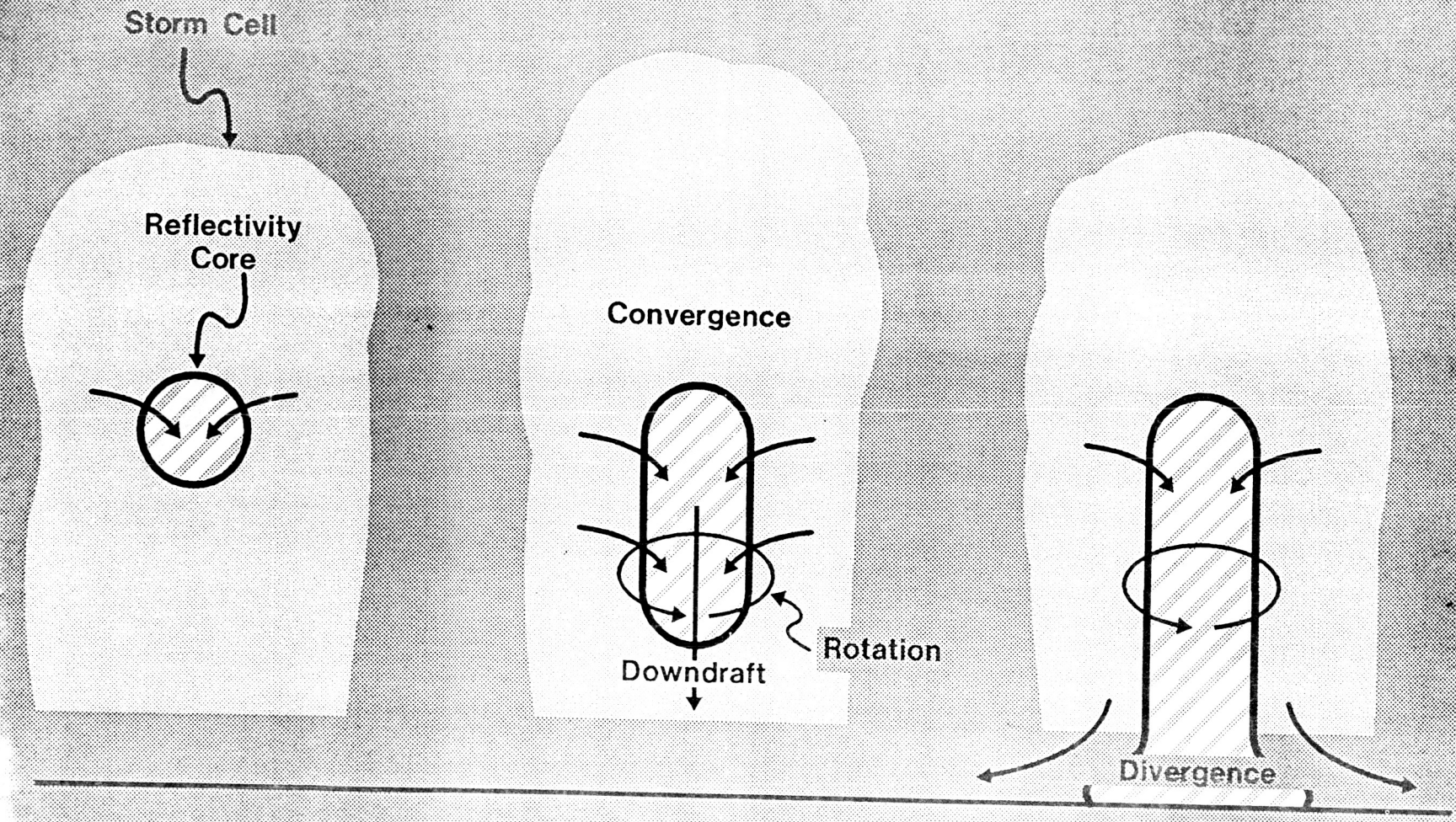
*This work was sponsored by the Federal Aviation Administration. The United States Government assumes no liability for its contents or use thereof.

SUMMER 1988 TDWR MICROBURST ANALYSIS

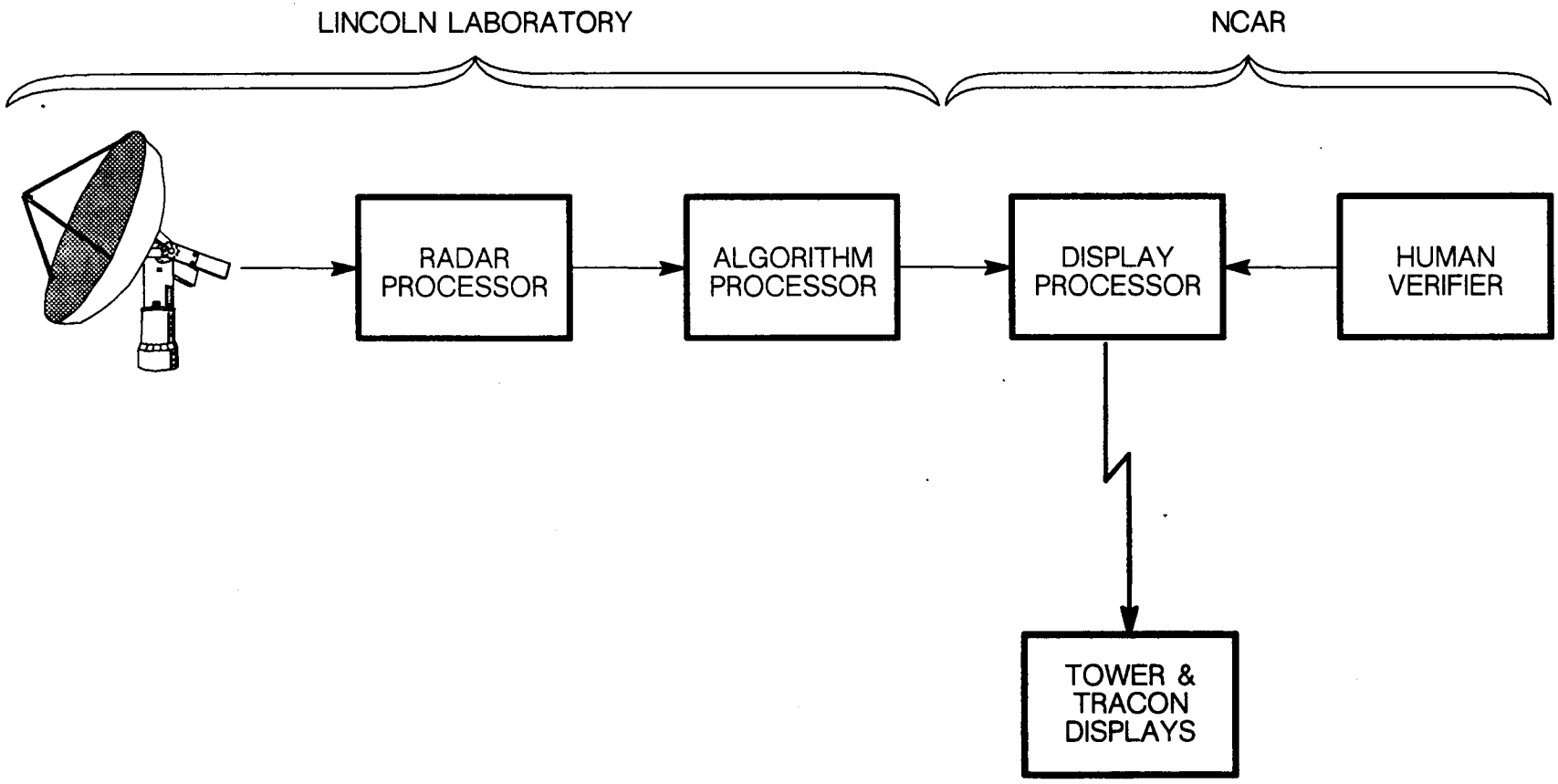
M.W. MERRITT
MIT LINCOLN LABORATORY

- TDWR OPERATIONAL EVALUATION
- "QUICK-LOOK " PERFORMANCE RESULTS
- ANALYSES IN PROGRESS

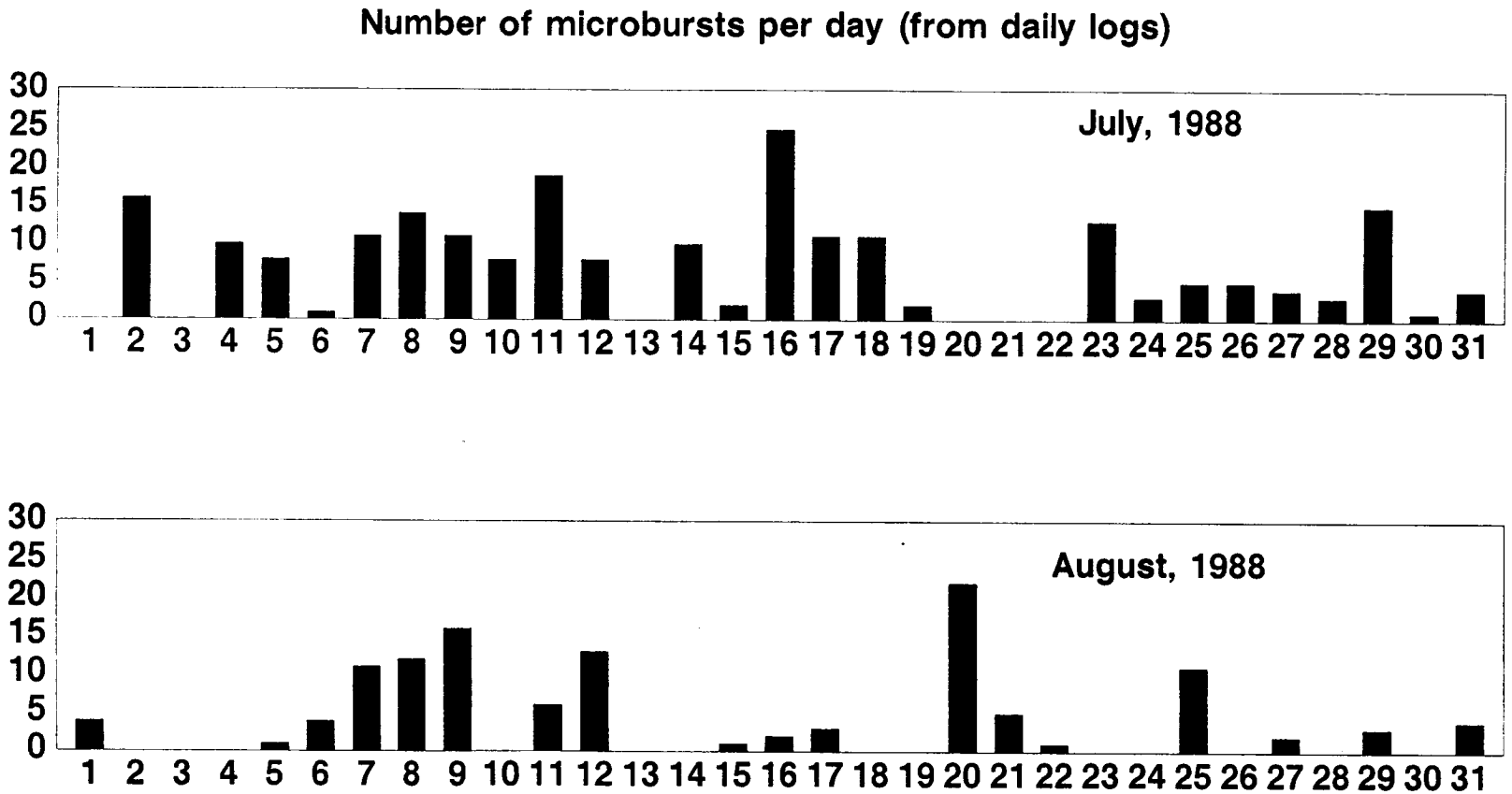
MICROBURST FEATURES ALOFT



TDWR DEMONSTRATION SYSTEM



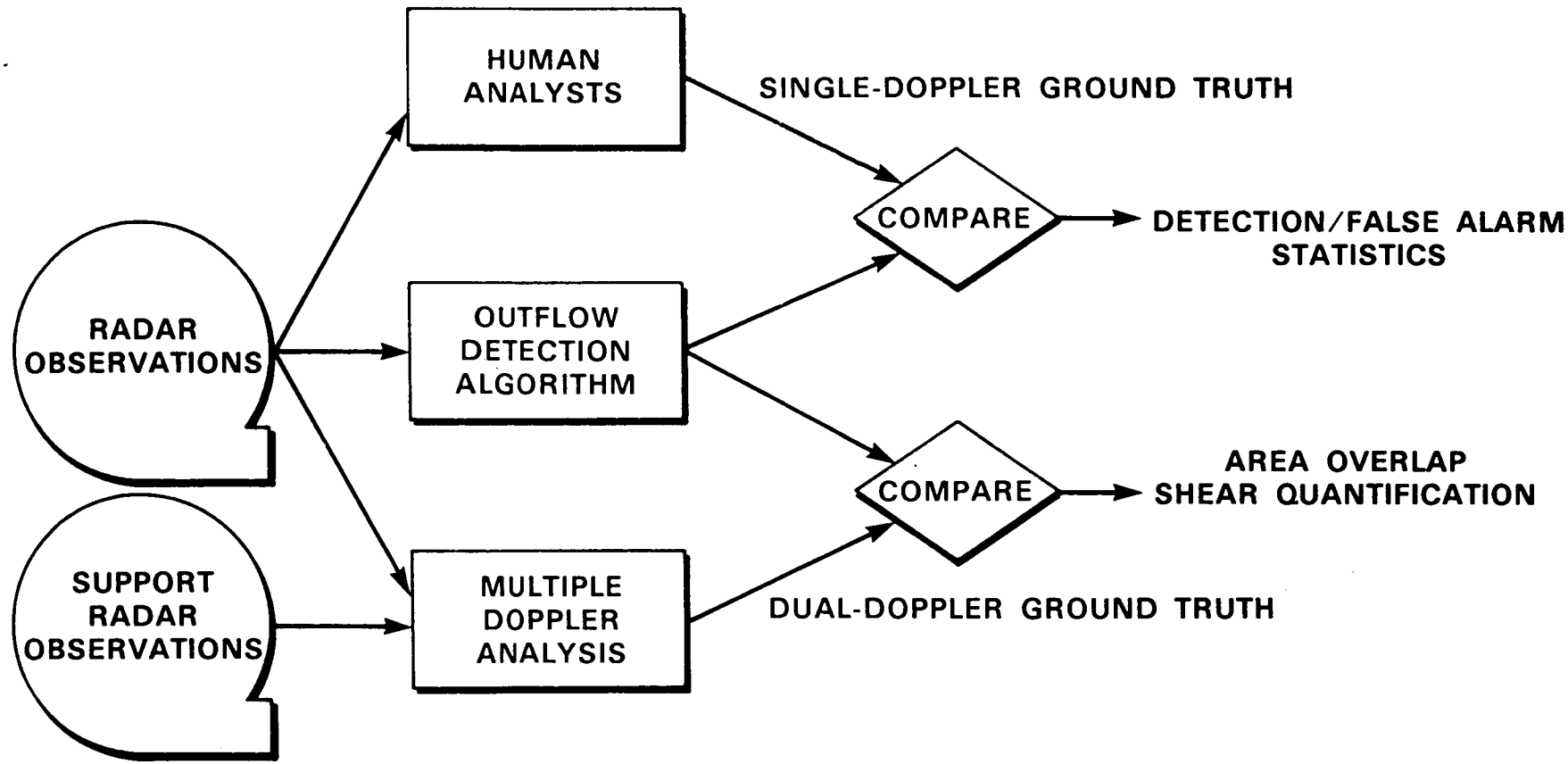
SUMMARY OF MICROBURST EVENTS



FAA GOALS FOR TDWR
MICROBURST DETECTION PERFORMANCE

- > 90% PROBABILITY OF DETECTION
- < 10% PROBABILITY OF FALSE ALARM
- ONE MINUTE ADVANCE WARNING
- +/- 5 KNOTS (OR 20%) ACCURACY ON STRENGTH

ALGORITHM SCORING PROCEDURE



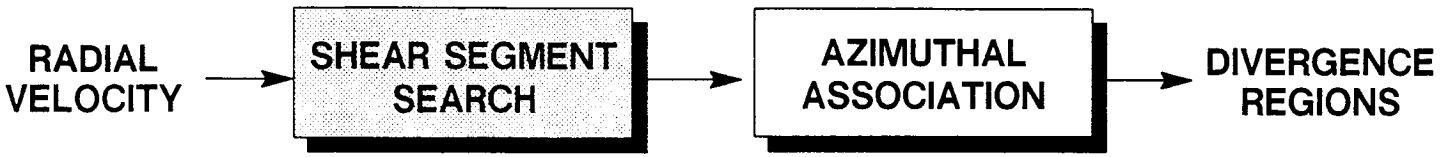
79242-3

MICROBURST PERFORMANCE ANALYSIS
(SINGLE DOPPLER GROUND TRUTH)

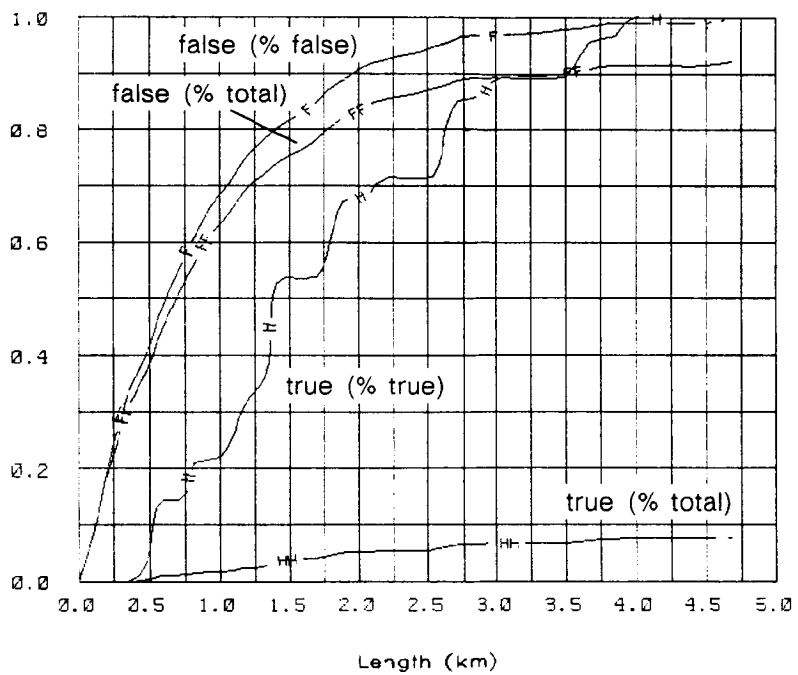
Date	TRUE EVENTS >15 m/s	TRUE EVENTS ≤15 m/s	Detected Events >15 m/s	Detected Events ≤15 m/s
10 June 88	59	37	56	28
21 June 88	45	36	44	32
25 June 88	70	19	69	16
7 July 88	46	48	43	32
17 July 88	39	1	38	1
Totals	259	141	250	109

Probability of Detection (>15 m/s)	=	250/259	=	97%
Probability of Detection (≤15 m/s)	=	109/141	=	77%
Probability of Detection (overall)	=	359/400	=	90%
Probability of False Alarm	=	21/417	=	5%

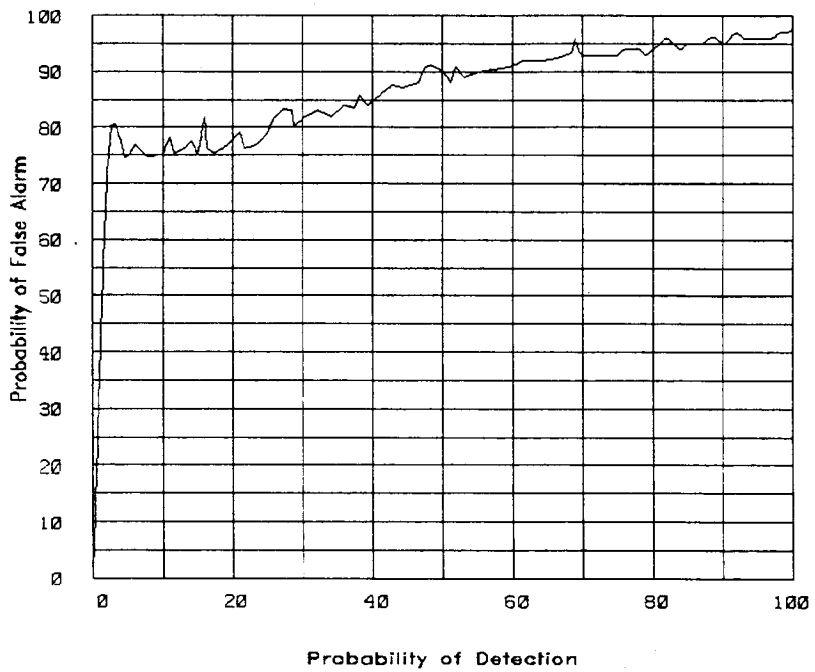
PERFORMANCE OF
1-DIMENSIONAL SHEAR LOCATION ALGORITHM



DISTRIBUTION OF SEGMENT LENGTHS



R.O.C.



12 Oct 88

TIMELINESS OF MICROBURST DETECTIONS

HOW MUCH ADVANCE WARNING CAN BE PROVIDED TO PILOTS BY A GROUND-BASED RADAR SYSTEM?

DATE	SURFACE ONLY	3-D ALGORITHM	IMPROVEMENT	PRECURSOR WARNING
7 JUNE 1986	0.0	+1.3	+1.3	+10.1
25 JULY 1986	-1.8	-0.8	+1.0	+6.0
31 JULY 1986	-0.9	0.0	+0.9	+5.7
23 MAY 1987(a)	-3.4	-2.5	+0.9	+6.3
23 MAY 1987(b)	0.0	+2.6	+2.6	+4.7
23 MAY 1987(c)	0.0	0.0	0.0	+4.8
23 MAY 1987(d)	0.0	+2.3	+2.3	+5.9
AVERAGE	-0.9	+0.4	+1.3	+6.2

(MINUTES PRECEEDING START OF EVENT)

RADAR OBSERVABILITY OF MICROBURST OUTFLOWS DENVER, 1988

- COMPARE RADAR OBSERVATIONS WITH SURFACE MESONET
- TIME PERIOD: 1 JULY – 31 AUGUST 1988
- SUMMARY RESULTS:

		RADAR HIT	RADAR MISS
MESONET	HIT	66 (94.3%)	2 (2.9%)
	MISS	2 (2.9%)	?

12 Oct 88