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**RADAR BACKSCATTER FROM AIRPORTS
AND
SURROUNDING AREAS**

Robert G. Onstott
Environmental Research Institute of Michigan
Advanced Concepts Division
Radar Science Laboratory
P.O. Box 8618
Ann Arbor, MI 48107
(313)994-1200

The description of the clutter environment encountered during runway approaches is important in the development of aircraft instrumentation to detect microbursts or severe low altitude windshear. The purpose of the effort described here is to provide a description of ground clutter at and near airports. Realistic clutter scenes will be assembled using high-resolution synthetic aperture radar (SAR) data for incorporation into the NASA LaRC Microburst Simulation Model.

The Environmental Research Institute of Michigan (ERIM) has assembled an extensive inventory of SAR data. The archive has been examined for data collected of airports at an X-band frequency, at angles near grazing, and from which accurate radar scattering coefficients may be extracted (i.e. data has been recorded digitally and includes calibration target arrays).

The Willow Run Airport located near Detroit, Michigan has been overflown many times over the last 15 years and will serve initially as the principle airport site. The first clutter scene has been assembled. These data were obtained on December 17, 1984. The depression angle is about 22 degrees and the antenna transmit-receive polarization is Vertical-Vertical (VV). Analysis has begun by identifying potential contributors to the clutter background at and near the airport. The range of cross sections in a 6 km x 12 km region about the airport is being examined. This will be further broken down into the various scatters and into categories of like scattering properties.

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PURPOSE

Describe Ground-Clutter Environment At and Near Airports

APPROACH

- I. Examine Existing Synthetic Aperture Radar (SAR) Data Archive
- II. Supplement with New SAR Data
- III. Supplement with Surface-Based Scatterometer Data

RADAR PARAMETERS

Frequency = X-Band

Polarizations = Like and Cross

Angles = Near Grazing

STATUS

- Work Began 15 September 1987
- Kick-Off Meeting at LARC
- Data Archive Examined
- First Airport-SAR Image Created
- Clutter Analysis has been Started

DATA ARCHIVE

Have Selected Sites According To

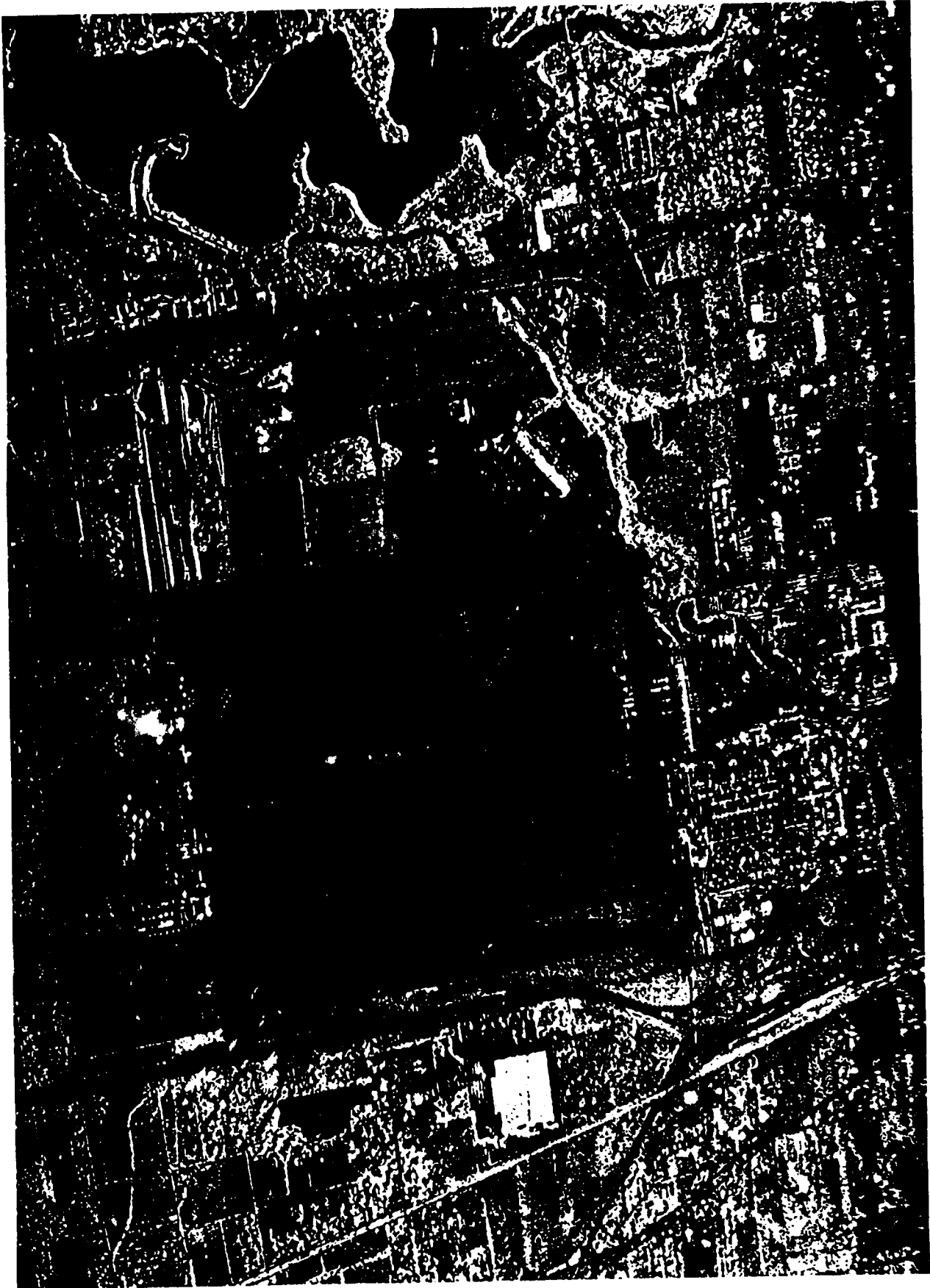
- Airports
- Digitally Recorded Data
- X-Band Frequency
- Calibration Targets are Present

Possible Airport Sites

Willow Run, Detroit, Michigan (principal site)
Peconic River Airport
Victoria, British Columbia

Radar Parameters

Angle = 10° to 20° (grazing)
Polarization = VV, VH, HV, HH



CLUTTER SCENES

Airport:

- Instrumentation
Anemometer
VOR
Glide Slope
Beacons
Antennas
Towers
- Buildings
- Runways
- Grass Covered Fields
- Aircraft Parked, Taxiing & Landing
- Ground Vehicles Parked and Moving
- Trees
- Fences

CLUTTER SCENES (Continued)

Surrounding Areas:

- **Vehicles Traveling on Adjacent Highways**
- **Urban, Residential, Commercial and Industrial**
- **Trees, Woodlands and Forest**
- **Fences**
- **Trains**
- **Lakes, Rivers and Shoreline**
- **Mountains**
- **Farmland and Crops**

CLUTTER ANALYSIS

- (1) Inventory Clutter Scenes
- (2) Describe Statistically
Mean
Probability Distribution
- (3) Examine Sensitivity to Radar Parameters
Depression Angle
Aspect Angle
Polarization