A Presentation to StART

Background Information on Airport Noise Monitoring Systems

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History of Systems & Best Practices

- First systems developed in late 1960s and early 1970s
  - Seattle first system dates to early 1970s
  - Hydrophones were used as microphones
  - Seattle has updated systems about every 20 years corresponding to technology improvements
- International Standards & Best Practice Guidelines
  - IEC 61672 (Sound Level Meters and Microphones)
  - IEC 60942 (Sound Level Calibrators)
  - SAE ARP 4721(Monitoring Noise in the Vicinity of Airports)
  - ISO 20906 (Unattended Noise Monitoring of Aircraft Sound In the Vicinity of Airports)

Goals

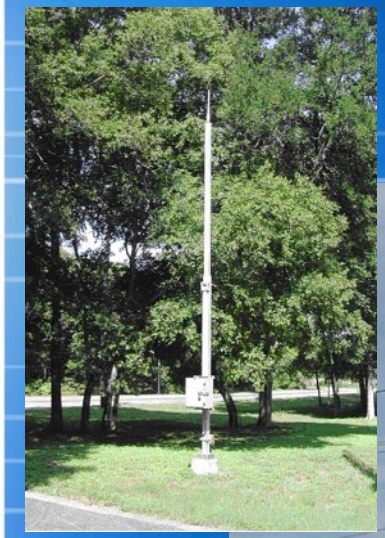
- Monitor noise levels generated from aircraft operations
- Compare with noise policy guidelines
- Documentation for community/governmental groups
- Justify mitigation measures
- Minimize noise impact on nearby communities

Use of the Data

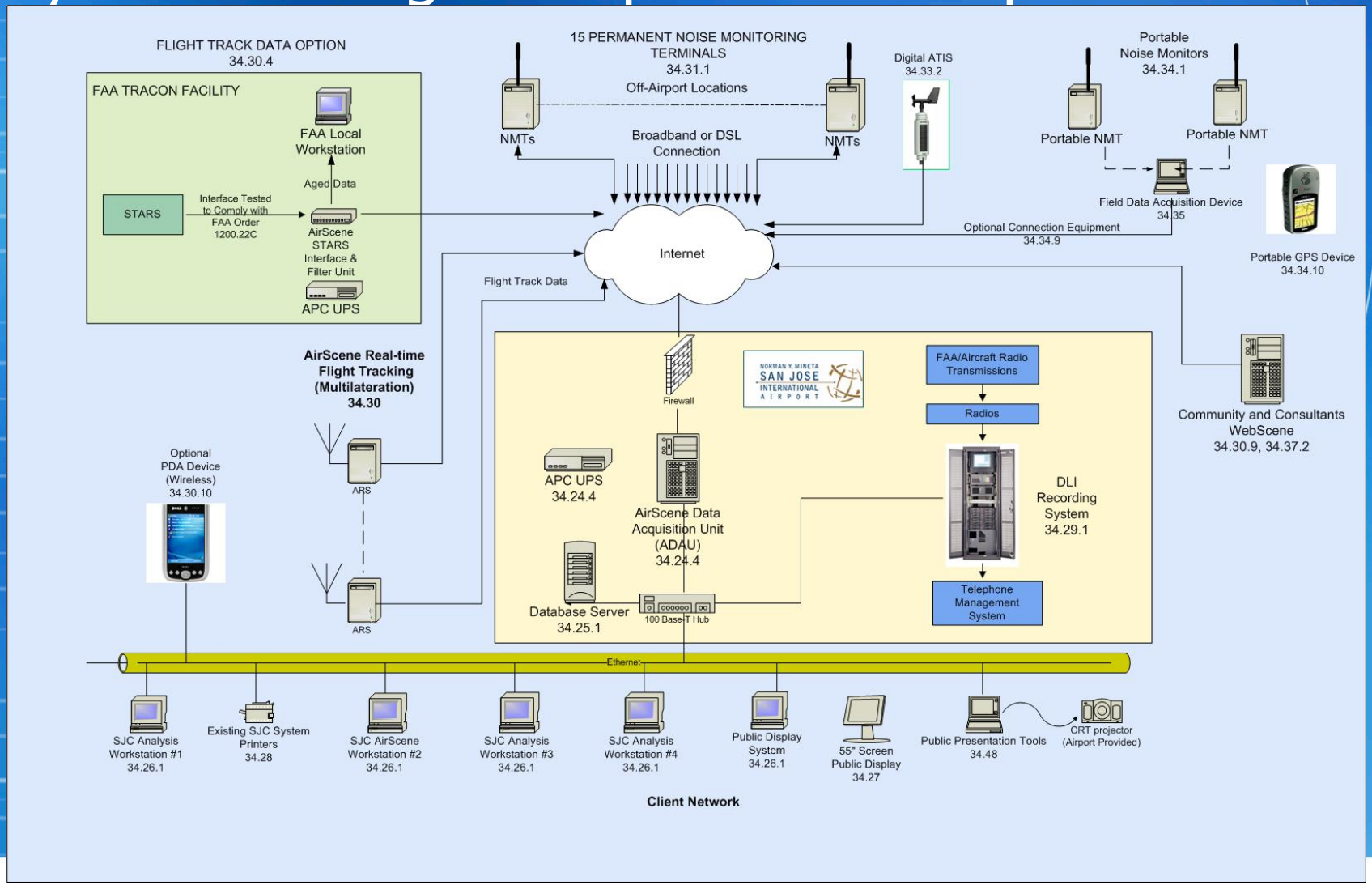
- Link Noise Events to Specific Flights
- Validate Noise Modeling
- Flight Track Analysis
- Evaluate Noise Abatement Alternatives
- Respond to Community Complaints/Concerns
  - Includes processed raw data by request

Capture Flight Tracks and Overflight Noise

Aircraft Noise Monitors



System Design & Spec. Development



Major System Components

- Analysis and Reporting Software
- Computer Systems
- Geographic Information System
- Remote Noise Monitors
- Portable Noise Monitors
- Flight Track Acquisition System (Radar Data)
- Complaint Logging System
- Meteorology Data Acquisition
- Air Traffic Control Radio Recorder

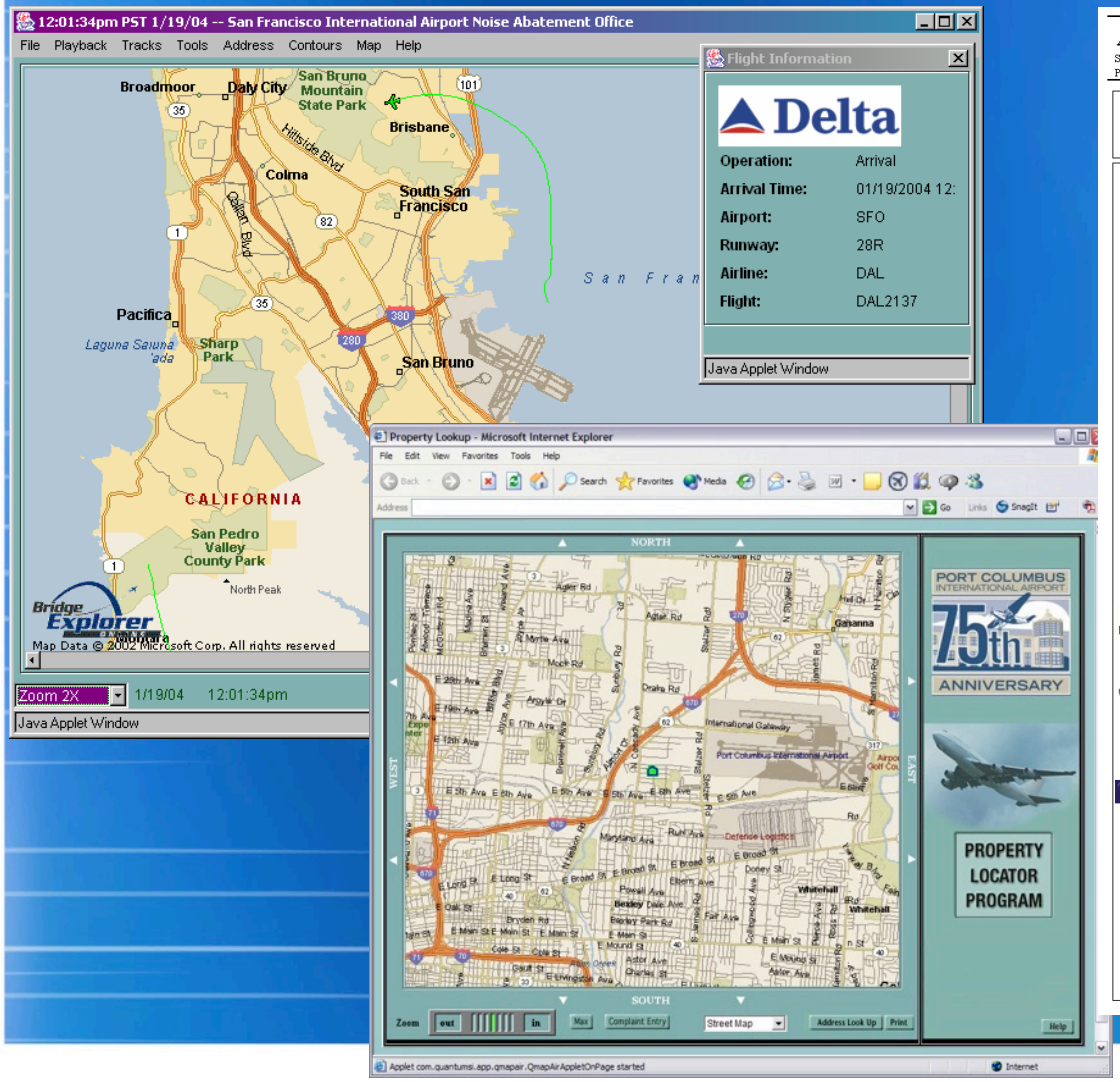
NOISE MONITORING EQUIPMENT

- Directional Characteristics
- Microphone Height
- Time Averaging Characteristics
- Clock
- Resolution of Reported Noise Levels
- Threshold Sound Level
- Linear Operating Range
- Transmission of Data
- System Calibration
- Environmental Characteristics
- Back-up Electrical Power
- Remote Site Data Back-up
- Remote Monitoring Station Supplies and Maintenance
- Signal Output

Site Selection - Technical Considerations

- Ambient Noise
- Reflective surfaces
- Shielding by terrain or structures
- Utilities (solar and cellular possible)
- Access
- Long Term Easement
- Electromagnetic Radiation
- Vandalism Potential

Technical Reporting



Airline Fly Quiet Summary

San Francisco International Airport
Period: 4th Quarter 2001

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SFO

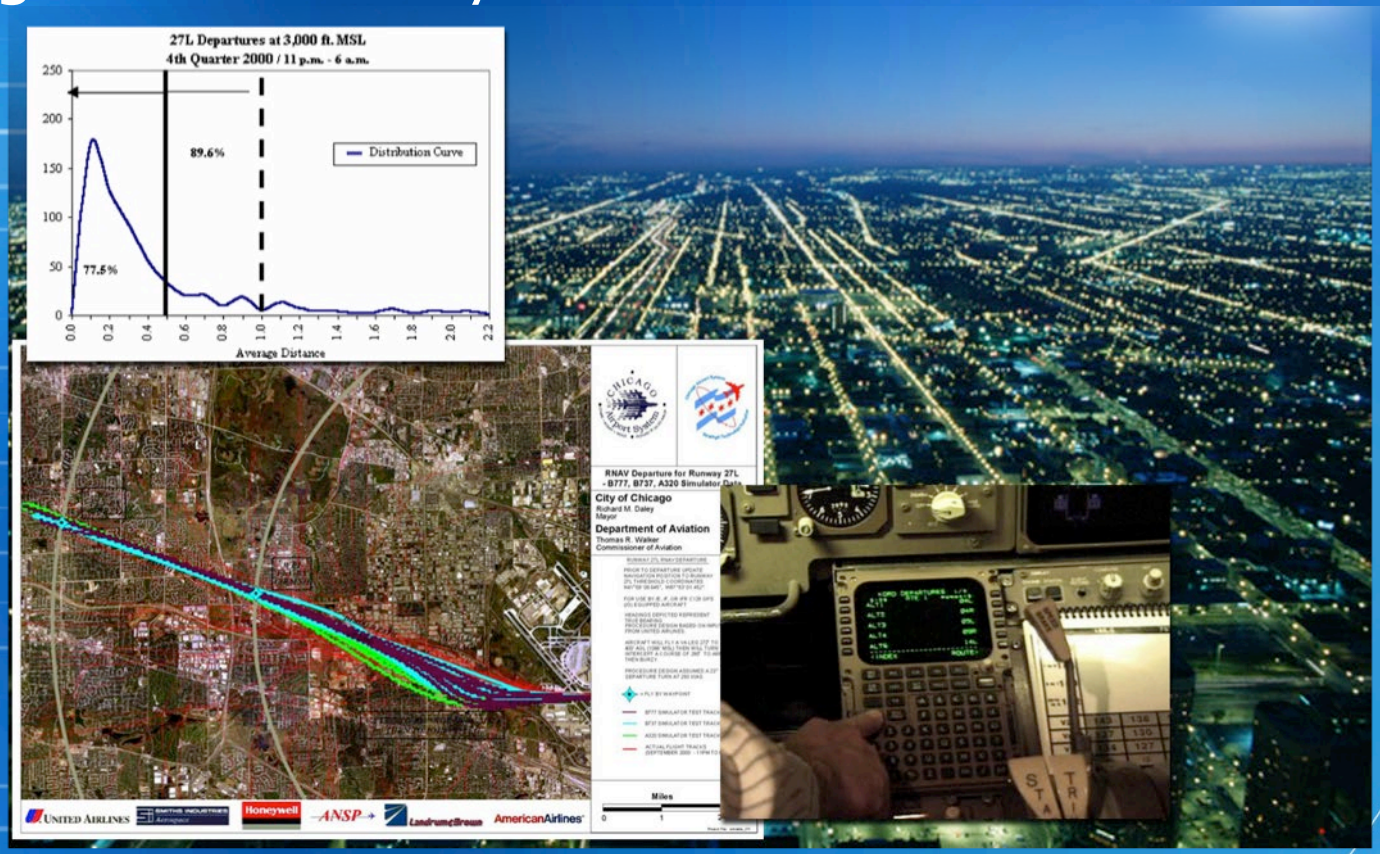
Airline	Weighting	Average Daily Jet Operations	Fleet Quality Rating 34%	Noise Exceedence Rating 33%	Procedure Compliance Rating 33%	Airline Fly Quiet Rating	Airline Fly Quiet Rating
Philippine	PAL	2.6	83	100	100	94	
AMT	AMT	7.0	88	100	92	93	
ANA	ANA	1.4	85	100	NA	92	
TAI	TAI	1.7	83	100	94	92	
AEROFLOT	AFL	0.7	84	100	91	91	
National Airlines	ROK	9.5	93	100	81	91	
UNITED	UAL	298.4	86	100	87	91	
Alaska Airlines	ASA	38.9	79	100	94	91	
USAir	USA	20.0	90	100	80	90	
MIDWEST EXPRESS AIRLINES	MEP	1.8	70	100	100	90	
DHL	DHL	2.5	68	100	100	89	
HAWAIIAN AIRLINES	HAL	1.9	65	100	100	88	
TWA	TWA	6.2	88	100	77	88	
BRITISH AIRWAYS	BAW	3.4	77	100	NA	88	
NCA Nippon Cargo Airlines	NCA	0.8	77	100	NA	88	
virgin atlantic	VIR	1.9	76	100	NA	88	
Delta Air Lines	DAL	37.7	85	100	79	88	
CATHAY PACIFIC	CPA	2.3	84	100	80	88	
California Coastal Airways	CCA	1.4	75	100	NA	88	
SkyWest	SKW	9.4	100	100	60	87	
KOREAN AIR	KAL	2.1	81	100	78	86	
American	AAL	68.6	79	100	78	86	
FEDERAL EXPRESS	FDX	3.7	78	100	79	86	

50 60 70 80 90 100

Source: SFO Noise Abatement Office

ANMS Operations

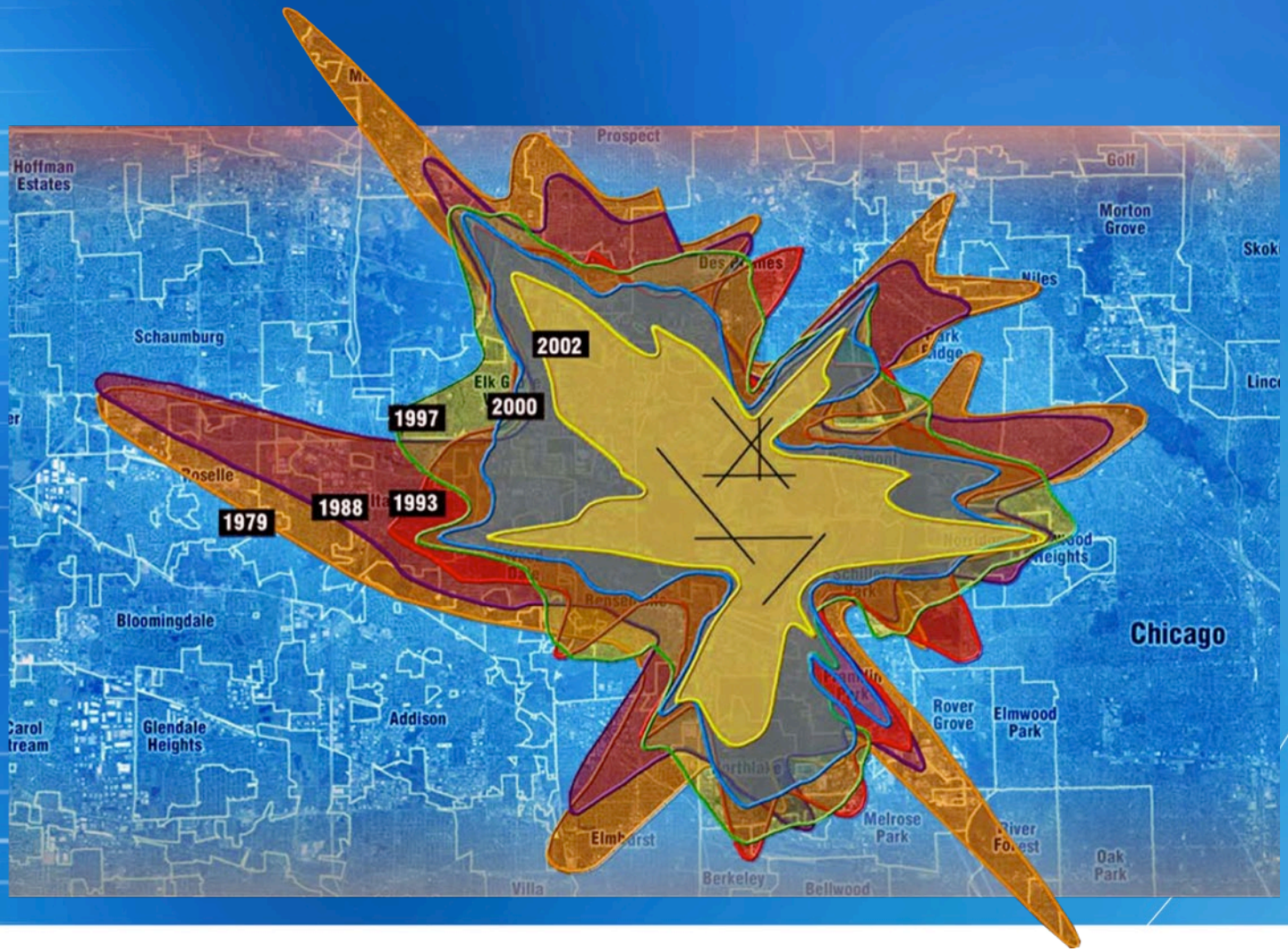
- Flight Track Analysis



ANMS Operation

- Noise Complaint Handling

Noise Modeling



Noise Measurement vs Noise Modeling

- Historically easy to measure aircraft noise
  - Older noisier aircraft stood out from community noise
  - Newer quieter aircraft make measuring aircraft noise more difficult
    - "Signal to Noise Ratio"
  - Easier to measure aircraft noise near the airport, especially under the flight track
  - Farther from the airport it transitions to a point where the best estimate of aircraft noise may be using a computer aircraft noise model
    - "Virtual Noise Monitor"
    - The issue comes down to the inability to detect when an aircraft noise event and car, truck, motorcycle, bus, etc. occurs simultaneously.
    - Noise monitors don't hear, they only measure sound level

Questions?