



Air Traffic Flow Management (ATFM)



U.S. Department of Transportation
Research and Innovative Technology Administration

ATFM Systems and Required Infrastructure

October 20-21, 2008

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Air Traffic Flow Management Systems and Required Infrastructure

- U.S. Technology-Based Solution -



Air Traffic Control

Air Traffic Management



Figures extracted from selected FAA, Air Force, NOAA and Commercial web sites

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Enables traffic flow operations in the United States

Jointly provides FAA traffic managers and NAS users:

- Real-time domestic & international air traffic situational awareness
- Forecasted demand at airports, sectors, fixes, other NAS elements and user defined airspace volumes based on 4D flight trajectories
- Visual warnings and alerts on airspace congestion and potentially unsafe air traffic operating levels
- Tools to implement congestion avoidance programs

Enables shared situational awareness with NAS Users

- FAA, DoD, Airlines, International Partners, General Aviation

Provides Aircraft Situation Display to Industry (ASDI)

- Travel Vendors, Airlines, Others

Provides ATFM Data to Government (TFMDG)

- U.S. DoD/Military, Other DOT Agencies, Others

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Domestic Operational Sites

- Continental U.S. (CONUS)
 - Air Traffic Control Systems Command Center (ATCSCC)
 - 21 Air Route Traffic Control Center (ARTCC) Facilities
 - 31 Terminal Radar Approach Control (TRACON) Facilities
 - Others (e.g., Towers, Regional)
- Outside Continental U.S.
- Military/U.S. DoD Sites
 - Air Defense (10 sites), Scott AFB, Andrews AFB, DISA

International sites

- Canada (10 sites)
- London, Mexico
- Chile, Columbia

Others

- NASA Ames Research Center, Airlines, Mitre, Lincoln Labs, Aviation Weather Center



Adding Sites Each Year

- Additional Air Defense Sites
- Department of Homeland Security
- International – Japan, Eurocontrol

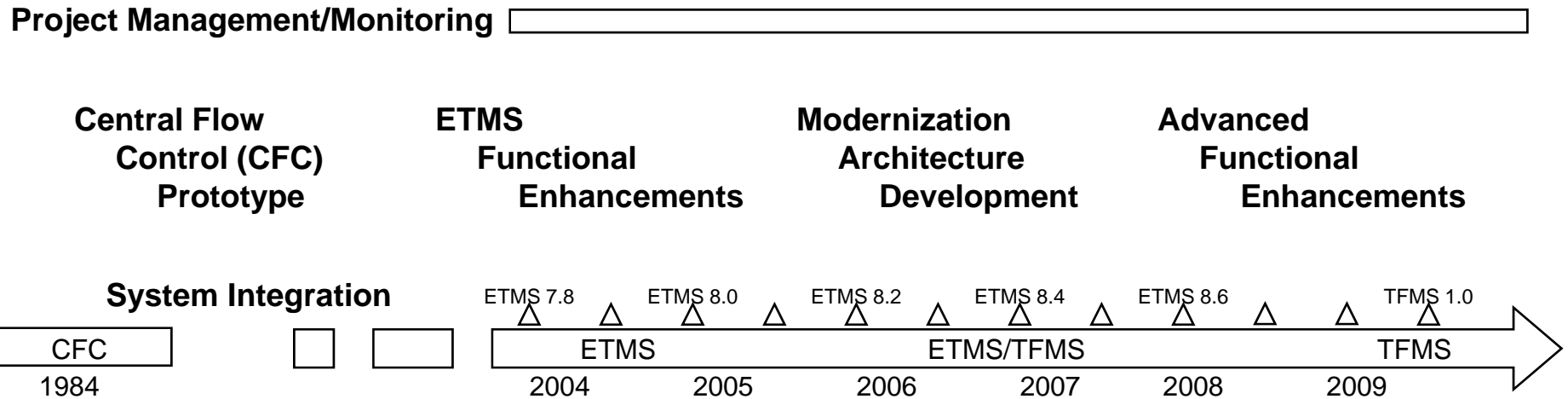


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Continuous Improvement through Evolutionary Development and Incremental Delivery of ATFM Products



- Established CFC Facility at FAA HQ
- Conversion to Open System Architecture
- Air Space Flow Programs
- Development of Aircraft Situation Display
- Introduction of Airline Data through CDM
- Modernization
- Move to ATCSCC in Herndon, VA
- Development of Interactive ATFM Tools
- Certification for Year 2000 Compliance
- Non-Proprietary System Technology Refresh

Integrated Delivery of Functional Enhancements and Infrastructure

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User mode sharing

- Early Intent messages
- Collaborative (CDM) airline messages (FC, FM, FX)
- Interfaces to neighboring countries for flight data
- Common Situational Awareness (e.g. Common Constraint Situation Display)

Protection of data

- Military filtering
- International data
- Airline competitive sensitive data
- Filtered list requests

Automation and algorithms

- Flight trajectory modeling
- Monitor/Alert future predictions
- Weather forecasts
- Flow Evaluation Areas (FEAs)/Flow Constrained Areas (FCAs)
- Ground Delay Programs (GDPs)/Issuing Clearance Times (CTs)
- Rerouting options

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Modernized H/W Platform - Technology Refresh System “State” Maintained for +/- 24 Hours:

- 23,000 Airports (2600 monitored)
- 1300 Sectors (dynamically reallocated)
- 38,000 Fixes and Waypoints
- 1200 Jet and Victor Airways
- 8000+ Active Flights (Instantaneous Total Count)
- 70,000 Flights Per Day

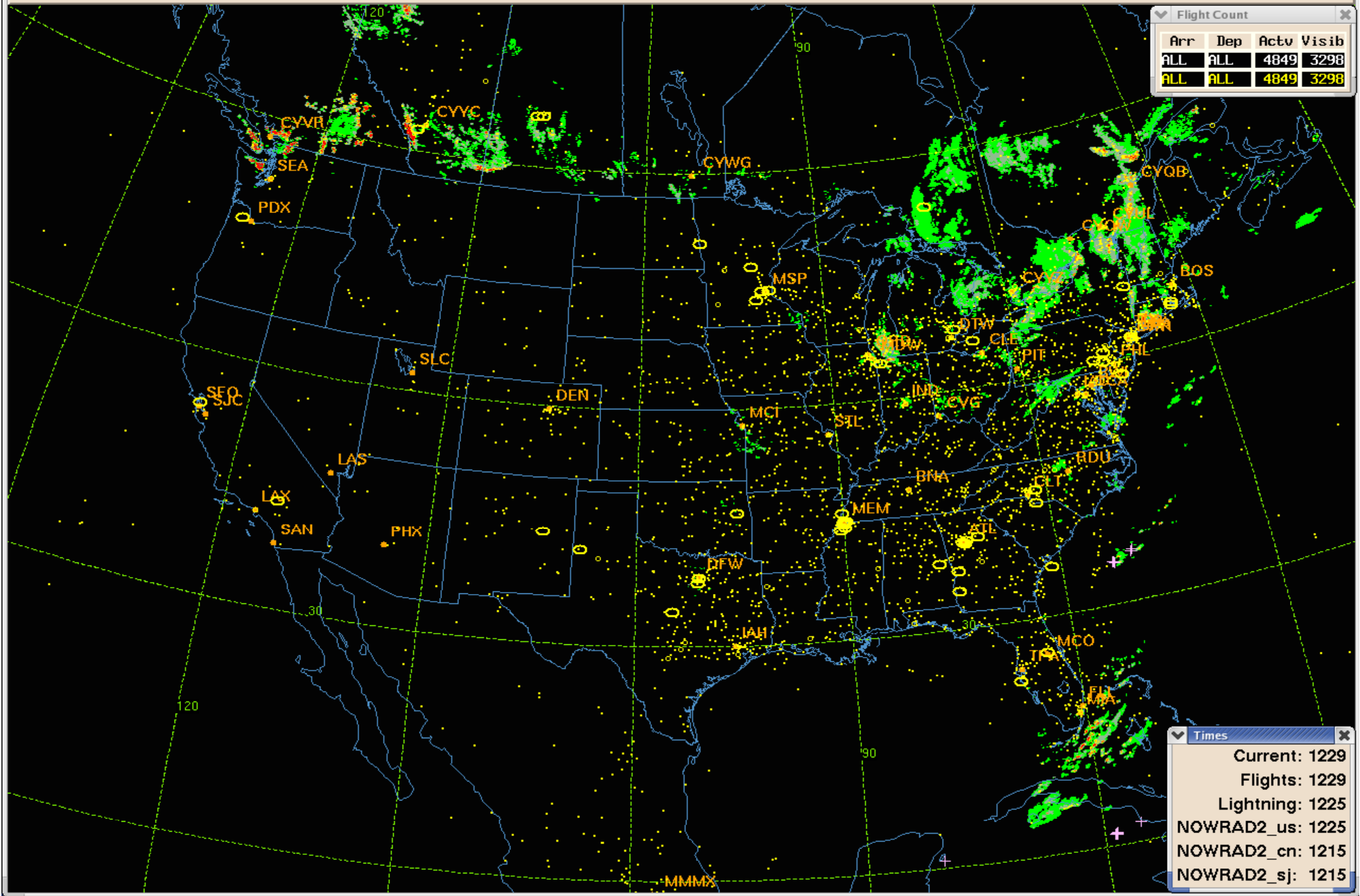
Data Frequency - Typical Message Load:

- 10,000,000 Flight Data Messages Per Day
- 20 Ground Delay Programs, 10 National Playbook Reroutes
- 400 Flow Constrained Areas, 500 Airport Demand Lists
- 40,000 User Requested NAS Element Demand Lists

Approximately 1,500,000 lines of C and C++

Flight Count

Arr	Dep	Actv	Visib
ALL	ALL	4849	3298
ALL	ALL	4849	3298

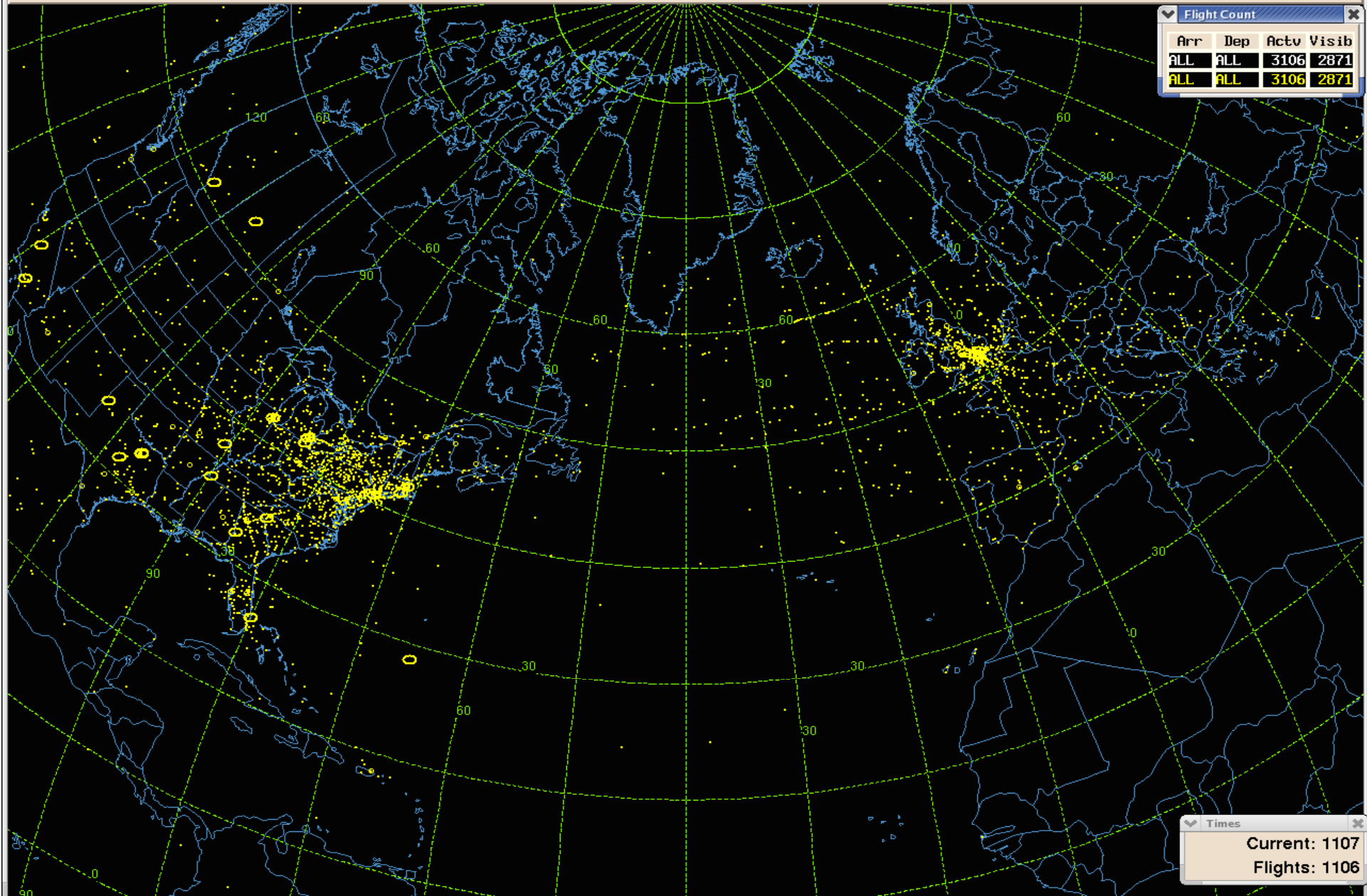


Times

Current:	1229
Flights:	1229
Lightning:	1225
NOWRAD2_us:	1225
NOWRAD2_cn:	1215
NOWRAD2_sj:	1215

Flight Count

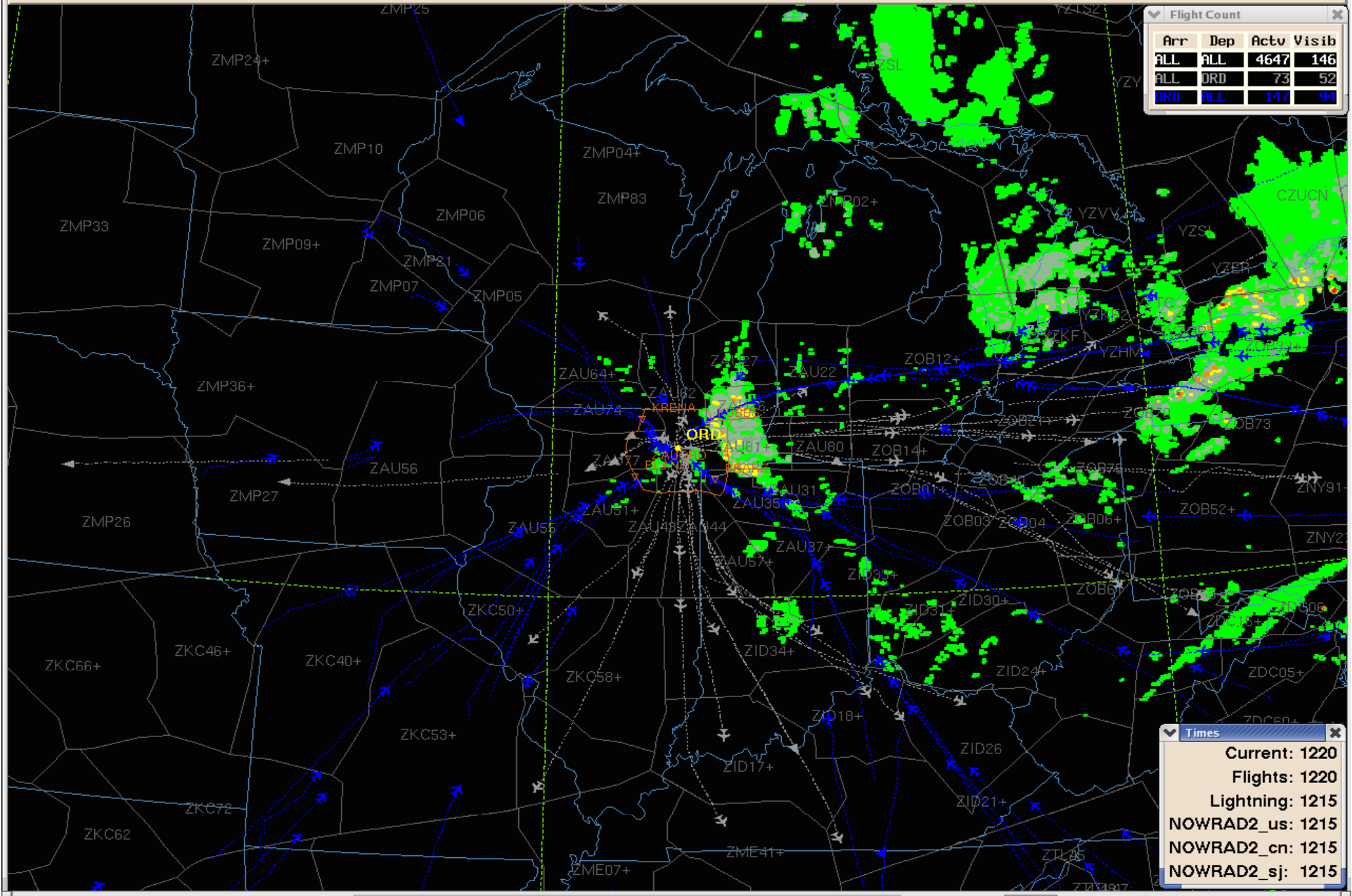
Arr	Dep	Actv	Visib
ALL	ALL	3106	2871
ALL	ALL	3106	2871



Times
Current: 1107
Flights: 1106

Flight Count

Arr	Dep	Actv	Visib
ALL	ALL	4647	146
ALL	ORD	73	52
ORD	ALL	147	94

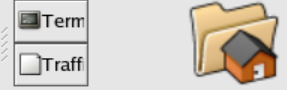


Times

Current:	1220
Flights:	1220
Lightning:	1215
NOWRAD2_us:	1215
NOWRAD2_cn:	1215
NOWRAD2_sj:	1215

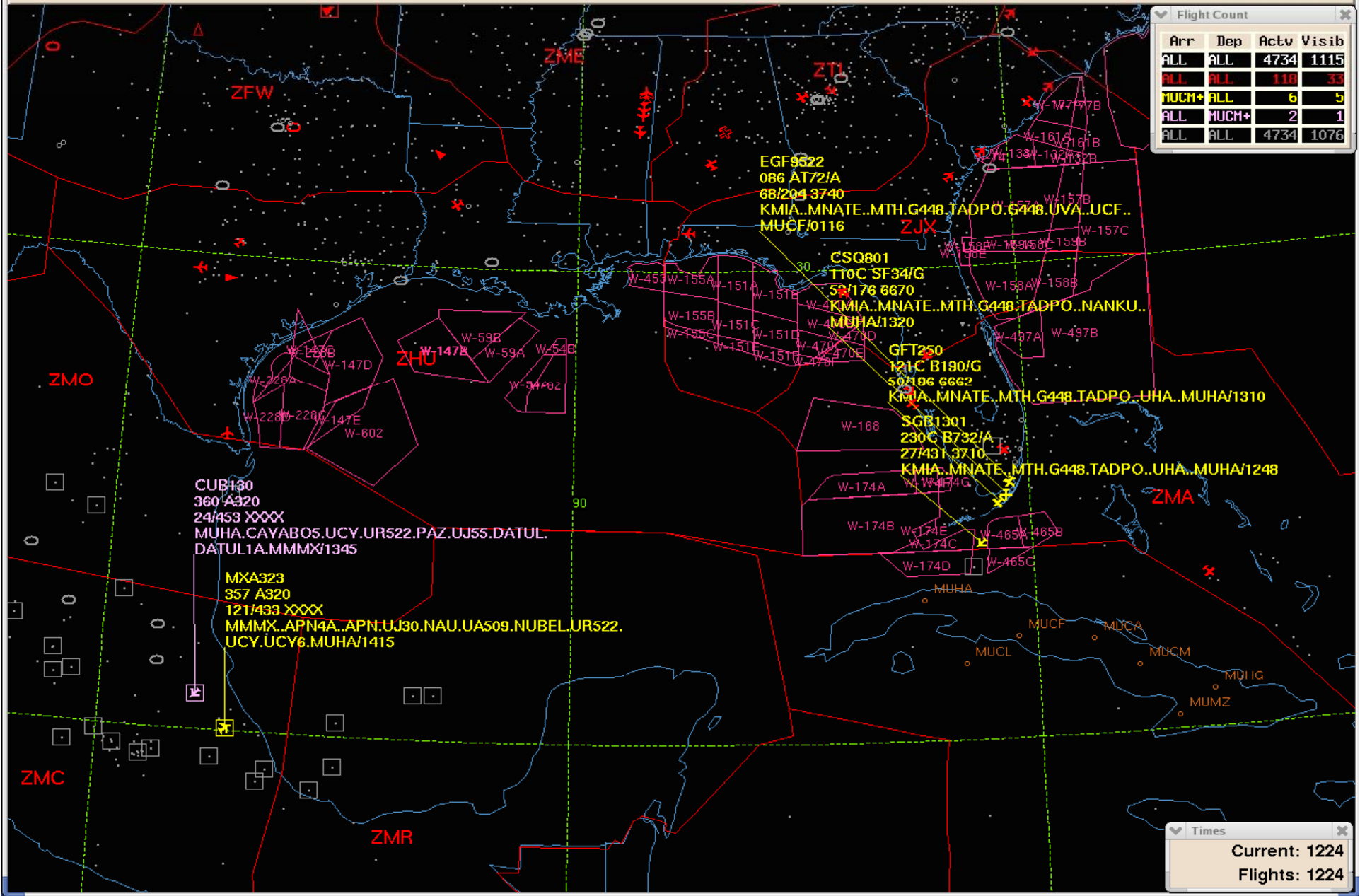


India	BOS-EWR	ORD	USA	Military	Transatlantic
Edit	Copy	Compile	Run	Workspace 11	Workspace 12



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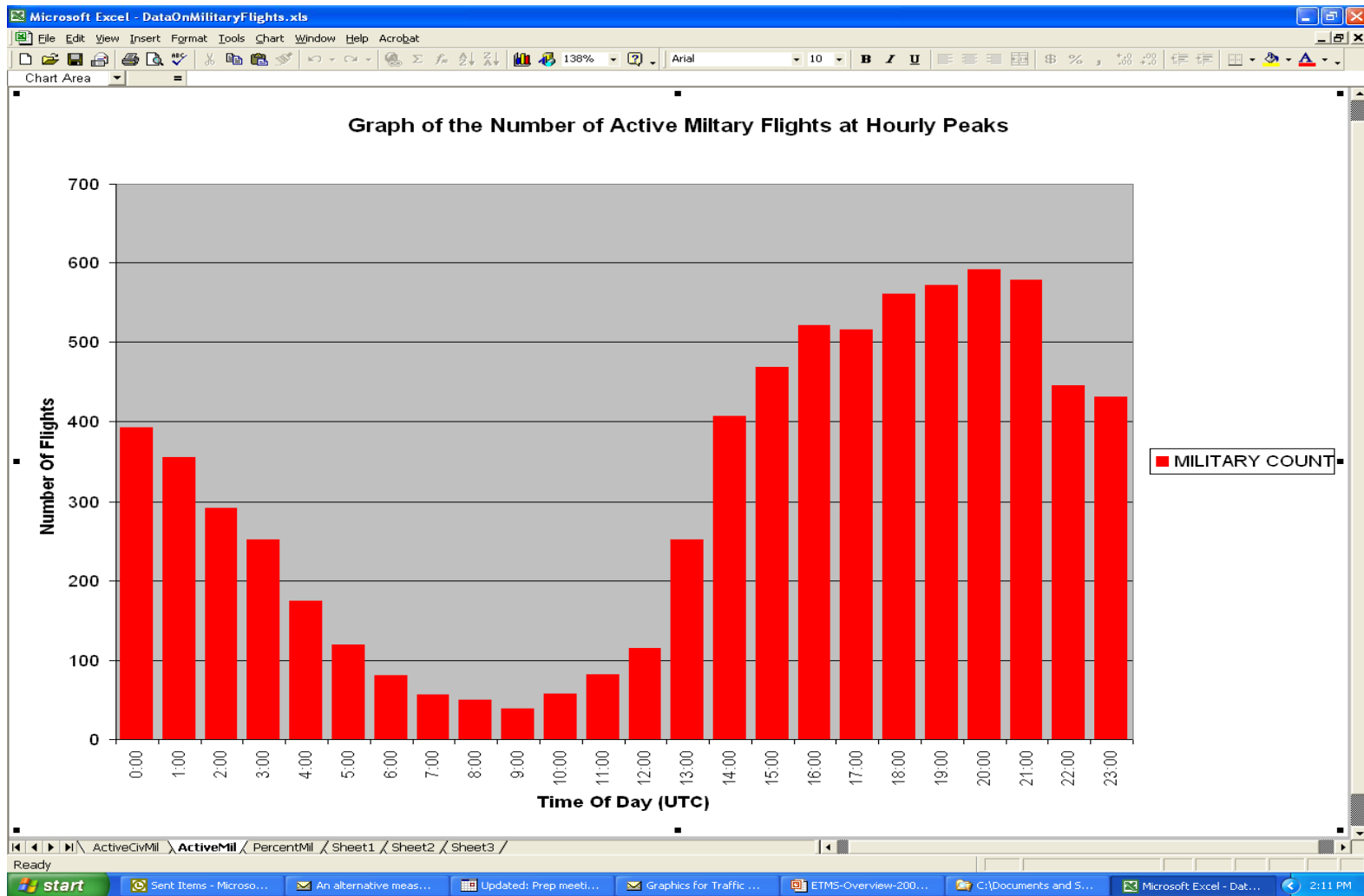
Arr	Dep	Actv	Visib
ALL	ALL	4734	1115
ALL	ALL	118	33
MUCH+	ALL	6	5
ALL	MUCH+	2	1
ALL	ALL	4734	1076



Times
Current: 1224
Flights: 1224

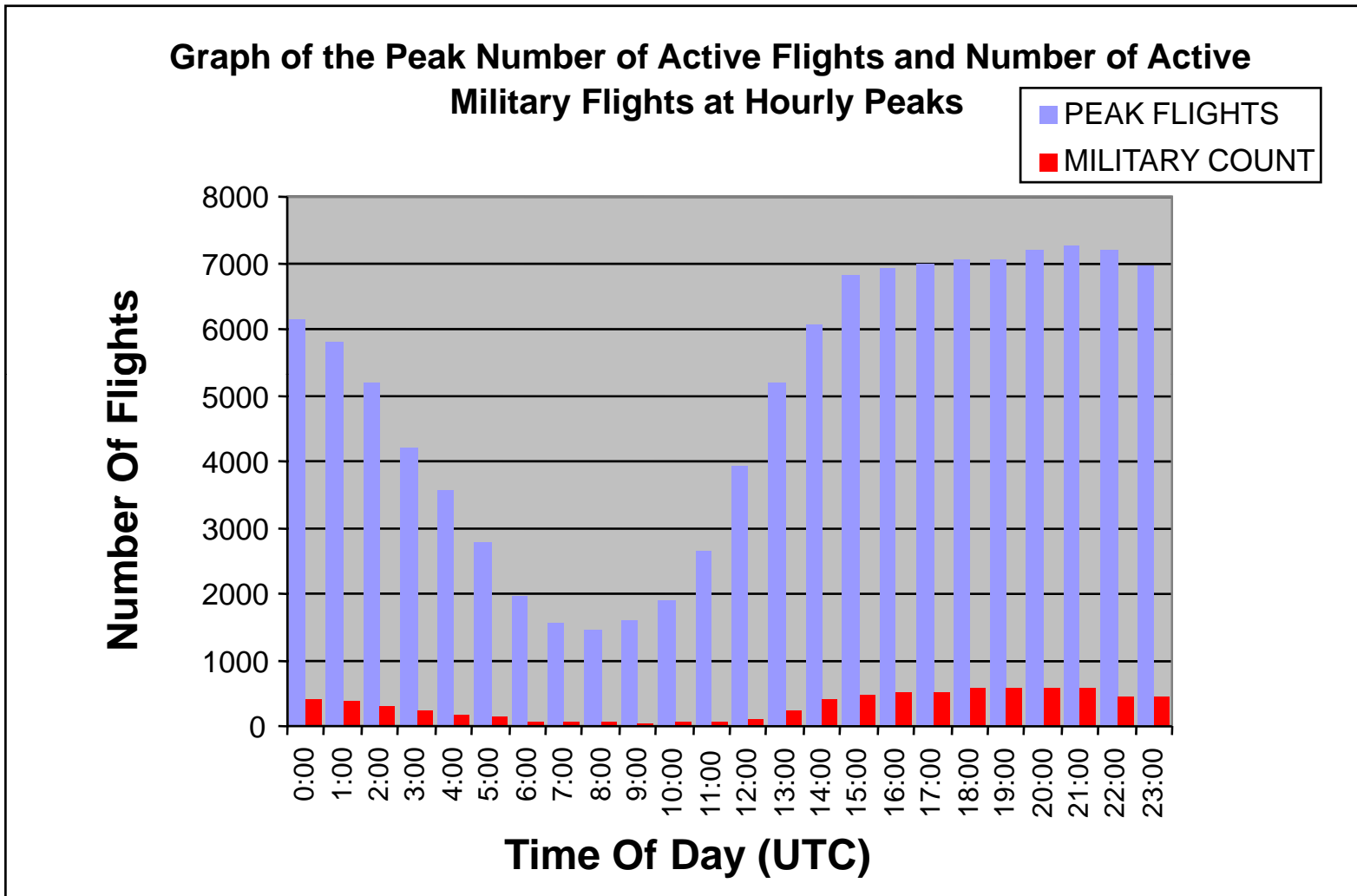
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India Air Traffic Flow Management Movie

Two days of data compressed to 1 ½ minutes

Captured using existing U.S. ATFM system

India airports shown:

1. New Delhi, VIDP, Indira Gandhi International Airport (Palam)
2. Mumbai, VABB, Chhatrapati Shivaji International (Sahar International)
3. Kolkata, VECC, Netaji Subhas Chandra Bose International Airport
4. Hyderabad, VOHY, Hyderabad Airport
5. Bangalore, VOBG, Bangalore International Airport
6. Chennai/Madras, VOMM, Chennai International Airport

International flights only

Only flights in feed into U.S. ATFM (London, Airlines)

Based on schedule and flight plan trajectories

No confirming real-time surveillance data

Windows Media Player

Now Playing Library Rip Burn Sync Media Guide

Traffic Situation Display (Dynamic Projection)

Display Maps Flights Alerts Weather Reroute FEA/FCA Tools **BOATM** Help

Flight Count

Arr	Dep	Actu	Visib
ALL	ALL	6724	19
ALL	VECC	0	0
ALL	VOHY	0	0
ALL	VOMM	0	0
ALL	VOBC	0	0
ALL	VIDP	2	0
ALL	VABB	4	0
VECC	ALL	0	0
VOHY	ALL	0	0
VOMM	ALL	1	1
VOBC	ALL	0	0
VIDP	ALL	1	1
VABB	ALL	4	3
ALL	ALL	6724	19

Times

Current: 1523
Flights: 1523

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start | Inbox - Microsoft Out... | RE: Telcon on paper f... | ATFM-India-2008.ppt | PowerPoint Slide Sho... | Windows Media Player | 1:38 PM

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Observations on ATFM for India:

1. Alternative Solutions for India ATFM Exist
2. Military Interaction Must Be Addressed
3. Collaboration With Airlines/Air Space Users Must Be Established
4. Concept of Operations, Qualitative Requirements, Specifications, Road Map Need to be Defined
5. U.S. Industry Has and Can Contribute