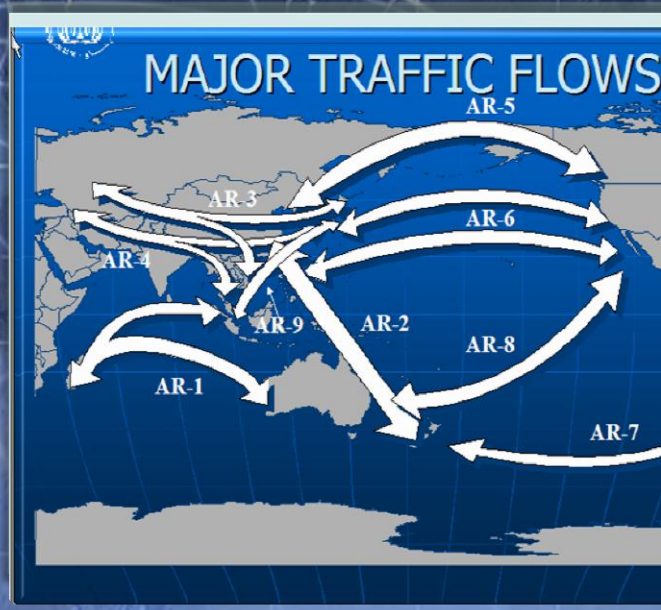
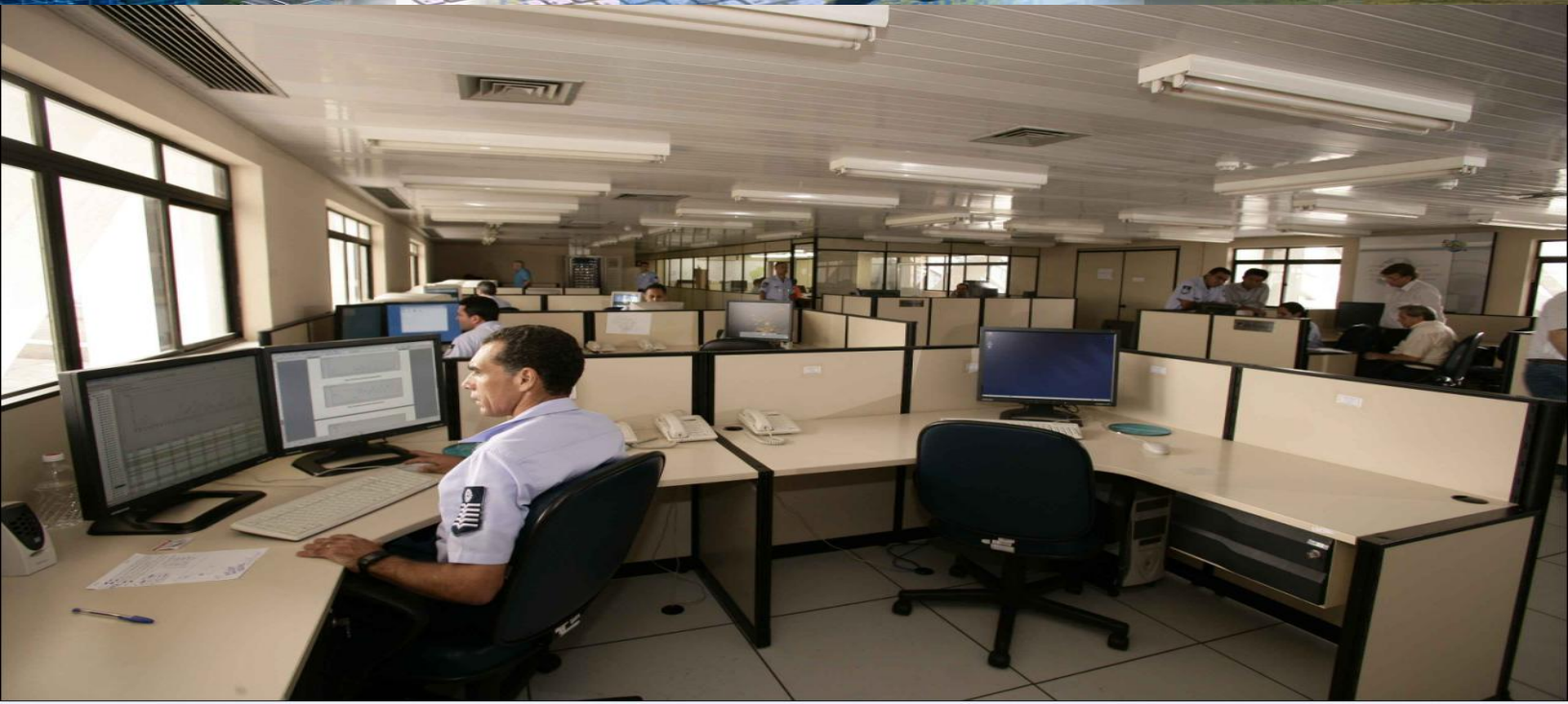
Traffic Flow Management



December 2010

TRAFFIC MANAGEMENT CENTERS

National Operations Centre




RJTT 34L
0540Z
11UTCまでの気象ポイント
05UTC発表
空域
なし
空港
RJCC ～10 TSRA

Federal Aviation
Administration

Evolution of Traffic Flow Management

- **1960's**
  - Ground stop programs and circling by individual facilities
  - **Central Altitude Reservation Facility (CARF)** established to facilitate the flow of civilian air traffic around military movements

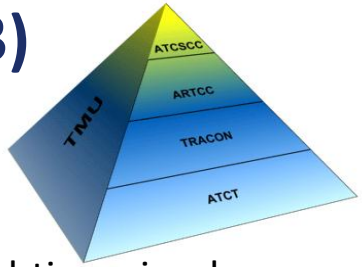
- 1970's
  - **Central Flow Control Facility (CFCF)** advise facilities on national traffic flow

Evolution of Traffic Flow Management (2)

- **1970's**
  - Traffic Volume increased with **deregulation** and **affordability** of private aircraft (business type small jets).
  - The **oil crisis** made us focus on reducing airborne holding and flight delays.

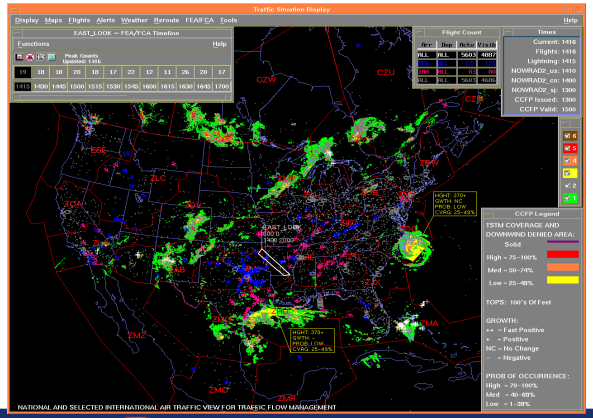
- Early 1980's
  - **Fuel efficiency** became a primary goal
  - Air Traffic Controller **strike** and associated constraints on National System
  - CFCF played a strong role in maintaining safety and efficiency in aftermath of strike

Evolution of Traffic Flow Management (3)



- **Mid/Late 1980's**
  - **Traffic Management Units (TMU)** implemented in facilities
  - **Aircraft Situation Display (ASD)** implemented at CFCF for real-time visual displays of air traffic
  - **Monitor Alert** to analyze flight plans and project congestion areas

- 1990's
  - **Enhanced Traffic Management System (ETMS)**
  - **Meteorological Weather Processors** installed for real-time data



Similarities between ANSPs

SAME PRESSURES

- – Maintain Safety
- – Accommodate Growth
- – Eliminate Restrictions
- – Contain Costs

SAME CUSTOMERS

- – Same Airlines
- – Same Aircraft
- – Same Avionics
- – Same Pilots

SAME OBLIGATIONS

- – Chicago Convention
- – ICAO SARPS

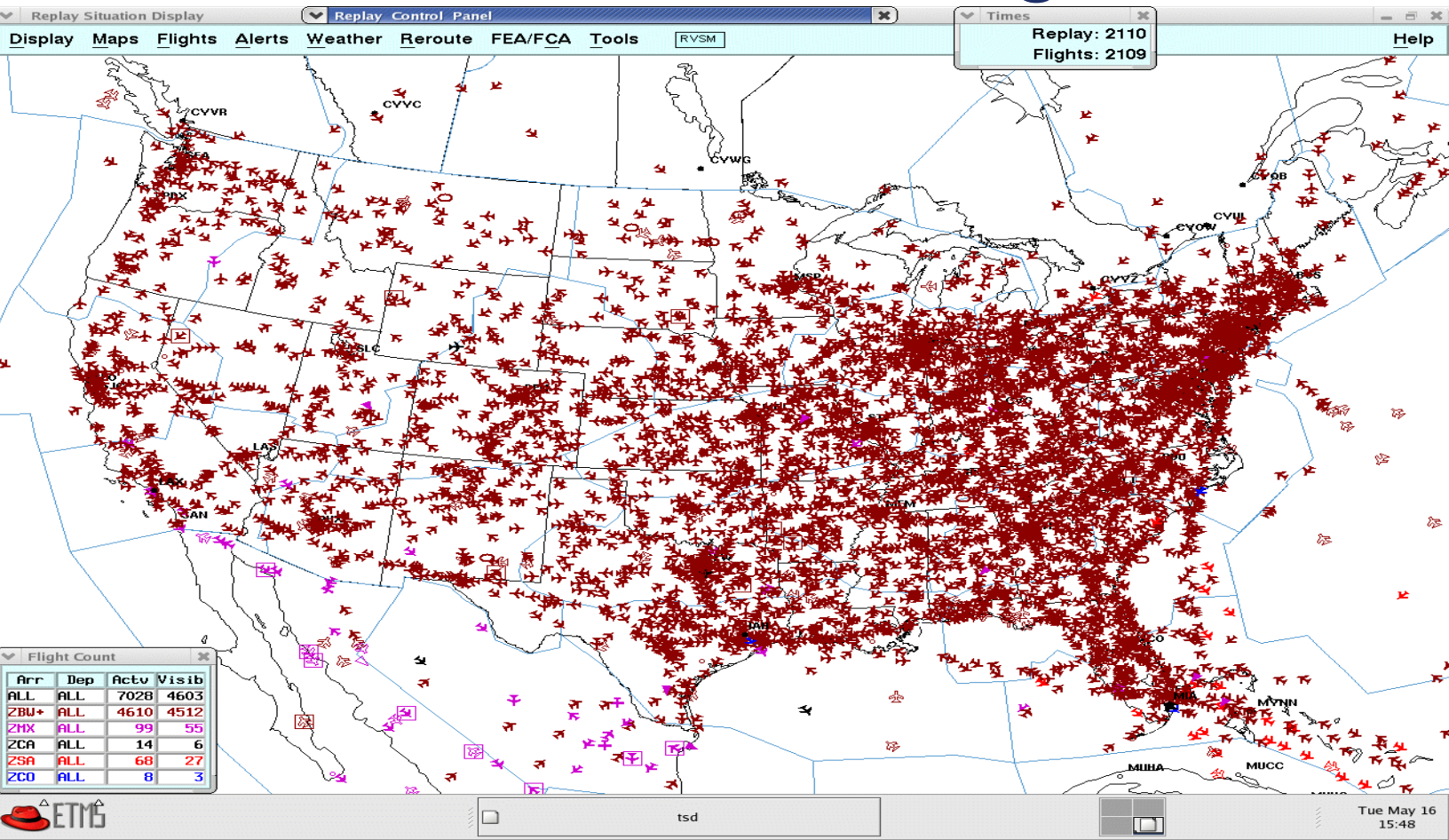
SAME CONSTRAINTS

- – Political Visibility
- – Environmental Pressures
- – Financial Constraints
- – Security demands

SAME OPPORTUNITIES

- – High Competence (Technical & Operational) – Advanced Technology

•The FAA Challenge



Air Traffic Flow Management

- **Mission**
  - To balance air traffic demand with system capacity to ensure safe and efficient utilization of the National Airspace System
- **Operational benefits**
  - Minimizes delay and congestion
  - Increases throughput
  - Increases system safety
  - Lowers cost through fuel savings
  - Provides scheduling predictability
  - Supports the implementation of new technology and procedures that enhance airspace capacity

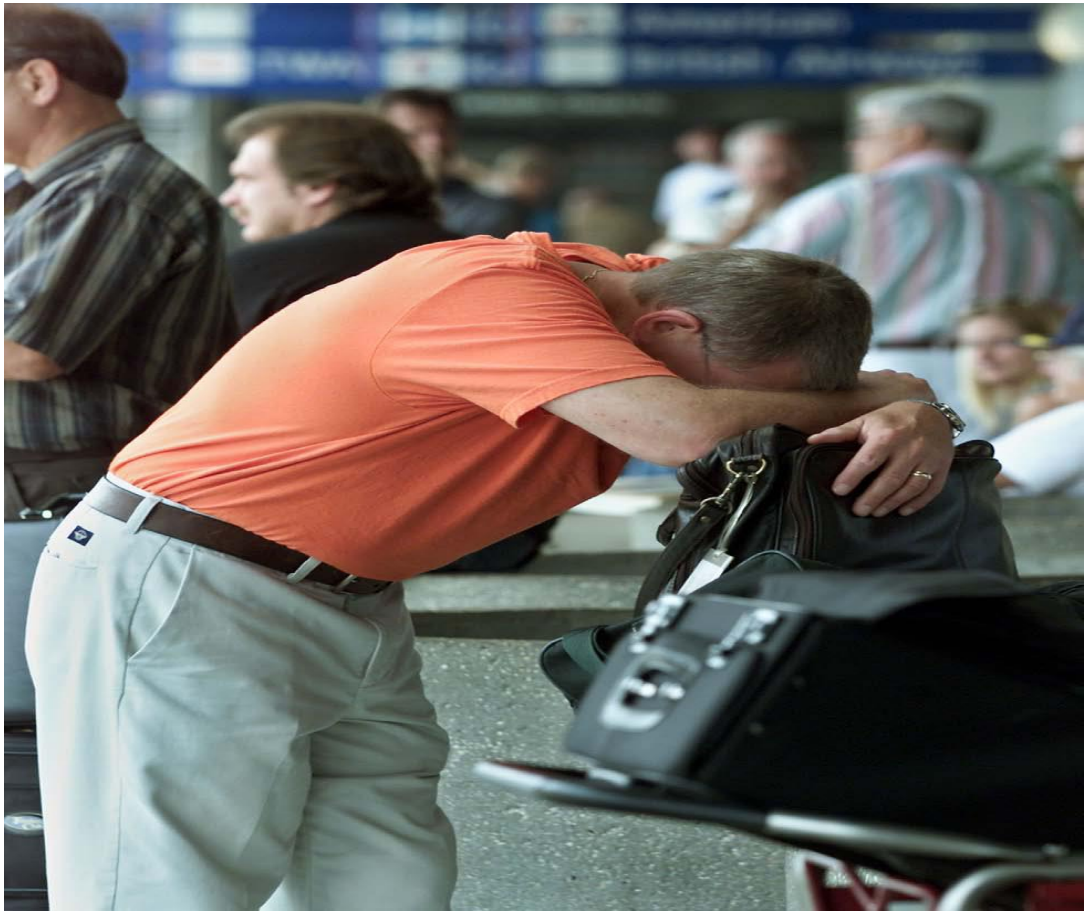
We don't make a lot of the products you buy.

We make a lot of the products you buy better.®

We don’t directly control Air Traffic

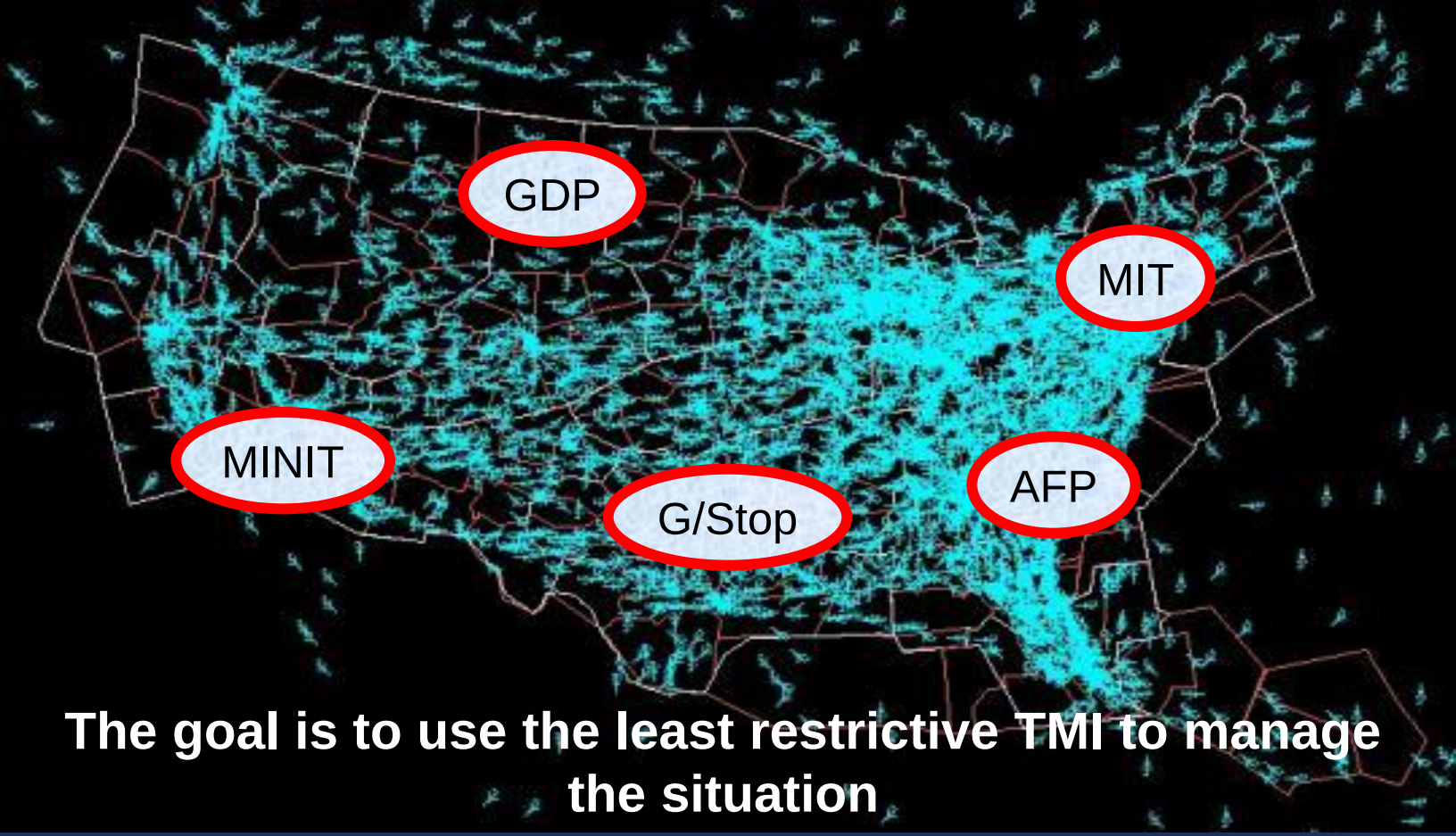
We make that Air Traffic Control Safer and more Efficient

Federal Aviation Administration




UNITED
UNITED
UNITED

Federal Aviation Administration



The goal is to use the least restrictive TMI to manage the situation

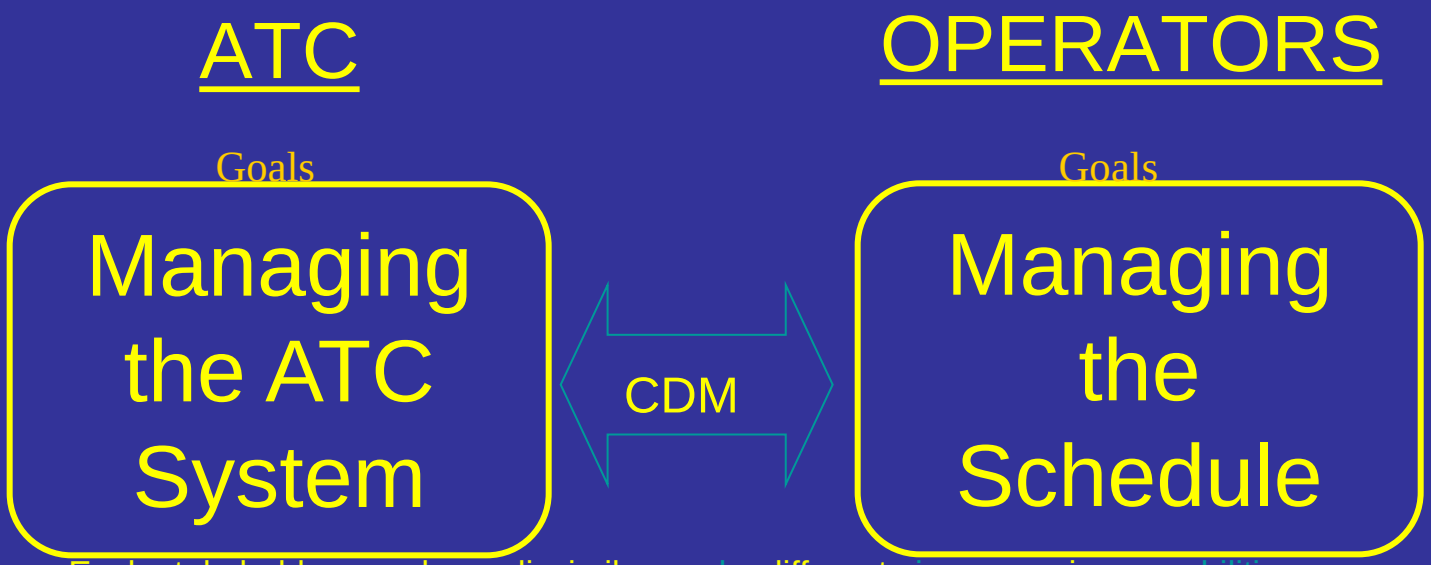
Collaborative Decision Making

What is Collaborative Decision Making (CDM)

- - Traffic Flow Management operational philosophy
- - Associated shared technologies and procedures
- - Enable Air Navigation Service Providers and Stakeholders to identify and work towards common goals
- - Enables Stakeholders to meet business or mission needs within the commonly understood operational constraints

** Maximizes trust, operational efficiency, and safety **

Why Collaborate?



Each stakeholder may have dissimilar goals, different views, varying capabilities

Each makes autonomous strategic and tactical decisions to achieve their individual goals

Sometimes these decisions run counter to ATC decisions

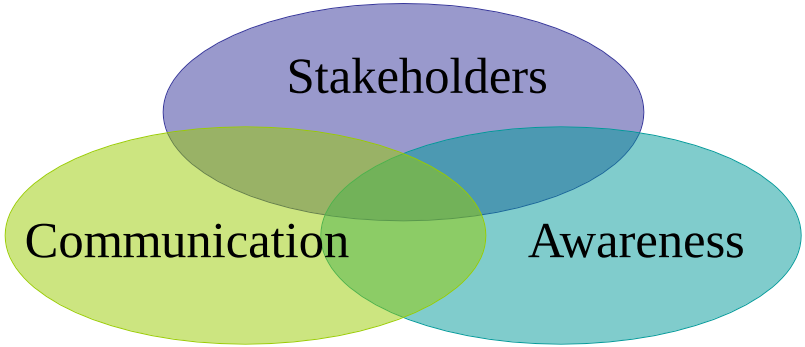
…Affecting the entire system in ways not known to ATC

Result:

Collaboration can provide Shared Situational Awareness and Collaborative Resolutions for Win-Win Solutions for both ATC and Stakeholders

Collaboration leads to enhanced options resulting in improved decision making, stakeholder acceptance and support, and increased service performance

An operating philosophy



Airline Transport Association

National Business Aviation Association

- **Local representative for member business aircraft operators**

- **Role and Responsibilities**
  - Coordinates the concerns of specific customer groups to the ATCSCC about the impact of specific traffic management issues
  - Provides information to the customers on planned or current traffic initiatives
  - Provides information to ATCSCC on significant unscheduled or unanticipated GA movement

Air Traffic Services Cell

The ATSC is a Civil/ Military organization created to resolve DoD/ FAA issues while ensuring DoD needs are met in the National Airspace System

ATCSCC Operational Floor

WX

NSST + Terminal

TCA
ARO/STMP

I/O NOM

TMA

NOCC

ETMS
Hotline

CSA

NOCC AVN ATA NBAA

CDM D O T S

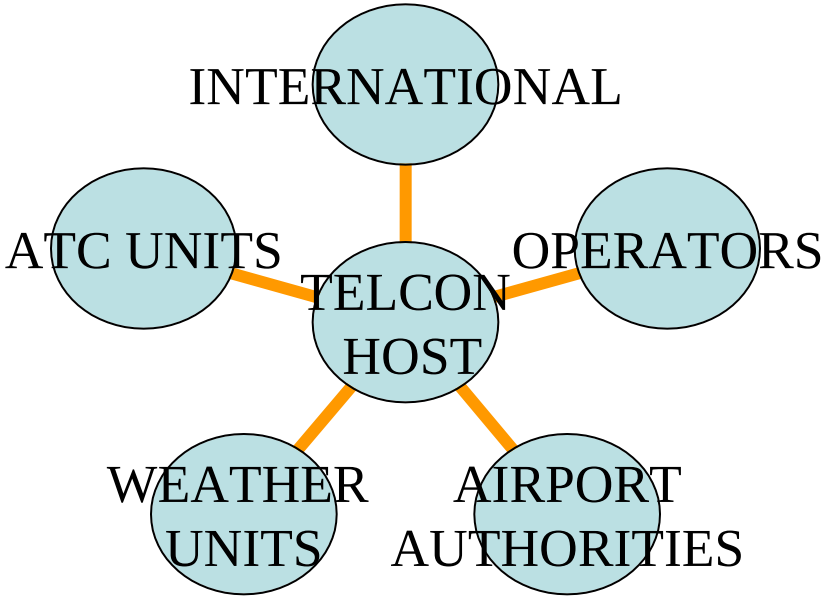
NOTAM

Crisis Management Center

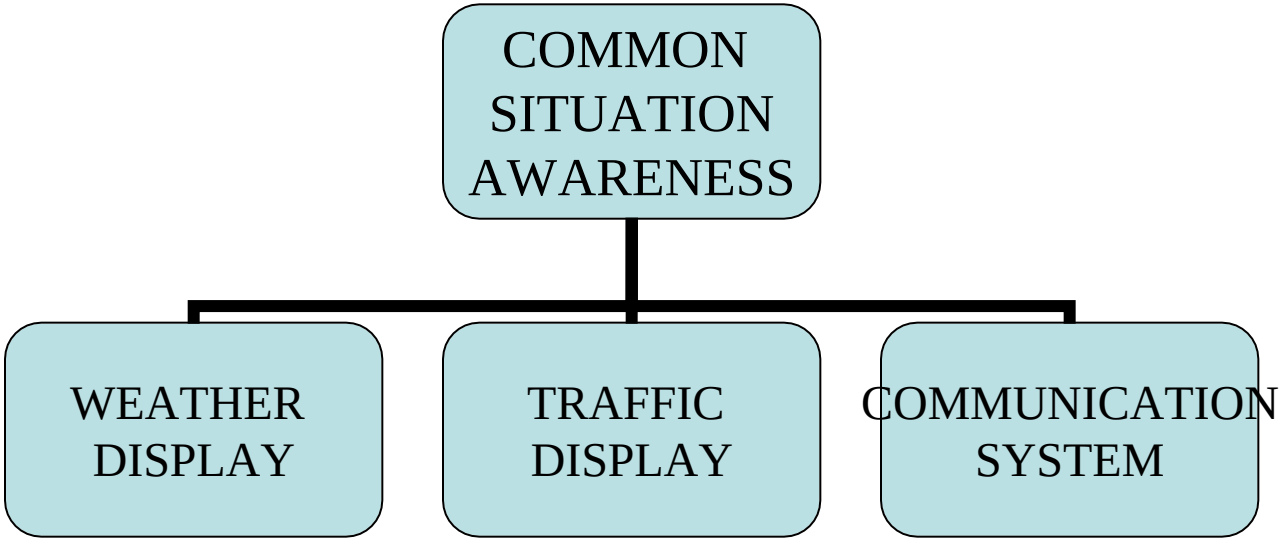
DOD

CARF

Communication



Awareness


COMMON SITUATION AWARENESS
WEATHER DISPLAY
TRAFFIC DISPLAY
COMMUNICATION SYSTEM

CDM Collaborative Tools

-Integrates Data to Enhance Decisions-

Common Situational Awareness between Stakeholders and ATC allows for integration of data from all sources to make a more informed, "**Better"** decision

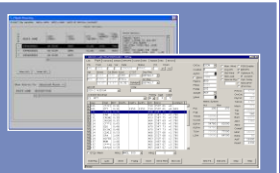
- Integration of ATC and Airline Data to provide a "Big Picture"
- Improved Situational Awareness, Enroute & Airport Flow Tools, Real time information & Uniform Reaction to system impacts, Analysis –lessons learned

Flight Following, Weather, & Decision Support Tools

Proactive Flight & Weather data Common understanding

Enroute & Airport Flow Tools for flow management

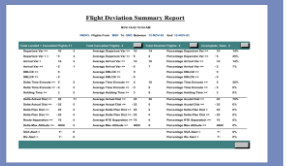
Monitor flows, predict delays, optimize response to impacts



Flight Planning changes, OIS & NTML Mgmt. Tools

Optimized plans

Shared info & responses to System impacts



Event Analysis Tools for Real-time & historical performance

Data & Analysis

BOBCAT


Ashgabat
Dyushanbe
Dushanbe
Tajikistan
AMDAR
Mashhad
LEMOC
RANAH
CHARN
MURAD
Kabul
LAJAK
SOKAM
Afghanistan
Islamabad
SITAX
PAVLO
BN
DI
PAROD
ROSIE
ASEUM
ZB
JHANG
SAMAR
GUGAL
ASARI
SERKA
BUTOP
Pakistan
Delhi
New Delhi
RK
TIGER
GURTI
VIKET
AGG
NH
BIDAN

ATFM BOBCAT July 2007 Airline benefits (WP7)

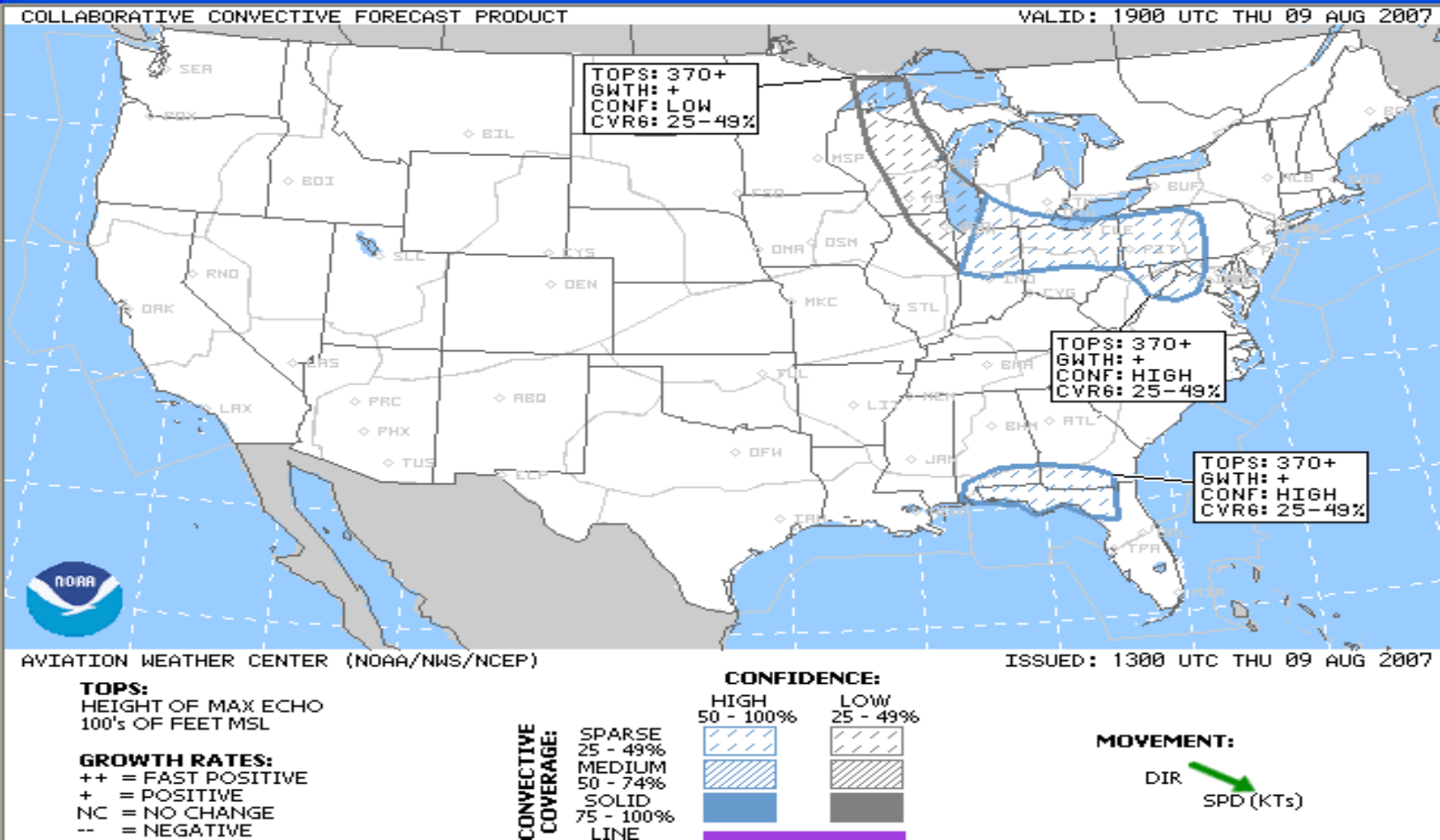
- **environmental benefits of reduction in noxious gas emissions**
  - 12 million kilograms of fuel savings annually, associated with
  - 50 million kilograms of reduction in carbon dioxide emissions per year
- **$12, 000,000 Airline cost savings**
- **Substantial reduction in ground delays**

ATFM BOBCAT July 2007 ANSPs benefits

- **immediate ATC workload reduction together with safety and capacity enhancements**
  - Kabul FIR- were better regulated more evenly spread, enabling safer air traffic control
  - Enroute ANSP- immediate ATC workload reduction together with safety and capacity enhancements

- **substantial reduction in ground delays**

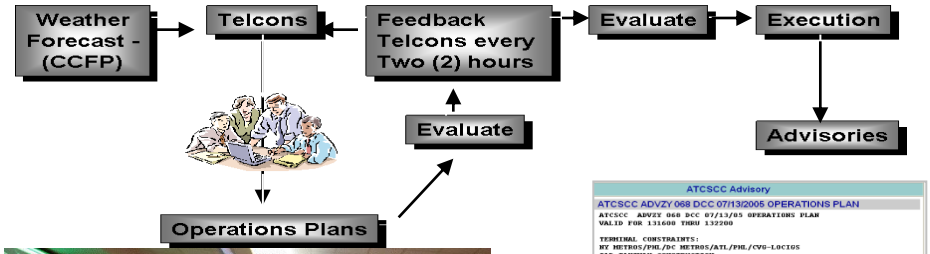
Weather Products: CCFP

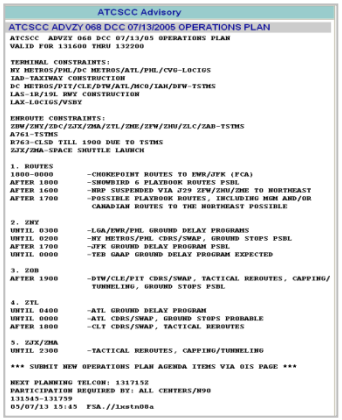


Planning Process

Who Participates?

- ATCSCC
- Facility TMUs
- Facility Ops
- Domestic Airlines
- International Airlines
- Business/General Aviation
- Military Ops
- International Command Centers




ATCSCC Advisory

ATCSCC ADVZY 068 DCC 07/13/2005 OPERATIONS PLAN

ATCSCC ADVZY 068 DCC 07/13/05 OPERATIONS PLAN
VALID FOR 131600 THRU 132200

TERMINAL CONSTRAINTS:
NY METROS/PHL/DC METROS/ATL/PHL/CVG-LOCIOS
IAD-TAXIWAY CONSTRUCTION
DC METROS/PIT/CLE/DFW/ATL/MCO/IAH/DFW-TSTMS
LAS-1R/19L RWY CONSTRUCTION
LAX-LOCIOS/VSBY

ENROUTE CONSTRAINTS:
ZDW/ZNY/ZDC/ZJX/ZMA/ZTL/ZME/ZFW/ZHU/ZLC/ZAB-TSTMS
A761-TSTMS
B763-CLSD TILL 1900 DUE TO TSTMS
ZJX/ZMA-SPACE SHUTTLE LAUNCH

1. ROUTES
1800-0000 -CHOKEPOINT ROUTES TO EWR/JFK (FCA)
AFTER 1800 -SHOWBIRD 6 PLAYBOOK ROUTES PSBL
AFTER 1600 -MRP SUSPENDED VIA J29 ZFW/ZHU/ZME TO NORTHEAST
AFTER 1700 -POSSIBLE PLAYBOOK ROUTES, INCLUDING MGM AND/OR CANADIAN ROUTES TO THE NORTHEAST POSSIBLE

2. ZNY
UNTIL 0300 -LGA/EWR/PHL GROUND DELAY PROGRAMS
UNTIL 0200 -NY METROS/PHL CDRS/SWAP, GROUND STOPS PSBL
AFTER 1700 -JFK GROUND DELAY PROGRAM PSBL
UNTIL 0000 -TEB GAAP GROUND DELAY PROGRAM EXPECTED

3. ZOB
AFTER 1900 -DTW/CLE/PIT CDRS/SWAP, TACTICAL REROUTES, CAPPING/TUNNELING, GROUND STOPS PSBL

4. ZTL
UNTIL 0400 -ATL GROUND DELAY PROGRAM
UNTIL 0000 -ATL CDRS/SWAP, GROUND STOPS PROBABLE
AFTER 1800 -CLT CDRS/SWAP, TACTICAL REROUTES

5. ZJX/ZMA
UNTIL 2300 -TACTICAL REROUTES, CAPPING/TUNNELING

*** SUBMIT NEW OPERATIONS PLAN AGENDA ITEMS VIA OIS PAGE ***

NEXT PLANNING TELCON: 131715Z
PARTICIPATION REQUIRED BY: ALL CENTERS/M90
131545-131759
05/07/13 15:45 FSA.//lxstn08a

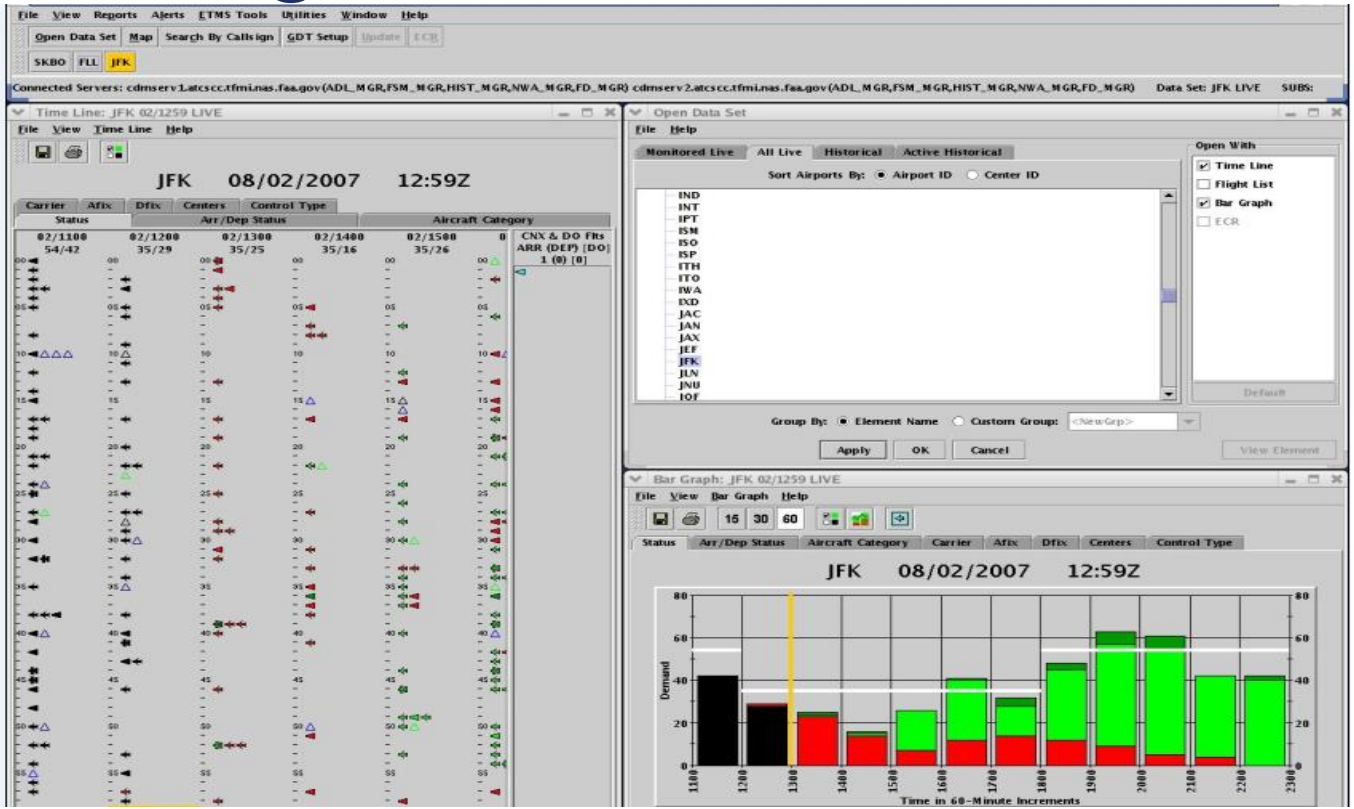
Federal Aviation Administration

ATFM Metrics

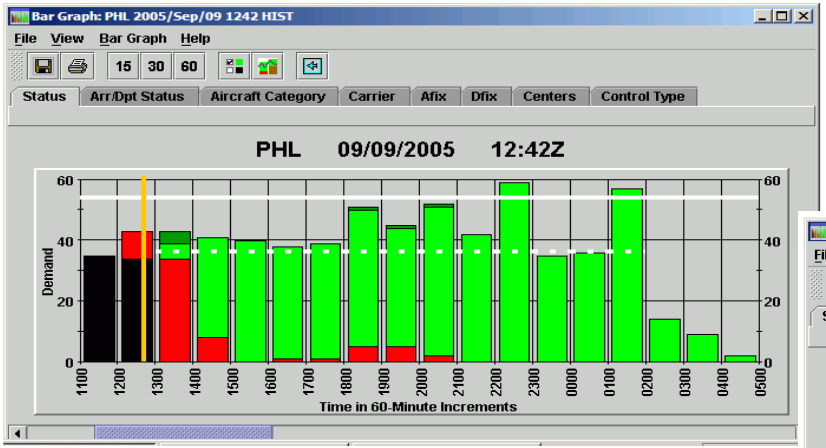
Traffic Management Modeling for Safety: Determining Aerodrome Acceptance Rate (AAR)

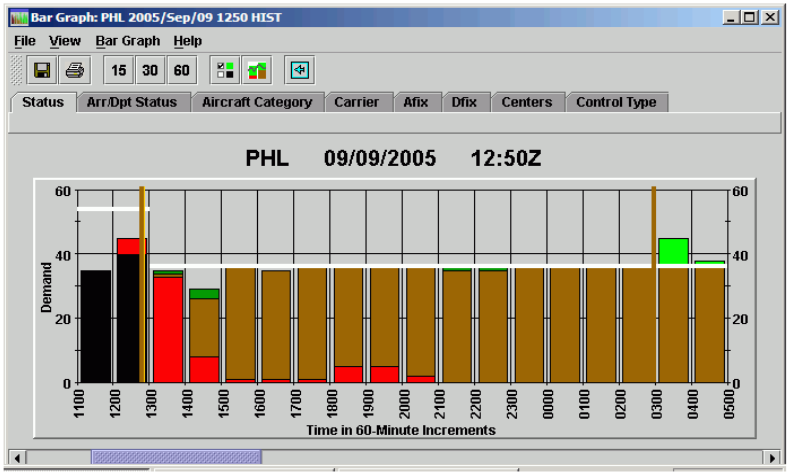
The number of arrival aircraft that an aerodrome -- in conjunction with weather conditions, terminal airspace, ramp space, parking space, and facilities -- can accept per hour

Flight Schedule Monitor



The Before and After

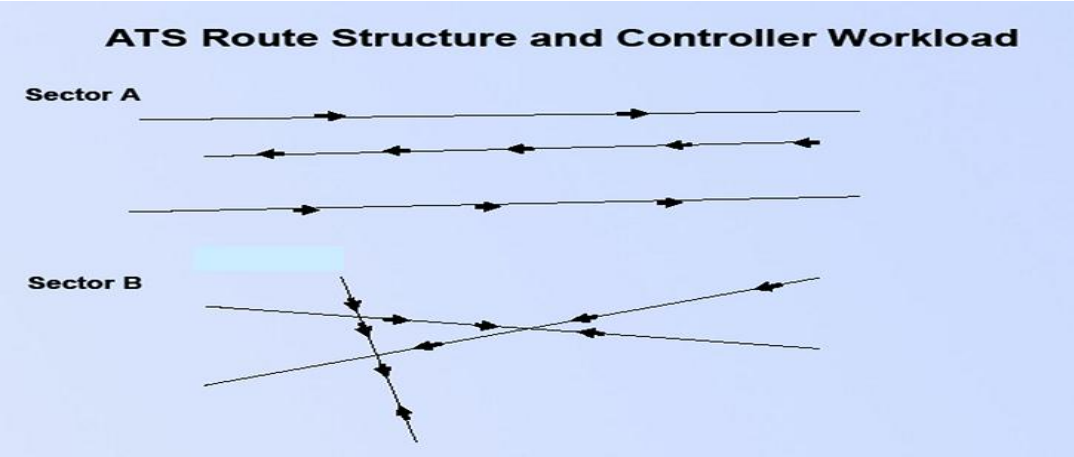




Traffic Management Modeling for Safety:

Determining Sector Capacity

- **Sector capacity:**
  - The optimum number of flights, in a given sector, for a specified period of time, that can be managed safely and efficiently

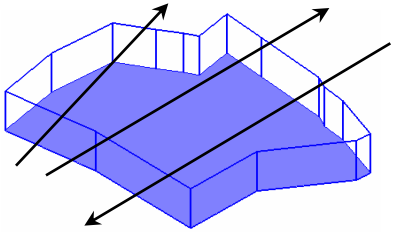


Reference: AIM 2013 Chap 17-7-2

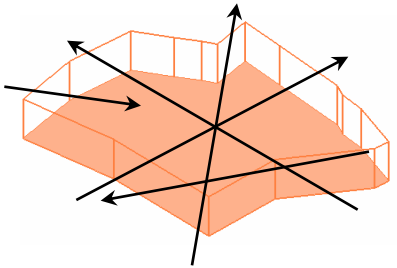
Traffic Complexity, Controller Workload, and Sector Capacity

Traffic flow characteristics create different levels of complexity for a sector:

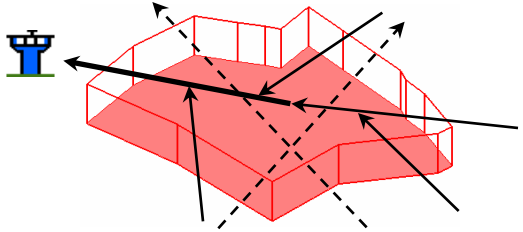
Cruise Traffic



Altitude Transitioning and Crossing Traffic



Arrival and Crossing Traffic

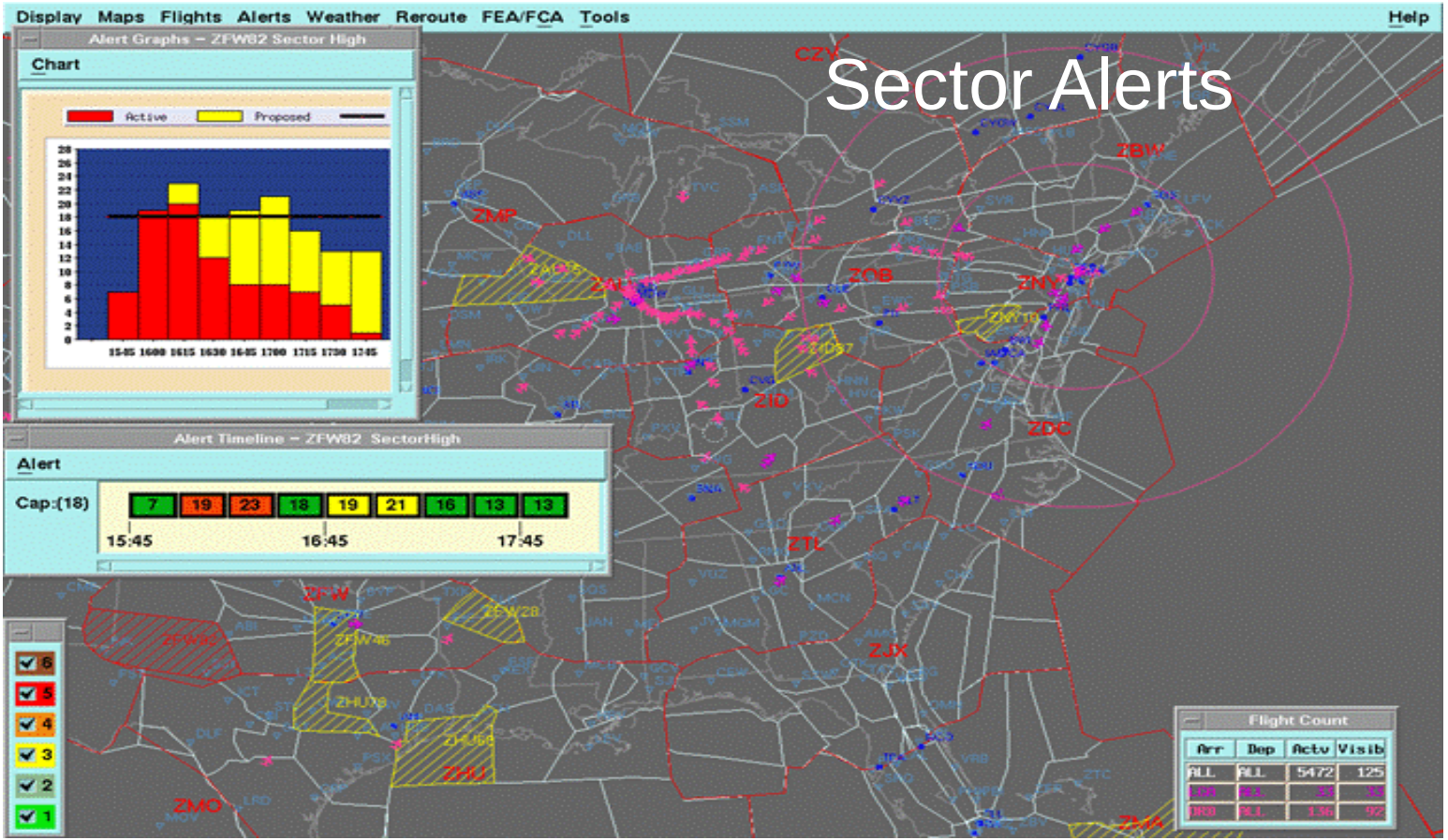


Different levels of complexity

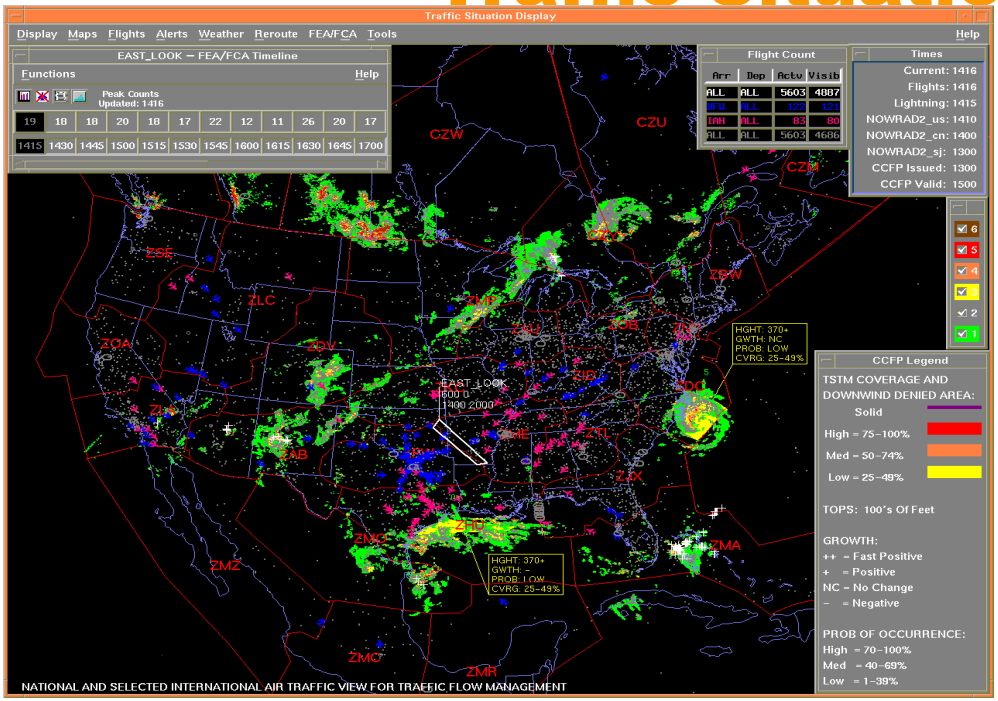
Different levels of workload

Different levels of capacity

Sector Alerts



Traffic Situation Display



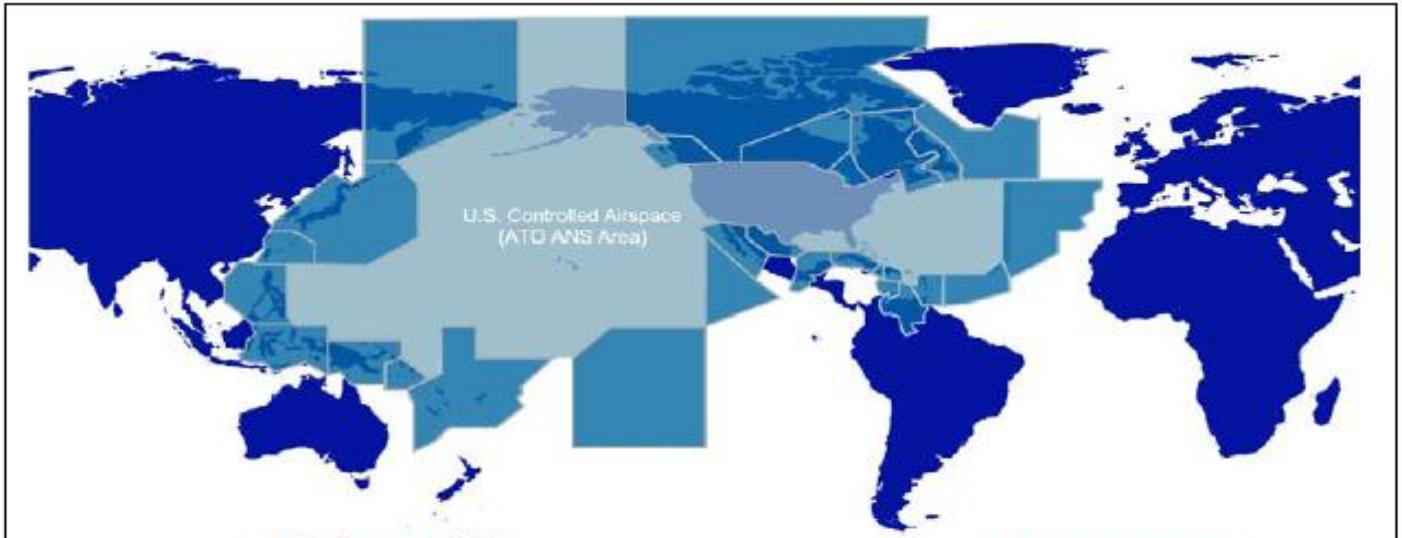
Common Situational awareness

- Provides National Airspace System (NAS) and foreign-source information
- Distinguishes civil & military aircraft
- Displays all flights or flights sorted by origin, destination, airline, type of aircraft, and/or NAS element: sophisticated data filters
- Once per minute updates
- Weather information
- Customizable display and queries
- User selectable views via zoom, move, and projection features

- Interoperable with airlines to form common situation awareness

International Connectivity

Global Reach



ATO Responsibility

- Approx. 77 million sq. km of total airspace
- 15.15% of earth's surface
- Largest area of all ANSPs (Australia 2nd (9.2%) at 47 million sq. km)

ATO Collaboration

- Daily interaction with 18 international ANSPs
- 29 adjacent Flight Information Regions (FIR)

Our ATO ANS service delivery responsibility includes the entire United States, adjacent oceanic areas, and collaboration with other international ANS service providers.

International Operations

- DATA Sharing Agreements
  - **Canada**
  - **United Kingdom**
  - **Mexico**
  - **EUROCONTROL**
  - **Dominican Republic, Trinidad & Tobago**
  - **COCESNA, Panama, Colombia, Chile**
  - **Japan**
  - **Future (Brazil)**

International ATFM Telephone Conferences

- NAV CANADA – twice per day
- EUROCONTROL – twice per day
- MEXICO – twice per day
- CARIBBEAN – once per day
- COLOMBIA – once per day
- BRAZIL – once per day
- JAPAN – twice per week (three in 2011)
- Russia - monthly

- Ad Hoc

  Hurricane - as needed

ANSP State Leadership

Must Collaborate to:

- Ensure global standards of safety and service in all systems
- Ensure common standards and procedures
- Enable air transportation growth and competition in all state markets
- Minimize ASP costs by sharing information, results & efforts

ICAO DOC 4444

3.2.2 Flow management procedures

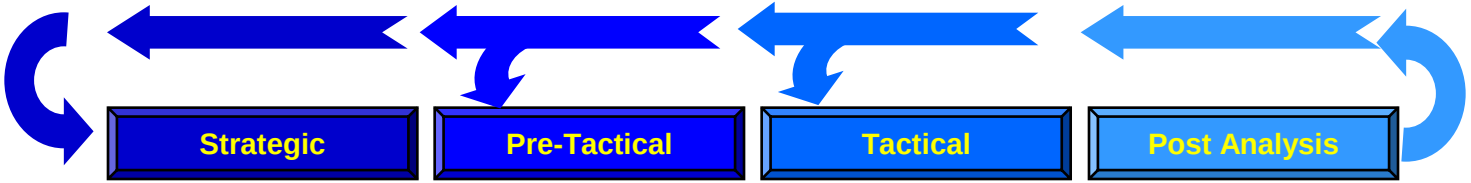
ATFM should be carried out in three phases:

- a) ***strategic planning***, if the action is carried out more than one day before the day on which it will take effect. Strategic planning is normally carried out well in advance, typically two to six months ahead

- b) ***pre-tactical planning***, if the action is to be taken on the day before the day on which it will take effect

- c) ***tactical operations***, if the action is taken on the day on which it will take effect

Traffic Flow Management Process



	Strategic	Pre-Tactical	Tactical	Post Analysis
Key Activities	• Identify long-term system demands and choke points • Analyze and implement needed policy and procedure changes • Define and implement new decision support tools	• Predict near-term traffic loads • Assess potential effects of forecasted weather and historical/predicted traffic loads • Refine procedures	• Analyze impact of real-time system constraints on the NAS • Implement CDM planning and execution of flow initiatives	• Analyze archived traffic and staffing data • Generate and distribute performance metrics • Identify support tool shortfalls
Results	• Airspace redesign • Procedure or policy changes • Priorities for research and development	• Examine impact areas for next day of operations • Develop strategies for balancing traffic forecasts against assumed capacity	• Collaborative resolution of demand/capacity imbalances • Minimization of disruption to User plans	• Assessment of effectiveness of specific flow initiatives • Potential procedure or policy Changes

With No Order Comes Chaos

Enhancing Efficiencies Means

Make A Greener World by increasing Efficiencies and thereby reducing Green House Gases

Collaborative Decision Making

cdm.fly.faa.gov