

# Air Traffic Flow Management

- A Complex System



Data showed Air India, IndiGo, SpiceJet Ltd, Jet Airways (India) and GoAir were able to fill their flights more in 2017—flights were 86.1% full in 2017, compared with 75.5% in 2011. Photo: HT

## India's air traffic doubles to 117 million passengers in 6 years

2 min read · Updated: 24 Jan 2018, 05:31 PM IST

Tarun Shukla

100 flights took off every hour in 2017, compared with 67 in 2011, shows aviation regulator DGCA's



## Mumbai airport handles record 1,004 flight movements

**Dec 9, 2018**

*The city being the financial capital, has been inundated with flight movements, having long its saturation point due to sharp traffic management by Air Traffic Controllers (ATC).*

By Anirban Chowdhury, PTI | Updated: Dec 09, 2018, 06:30 PM IST



## In 24 hours, Mumbai airport handles 969 flights; sets new world record

Manju V | TNN | Nov 26, 2017, 14:54 IST

**Nov 26, 2017**



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A+



or single-runway operations, Mumbai airport hours on Friday. It broke its own record of Ltd spokesperson (MIAL).

ubai and Delhi have airports with two or lv Though Mumbai has two runways, they



Save



AIRCRAFT 1,500 / 11,353

AIRPORT DELAYS

AIRPORT	ARR	DEP
Muscat (MCT)	4.5	1.9
Hanoi (HAN)	2.7	3.7
Doha (DOH)	4.1	1.8
Naha (OKA)	0.9	4.2
Reykjavik (KEF)	5.0	0.0

[Go to delay map](#)

TWEETS

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# A night in Delhi's Air Traffic Control Room

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Air traffic control

**Air Traffic Control is like playing chess, long distance, with live explosives. It is the second most stressful job in the world after precision surgery.**

**Anand Vivek Taneja**

November 24, 2015



- A Day in the Life of Air Traffic Over the United States
  - <https://www.youtube.com/watch?v=d9r3H4iHFZk>
  -
- Being an Air Traffic Controller | India | Mumbai ATC | Short Film
  - <https://www.youtube.com/watch?v=w3Ju1hBNI2Q>

View from IGIA ATC Tower, New Delhi



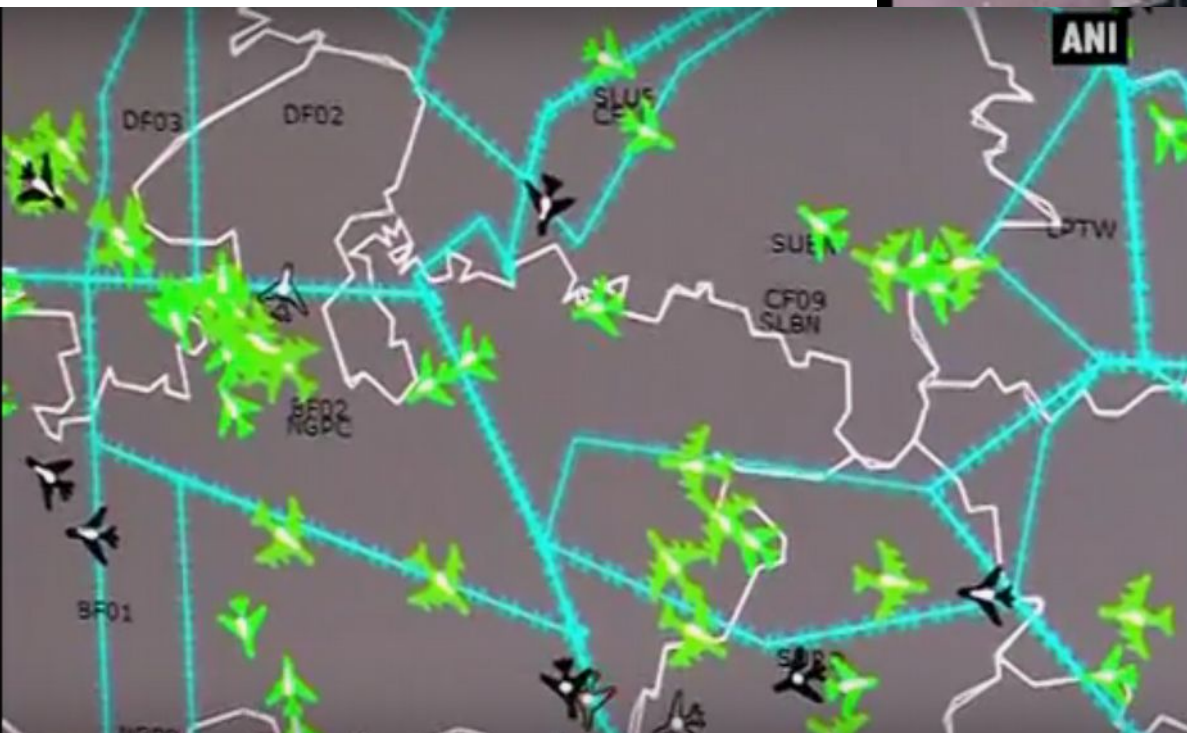


View from IGIA ATC Tower, New Delhi



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AIR TRAFFIC FLOW MANAGEMENT CENTRE





# ATFM ?

- Air Traffic Flow Management (ATFM) System will provide capabilities for effective Demand and Capacity Balancing (DCB).
- The ATFM tools will enable improved management of demand and capacity, and will help system stakeholders to deal with the increased complexity of the nation's air routes.

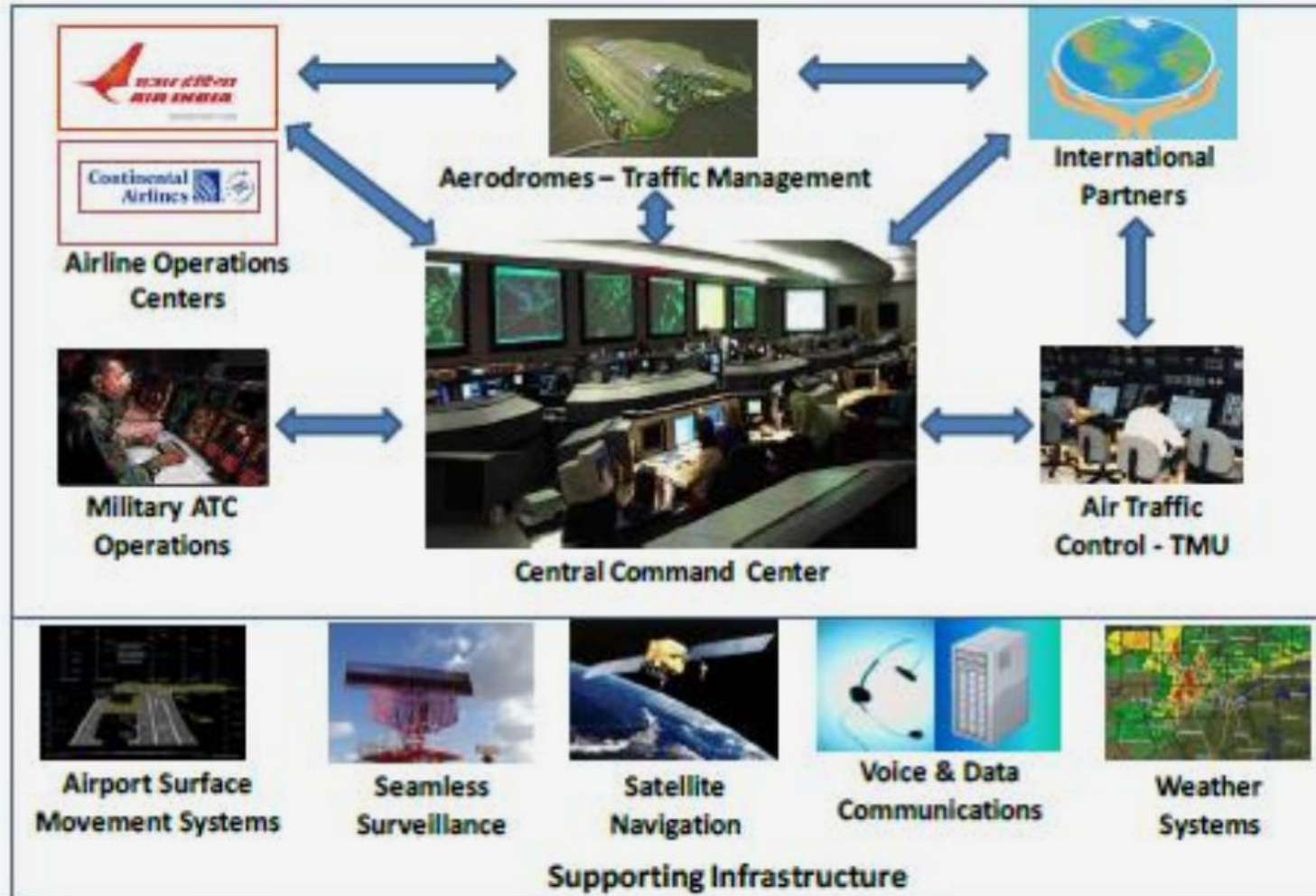
# Why do we need such a system?

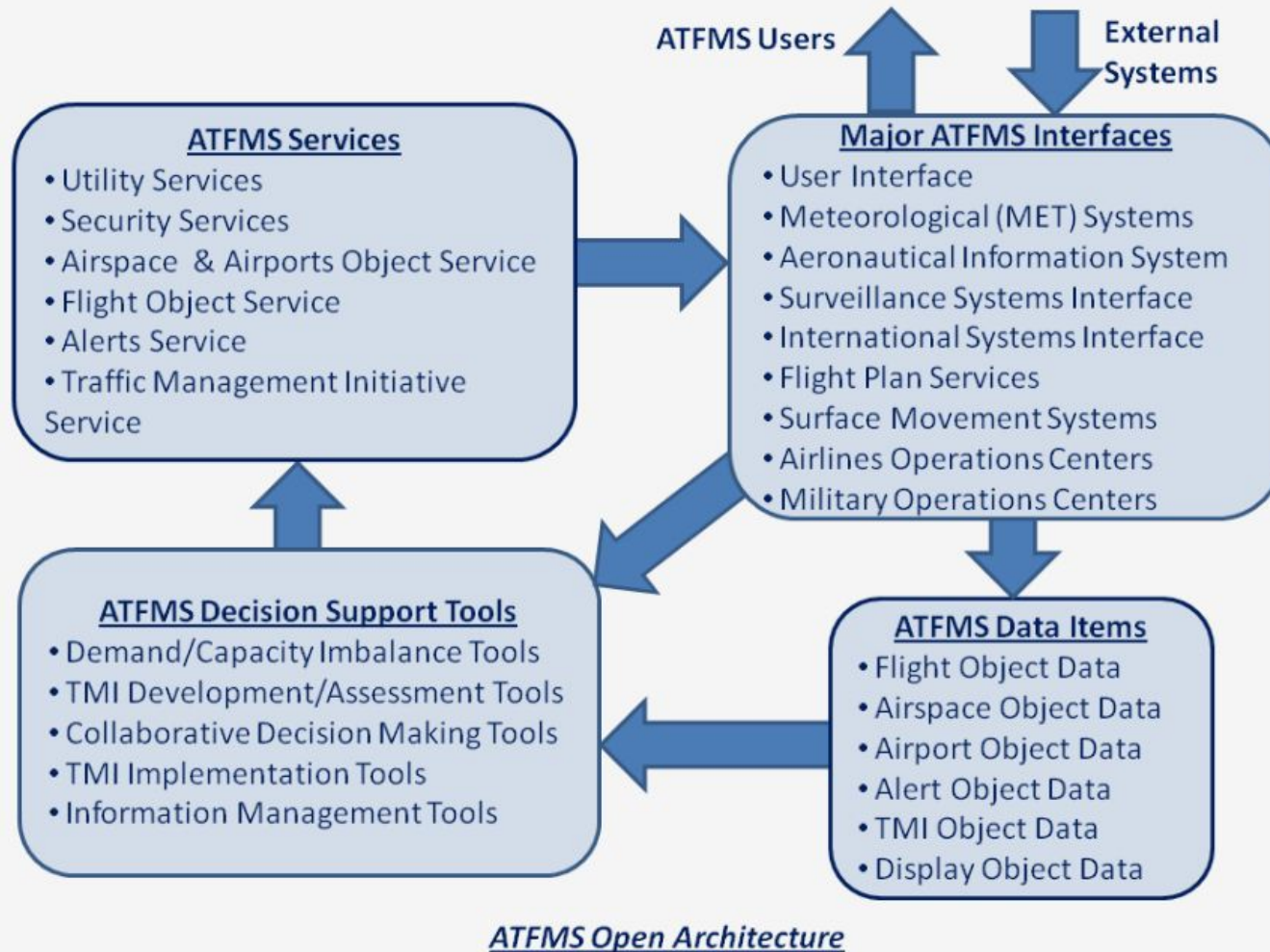
- Tactical approach to match fixed capacity
  - How to make it dynamic, near real-time
- Develop a more strategic and collaborative approach to **managing system-wide resources and capacities** to match capacity

**ATFM concept is Collaborative Decision Making (CDM)**



The high level architecture of C-ATFM system is shown below.





**Figure 2 - ATFMS Open Architecture**



## ATFMS Services Architecture

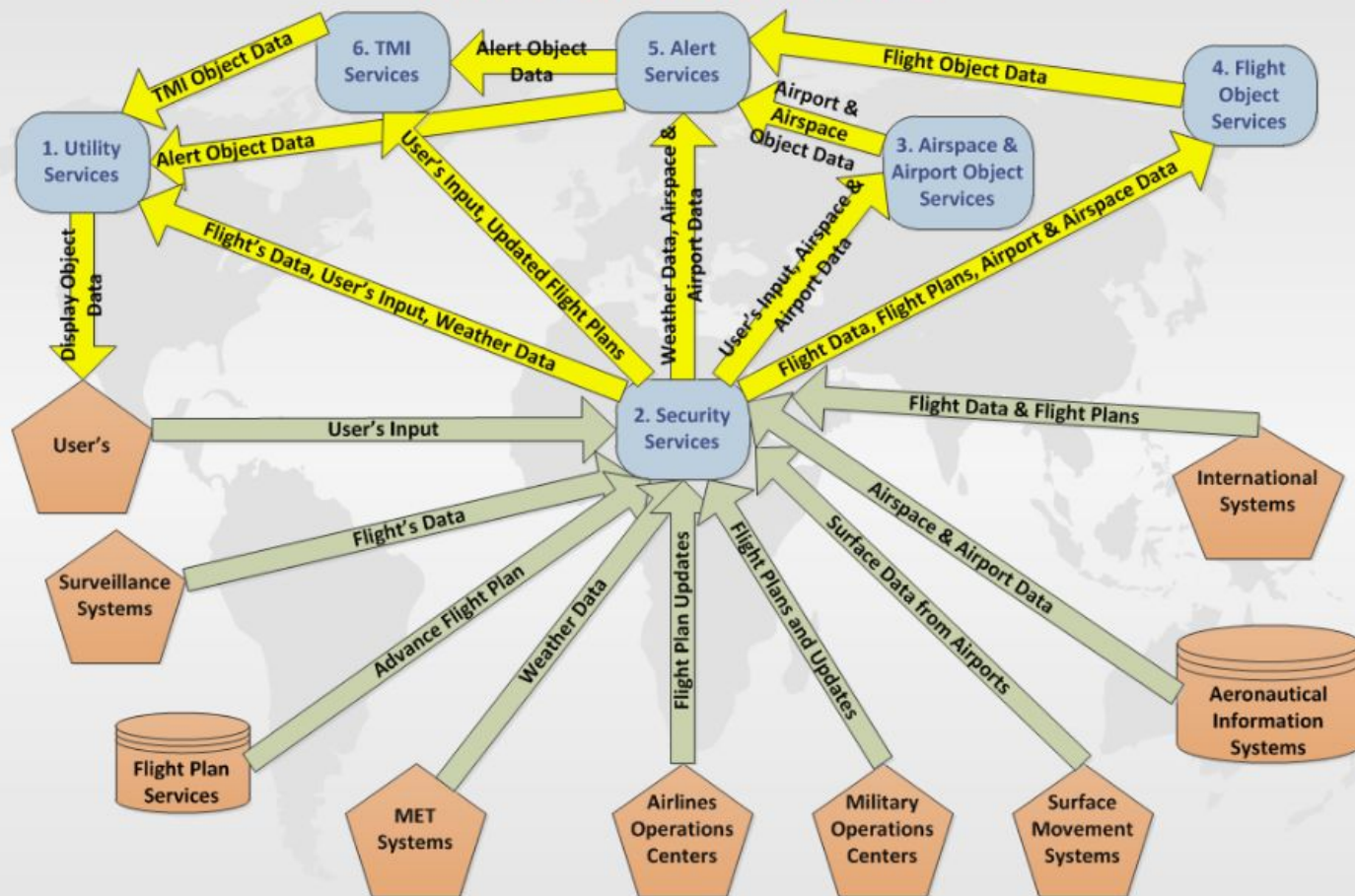
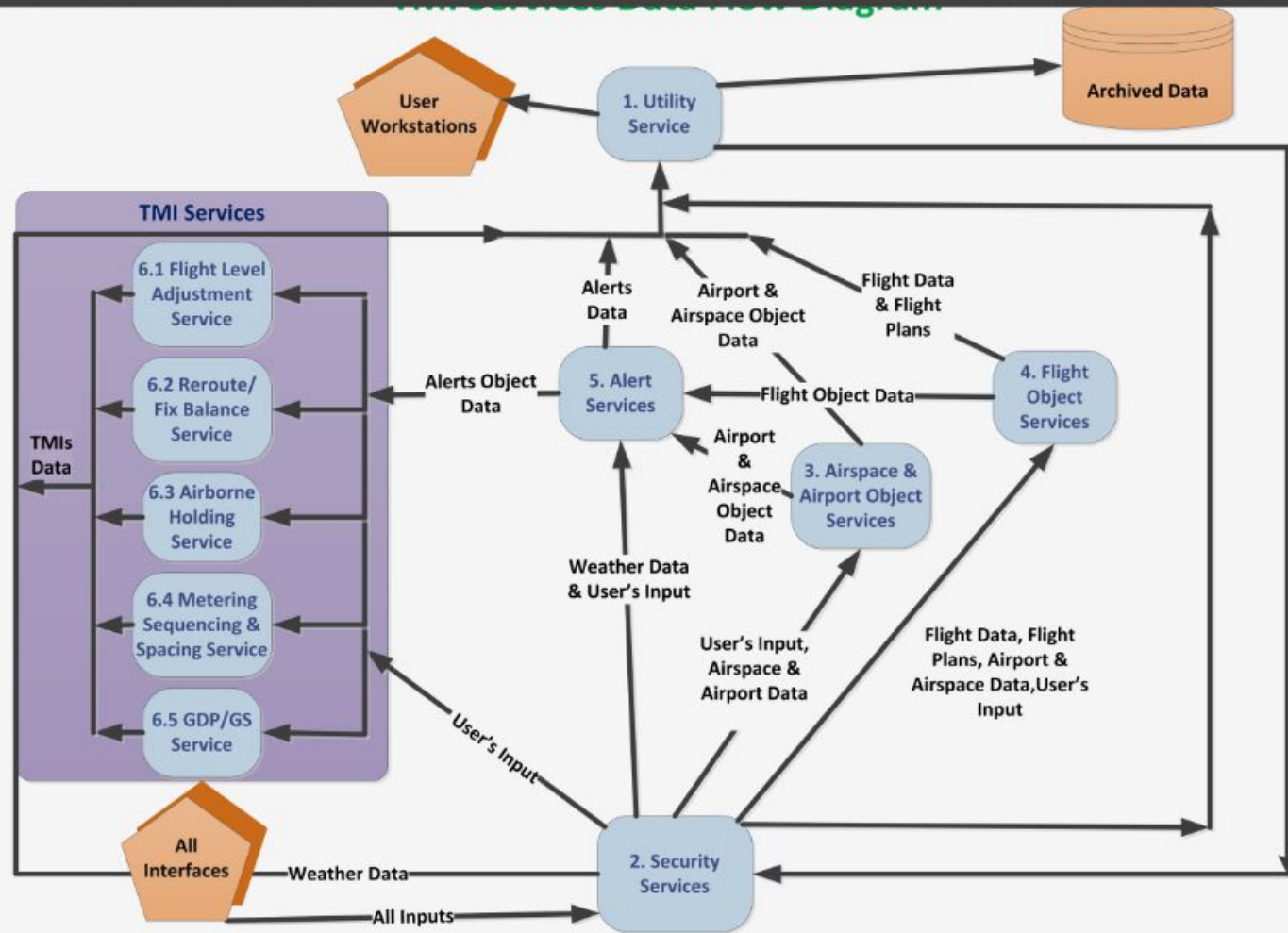


Figure 3 - ATFMS Service Level Architecture



**Figure 9 - TMI Services Data Flow Diagram Major ATFMS Interfaces**



# Phases of Operation

- Each is differentiated with time, scale, focus, and goals
- Phases are
  - Strategic Management (scheduled flights mainly, wk)
  - Pre-tactical Management (non-sch; events; constraints)
  - Tactical Management (executing flight plans, monitoring)
  - Post Analysis

## CAPACITY OPTIMIZATION

Optimize use of available capacity

Sector management :

- Configuration
- Number of sectors

Civil / military coordination

Reduce traffic complexity

Review monitoring values

Balancing arrival / departure capacity

Use other available capacity

Balancing arrival / departure capacity

Flight management

Advancing traffic

Regulate demand

Slot allocation

Constrain airborne traffic

	ATFM Measures		
	Strategic	Pre-tactical	Tactical
Vertical			Flight level capping scenario
Lateral	Playbook routes	Playbook routes	Fix balancing Rerouting scenario Rerouting (alternative scenariii) Playbook routes
Longitudinal			Miles-in-trail Minutes-in-trail Minimum departure interval
Time	Ground delay program Airborne holding	Ground delay program	Slot swapping Ground delay program Ground stop Airborne holding



# Required Modes of Operation for ATFMS

- ATFMS Operational Mode
- Standby Mode
- Shadow/TrainingMode
- Replay Mode

# CDM benefits to AAI

- Ensure safe separation;
- Maximize throughput;
- Make efficient use of available capacity;
- Manage controller workload;
- Provide equitable service; and
- Achieve environmental efficiencies.

# Benefits to Stakeholders

- Enhanced flight safety;
- Improved on-time arrivals;
- Improved accomplishment of mission objectives;
- Minimizing delays;
- Optimizing passenger/crew/aircraft connections;
- Minimizing turn times; and
- Fuel savings