Performance Metrics for Oceanic Air Traffic Management

Moving Metrics Conference

Pacific Grove, California

January 29, 2004

Oceanic Metrics Team

Agenda

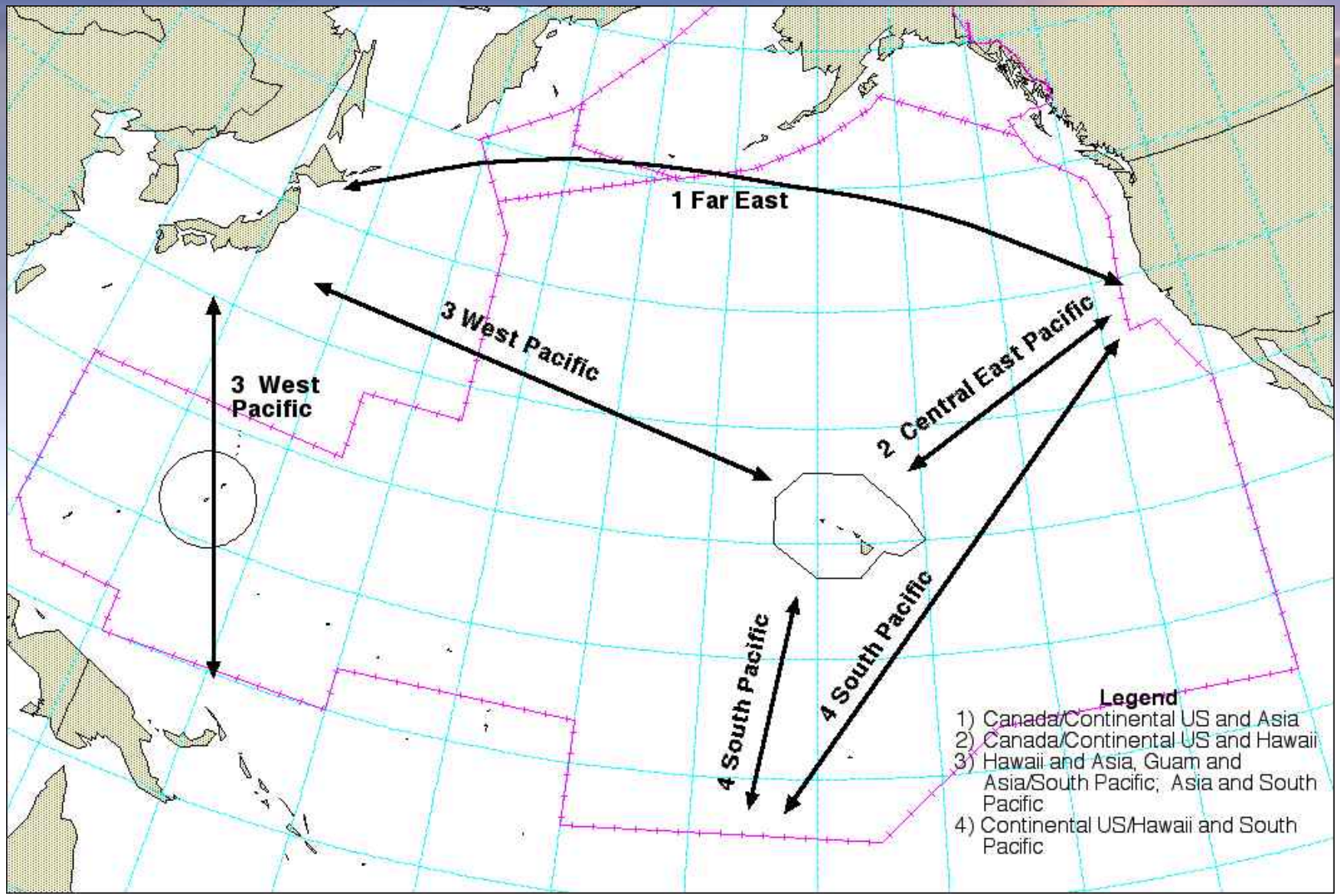
- ***Metrics Team***
  - Michele Merkle, FAA AUA-600
  - Lynne Hamrick, MITRE/CAASD
  - Yueh-Shiou Wu, MITRE/CAASD
  - Tamara Karakis, CSSI
- ***Introduction: Purpose & Background of Oceanic Air Traffic Control (ATC)***
- ***Background of Oceanic Metrics***
- ***Air Carrier Meetings***
- ***Oceanic Metrics Overview***
- ***Metrics Based on Priorities***
- ***Sample Dashboard Charts***
- ***Current Challenges Related to Oceanic Metrics***
- ***Baseline Performance Results***
- ***Summary***

Introduction

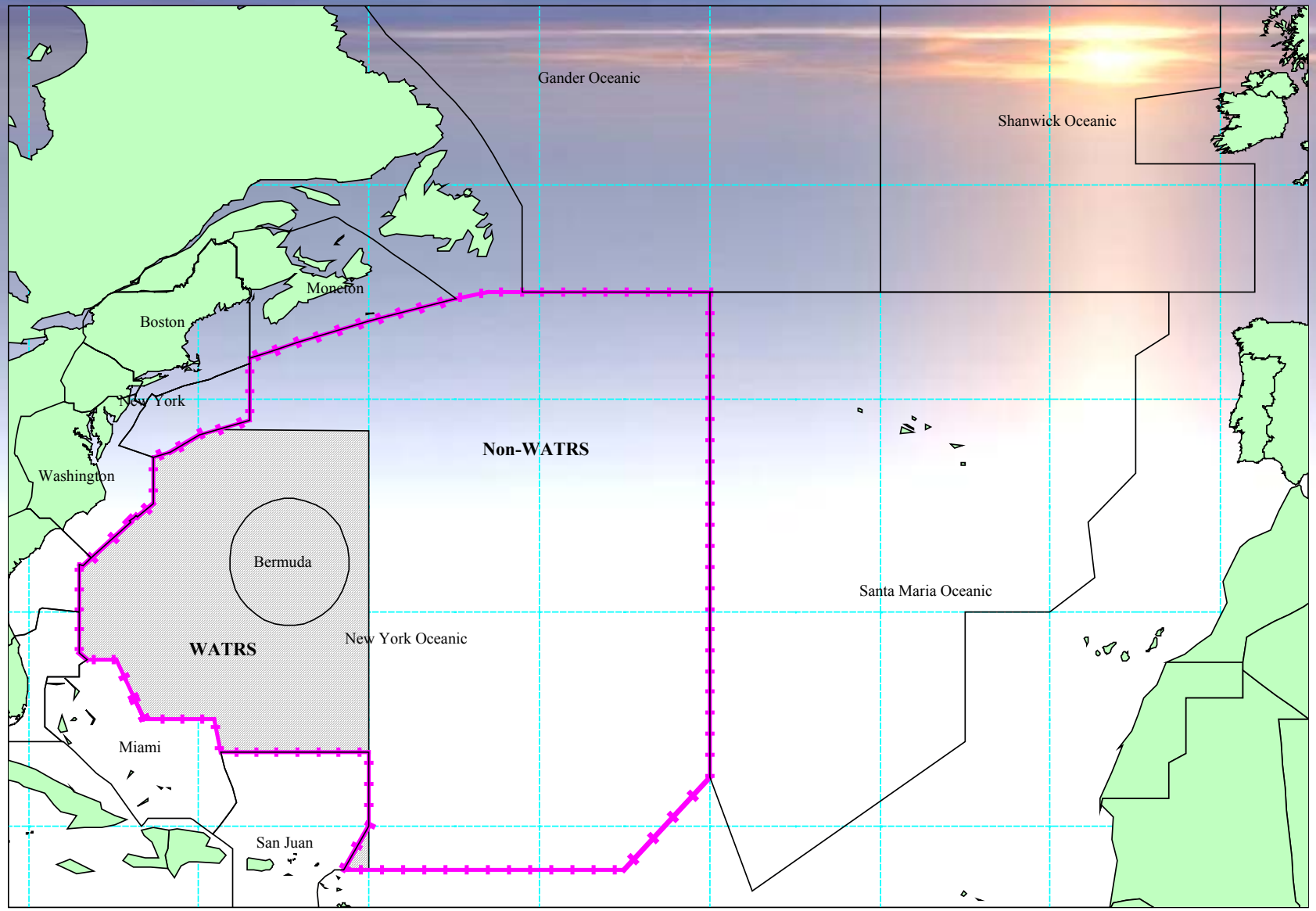
- ***Purpose of Briefing***
  - Provide an overview of oceanic performance metrics
  - Describe challenges related to measuring oceanic Air Traffic Control (ATC) service qualities
  - Discuss initial results and trends

- ***Background of Oceanic Air Traffic Control (ATC)***
  - Non-radar procedural separation
  - Communications via
    - Controller-Pilot Data Link (CPDLC) for Future Air Navigation System 1/A (FANS 1/A)-equipped aircraft
    - High Frequency (HF) Radio Operator for non-equipped aircraft
  - Oakland Oceanic Center (ZOA) controls 21.3 million square miles
  - New York Oceanic Center (ZNY) controls 3.3 million square miles

Oakland Oceanic Airspace



New York Oceanic Airspace



Background of Oceanic Metrics

- ***1993 Government Performance and Results Act (GPRA)***
  - Required federal agencies to measure their performance and effectiveness
- ***FAA moves towards Performance Based Organization (PBO) and Air Traffic Organization (ATO) formed***
  - Goal to develop a more efficient and businesslike air traffic system
  - AUA goal to continue improving oceanic service, while measuring the effect of new automation/procedures on the service provided

Air Carrier Meetings

- ***Onsite Air Carrier Meetings in 1999 and 2003***
  - Dialogue with air carriers coordinated via Air Transport Association (ATA) meeting
  - Onsite air carrier visits in 1999 and 2003
    - Air Canada Corporation, American Airlines, Continental Airlines, Delta Airlines, Federal Express Corporation, Northwest Airlines, United Airlines, United Parcel Service Corporation, US Airways Corporation
  - Air Carrier Personnel
    - Operational Analysts, Dispatchers, Meteorologists, Pilots, Instructors, ATC, Operational Managers

- ***Summary of Air Carriers Visits***
  - Received an overview of air carrier operations
    - operating environment, route structure, fleet mix
  - Consolidated and compared lists of priorities
  - Discussed data sources
  - Established baseline metrics

Oceanic Metrics Overview

- ***Purpose of the "Dashboard"***
  - Provides visual summary of performance of pertinent metrics for facility and airspace regions within the Flight Information Region (FIR)
  - Tracks customer demand and level of service provided by the FAA oceanic ATC
  - Establishes baseline to determine affect of automation and/or procedure changes (e.g., Advanced Technology and Oceanic Procedures or ATOP)
  - Identify anomalies and areas that need more tracking
  - Provide monthly charts for monitoring trends in oceanic service qualities
- ***Established data exchange process with Centers***
  - Primary data source: Oceanic Display and Planning System (ODAPS)
  - Other data sources: Oceanic Data Link (ODL), Track Advisory (TA)
- ***Generated programs to process and analyze data***
  - Oceanic Data Repository (ODR)
  - Oceanic Analysis Tool Set (OATS)
  - Oceanic Metrics Generator (OMG)

Metrics Based on Priorities

- ***Air Carrier Priorities and Oceanic Metrics***

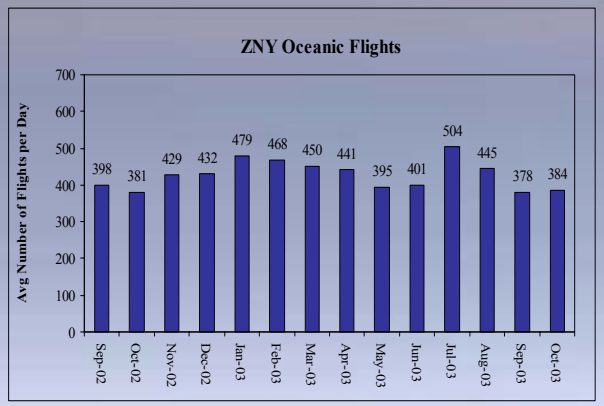
Air Carrier Priorities	*Metrics*	*Data Availability and Sources*
Operating Environment	✈Flight count ✈Avionics equipment ✈Fleet mix	***Available*** ✈Flight Plans from ODAPS
Communication	✈Avionics equipment ✈Altitude requests ✈Response times	***Available*** ✈Flight Plans from ODAPS ✈HF messages from ODAPS ✈CPDLC messages from ODL
Safety	✈Operational errors ✈Altitude requests due to WX ✈Deviation requests	***Available*** ✈AAT-200 ✈HF messages from ODAPS ✈CPDLC messages from ODL
Efficiency - Flexibility ✈Requests Granted	✈Altitude requests granted ✈Response time	***Available*** ✈Plans from ODAPS ✈HF messages from ODAPS ✈CPDLC messages from ODL

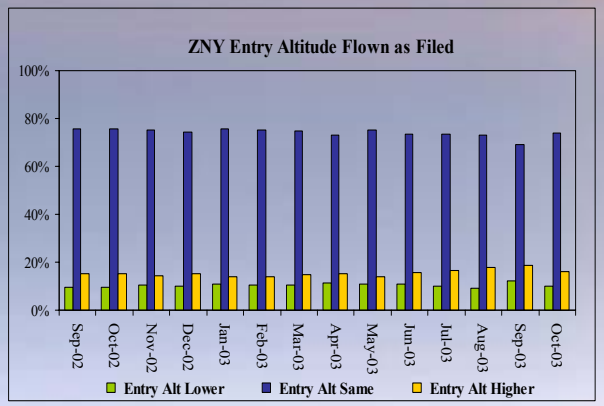
Metrics Based on Priorities (Continued)

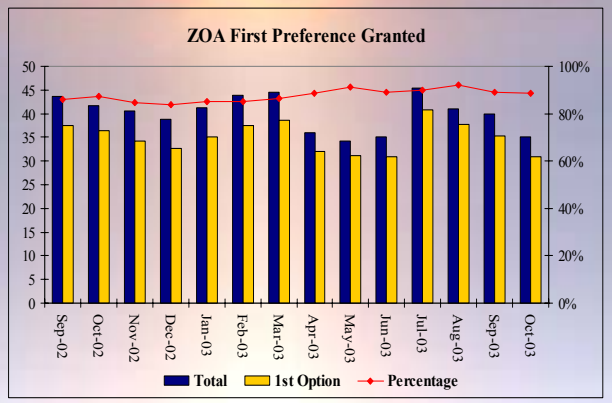
- ***Air Carrier Priorities and Oceanic Metrics***

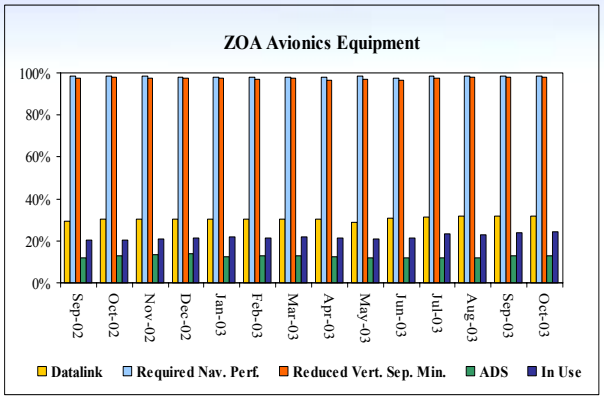
Air Carrier Priorities	*Metrics*	*Data Needed*
User Satisfaction - Predictability →Optimal vs. Actual →Planned vs. Actual	→First preference granted →Entry altitude flown as filed	***Available*** →Flight Plans from ODAPS →Position reports from ODAPS →Track Advisory reports
User Satisfaction - Predictability →Delay / On-time Performance		***In Development with Aviation System Performance Metrics (ASPM) and Enhanced Traffic Management System (ETMS)*** →Planned departure and arrival times →Actual departure and arrival times
User Satisfaction →Fuel Consumption		***In Development*** →Preferred route and altitude in ICAO Flight Plan (FPL) vs. Actual route and altitude flown

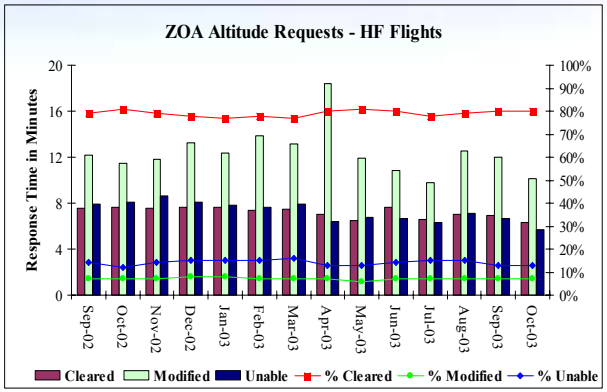
Sample Dashboard Charts

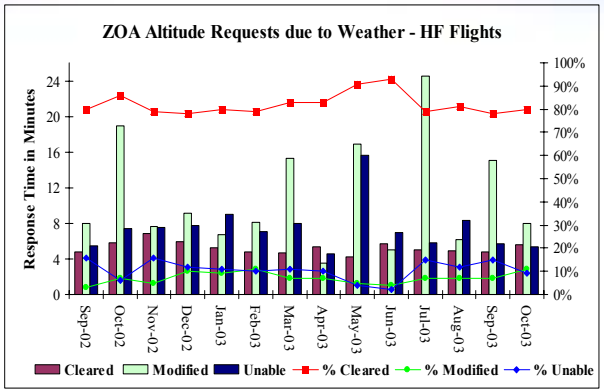












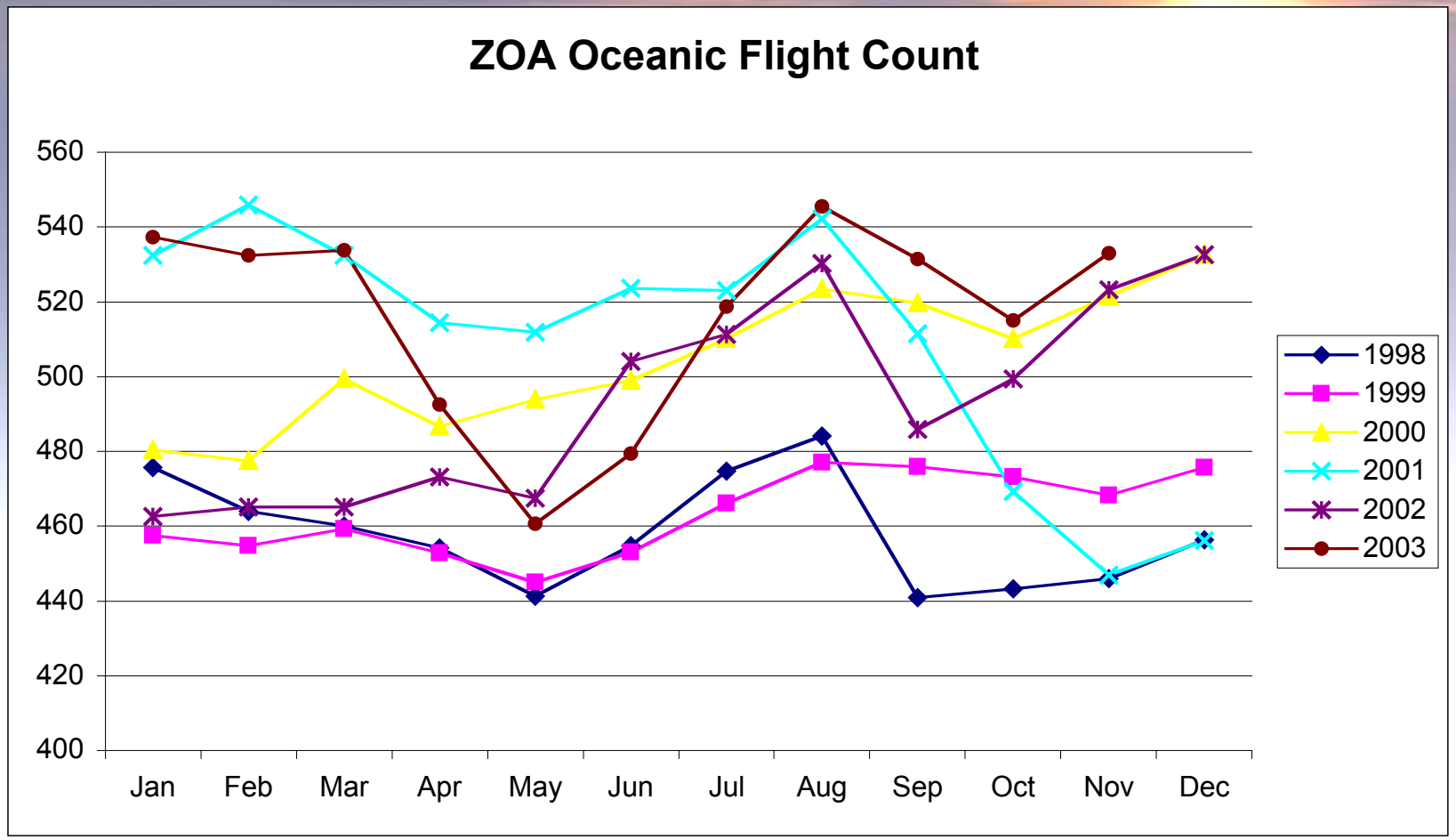
Current Challenges Related to Oceanic Metrics

- *US oceanic performance metrics are affected by actions taken by non-US oceanic ATC*
- *Limited end-to-end data available*
- *Variations in operations and priorities across different geographic and domain sub-regions*
- *Processing HF messages*

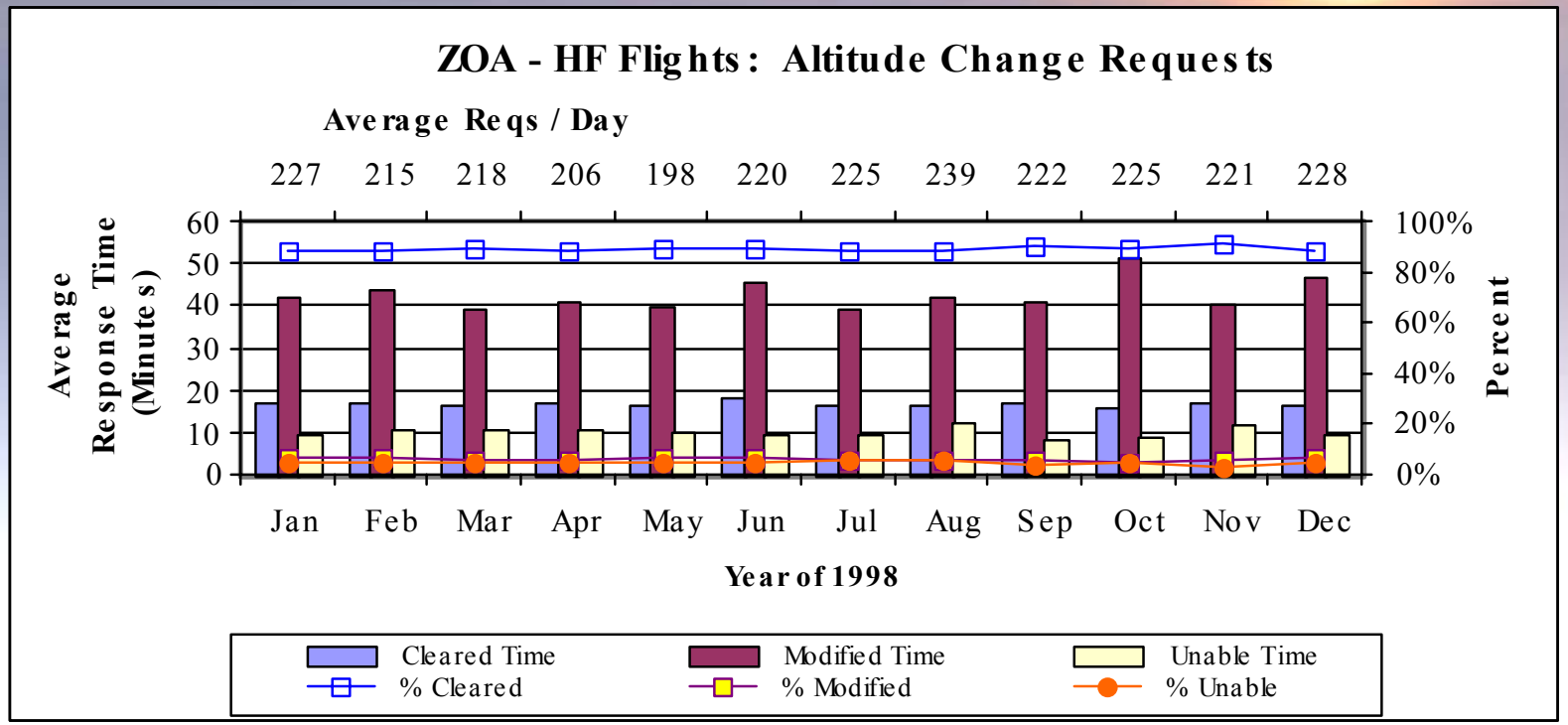
Baseline Performance Results

- ***Trends observed***
  - Response time for HF flights are longer than that for FANS 1/A flights
  - Percent of positive or negative response to request are basically the same regardless of the aircraft communication capabilities (i.e., FANS 1/A or HF)
  - Daily traffic varies more than 30% (e.g., May and August); but variation of performance level is small
  - Most flights (80%) received preferred entry altitude for New York airspace or first preference for the Pacific Organized Track System (PACOTS)
  - Average response time to altitude change requests has decreased from 10-50 minutes in 1998 to 5-15 minutes for HF flights and 3-6 minutes for FANS 1/A flights in 2003
- ***Plausible reasons for the above trends***
  - Introduction of data link not only allow FANS 1/A flights to communicate with ATC faster, it also reduced congestion on the channel allowing HF flights to get better services
  - Oceanic Data Link enhanced controller productivity for all flights, not just FANS 1/A flights
  - Whether a positive response can be granted is dependent on traffic situation, not on communication means
  - Implementation of Reduced Vertical Separation Mimima (RVSM) allowed more flights to fly their preferred altitude profile
- ***Sample slides follow***

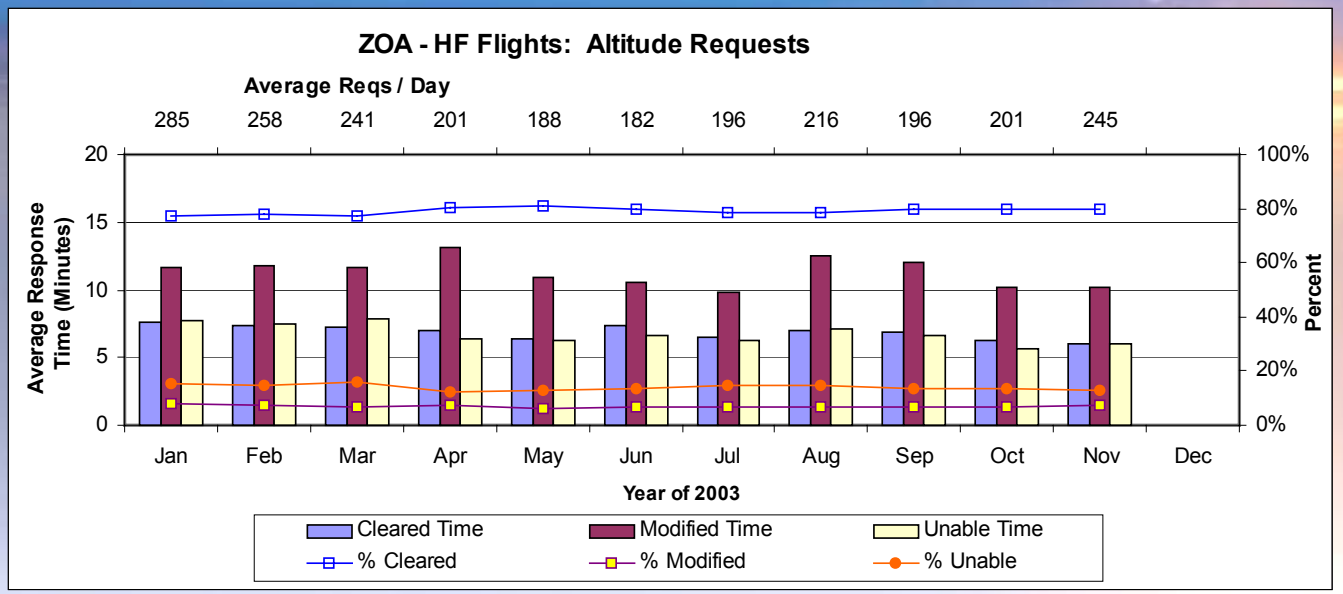
Baseline Performance Results (Continued)

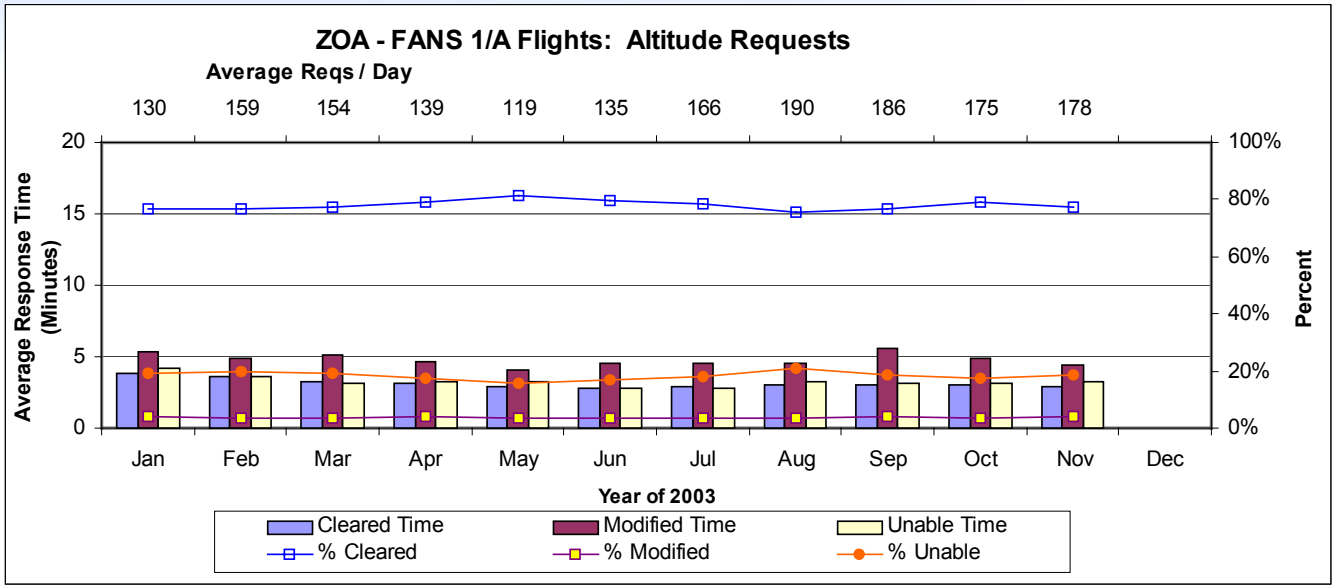


Baseline Performance Results (Continued)



Baseline Performance Results (Concluded)





Summary

- ***Oceanic Performance Metrics***
  - Assesses the operating environment and quality of oceanic service provided to the airspace users
    - Summary of performance
    - Tracks customer demand and level of service provided
  - Provides a foundation for making sound business decisions
    - Baseline comparison
    - Anomalies
    - Trends
- ***Oceanic Metrics are evolving and expanding to meet the challenges of measuring a complex system and the performance of ATC service in a meaningful way***
  - Different data sources (e.g., ATOP is replacing ODAPS and ODL)
  - Additional facilities (e.g., Anchorage)
  - Changing priorities