

**TURKISH
AVIATION
ACADEMY**



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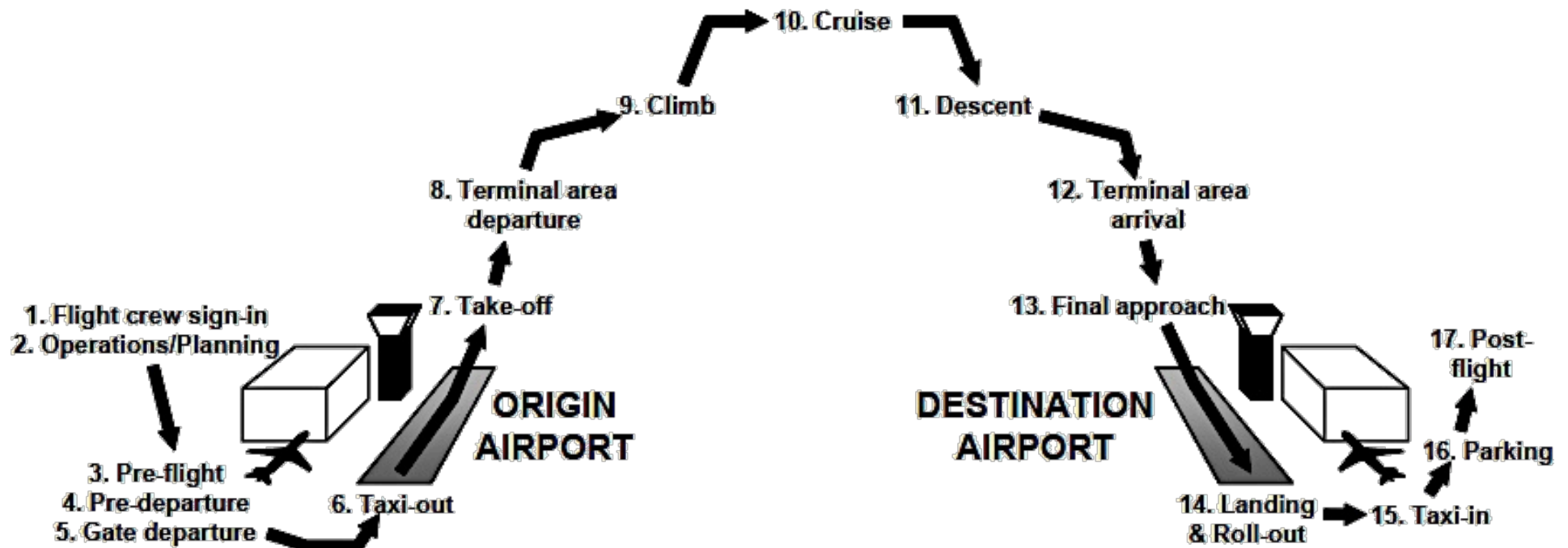


Enroute and Oceanic Operations
Prof. Hamsa Balakrishnan

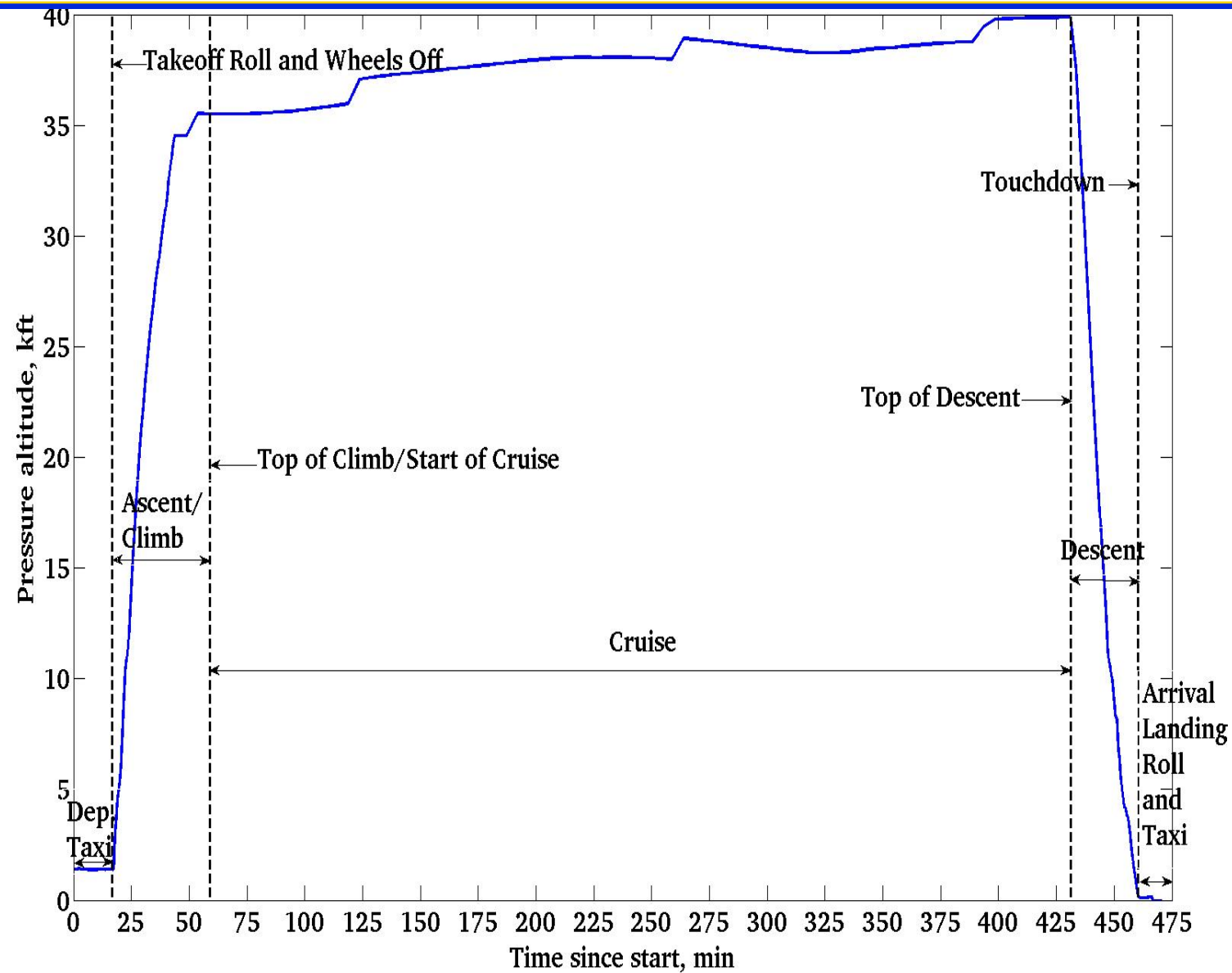
Istanbul Technical University
Air Transportation Management
M.Sc. Program

Air Transportation Systems and Infrastructure
Strategic Planning
Module 09 : 26 May 2015

Typical flight phases



Typical flight phases

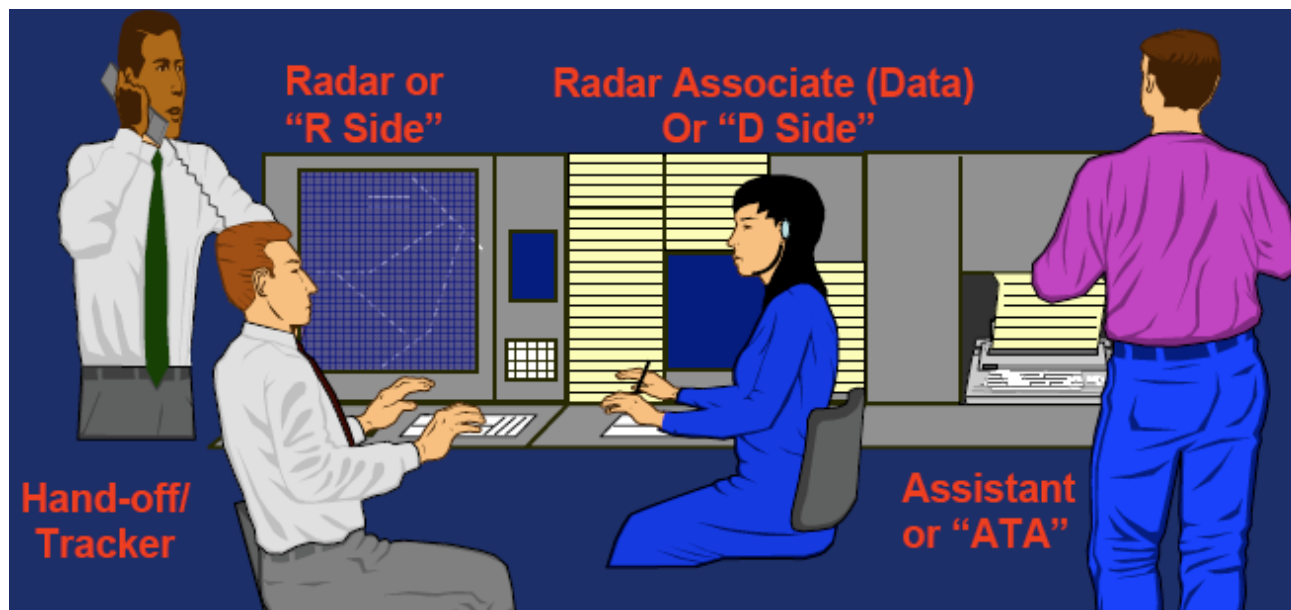


Recall:
Air Route Traffic Control Centers (ARTCCs or Centers)

- Every ARTCC is divided into smaller units called *sectors*
- Sectors designed to make it easier for the Air Traffic Controller to separate aircraft within the sector
 - ARTCCs sectorized in both vertical and horizontal planes
 - An ARTCC may contain between 20 and 80 sectors (usually in 2-3 vertical levels)
 - Low (0-18,000 ft), High (FL 180-FL 360), Super-High (FL 360-FL 600)
 - As aircraft pass from sector to sector, so does responsibility for separation, through *handoff* process
 - Transfer of communication must precede transfer of control (actual crossing of boundary)

ARTCC (en route sector) ATC positions

- Each sector typically has 1 to 3 ATCo: flight data controller, radar controller, radar associate (nonradar controller)
 - ❑ R-side (Radar controller) - provides separation between all IFR flights in the sector; communicates with pilots (light traffic: works the sector alone)
 - ❑ D-side (Radar associate – data): handles flight strip data and user requests; detects traffic conflicts not on radar display; coordinates with other sectors; supports R-side controller
 - ❑ ATA – (Assistant) delivers flight strips to sectors



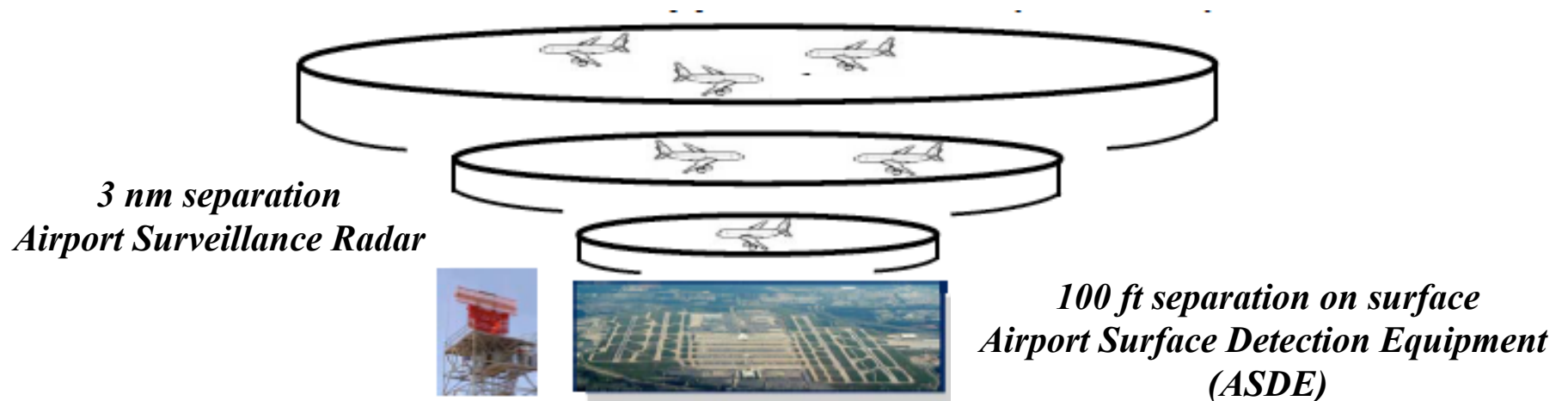
Flight progress strip (ARTCC version)

Number of times flight plan has been amended		Route of flight	
Aircraft Identification		Type Equipment	
Type aircraft	Time at fix	Beacon code	
Filed true airspeed	19	45	
Ground speed	068	09	
Computer Identification	Sector number	Strip number	Fix posting for Sector 21
Coordination fix time	Previous fix	Altitude	Remarks section
Coordination Symbol to adjacent ATC facility			

AAL278	1	TXK	45	330	DFW.\.TXK LIT J6	6262
B762/R					HVQ LDN JASEN1	
T468	G500	1930			IAD	
21						
LIT						
068	09				o AAL278 SPL FLT	*ZTL

Separation requirements

- 5 nm separation enroute (compared to 3 nm in TRACON)



*5 nm separation
Air Route Surveillance Radar (ARSR)*

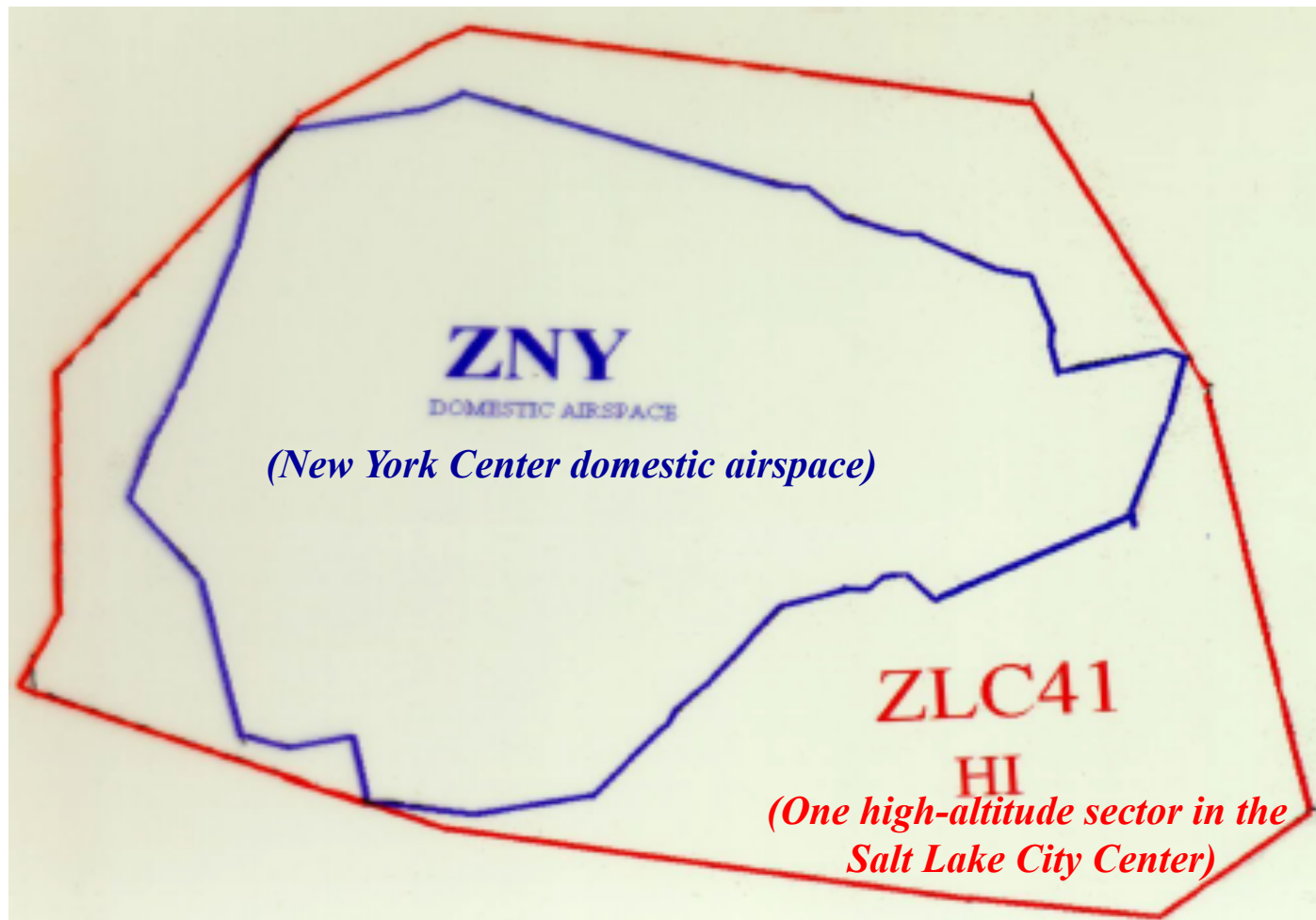
Enroute airspace sector capacity

- In the US, airports tends to be main bottlenecks
- Airspace sector capacity depends on many factors (weather, workload, flow complexity, etc.)
 - Rule of thumb: “Monitor Alert Parameter” (MAP)

Average sector flight time	MAP value*
3 min	5
4 min	7
5 min	8
6 min	10
7 min	12
8 min	13
9 min	15
10 min	17
11 min	18
12 min and higher	18

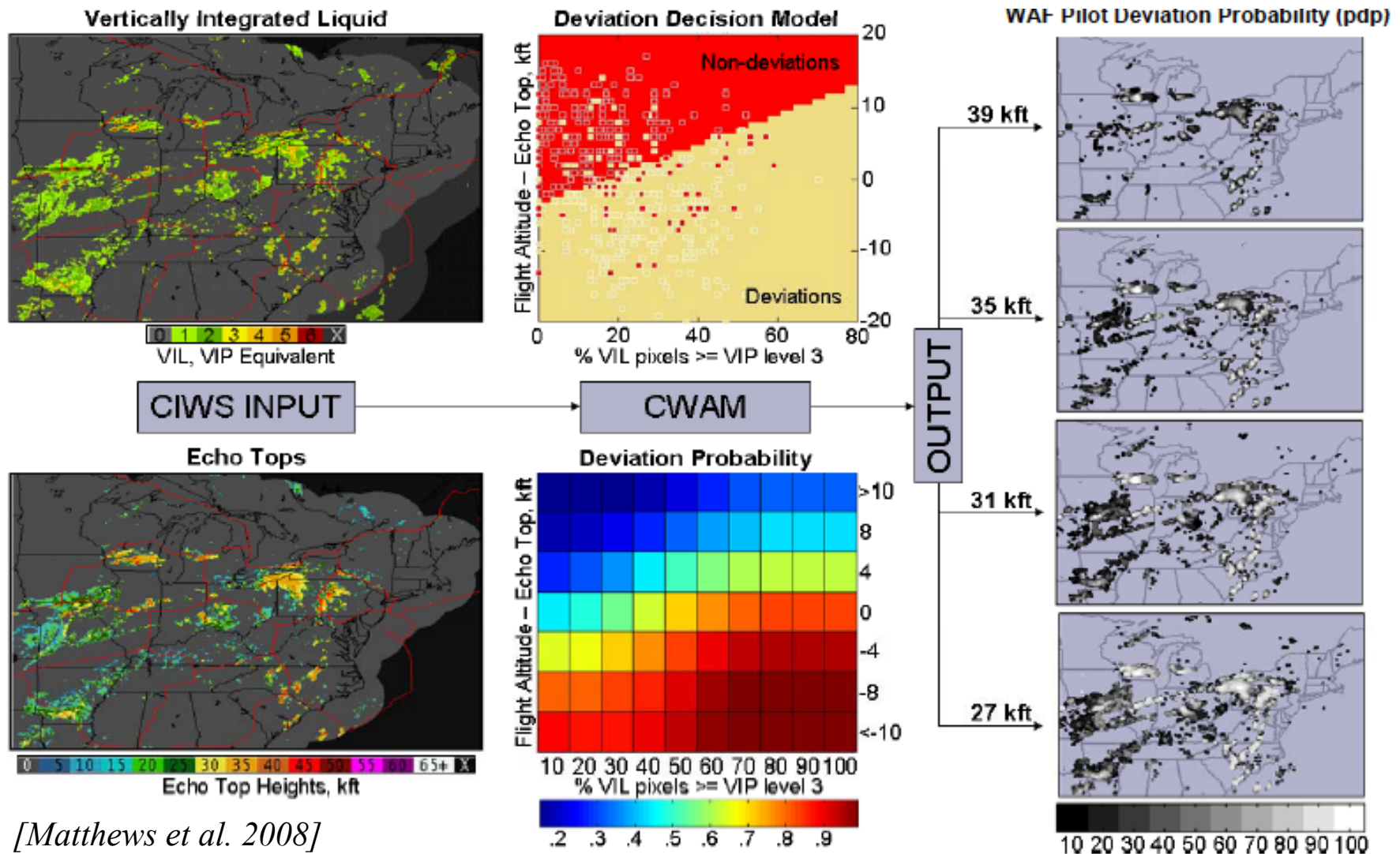
**Representative values. Actual values are sector-specific*

Sector sizes can vary significantly



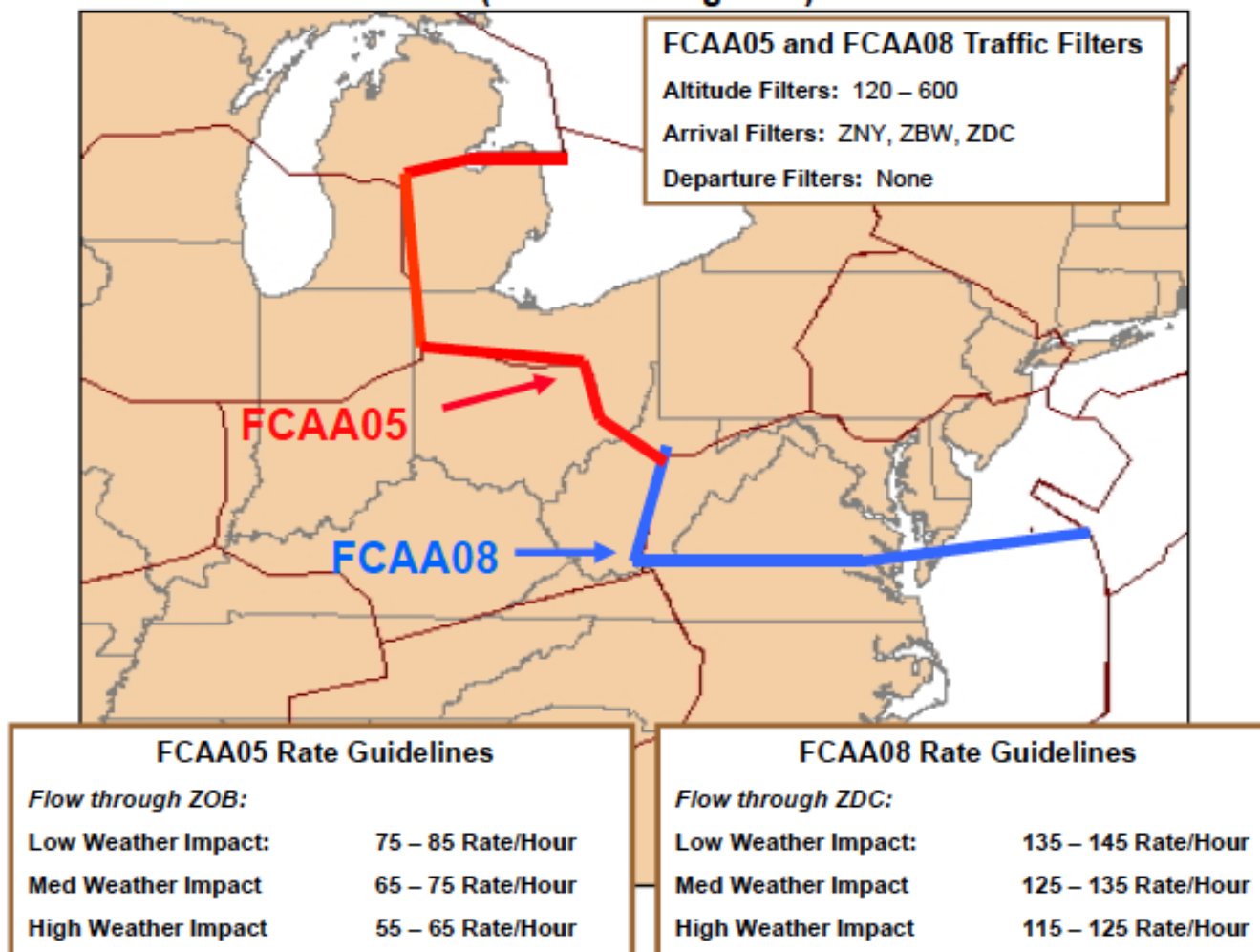
Impact of weather on enroute traffic

- Convective Weather Avoidance Model (CWAM)



Airspace Flow Programs

- Used to manage en route demand when capacity is reduced

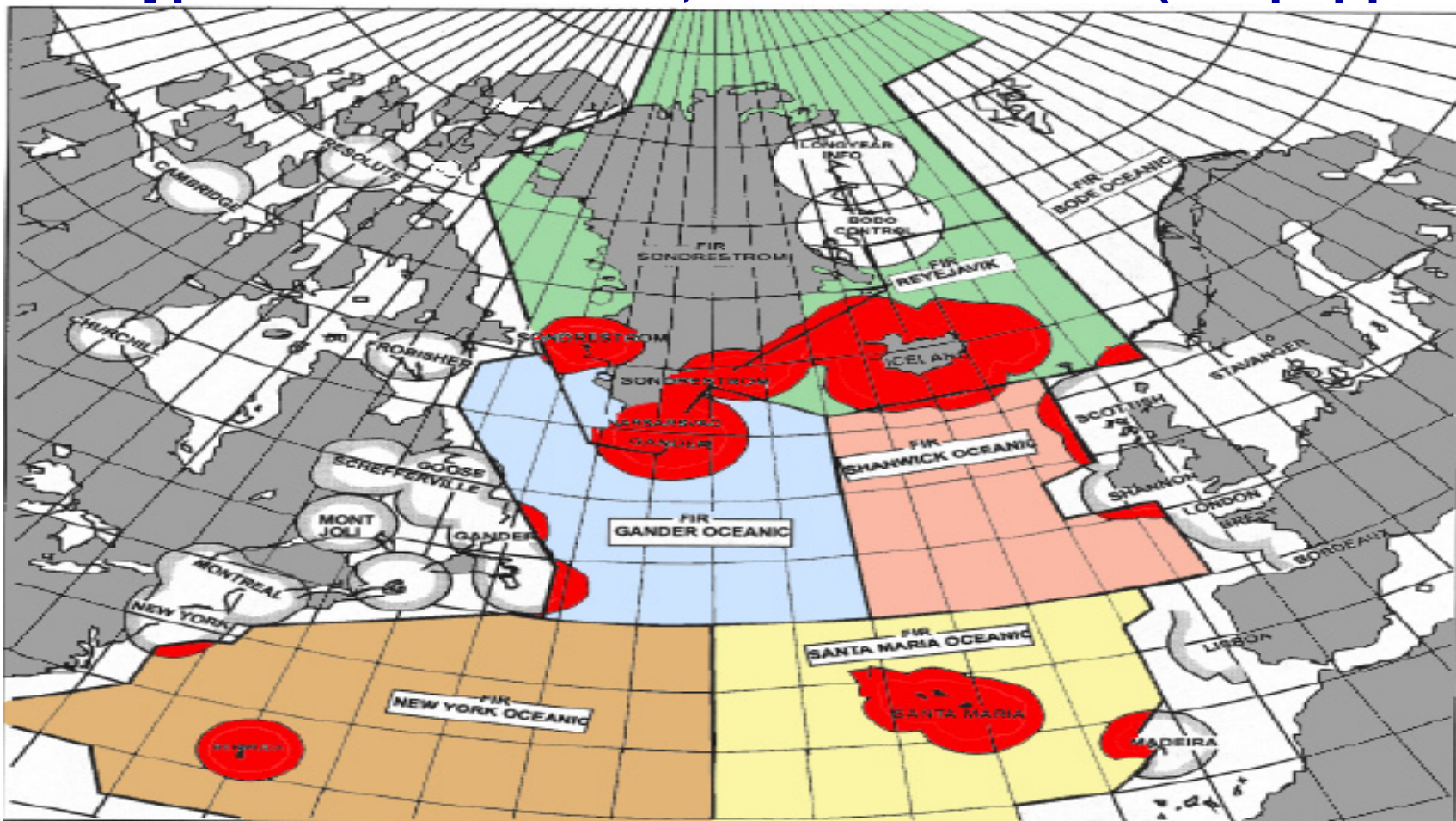


Oceanic Operations

- **Typically characterized by low density**
- **Poor CNS capabilities (limited, if any, VHF/radar coverage)**
- **International operations; ICAO oversight**
- **Limited opportunities for diversion**
- **Limited weather updates**

Poor VHF/radar coverage

- Aircraft report to Oceanic Control Areas as they cross waypoints via SATCOM, HF radio or ADS (if equipped)

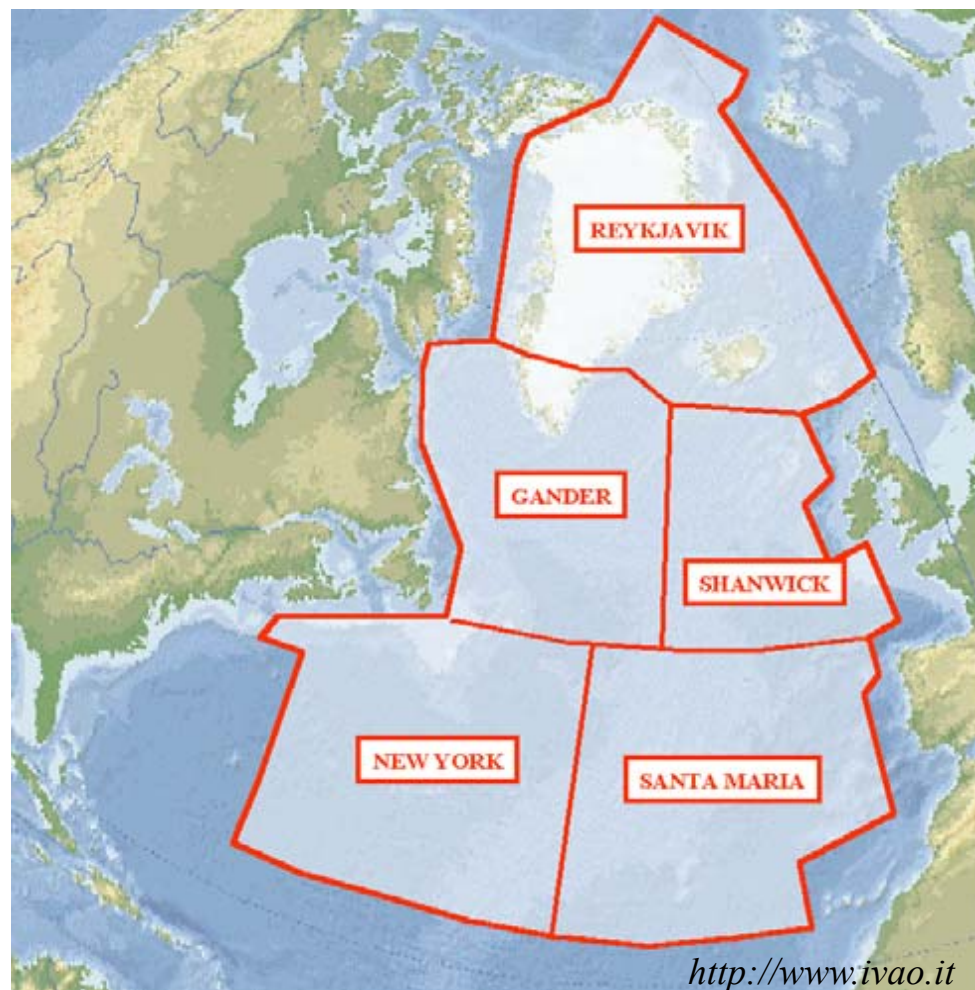


Revised by ATA-10 6/09/96

[Midkiff et al. 2009]

Oceanic Control Areas (OCAs)/ Oceanic Area Control Centers (OACCs)

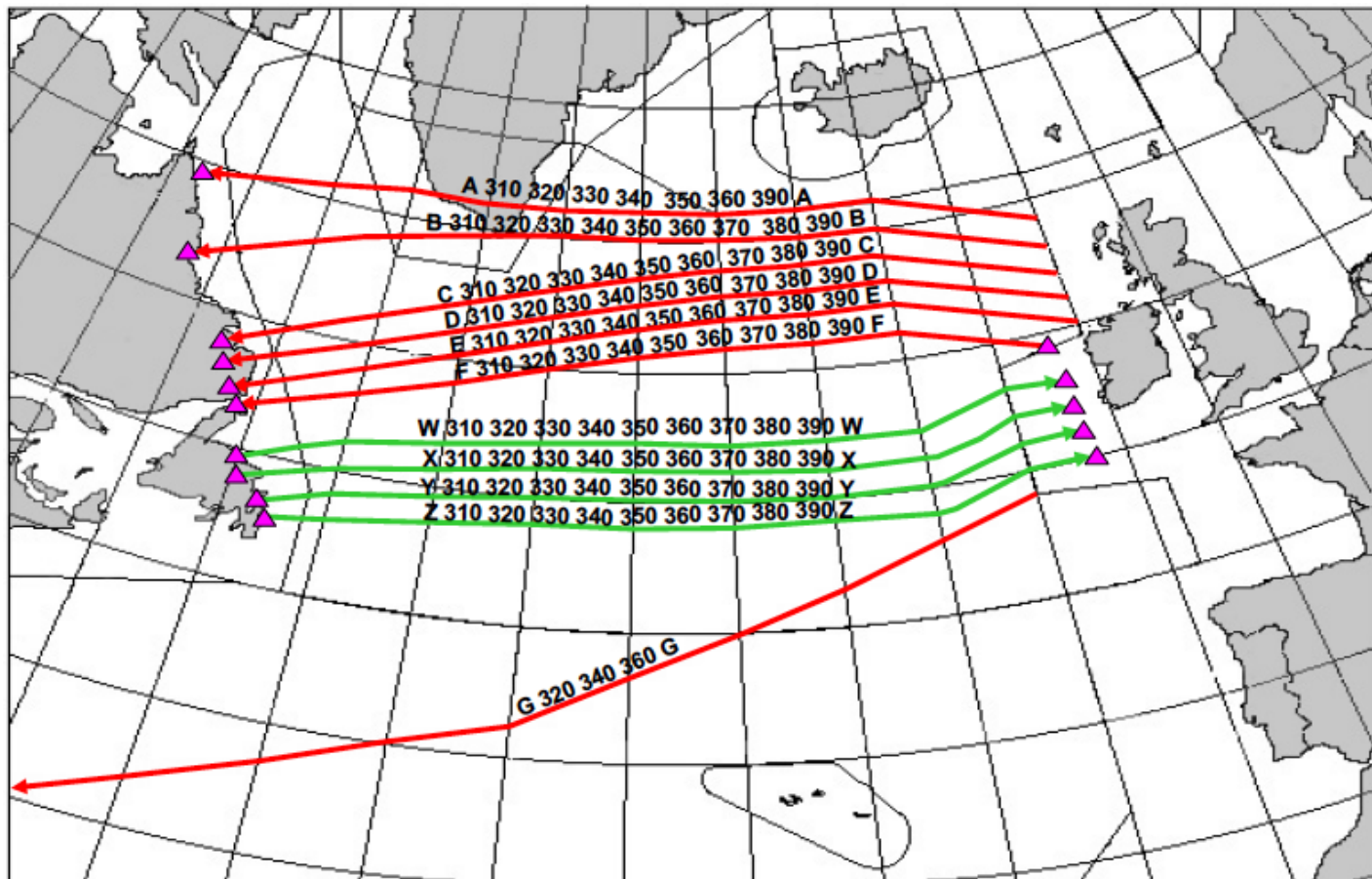
- North Atlantic OACCs**





North Atlantic Tracks (NATS)

- Published/updated daily; directions reversed twice daily
- Reduced Vertical Separation Minima (RVSM)



http://www.turbulenceforecast.com/atlantic_westbound_tracks.php

http://www.turbulenceforecast.com/atlantic_eastbound_tracks.php

NATS

North Atlantic Tracks - Last updated at 2014/04/15 18:46 GMT

The following are active North Atlantic Tracks issued by Shanwick Center (EGGX) and Gander Center (CZQX). Any NOTAMs pertaining to these tracks (waypoint changes, procedures) will be found by searching the ARTCC NOTAMs under Shanwick Center (EGGX), Gander Center (CZQX), Boston Center (KZBW) and New York Center (KZNY).

*A,B,C,...: Westbound
X,Y,Z,...: Eastbound*

142015 EGGXZQZX
(NAT-1/2 TRACKS FLS 310/390 INCLUSIVE
APR 15/1130Z TO APR 15/1900Z
PART ONE OF TWO PARTS-
A DINIM 51/20 51/30 49/40 46/50 URTAK BANCs
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL-
B SOMAX 50/20 50/30 48/40 45/50 VODOR RAFIN
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
NAR NIL-
C BEDRA 49/20 49/30 47/40 44/50 BOBTU JAROM
EAST LVLS NIL
WEST LVLS 310 320 330 340 350 360 370 380 390
EUR RTS WEST NIL
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EAST LVLS NIL
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E SEPAL 47/15 47/20 47/30 45/40 42/50 41/60 JOBOC
EAST LVLS NIL
WEST LVLS 310 320 340 350 360 370 380 390
EUR RTS WEST LAPEX
NAR NIL-
END OF PART ONE OF TWO PARTS)

151259 CZQXZQZX
(NAT-1/2 TRACKS FLS 320/400 INCLUSIVE
APR 16/0100Z TO APR 16/0800Z
PART ONE OF TWO PARTS-
U HO PORGY 58/50 59/40 59/30 58/20 58/15 GOMUP GINGA
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N197C-
V FOXKE LOACH 57/50 58/40 58/30 57/20 SUNOT KESIX
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N179C-
W VALIE SCROD 56/50 57/40 57/30 56/20 PIKIL SOVED
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N165E N169A-
X STEAM OYSTR 55/50 56/40 56/30 55/20 RESNO NETKI
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N149B N155A-
Y REDBY CARPE 54/50 55/40 55/30 54/20 DOGAL BEXET
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS EAST NIL
NAR N135B N141B-
END OF PART ONE OF TWO PARTS)

Extended Twin-Engine Operations (ETOPS)

- During extended overwater operations with twin-engine aircraft types, flight must remain within a specified flying time of an alternate airport (on one engine)

