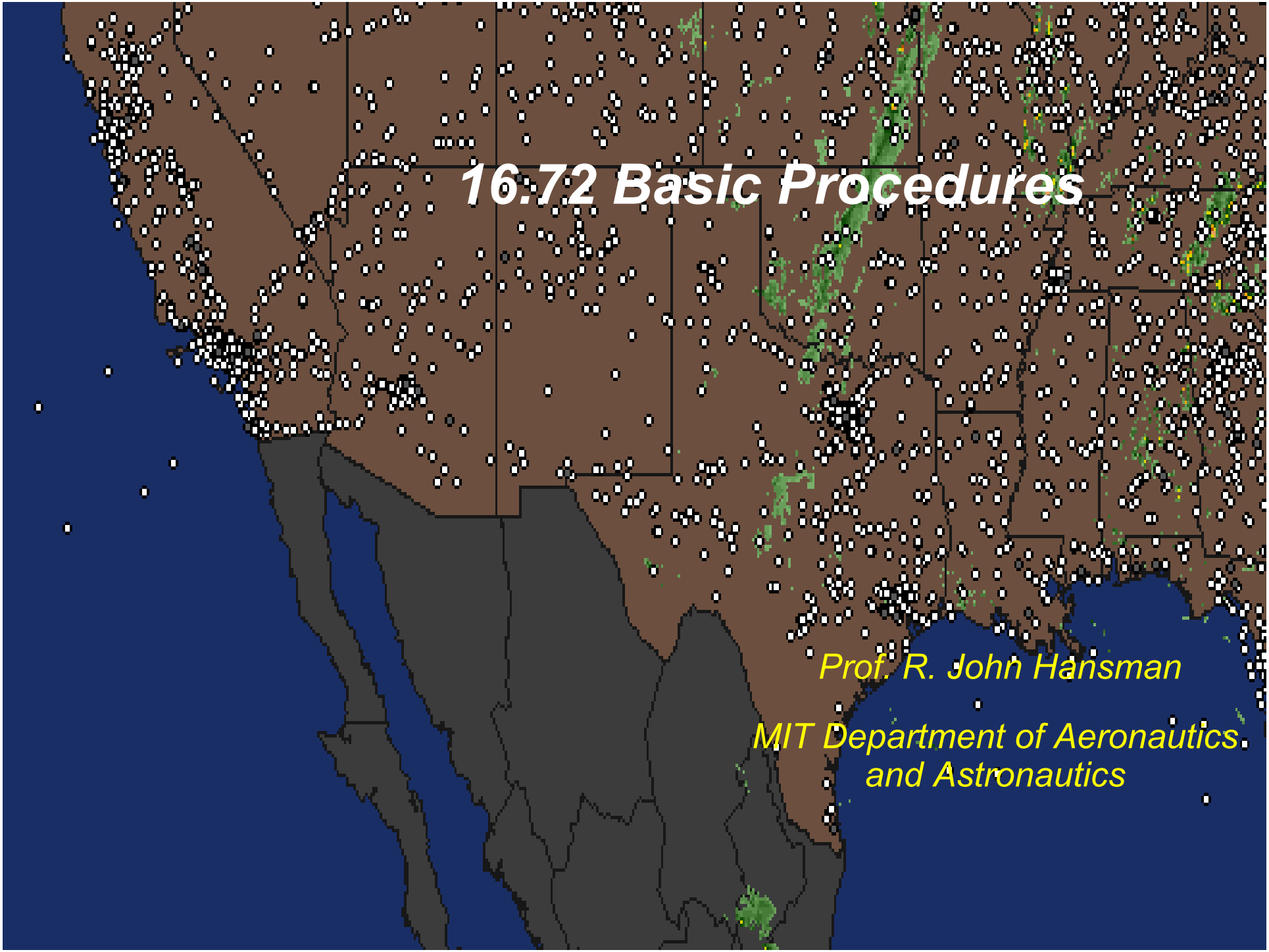


16.72 Basic Procedures

Prof. R. John Hansman

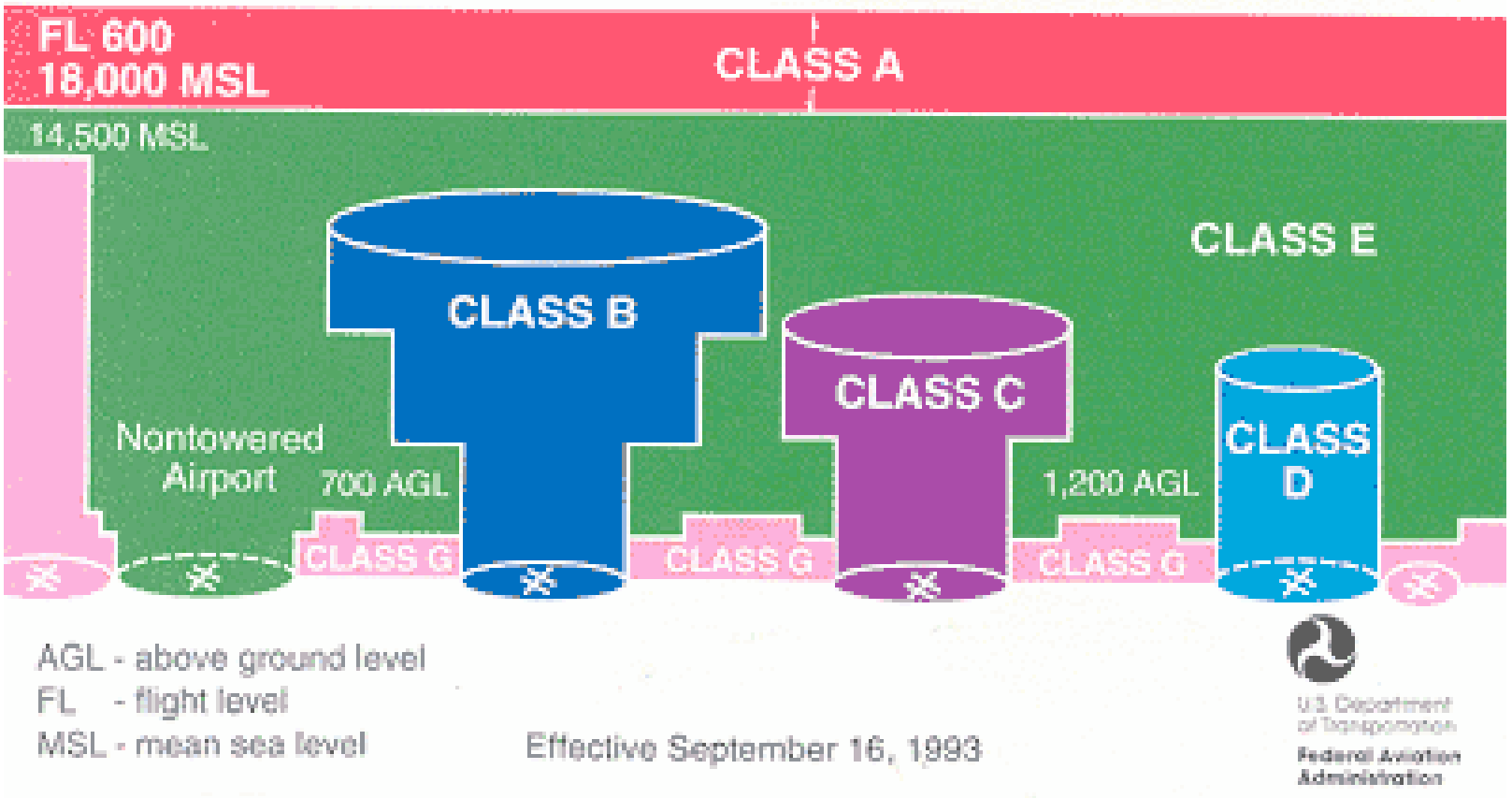
MIT Department of Aeronautics and Astronautics

Basic Concepts/Terms

- IFR = Instrument Flight Rules
- VFR = Visual Flight Rules
- IMC = Instrument Meteoroligical Conditions
- VMC = Visual Meteoroligical Conditions

- FAR Part 91 - General Operating Rules

US Airspace Classes



From: http://www.asy.faa.gov/safety_products/airspacecard.html

Service Characteristics of Airspace Classes

Airspace Classes	Communications	Entry Requirements	Separation	Special VFR in Surface Area
A	Required	ATC clearance	All	N/A
B	Required	ATC clearance	All	Yes
C	Required	Two-way communications prior to entry	VFR/IFR	Yes
D	Required	Two-way communication prior to entry	Runway operations	Yes
E	Not required for VFR	None for VFR	None for VFR	Yes
G	Not required	None	None	N/A

From: http://www.asy.faa.gov/safety_products/airspacecard.html

Airspace Class Characteristics

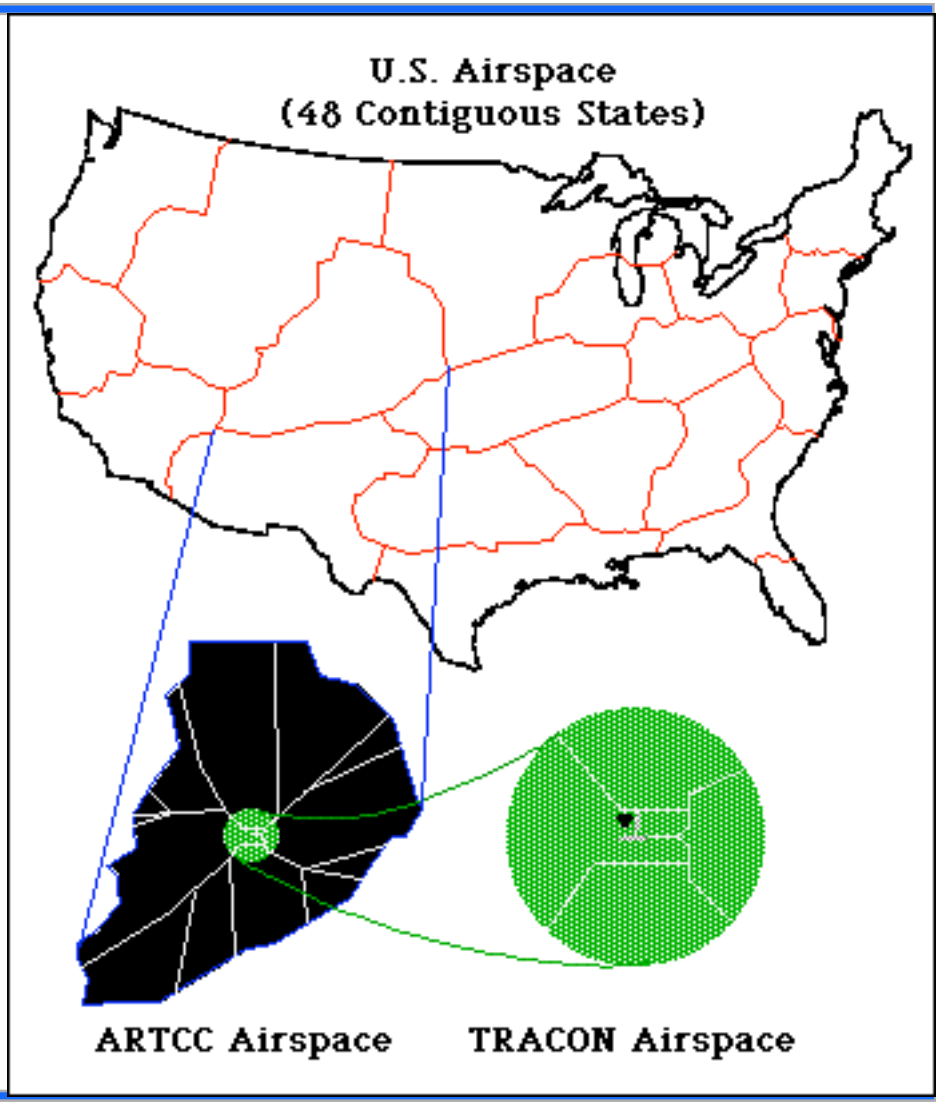
An Easy-to-Read Chart for VFR Flight

Airspace Features	Class A	Class B	Class C	Class D	Class E	Class G
Entry Requirements	ATC Clearance	ATC Clearance	Prior two-way communi-cations	Prior two-way communi-cations	None	None
Minimim Pilot Qualifications	Instrument rating	Private or student certificate location dependent	Student certificate	Student certificate	Student certificate	Student certificate
Two-way Radio Communications	Yes	Yes	Yes	Yes	Not required	Not required
Special VFR Allowed*	No	Yes	Yes	Yes	Yes	N/A
VFR Visibility Minimum	N/A	3 Statute miles**	3 Statute miles**	3 Statute miles**	3 Statute miles**	1 Statute mile**
VFR Minimum Distance from Clouds	N/A	Clear of clouds	500 feet below, 1,000 feet above, 2,000 feet horizontally**	500 feet below, 1,000 feet above, 2,000 feet horizontally**	500 feet below, 1,000 feet above, 2,000 feet horizontally**	Clear of clouds**
VFR Aircraft Separation	N/A	All	IFR	Runway operations	None	None
Traffic Advisories	Yes	Yes	Yes	Workload Permitting	Workload Permitting	Workload Permitting
Former Airspace Equivalent	Positive control area (PCA)	Terminal control area (TCA)	Airport radar service area (ARSA)	Airport traffic area and control zone	General controlled airspace	Uncontrolled airspace

From: http://www.asy.faa.gov/safety_products/airspaceclass.htm

Current Control Structure

- **Surface Control**
  - ❑ “Ground”
- **Local Control**
  - ❑ “Tower”
- **Terminal Area Control (TRACON)**
  - ❑ “Approach and “Departure”
- **Enroute Control (ARTCC)**
  - ❑ “Center”
- **Oceanic Control (FIR)**
  - ❑ “Oceanic”
- **Flow Control (ATCSCC)**
  - ❑ “Central Flow”



Example Flight

- **Logan KBOS > Washington Dulles KIAD**

Flight Plan Form

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

FLIGHT PLAN

(FAA USE ONLY) ☐ PILOT BRIEFING ☐ VNR ☐ STOPOVER | TIME STARTED | SPECIALIST INITIALS

1. TYPE	2. AIRCRAFT IDENTIFICATION	3. AIRCRAFT TYPE/ SPECIAL EQUIPMENT	4. TRUE AIRSPEED	5. DEPARTURE POINT	6. DEPARTURE TIME		7. CRUISING ALTITUDE
					PROPOSED (Z)	ACTUAL (Z)	
☐ VFR			KTS				
☐ IFR							
☐ DVFR							

8. ROUTE OF FLIGHT

9. DESTINATION (Name of airport and city)	10. EST. TIME ENROUTE		11. REMARKS
	HOURS	MINUTES	

12. FUEL ON BOARD		13. ALTERNATE AIRPORT(S)	14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE	15. NUMBER ABOARD
HOURS	MINUTES		17. DESTINATION CONTACT/TELEPHONE (OPTIONAL)	

16. COLOR OF AIRCRAFT

CIVIL AIRCRAFT PILOTS, FAR 91 requires you file an IFR flight plan to operate under instrument flight rules in controlled airspace. Failure to file could result in a civil penalty not to exceed $1,000 for each violation (Section 901 of the Federal Aviation Act of 1958, as amended). Filing of a VFR flight plan is recommended as a good operating practice. See also Part 99 for requirements concerning DVFR flight plans.

FAA Form 7233-1 (8-82) CLOSE VFR FLIGHT PLAN WITH _____ FSS ON ARRIVAL

Direct User Access Terminal (DUAT) Flight Plan

From: KBOS -- Boston MA (General Edward Lawrence Logan Intl
To: IAD -- Washington DC (Washington Dulles International
Alt.: FL240 Profile: LR-35
Time: Tue Sep 19 14:00 (UTC)

Routing options selected: Automatic low altitude airway.
Flight plan route:
PVD V475 LGA V433 ARD V210 V3 MXE
Flight totals: fuel: 111 gallons, time: 1:23, distance 369.7 nm.

```
   Ident  Type/Morse Code  |                    | Fuel
   Name or Fix/radial/dist |                   | Time
   Latitude Longitude Alt. | Route   Mag  KTS  Fuel | Dist
---+--------+---------+-----| Winds   Crs  TAS  Time |------
 1. KBOS   Apt.           | Temp    Hdg   GS  Dist |  0.0
   Boston MA (General Edwa |--------+----+---+------| 0:00
   42:21:51  71:00:18    0 | Direct          15.0 |  370
---+--------+---------+-----| 210/21  222  250  0:11 |------
 2. PVD    .--. ...-  -..  | +7 C    223  229    43 | 15.0
   d115.6 Providence       |--------+----+---+------| 0:11
   41:43:27  71:25:46  112 | V475            9.4 |  327
---+--------+---------+-----| 201/25  263  250  0:07 |------
 3. ORW    ---  .-.  .--    | -3 C    258  233    28 | 24.4
   d110.0 Norwich          |--------+----+---+------| 0:18
   41:33:22  71:59:57  183 | V475           11.1 |  299
---+--------+---------+-----| 200/25  259  266  0:09 |------
```

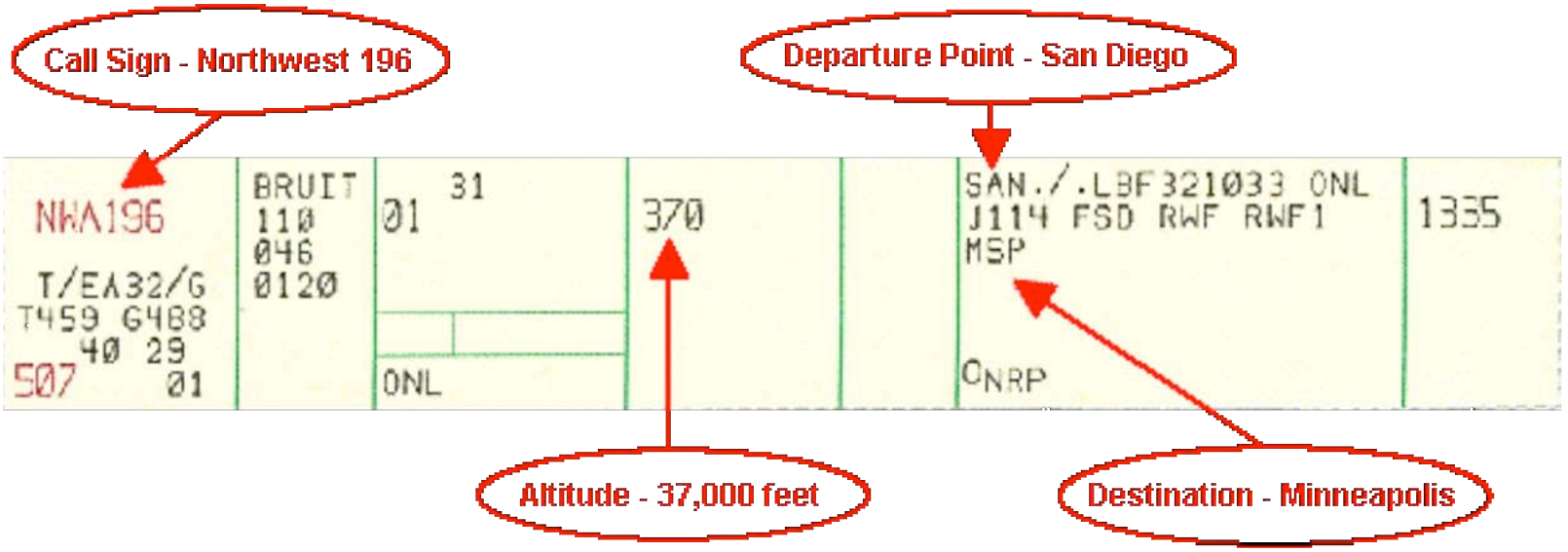
DUAT Flight Plan

(Preferred routes:
1 (H) GLYDE BAF J077 SAX J006 LRP V143 MULRR AML
Effective Time(s): 1100-0300

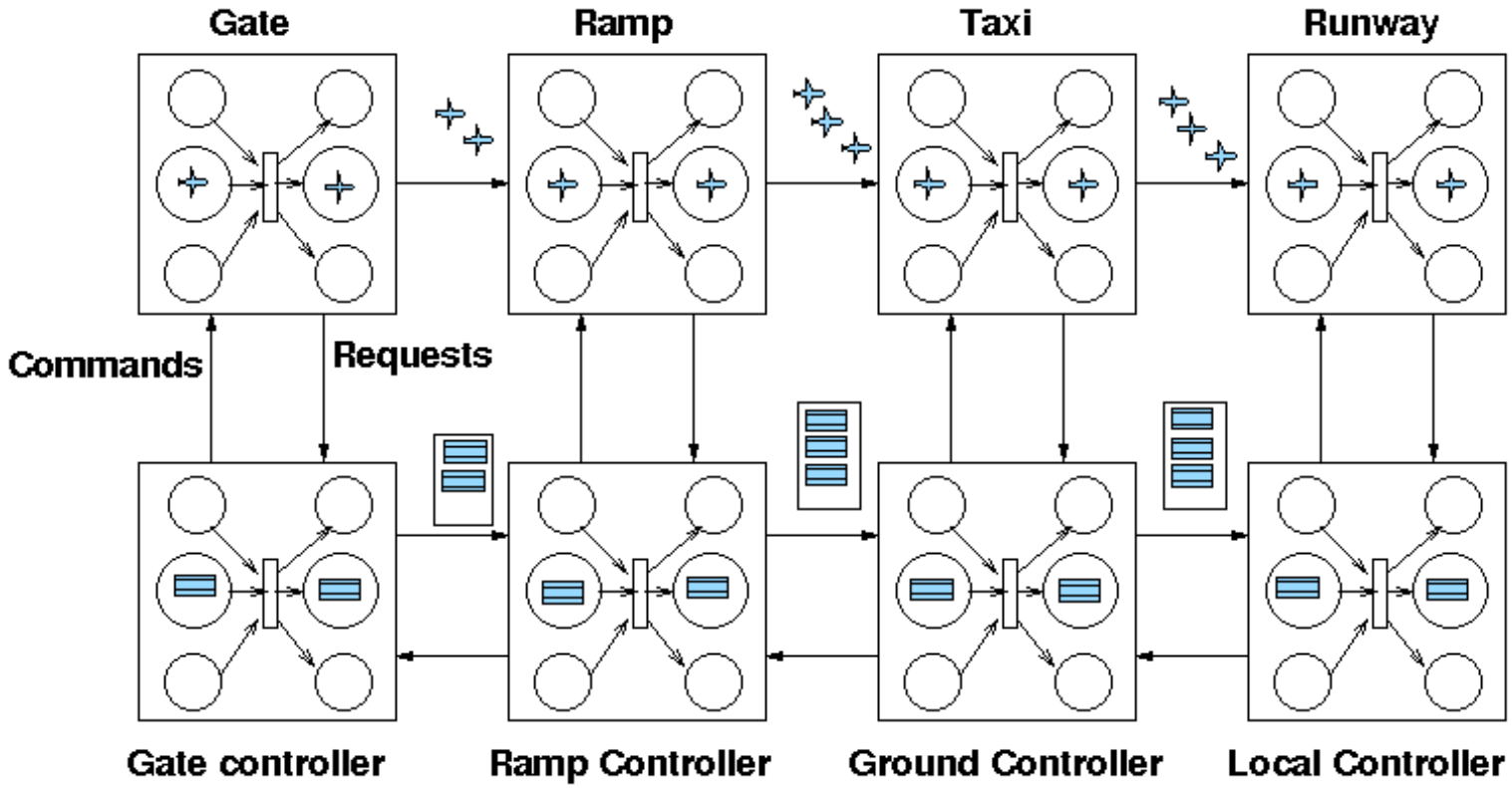
1	Type of flight plan:	IFR
2	Aircraft tail number:	N123LR
3	Acft type/special equip:	LJ35/K
4	True airspeed:	130
5	Departure point:	BOS
6	Departure time: (UTC)	Tue Sep 19 14:00
7	Altitude:	240
8	Route of flight:	PVD V475 LGA V433 ARD V210 V3 MXE
9	Destination:	IAD
10	Estimated time enroute:	0123
11	Remarks:	
12	Fuel on board:	0300
13	Alternate destination(s):	
14	Pilot's name:	ROBERT J HANSMAN
	Address:	MIT CAMBRIDGE MA 02139
	Phone no.:	
	Aircraft home base:	BED
15	Number aboard:	3
16	Color of aircraft:	W/R/GY
17	Dest contact name:	
	Phone no.:	

Flight plan accepted by DynCorp IS DUAT service and will be filed

Flight Progress Strip

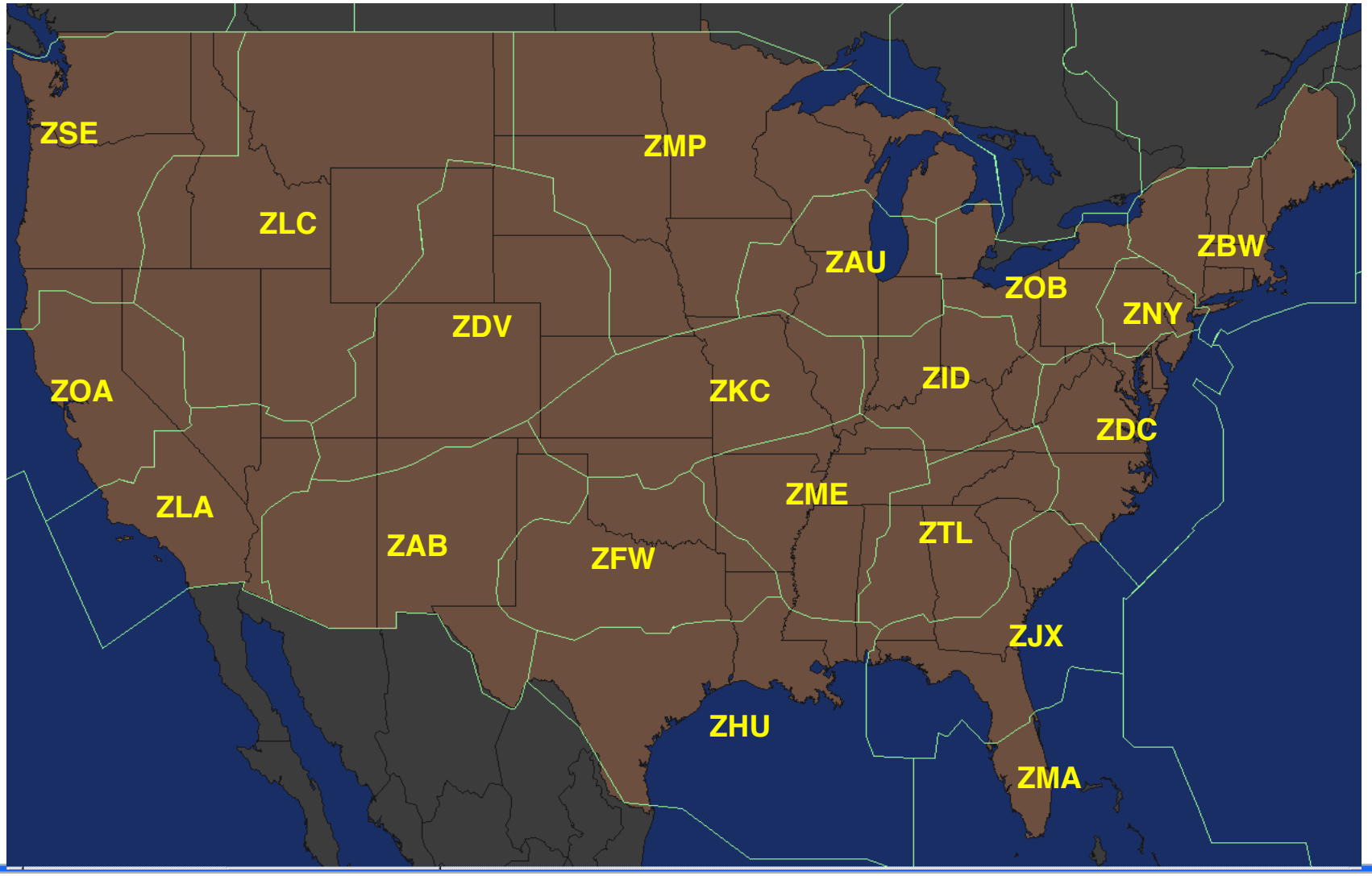


ATC Workload as a System Constraint



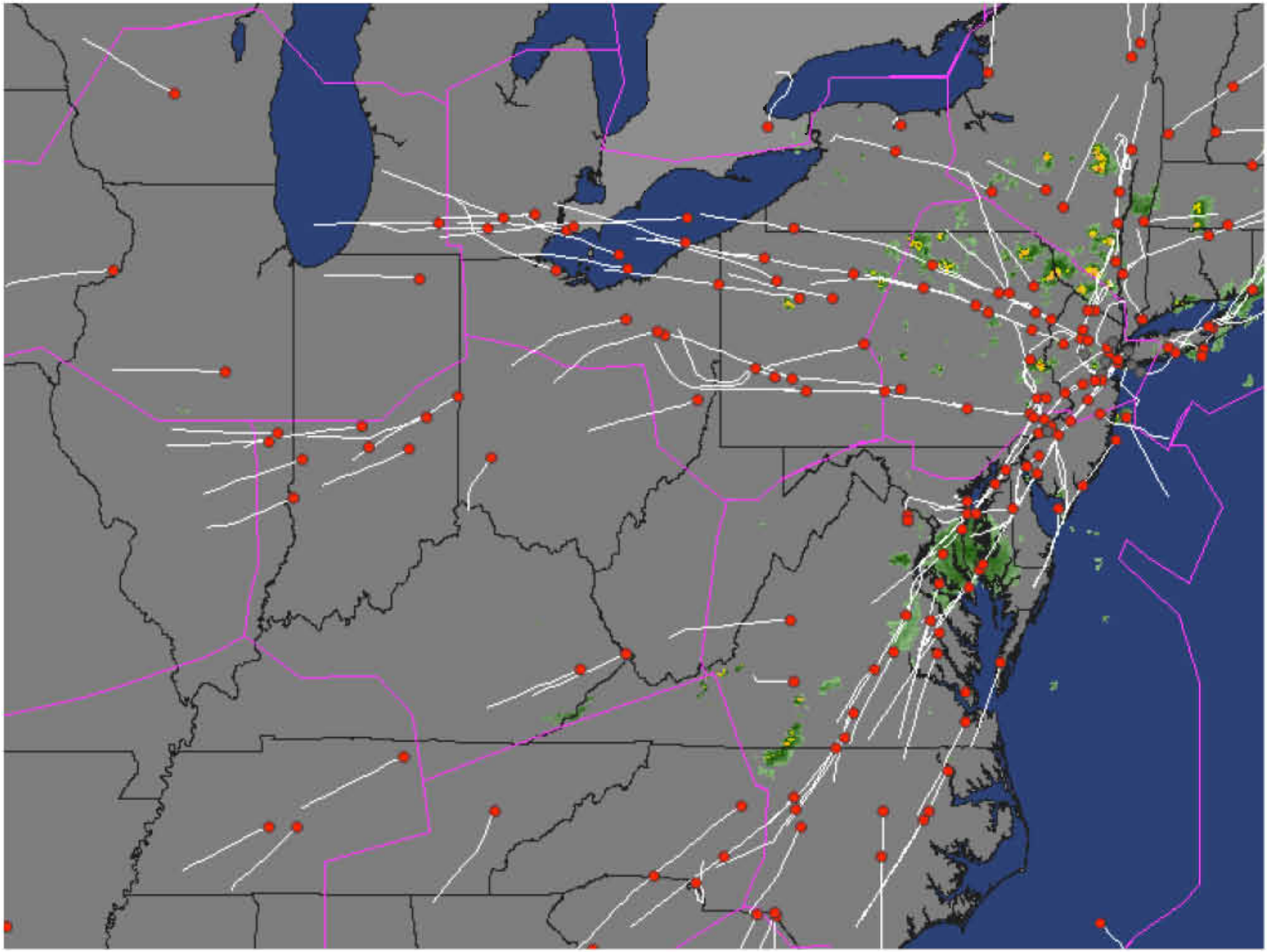
Clearance: PDC or CI Del, "Lear 123LR is cleared to IAD via Logan 5 Departure to PVD then as filed, climb and maintain 5000 expect FL 240 10 min after departure, squawk 3417. Contact Ground Control on 121.9 and advise ready to push"

US Air Route Traffic Control Center (ATRCC) Airspace - 20 Centers



Example Procedures

- **Altitude for Direction**
  - ❑ IFR, Even Thoustands Wesbbound, Odd Eastbound (0-179 Magnetic)
  - ❑ VFR +500
  - ❑ DRVSM above FL29
- **Radar Contact**
- **Transponders**
  - ❑ Codes
  - ❑ Mode C altitude verification
- **Hand Offs**
  - ❑ BOS, NY Transition LOAs
- **Lost Communication**
- **Holding Patterns**



Example Procedures

- **Weather and Flow Interruptions**
  - ❑ Traffic Flow Management
  - ❑ Collaborative Decision Making
  - ❑ Traffic Flow Management
- **Standard Flows**
- **Military and Restricted Airspace**
  - ❑ MOA, Restricted, Prohibited
- **Remote Sites**
  - ❑ Radar
  - ❑ Communication
- **Seperation Standards**
  - ❑ Enroute 5 Miles, 1000 ft
  - ❑ Terminal 3 miles, 1000 ft
  - ❑ Wake Vortex

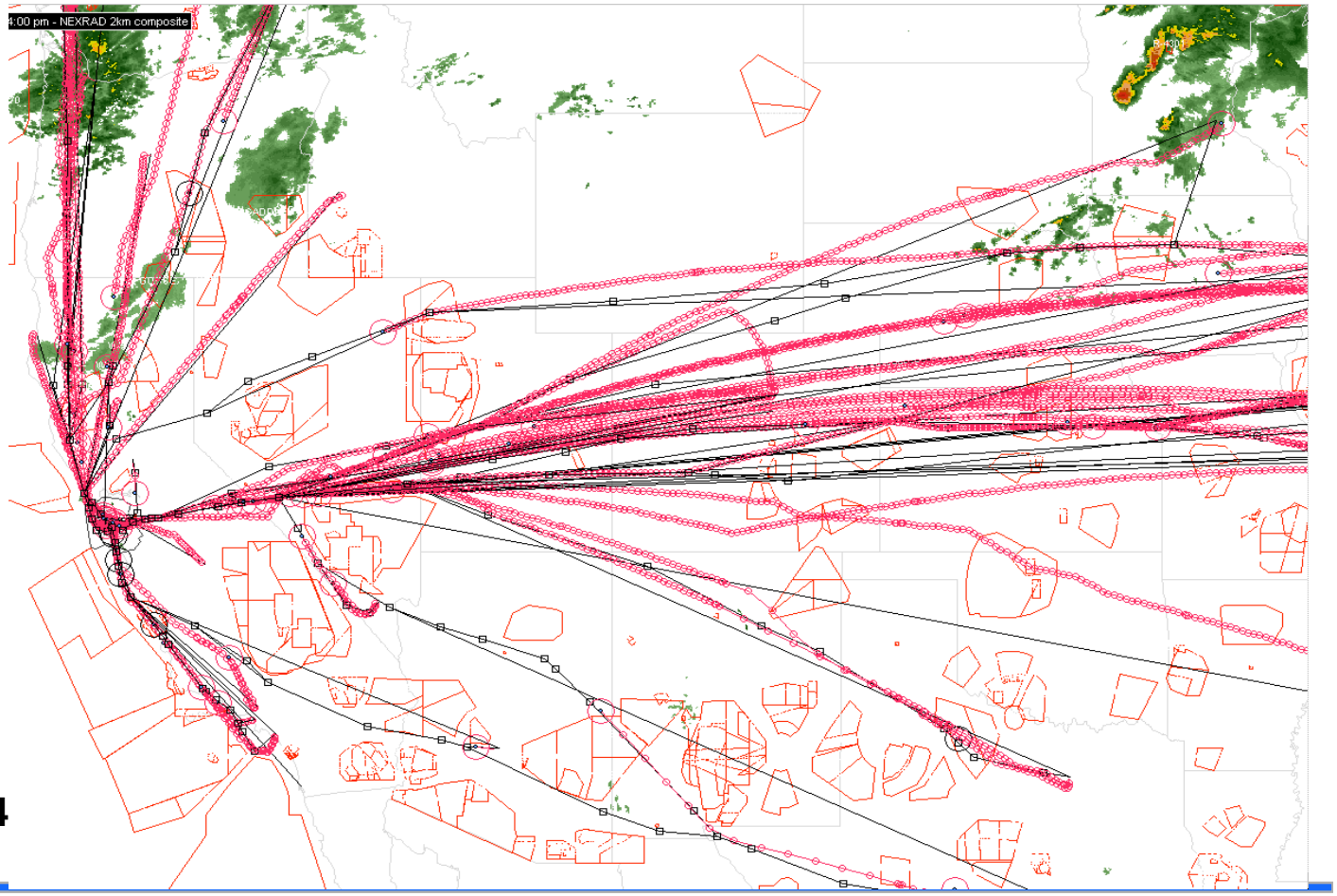
San Francisco

- Special use airspace provides additional constraints

Special Use Airspace

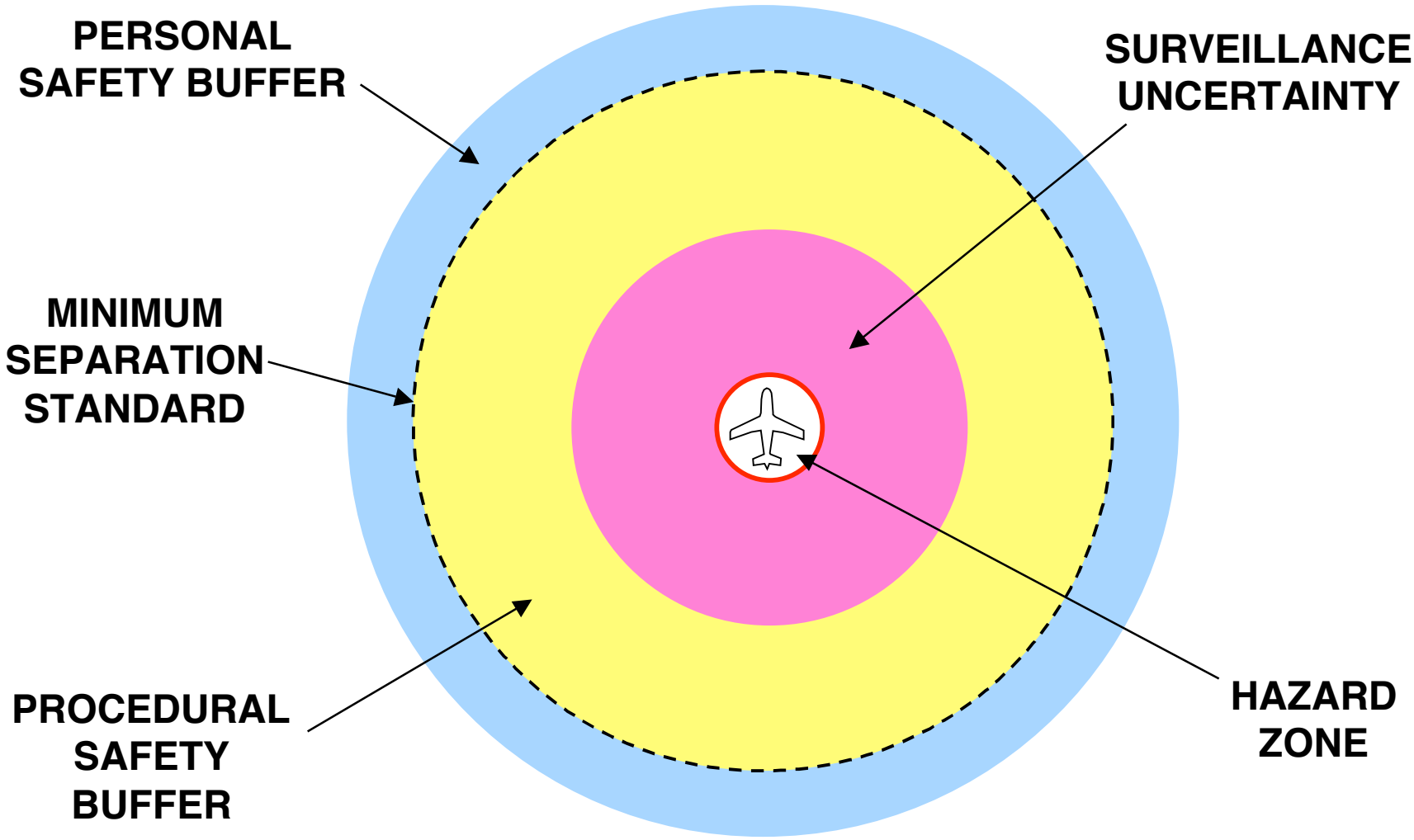
Route Flown

~~Flight Plan~~



- June 11, 2001 4

SEPARATION ASSURANCE CONSIDERATIONS



Flight Phase	Separation Minima	Selected Requirements[1]	Reference[2]	Controlling Factor
OCEANIC	LATERAL: 60-120 NM	Depends on speed and route (North Atlantic and Caribbean)	¶8-7-4 ¶8-8-4	Navigation accuracy, no radar
	or VERTICAL: 2000 ft	Above FL290 (non-RVSM)	¶8-7-2 ¶8-8-2	Altimetry accuracy
	1000 ft	Above FL290 (RVSM) or at or below FL290		
	or LONGITUDINAL: 10-60 minutes at track entry	Depends on speed and distance flown	¶8-3-3.e.	Navigation accuracy, no radar
EN ROUTE within the U.S.	LATERAL: 5 NM	Below FL 600, if multiple radar sensors (mosaic mode) radar or either aircraft more than 40 NM from antenna, and 60 NM for Mode S surveillance[3]	¶5-5-4	Radar resolution and update rate

Separation Requirements for Arrival (Same Runway)

- **Wake Turbulence Requirement**
  - ❑Radar Separation requirements

Trailing Aircraft

Leading Aircraft	Heavy	Large	Small
Heavy	4	5	5
B757	4	4	5
Large	3(2.5)	3(2.5)	4
Small	3(2.5)	3(2.5)	3(2.5)

  - ❑Visual Separation requirements
    - ◆ Pilots Discretion
- **Preceding arrival must be clear of runway at touchdown**
  - ❑Runway Occupancy time