



158th Fighter Wing  
Vermont Air National Guard



**M.A.C.A. MID-AIR COLLISION AVOIDANCE**  
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# 158th Fighter Wing Vermont Air National Guard



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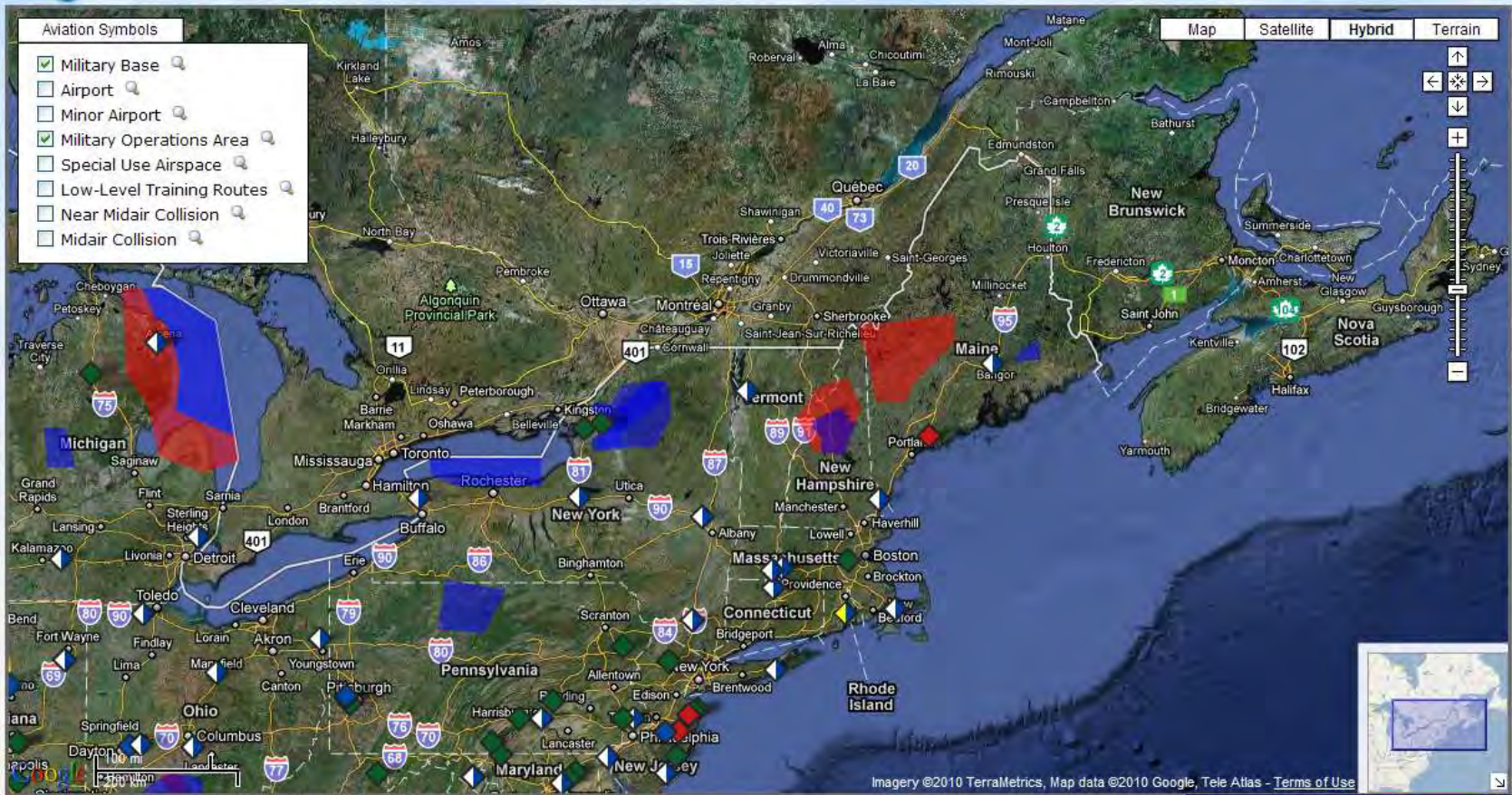
[Admin](#) >



START HERE

Search ICAO, Region or City Here

Select Map



Current Mouse Position - Latitude/Longitude : 43.786958, -79.145508  
Current Zoom Level: 6

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# 158th Fighter Wing Vermont Air National Guard



**Aviation Symbols**

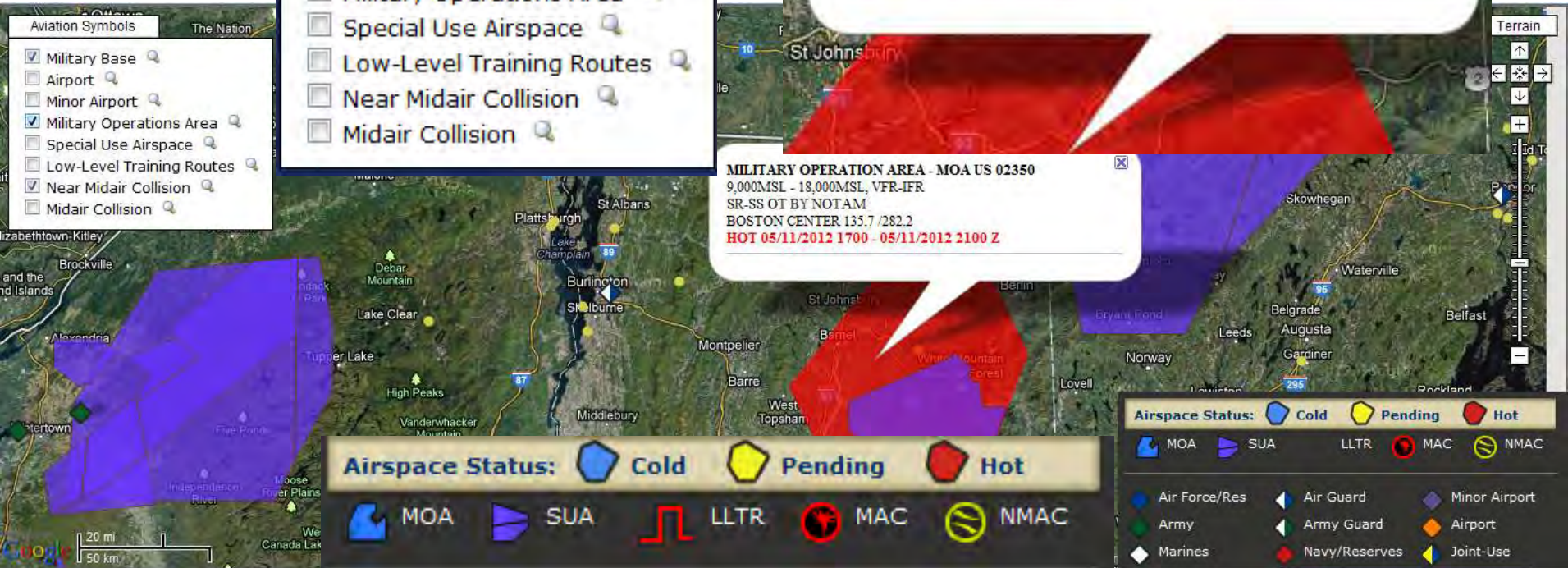
- Military Base
- Airport
- Minor Airport
- Military Operations Area
- Special Use Airspace
- Low-Level Training Routes
- Near Midair Collision
- Midair Collision

**MILITARY OPERATION AREA - MOA US 02350**  
 9,000MSL - 18,000MSL, VFR-IFR.  
 SR-SS OT BY NOTAM  
 BOSTON CENTER 135.7 /282.2  
**HOT 05/11/2012 1700 - 05/11/2012 2100 Z**

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**Airspace Status:** Cold Pending Hot

MOA SUA LLTR MAC NMAC

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MOA SUA LLTR MAC NMAC

Air Force/Res Air Guard Minor Airport  
 Army Army Guard Airport  
 Marines Navy/Reserves Joint-Use

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 Marines Navy/Reserves Joint-Use



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## Military Operating Areas (MOAs)

- Local MOAs -Viper, Yankee, Condor
- Check aeronautical charts for airspace limits
- Areas under the control of Boston ARTCC
- Center, nearest FSS and NOTAMs can advise you of their use
- Expect “training activities necessitating acrobatic or abrupt flight maneuvers” (AIM 3-4-5)
- Speeds in excess of 500 KIAS
- Up to 6 F-16s operating simultaneously, sometimes with other aircraft types



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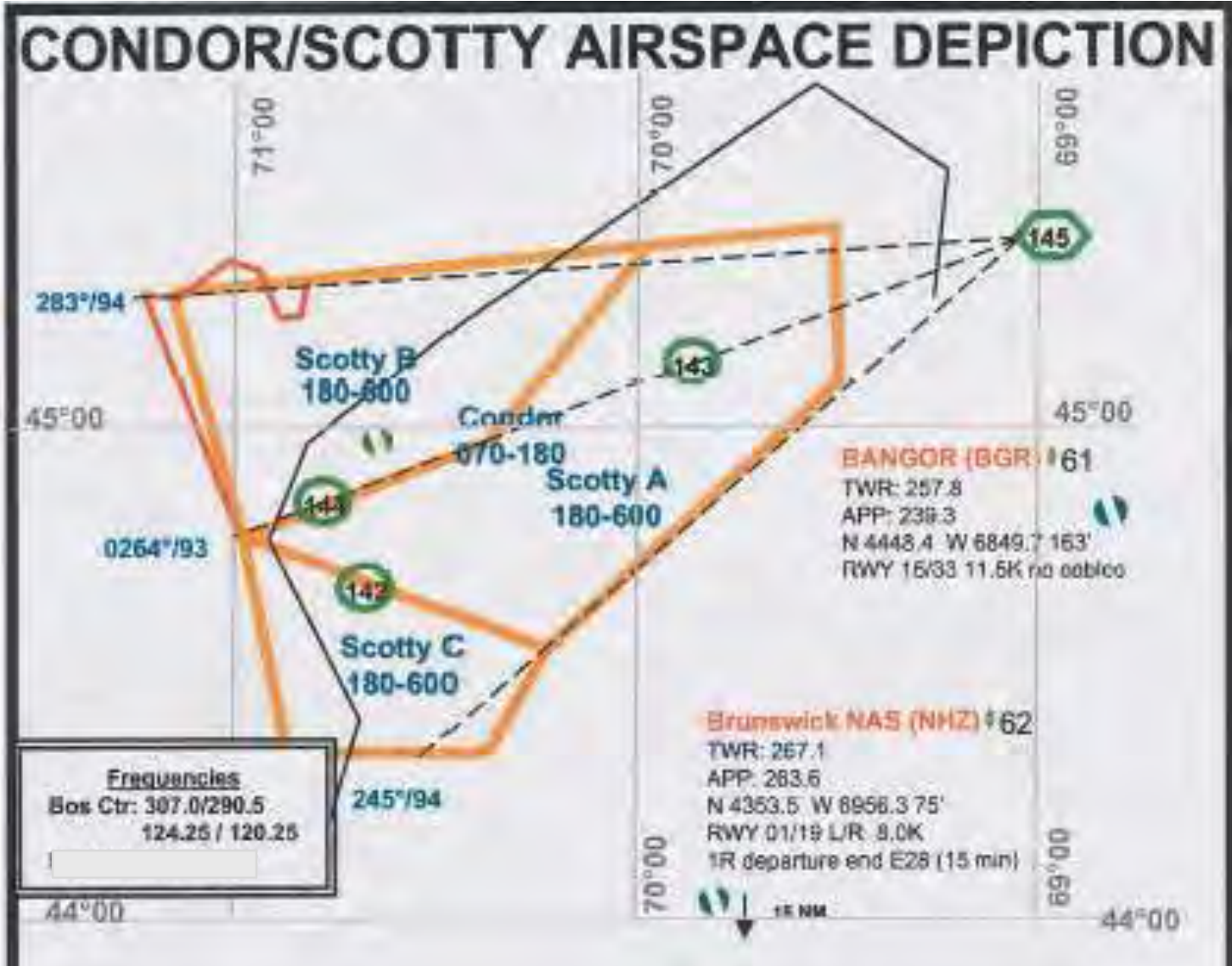
## Military Operating Areas (MOAs)

- IFR traffic may be cleared through if IFR separation may be provided, otherwise rerouted
- **VFR traffic** should “exercise extreme caution” (AIM 3-4-5). **It is best to avoid while active!**
- Active/inactive status can change frequently.
- **Contact the controlling agency for advisories prior to entering (Boston center 135.70, 123.875, 135.25) (AIM 3-4-5.c.)**
- **Contact any FSS within 100 miles to obtain accurate real-time information (AIM 3-4-5.c.)**





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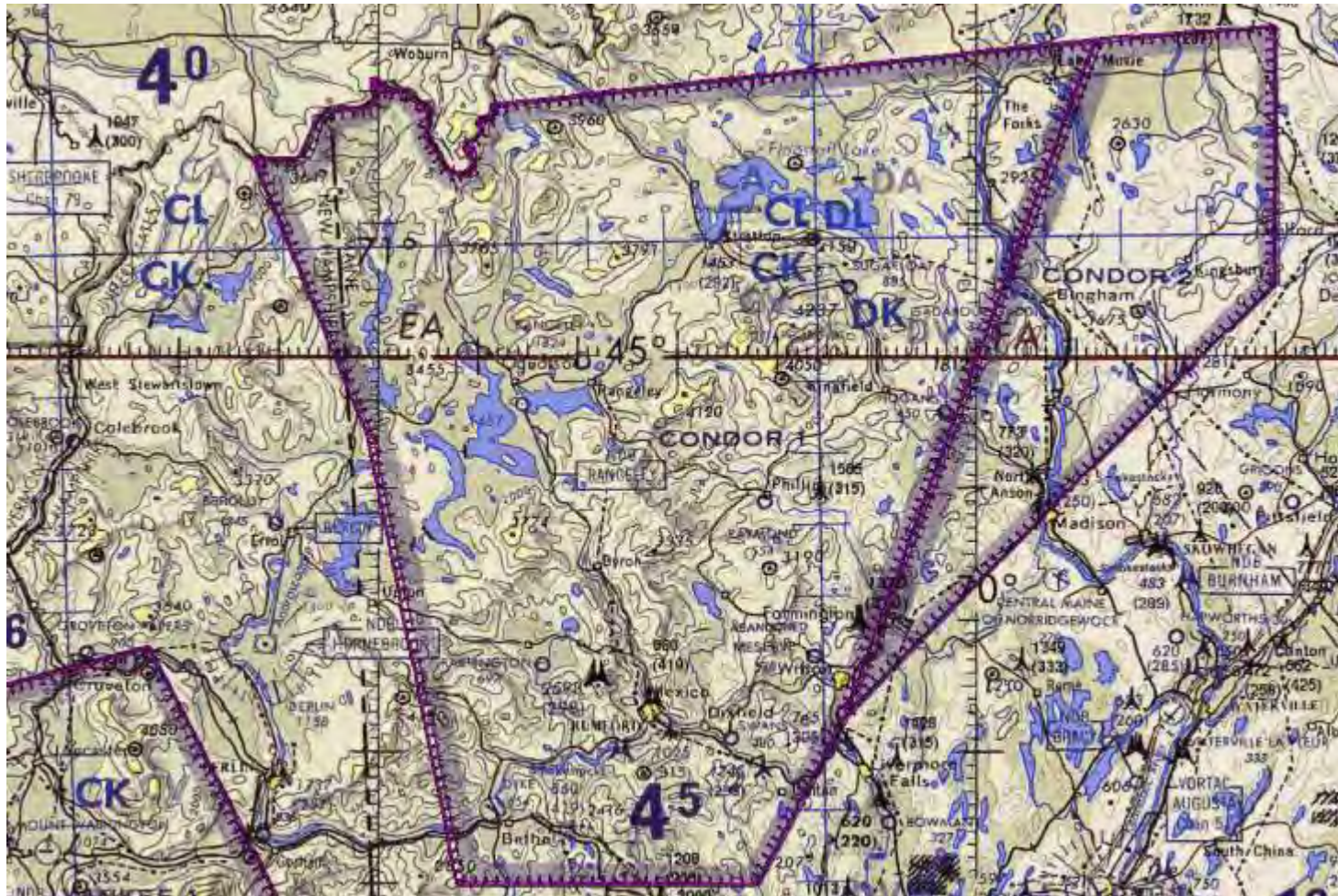




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## MACA – CONDOR MOA







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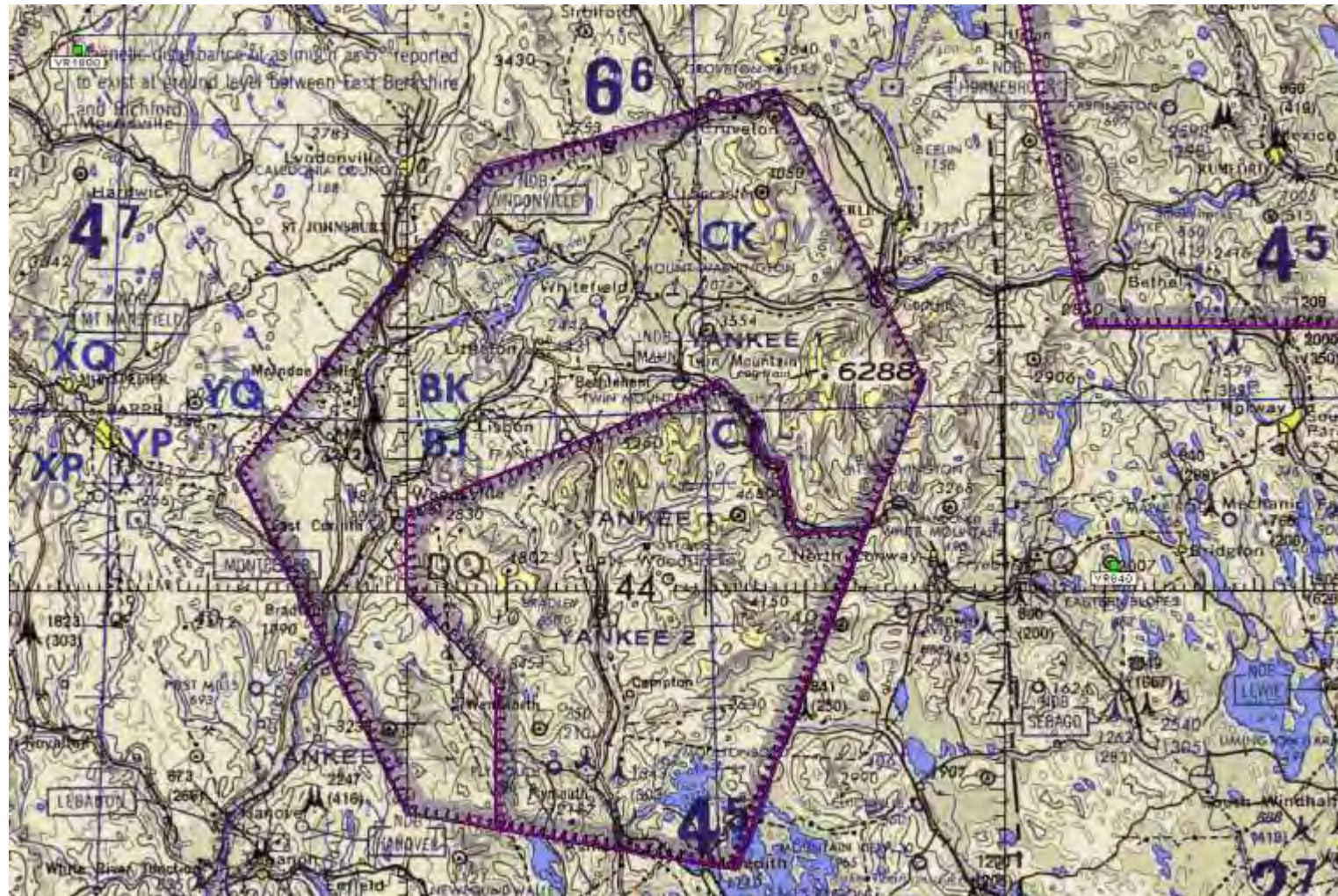




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## MACA – YANKEE MOA



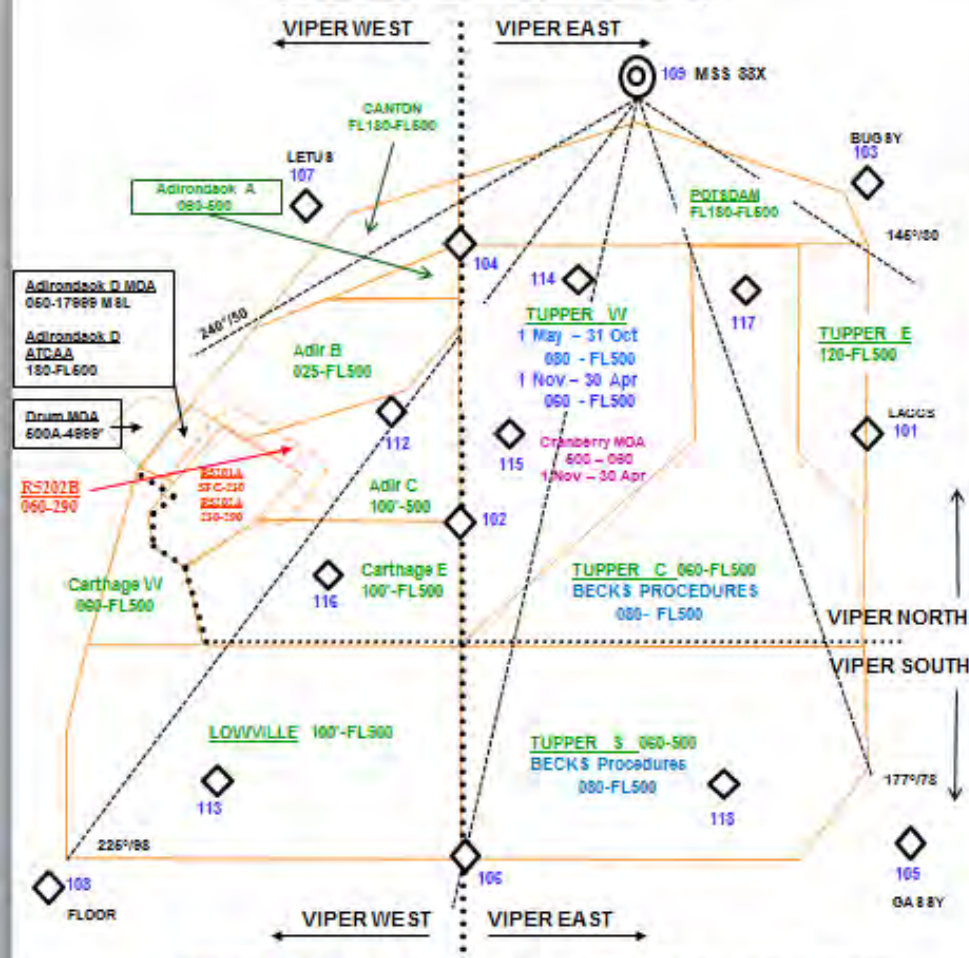




# 158th Fighter Wing



## VIPER AIRSPACE



**BECK'S PROCEDURES:** Tupper Central and South Base Altitude 8k MSL. Boston Ctr will advise. May be implemented 1 Nov - 30 April.

Frequencies		
Bos Ctr: 323.0	(U-8)	123.875 (U-8)

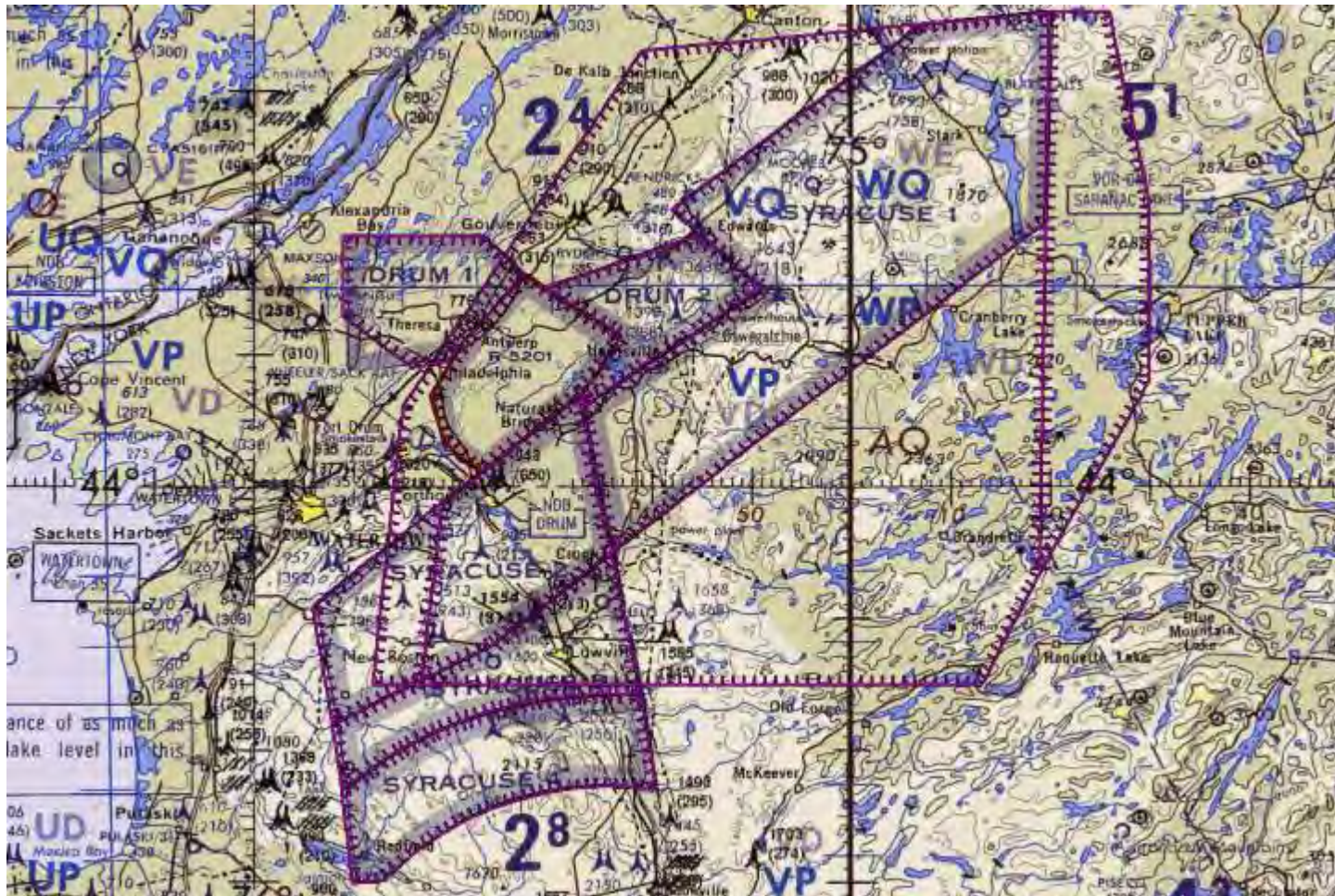




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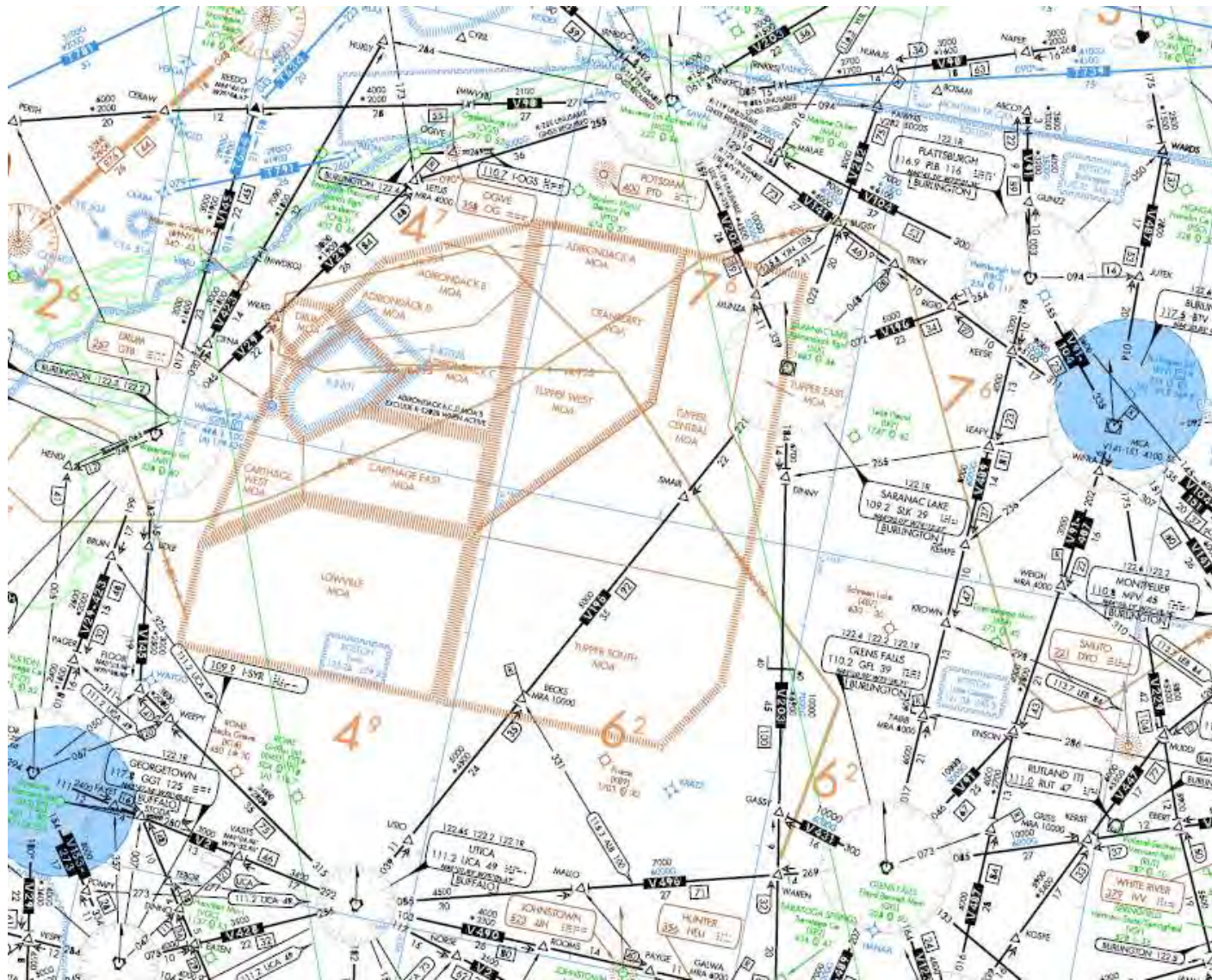
## MACA – VIPER MOA (dated map)







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## Military Training Routes (MTRs)

- **AIM Para 3-5-2:**

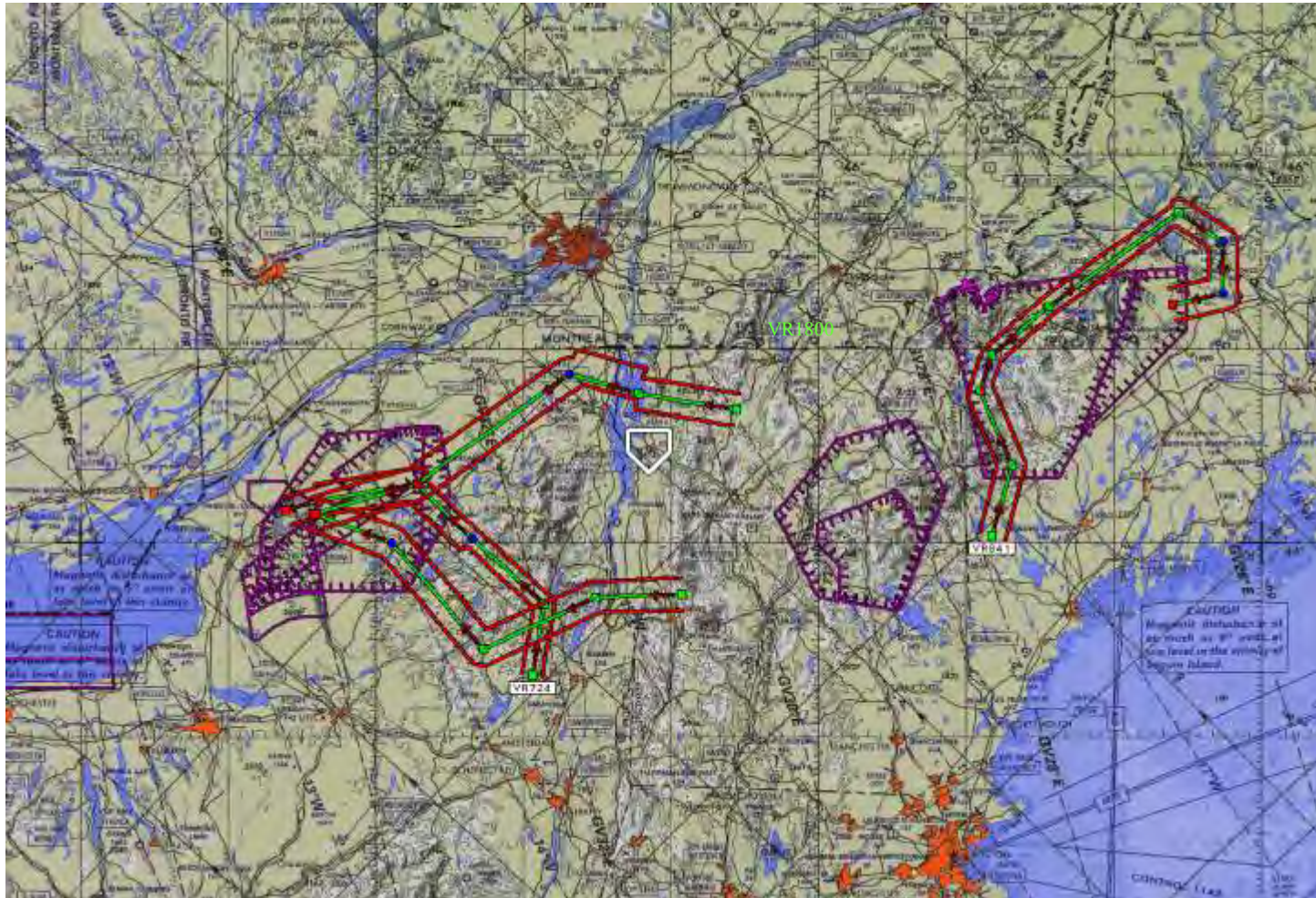
National Security depends largely on the deterrent effect of our airborne military forces. To be proficient, the military services must train in a wide range of airborne tactics. One phase of this training involves “low level” combat tactics. The required maneuvers and high speeds are such that they may occasionally make the see-and-avoid aspect of VFR flight more difficult without increased vigilance. In an effort to ensure the greatest practical level of safety for all flight operations, the MTR program was conceived.



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## MACA – LOW LEVELS







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## Military Training Routes

- **VR Routes (VMC 3000/5)**
  - **500' AGL to 1500' AGL (four numbers – VR1800/1801)**
  - **500' AGL to \_\_\_\_\_ (three numbers - VR725/840)**
    - **VR840 A - B TO 5000 MSL**
    - **VR840 B - C TO 6000 MSL**
    - **VR840 C - D TO 7000 MSL**
    - **VR840 D - E TO 8000 MSL**
    - **VR840 E - F TO 9000 MSL**
    - **VR840 F - G TO 10,000 MSL**
    - **VR840 G - H TO 11,000 MSL**
    - **VR840 H - I TO 12,000 MSL**
- **TYPICALLY 480 KIAS**
- **CAN BE HIGHER**



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## Military Training Routes

- 2 to 4 F-16s in tactical formations
  - spread to 9000' laterally and several miles in trail
- F-16 - difficult to see
- Nonparticipating aircraft:
  - Not prohibited, exercise "extreme vigilance" when flying through or near (AIM 3-5-2)
  - **It is best to avoid while active!**
  - Contact Boston Center, FSS to obtain current info
  - Route altitudes vary
  - Route width varies, can extend several miles either side of centerline
  - Most are uni-directional: clear before you cross, get across quick!

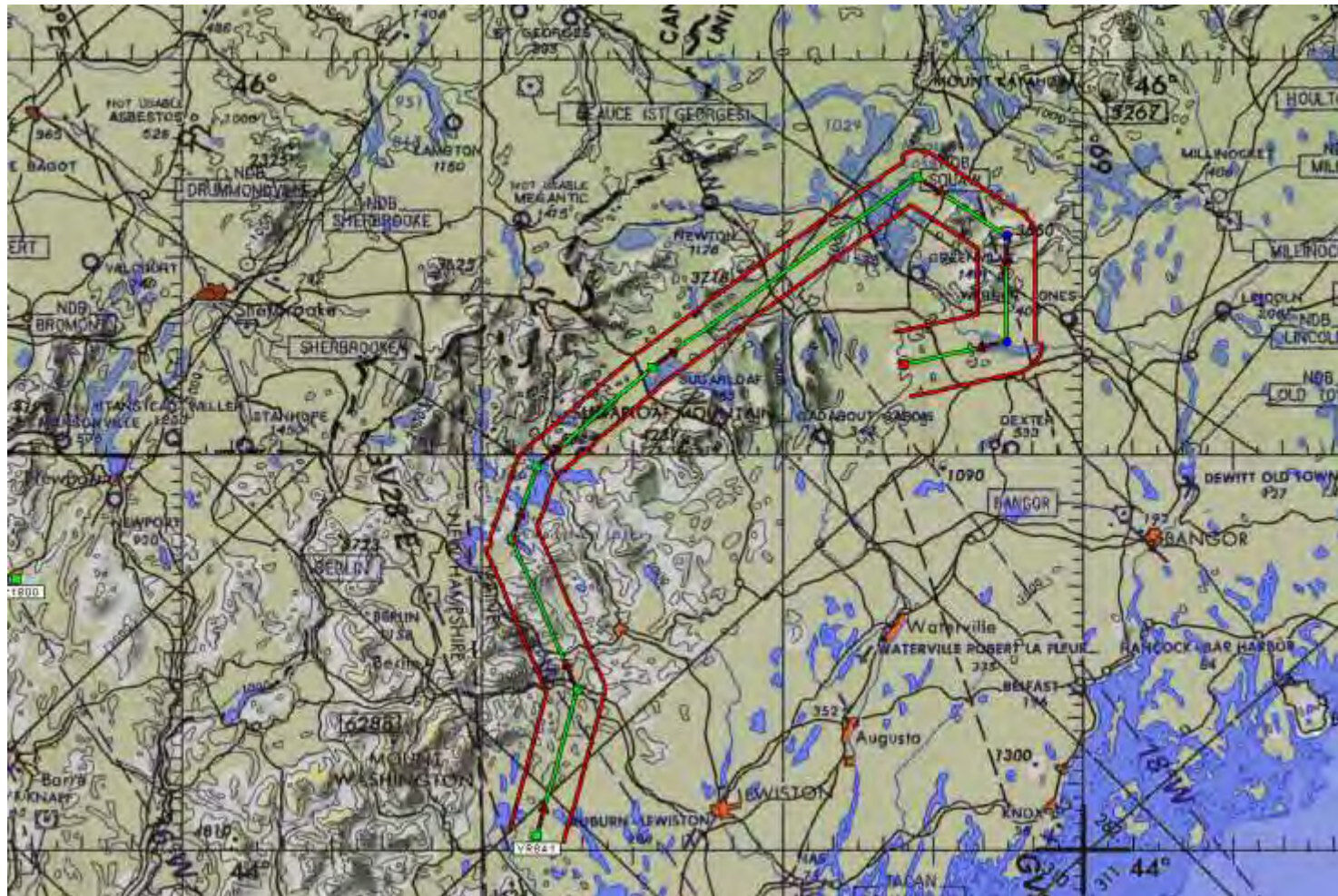




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## MACA – VR 840



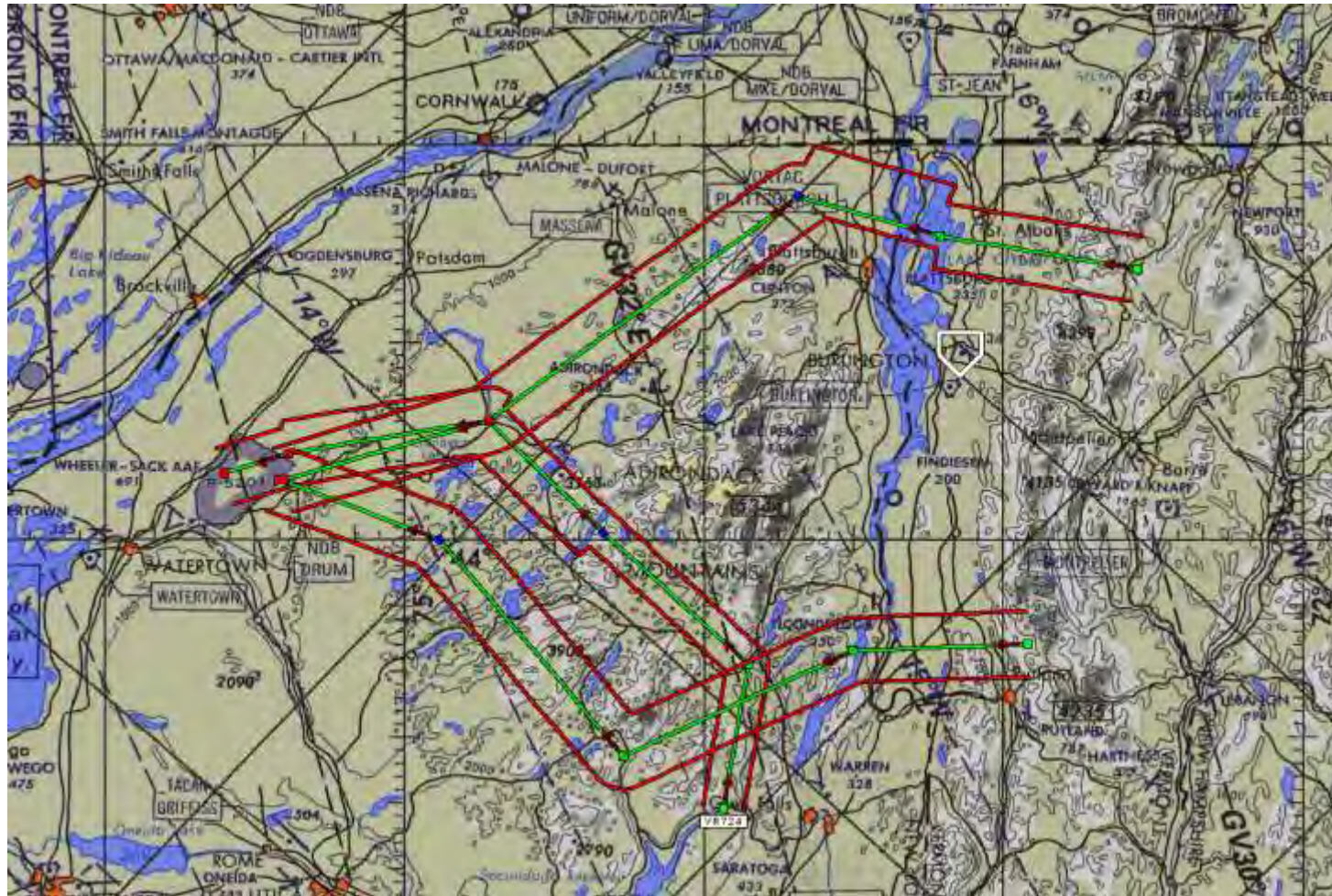




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## MACA – VR 1800/1801/725







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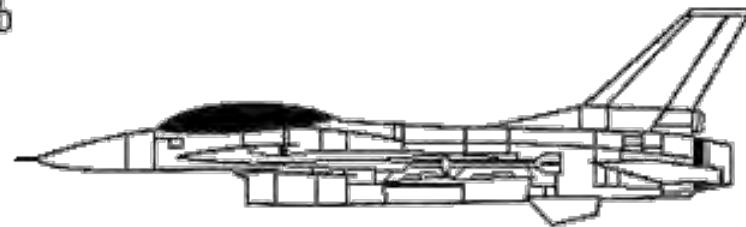
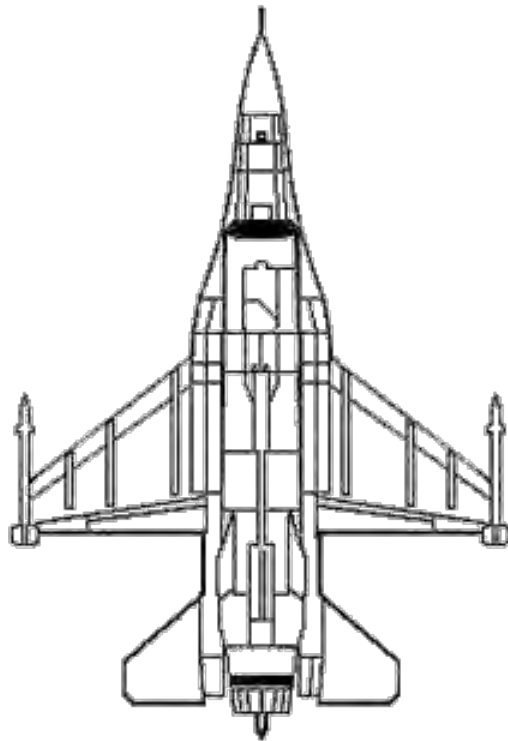


## General Dynamics F-16 Fighting Falcon

The F-16 is an all weather, single engine, single seat, multi-role fighter capable of speeds of MACH 2 +. It has a mid-wing configuration and a very tight turn radius. The 158 Fighter Wing (VTANG) flies F-16s out of Burlington International Airport. They usually fly in formation so if you see one, look for others!



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**Wingspan: 33 feet**

**Length: 49 feet**

**Maximum takeoff weight: 37,500 Lbs**

**Maximum cruise speed: 500+ KIAS**

**Approach speed: 150-180 KIAS**

**VHF radio: yes**

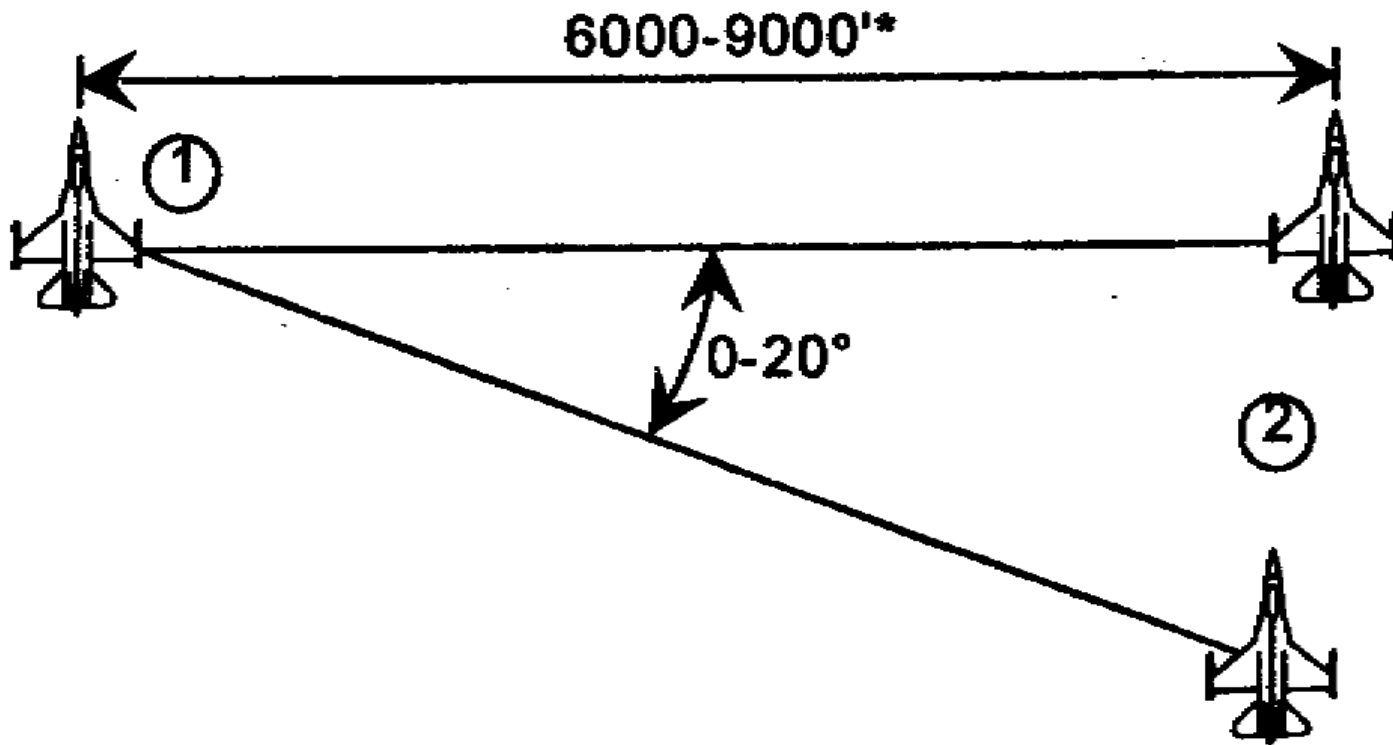
**Color: Gray**



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## 2 Ship Formation



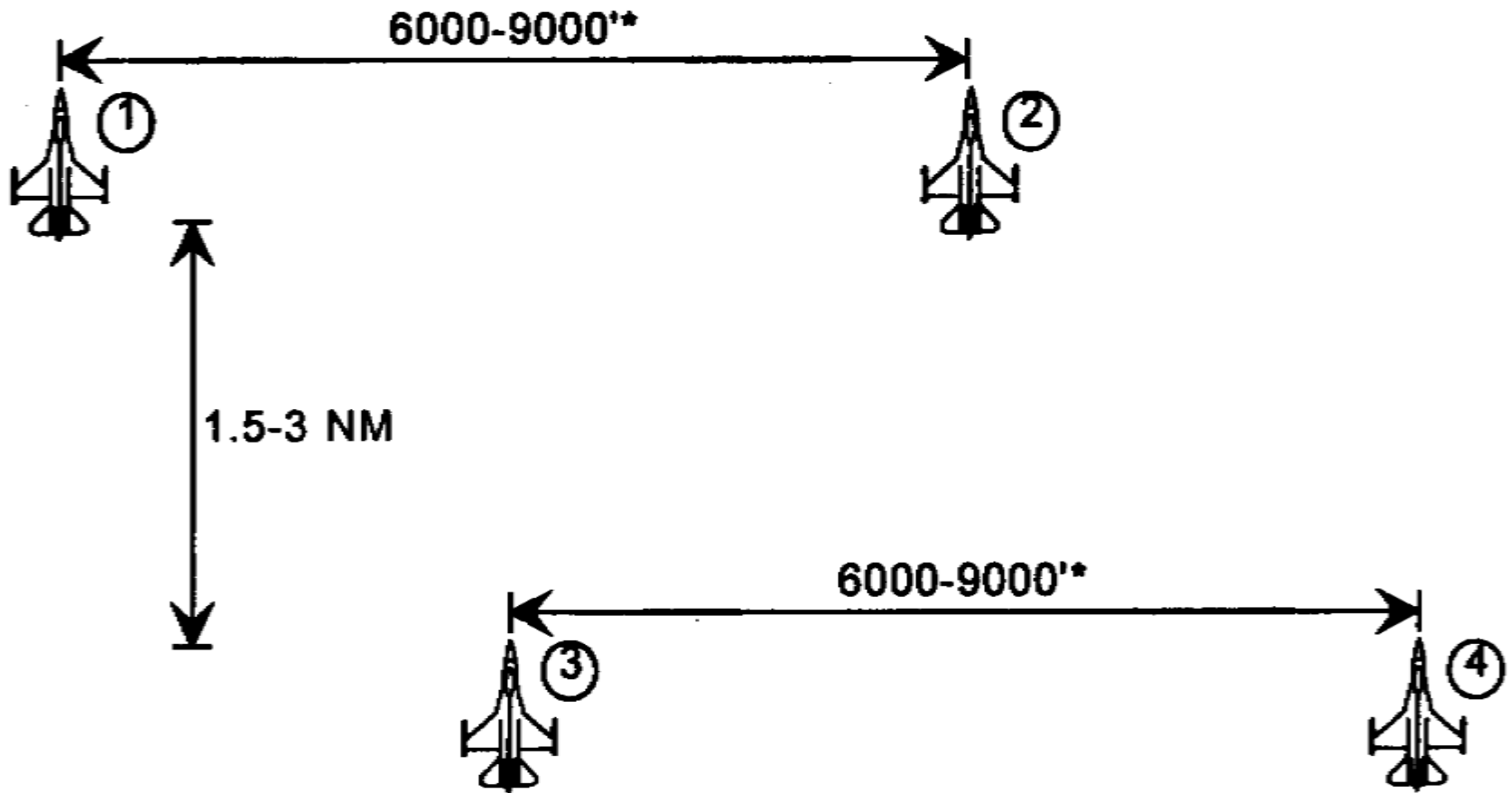




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## Four Ship Container

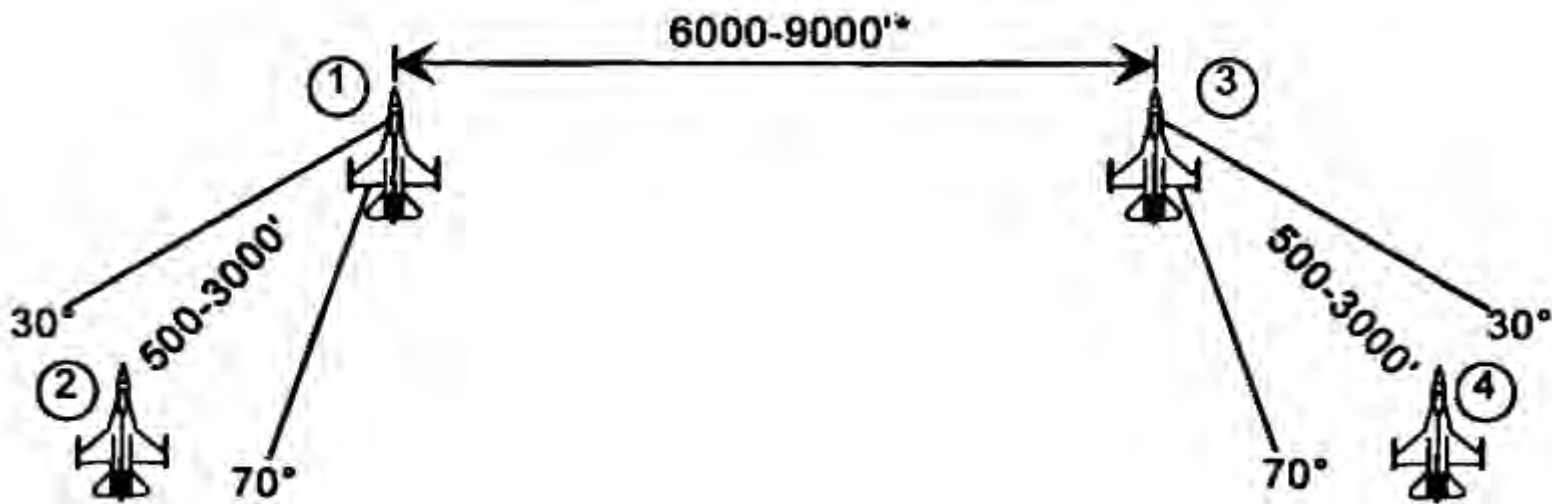




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## Fluid Four







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## Traffic Pattern Operations

- **IFR Departures - Runway HDG to 10,000' MSL**
- **Radar Traffic Pattern, Approaches**
- **45 degree entry to Initial at 2300' MSL**
- **Initial at 2300' MSL**
- **Downwind/Closed Pattern at 1800' MSL**
- **350 KIAS on departure, 300/350 KIAS on recovery**



# PATTERN PROCEDURES

Must be able to maintain VFR cloud clearances

## TAC RECOVERY

- Request through ATC.
- Entry: North/South High
  - 7-10 NM
  - 7 – 10K MSL Min.
  - Extended Centerline
- ≤ 350 kts
- 4k LAB
- Wingman to the West
- At or above **2800' MSL** UNTIL DOWNWIND then, **1800' MSL**

## OVERHEAD

INITIAL: **2300' MSL @ 3**

### EAST BREAK

**1800' MSL** on downwind

## CLOSED PATTERN

**1800' MSL**

**PATTERN  
BREAKOUT:**  
**2300' MSL**

**STRAIGHT - IN  
BREAKOUT:**  
**1800' MSL**

**SFO  
BREAKOUT:**  
**3300' MSL**

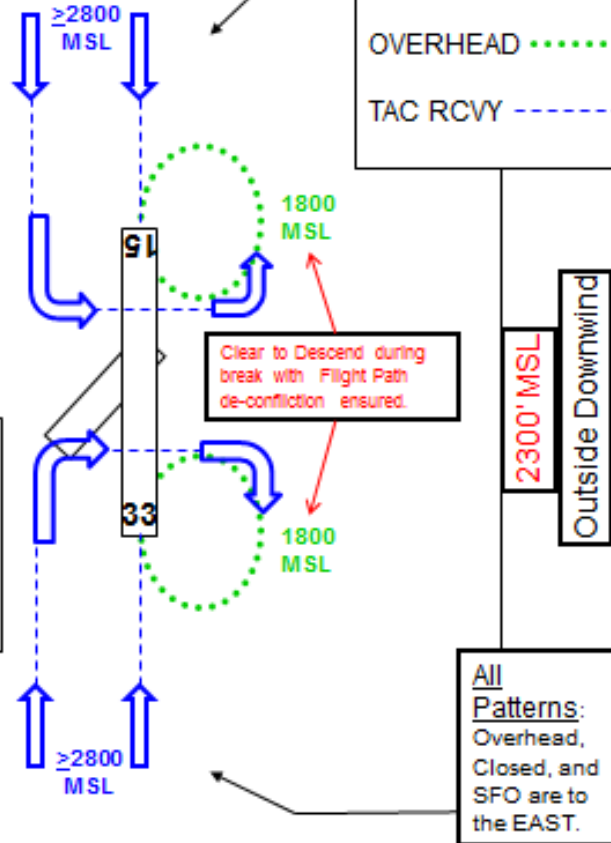
## NOISE ABATEMENT:

- TAC Recovery will be the **PRIMARY** recovery using the lowest possible power setting.
- Low approaches only for safety of flight or with Top 3 approval.

## LEGEND

OVERHEAD ..... (dotted green line)

TAC RCVY - - - - (dashed blue line)



All  
Patterns:  
Overhead,  
Closed, and  
SFO are to  
the EAST.

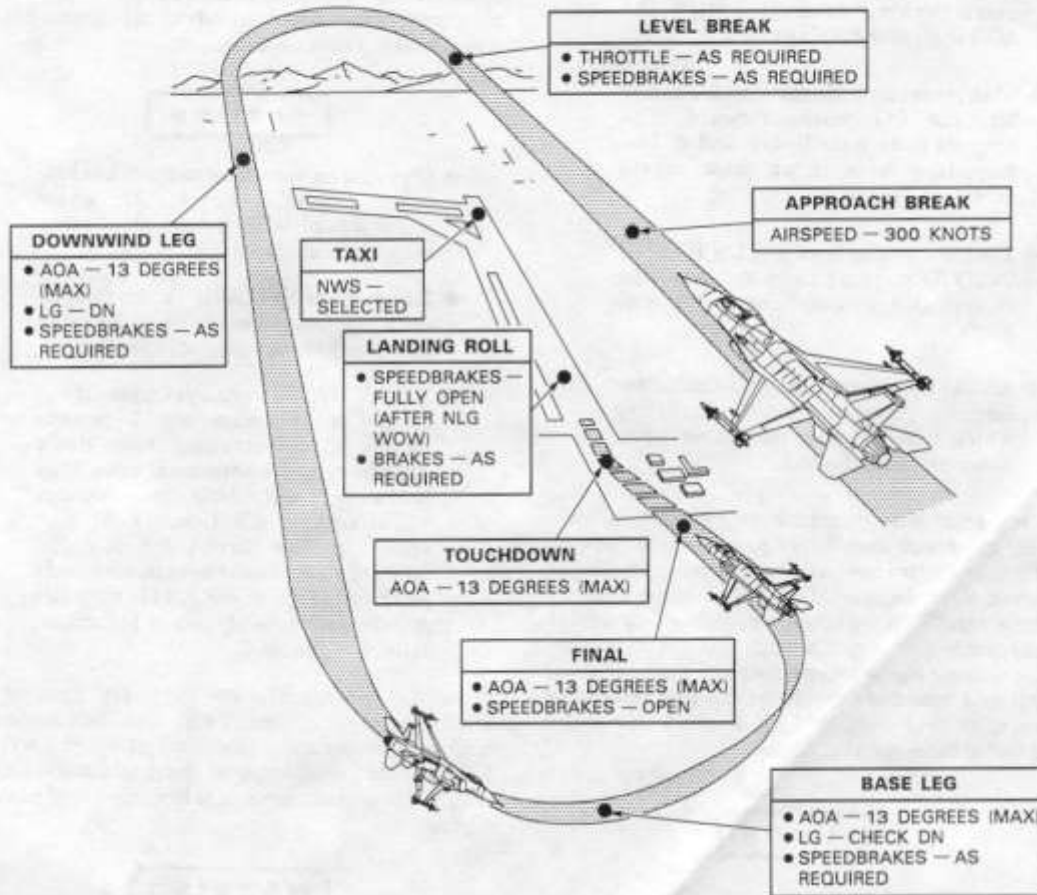




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## Normal Landing Pattern (Typical)





# SFO PROCEDURES

Prior Approval from Top 3 Required for SFO at BTV

\* Request Key Positions from Approach and/or Tower

**WEATHER MINS**  
1000' ABOVE  
PLANNED SFO ENTRY  
ALTITUDE AND  
5 MILES VIS.

## STRAIGHT - IN

\*NORTH HIGH  
Rwy 15

7-10 NM  
7000-10,000 MSL

**DO NOT HOLD AT:**  
**LOW KEY**  
**BASE KEY**

**SFO BREAKOUT**  
DESCEND NO  
LOWER THAN:  
**3300 MSL**  
Proceed to Initial or  
as directed

**OVERHEAD SFO**  
**MANEUVER TO THE**  
**EAST**

**\*HIGH KEY**  
**7,000 - 10,000 MSL**

**\*LOW KEY**  
**3,500 - 5,500 MSL**

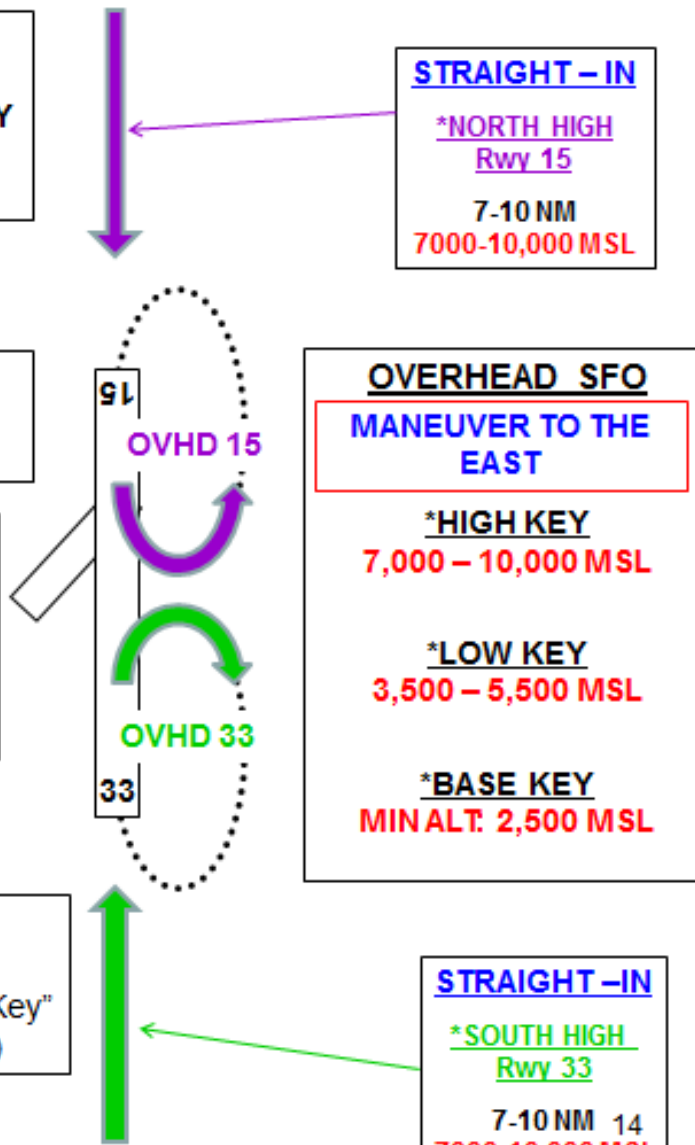
**\*BASE KEY**  
**MIN ALT: 2,500 MSL**

**COMM**  
Pilots will report:  
"High / Low / Base Key"  
"5nm" (Straight - In)

## STRAIGHT - IN

\*SOUTH HIGH  
Rwy 33

7-10 NM 14  
7000-10,000 MSL



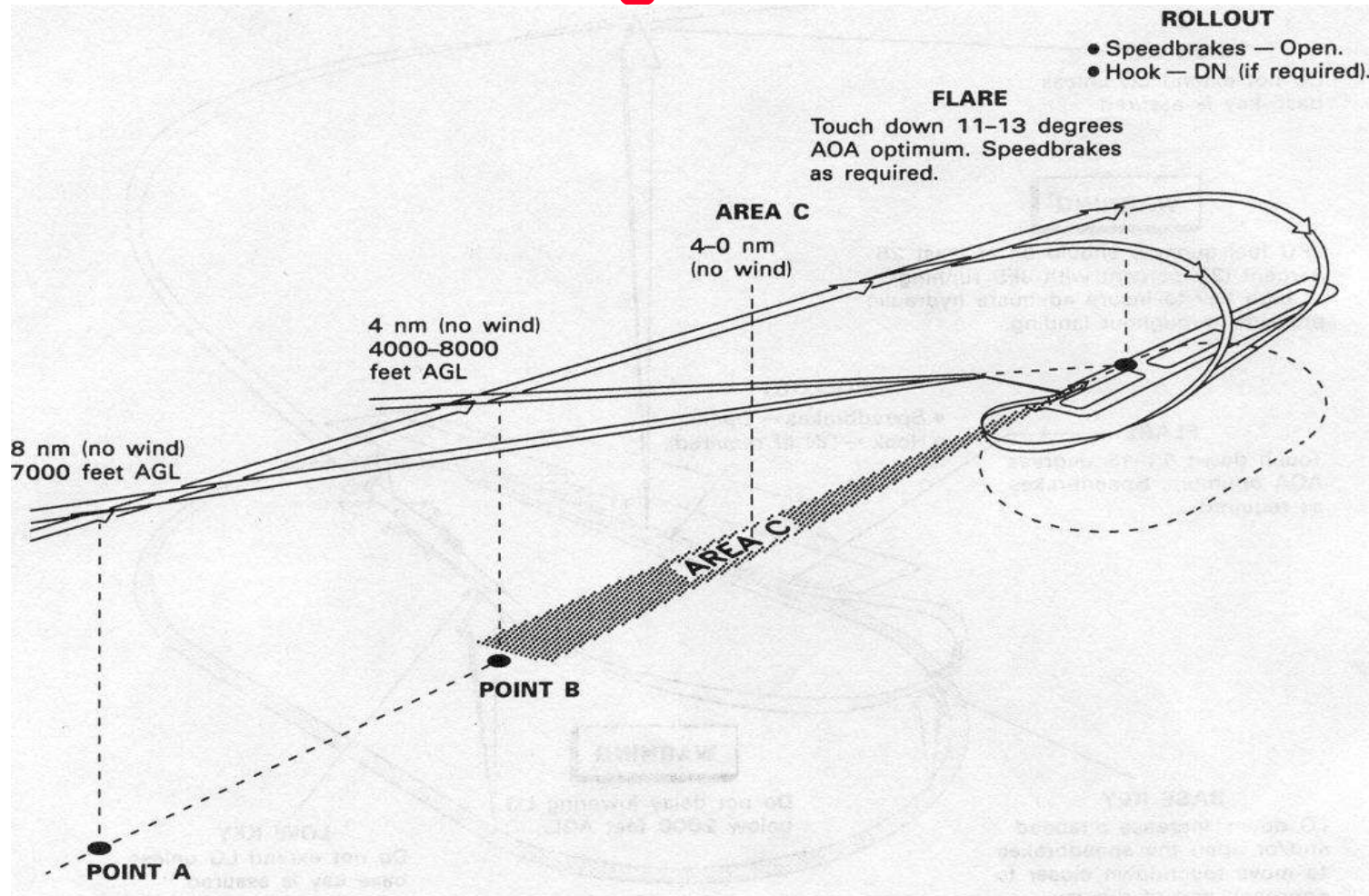




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## Straight In SFO





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## OVERHEAD SFO

7K - 10K AGL

**HIGH KEY**  
Do not extend LG unless base key is assured.

**WARNING**

EPU fuel quantity should be at least 25 percent (20 percent with JFS running) at high key to insure adequate hydraulic pressure throughout landing.

**FLARE**  
Touch down 11-13 degrees AOA optimum. Speedbrakes as required.

**ROLLOUT**  
• Speedbrakes - Open.  
• Hook - ON (if required).

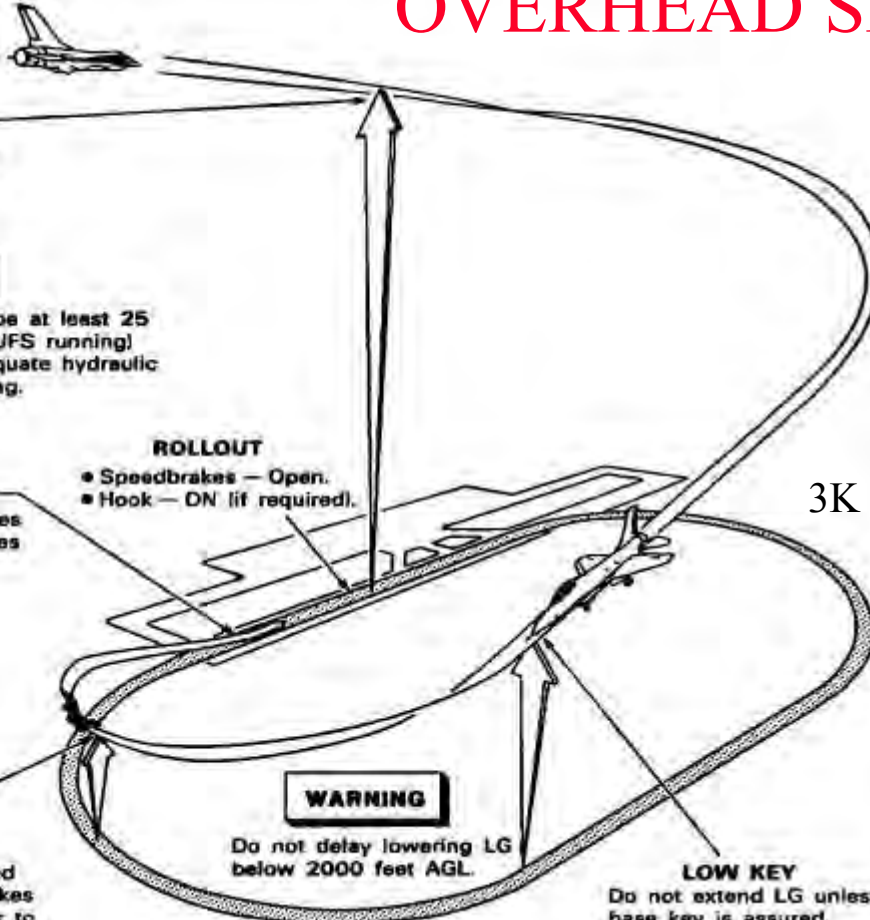
3K - 5K AGL

2K AGL

**BASE KEY**  
LG down. Increase airspeed and/or open the speedbrakes to move touchdown closer to approach end of runway.

**WARNING**  
Do not delay lowering LG below 2000 feet AGL.

**LOW KEY**  
Do not extend LG unless base key is assured.







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## Collision Avoidance Safety Tips

- **Preflight**
  - Know your route, study your charts for conflict areas
  - FSS / Notams
  - Current aeronautical charts
  - AIM
- **Airborne**
  - Stay in touch with ATC (IFR or VFR w/ advisories)
  - “See and Avoid” at all times - eyes out of the cockpit
  - Fly at higher altitudes
  - Don't fly VFR in marginal weather



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## Collision Avoidance Safety Tips

- **Airborne (cont'd)**
  - **Cranium on a swivel- look outside, not at your lap!**
  - **Landing light// anticollision lights**
  - **Develop visual scanning techniques**
    - **Blind spot**
    - **No motion = collision course**
  - **Use VFR hemispheric altitudes**
  - **Lift or drop your wings, helps you clear, makes you more visible**
  - **Clean Windscreen**
  - **Glasses if required**
  - **Talk and listen**





# Closure Rate

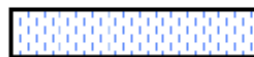
DISTANCE - SPEED - TIME



SPEED →	600	360	
	MPH	MPH	
DISTANCE	SECONDS		
10 Miles	60	100	+
6 Miles	36	60	++
5 Miles	30	50	+++
4 Miles	24	40	++++
3 Miles	18	30	Small F-15 silhouette
2 Miles	12	20	Medium F-15 silhouette
1 Mile	06	10	Large F-15 silhouette
1/2 Mile	03	05	Very large F-15 silhouette
0 Mile	0	0	Explosion graphic

•Hold this 3 feet from your eyes

•This chart is for an F-15 -The F-16 would be even harder to see because of its smaller size (wingspan 33 versus 48 feet) so the visual chart would be optimistic



*In this area; Relax!  
Why die all tensed up!??*



## REACTION CHART



### *Critical Seconds*

*Move away from the F-15 illustration about 3 feet. The F-15 silhouette represents the aircraft as it would appear from the distance indicated on that page. The time required to cover these distances is given in seconds for the combined speeds of 360 and 600 mph.*

*The blocks on the lower left corner of the previous page mark the danger area, based on the reaction times on the lower right of this page.*

see object	0.1
recognize aircraft	1.0
became aware of a collision course	5.0
decision to turn left or right	4.0
muscular reaction	0.4
aircraft lag time	2.0
<b>TOTAL</b>	<b>12.5</b>



# 158th Fighter Wing Vermont Air National Guard



**NASA ASRS (Aviation Safety Reporting System Report) 266694, March 1994**

**A civilian flying a piper PA-20 pacer had an near midair collision with 2 ok air national guard F-16's.**

## **Narrative:**

**AT APPROX XX42 AM LCL, WHILE SQUAWKING 1200 AND CLBING TO 4500 AND THROUGH 3800 MSL, I EXPERIENCED A NEAR MISS. FROM SLIGHTLY ABOVE AND L OF MY COURSE (310 DEGS) A FLT OF 2 F-16 ACFT PASSED AHEAD OF AND SLIGHTLY ABOVE MY ACFT, AT A DISTANCE OF LESS THAN 500 FT. LATER, MONITORING DEP (120.7), I HEARD APCH WARN OTHER ACFT OF THE F-16'S CRUISING AT 4000 MSL. THE F-16'S WERE GOING GENERALLY E AT THE TIME OF THE ENCOUNTER. MY CLB SPD WAS 90 KTS. COMMENT: I WAS FLYING IN A RADAR COVERAGE AREA BUT NOT IN VOICE CONTACT WITH DEP CTLRS. HOWEVER, I WAS MONITORING THE CORRECT FREQ (120.7). MY ACFT IS MODE C EQUIPPED AND ENCODER WAS CHKED FOR ACCURACY ON THE PREVIOUS DAY -- REPLY LIGHT WAS ACTIVE BEFORE AND AFTER THE NEAR MISS INCIDENT. IN MY OPINION, THE CAUSE OF THE NEAR-MISS WAS IN PART CAUSED BY THE FAILURE OF THE MIL LEAD PLT TO MONITOR HIS ONBOARD RADAR. CALLBACK CONVERSATION WITH RPTR REVEALED THE FOLLOWING INFO: THE RPTR WAS FLYING A PIPER PACER PA-20. HE BELIEVES THAT THEY SAW HIM, BUT NO EVASIVE ACTION WAS TAKEN. THE RPTR WAS FLYING JUST ON TOP OF AN INVERSION LAYER WHICH MIGHT HAVE MASKED HIS PRESENCE TO THE FGT'S.**





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## How to Obtain Additional Information

If you have any questions visit <http://www.seeandavoid.org> for general MACA information, call or write us at:

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