South Dakota Air National Guard

114 Fighter Wing

Mid-Air Collision Avoidance (MACA)

Lt Col Eric Knutson

6 April 2016
South Dakota Native
Joined SDANG in 1988

Flying Experience
- Instructor, Evaluator, Functional Check Flight Pilot
- Active duty assignments: Arizona, Florida, Texas, Utah, Korea
- Operations Provide Comfort, Southern Watch, Northern Watch, Noble Eagle, Iraqi Freedom, Coronet Nighthawk, 2010 SD Floods
- 3,000+ hrs in F-16
Mid-Air Collision Avoidance

- What is MACA
- Who we are
- What we do
- Where we fly
- What to look for
What is MACA?
- Air Force program to minimize risk of mid-air collisions with other aircraft.

What is MACA’s goal
- The goal of the Air Force MACA program is to promote a safe flying environment in areas Air Force aircrews conduct training.
HISTORY

• 175th Fighter Squadron established 20 September 1946
Sioux Falls F-16’s
- 22 Jets
- Tuesday-Friday
- One weekend per month
- One night week per month

16 sorties per day
F-16 Fighting Falcon

- "Viper"
  - 2 radios
  - Basic autopilot
  - APG-68 radar
  - Bubble canopy
  - Maneuverable
  - Datalink
  - GPS
  - NO TCAS
  - NO IFF interrogator
  - NO ADS-B
Military terms you may hear at KFSD:

- **“Initial”** - 3-5 miles on runway extended centerline at traffic pattern altitude. Can be single ship up to four airplanes.
- **“Tactical Initial”** – same except jets are in Line Abreast formation.
- **“Break”** – Position at which we start the 180 to downwind.
- **“Downwind”** – Same as civilian term
- **“Perch”** – The point to start a descending 180 turn to final.
- **“Closed”** – Climbing 180 to downwind following low approach.
- **“SFO”** – Simulated Flame Out pattern
- **“High Key”** – “Break” over runway 7,000’-10,000’
- **“Low Key”** – “Perch” at 3,000’-5,000’
- **“Base Key”** – 90 to final approx. 2,000’
ATC defines Standard Formation as all aircraft inside 1nm
- Fingertip – 3’ wingtip spacing. Only the leader is clearing formation.
- Route – 50’ – 500’ between aircraft.
- Chase – approx. 500’
- Only leader squawks.
**Arrivals – Visual, ILS, TACAN**

- Straight In “Final, Gear Down”
- Overhead - 1500’ AGL, 300 KCAS, “Initial” “Base, gear down”
- Tactical Overhead - 1500’ AGL, 350 KCAS, “Tactical Initial”
- SFO (Simulated Flame Out) – 3,000’-7,000’ AGL, 250 KCAS, “High Key”
- Straight In SFO

- Unable GPS, VOR, NDB approaches
ARRIVALS

SFO Pattern

High Key
7-10K

Low Key
3-5K

Base Key
2K min
Formation

What to look for:
- 2-4 aircraft
  - Fingertip or route is possible
- Outside SUA - 250-350K
  - VFR Standard formation
    - IFR trail – 2nm between aircraft
- Inside SUA - 200-800K, Mach 2.0 is possible
Special Use Airspace (SUAs)

FAA Order JO 7400.8X

No person may operate aircraft within these areas unless authorized by using agency!

- **Prohibited Areas** (i.e. DC Mall, Camp David)
- **Temporary Flight Restrictions or TFRs** (i.e. Disaster/Hazardous Relief Areas, Presidential travel, Air Shows, Sporting Events, Space Flight)
- **Restricted Areas** (Smoky Hill, Hardwood)

### Non-Regulatory Special Use Airspace Areas

<table>
<thead>
<tr>
<th>Type of SUA</th>
<th>Regulatory</th>
<th>Dimensions &amp; Purpose</th>
<th>Depicted on chart</th>
<th>ATC clearance needed for VFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning Area</td>
<td>No</td>
<td>3 nm from US coast, warns non-participating pilots of activities that may be hazardous</td>
<td>Yes</td>
<td>No, but advisable!</td>
</tr>
<tr>
<td>Military Operations Area</td>
<td>No</td>
<td>Defined vertical and lateral limits, separates certain military training activities, such as air combat tactics, aerobatics, and formation training, from IFR traffic</td>
<td>Yes</td>
<td>No, but exercise caution!</td>
</tr>
<tr>
<td>Alert Areas</td>
<td>No</td>
<td>Defined area, informs non-participating pilots of areas that may contain a high volume of pilot training or unusual aerial activity</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Controlled Firing Areas</td>
<td>No</td>
<td>Not charted, includes activities that could be hazardous to non-participating aircraft, CFA activities are suspended immediately when spotter aircraft, radar, or ground lookouts observe the approach of a non-participating aircraft.</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Local Area

Airspace used for training
- Lake Andes MOA/Sioux ATCAA
- O’Neill MOA/ATCAA
- Crypt MOA
- Smokey Hill
- Volk Field

Airfields
- Sioux City, Des Moines
- Offutt, Ellsworth, Lincoln
- Multi-mission fighter
- 2-20 aircraft
- All NOTAM altitudes, 200-1500 KIAS
  - Air-to-air – Point defense, asset protection
  - Air-to-ground – Interdiction, close air support
  - Common to work with other airframes, services
    - AWACS, WADS, JTACs, autonomous control
Smoky Hill / Hardwood

- R-3601 / R-6904
  - Weapons delivery
    - 25 lb BDU-33 up to 2,000 lb inert BDU-56
    - 20 MM training round
  - Low altitude tactical navigation
  - Close air support
  - Air Interdiction
  - Basic Surface Attack
Low Level Tactical Nav

- **VR-510**
- **IR-509**
- **IR-508**
- **IR-514**
- **IR-613**

**Day**

- **500’ AGL**
- **480 KTS**
- Line Abreast or Box formation (2+2)
- Potential for abrupt maneuvering for attacks or “threat” reactions
- 4-16 NM wide
- SFC to 3-5,000’ AGL (check FLIP)
Low Level Tactical Nav

**IR-509**

**Originating Activity:** 114 FW ANG, Joe Foss Field, Sioux Falls, SD 57104-0244, DSN 708-7746, C605-988-5148.

**Scheduling Activity:** 114 FW ANG, Joe Foss Field, Sioux Falls, SD 57104-0244, DSN 708-7746, C605-988-5148.

**Hours of Operation:** Daylight hours, Tue-Sat, OT by NOTAM

**Route Description:**

<table>
<thead>
<tr>
<th>Altitude Data</th>
<th>Pt</th>
<th>Fac/Rad/Dist</th>
<th>Lat/Long</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross at 100 MSL to</td>
<td>A</td>
<td>ONL 07/05</td>
<td>N42°37.00’/W97°32.00’</td>
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<tr>
<td>500 ASL</td>
<td>B</td>
<td>ONL 07/40</td>
<td>N42°35.00’/W97°48.00’</td>
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<td>ONL 08/32</td>
<td>N42°34.00’/W97°59.00’</td>
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<td>ONL 35/32</td>
<td>N42°34.00’/W97°59.00’</td>
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<tr>
<td>01 AGL B 500 MSL to</td>
<td>E</td>
<td>ONL 29/32</td>
<td>N42°43.00’/W98°20.00’</td>
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<tr>
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<td>ONL 26/47</td>
<td>N42°49.00’/W98°39.00’</td>
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<td>01 AGL B 500 MSL to</td>
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<td>ONL 30/90</td>
<td>N43°19.00’/W98°03.00’</td>
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<td>H</td>
<td>ONL 31/32</td>
<td>N43°29.00’/W98°10.00’</td>
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<td>ONL 11/32</td>
<td>N43°29.00’/W98°10.00’</td>
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<td>ONL 30/41</td>
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<td>ONL 30/16</td>
<td>N30°09.00’/W98°03.00’</td>
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<td>N</td>
<td>ONL 02/35</td>
<td>N30°47.00’/W98°13.00’</td>
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<tr>
<td>01 AGL B 500 MSL to</td>
<td>O</td>
<td>ONL 03/07</td>
<td>N30°56.00’/W98°09.00’</td>
</tr>
</tbody>
</table>

**Terrain Following Operations:** Authorized from Point C to L.

**Route Width:** 4 NM either side of centerline from A to C, 8 NM either side of centerline from C to L, 4 NM either side of centerline from L to O.

**Special Operating Procedures:**

1. Route is common with IR-508 between A to E, VFR-510 from I to L.
Resources

NOTAMS - https://pilotweb.nas.faa.gov/PilotWeb/
Airspace - http://sua.faa.gov/sua/
Airspace - http://www.seeandavoid.org/
FAA - http://www.faasafety.gov/
AIRSPACE ONEILL MOA ACT 500FT UP TO BUT NOT INCLUDING FL180 1546-1700Z
MACA

http://sua.faa.gov/sua/
MACA

http://www.seeandavoid.org/
MACA

http://tfr.faa.gov/tfr_map_ims/html/
**Ellsworth Air Force Base**

**Mid-air Collision Avoidance**

**28th Bomb Wing Flight Safety**

**Airfield Identifier:** KRCA  
**Operating Hours:**
- Mon. – Thur. 0700L – 0030L  
- Fri. 0700L – 2100L  
- Closed Weekends and Holidays

**Coordinates:** 44° 08’N 103°06’W  
**Elevation:** 3276’

**Frequencies:**
- Approach – 119.5
- Tower – 126.05
- Ground – 121.8
- ATIS – 120.625

**Operating Hours:**
- Mon. – Thur. 0700L – 0030L  
- Fri. 0700L – 2100L  
- Closed Weekends and Holidays

**http://sua.faa.gov/**

**http://www.seeandavoid.org/**
Ellsworth AFB is closed to all civil traffic. Contact Ellsworth Approach for traffic advisories. Extensive, high speed heavy aircraft in and around Ellsworth AFB. Use extreme caution!

Radar Pattern Runways 13 and 31
Downwind: 6000’ MSL/ 10-20 miles
Base: 5200’ – 6000’ MSL/ 6-20 miles from end of runway
Final: 5200’- 6000’ – Descending 6 – 20 miles from end of runway

VFR Traffic Pattern
Altitude: 4500’ MSL
Downwind: 3.5 miles from runway (east and west side)
Base: 3 miles from approach/Departure end
Final: 3 mile final from approach/departure end
Overhead: 5000’ MSL / 4nm Initial / West Break

VFR Overhead Pattern
Altitude: 5000’ MSL
Initial: 3-4 miles from end of runway / West break
Rollout: 1 1/4 mile & 3600’ MSL
*Aircraft will normally proceed to initial at 5000’ MSL unless otherwise directed by ATC
Air Traffic Controlled Airspace (ATCAA)
- Gateway West (FL180-FL260)
  - Day-to-Day use
- Gateway East (FL180-FL260)
  - PRTC MOAs have ATCAAs above them

Published Hours
- 0730-1200 and 1800-2330 Mon-Thr (2 hr NOTAM)
- 0730-1200 Fri (2 hr NOTAM)
- Other times by NOTAM (4 hr NOTAM)
- These are times you can anticipate usage
- The airspace will only be activated when scheduled

Military Operations Areas (MOAs)
- Low MOAs – 500’ AGL to 12,000’ MSL
- High MOAs – 12,000’ MSL to FL180
- Primary Day-to-Day use MOAs
  -- PR1 (PR1A, PR1B, PR1C, PR1D)
  -- PR2
  -- PR3
  -- PR4 (No Low MOA, only High)
MACA
General Tips & Techniques

- Announce your Intentions on UNICOM – we use/monitor same freqs you use
  - Use **standard traffic patterns** at uncontrolled airfield. **BE PREDICTABLE!!**
  - Use **landing lights** at lower altitudes, especially when near airports

- Request Flight-Following and radar services to the MAX extent possible
  - Stay alert and communicate your intentions to MSP Center
  - **Use your Transponder**; helps with early ID on Traffic Collision Avoidance Systems (TCAS)
  - ATC can assist in resolving traffic conflicts and help you traverse controlled airspace
MACA
General Tips & Techniques

♦ Know your flying responsibilities
  ♦ Use appropriate hemispherical altitudes and don’t let your altitude ‘wander’
  ♦ Understand visual limitations and proper scanning techniques
    ♦ If an aircraft appears to have ‘No Relative Motion; you’re on Collision Path’
  ♦ Keep windscreen’s clean; bugs on the windscreen can obstruct other traffic.
  ♦ Flying at night, avoid white/bright lights in cockpit; disturbs your night vision (>10 min recovery)
  ♦ Complacency kills

SEE and BE SEEN!
Procedural deconfliction works if we all follow the published procedures.
Mid-Air Collision Avoidance

MACA

South Dakota Air National Guard
114th FW Safety Office  (605) 988-5841/5842

Air Force
28th BW Safety Office (605) 385-2599/4419