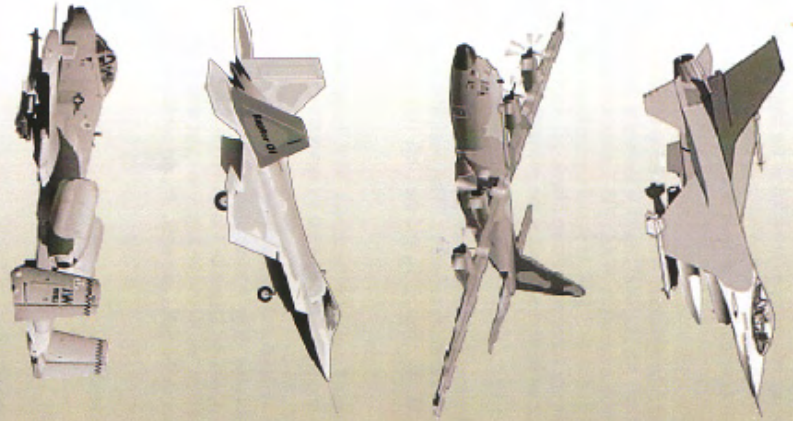

MACA

Mid-Air Collision Avoidance

2007/2008

299TH Range Control Squadron
6046 Cedar Lane
Hill AFB, Utah 84056

1 Aug 2007

MEMORANDUM FOR ALL GENERAL AVIATION AND TRANSIENT MILITARY PILOTS

FROM: 299 RCS/DO
6046 Cedar Lane
Hill AFB Utah 84056

SUBJECT: Mid-Air Collision Avoidance (MACA)

1. The skies over the Salt Lake valley are becoming as crowded as the highways down below. Increasing commercial air traffic and general aviation compete for limited airspace with military traffic requiring increased vigilance and cooperation by all of us.

2. The majority of the air traffic in the Intermountain West is funneled into the area surrounding Salt Lake City. The Utah Air National Guard is located at the Salt Lake International Airport (SLC-IAP), with a squadron of KC-135 Tanker aircraft on the East ramp. Twenty miles north of SLC-IAP is Hill AFB and Ogden Regional Airport, while to the south are Salt Lake Airport Number 2, Provo Municipal Airport, and Cedar Valley Airports. This saturation of airspace makes the potential for mid-air collision very high.

3. The purpose of this pamphlet is to promote flying safety and awareness in an effort to reduce the potential for aviation mishaps or collisions. This pamphlet describes the military aircraft operations at SLIAP, Hill AFB, and the Utah Test and Training Range (UTTR)

4. This pamphlet is not designed to take the place of Sectional, VFR Terminal, Area, and Low Altitude Enroute Charts and should not be used for navigation purposes.

5. Our goal is to provide the general aviation and military pilots with information that heightens their awareness and makes the valley a safer place to fly. Additional information can be obtained from the Ogden Air Logistics Center Flight Safety Office at Hill AFB. In addition to this pamphlet, we would be happy to meet with pilot groups to discuss military flight operations in the Salt Lake area. Please contact us if you desire further information:

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Cecilia Nackowski, MAJ, UTANG
299th Range Control Squadron
Director of Operations

MIDAIR COLLISION AVOIDANCE

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COLLISION AVOIDANCE TIPS

Studies on mid-air collisions show most occur below 8000MSL and near airports, navaids, and other high-density traffic areas. Here are some ideas to help you reduce your mid-air collision potential:

1. Become familiar with and use advisory services offered by air traffic control facilities when transiting the area. Hill Tower (127.15), Ogden Tower (118.7), Salt Lake Approach Control (120.2), or Clover Control on (118.45 or 134.1 as depicted) will provide traffic advisories to aircraft transiting the area.
2. Know where the high-density traffic areas are.
3. Fly as high as practical.
4. Obtain an IFR clearance or participate in radar flight following whenever possible, and continue to practice "see and avoid" at all times.
5. Use landing lights at lower altitudes, especially when near airports.
6. Announce your intentions on unicom and use standard traffic pattern procedures at uncontrolled fields. Try to present a predictable target.

7. Always use your Mode C transponder, and cross-check its accuracy with ATC whenever possible.
8. Use the appropriate hemispheric altitudes, and don't let your altitude wander.
9. Clear constantly for other aircraft, both visually and over the radio.
10. Keep your windows and windscreen clean and clear. A bug on the windscreen can obstruct a large object at a short distance.
11. Learn proper task management in the air. A cockpit can get really busy. Learn the proper methods to help you reduce workload demands and timing crunches.
12. Don't get complacent during instruction! Instructors make mistakes too. Many midair collisions occur during periods of instruction or supervision.
13. When flying at night, don't use white light. White light disrupts your night vision, even if used momentarily. Those few moments may kill you!
14. Beware of wake turbulence!
15. Understand the limitations of your eyes and use the proper visual scanning techniques. If another aircraft appears to have no relative motion in your windscreen but is increasing in size, it is on a direct collision course with you.
16. Execute appropriate clearing procedures before and during all climbs, descents, turns, abnormal maneuvers, or aerobatics.
17. Above all, **AVOID COMPLACENCY!** Remember there is no guarantee that everyone is flying by the rules, or that they are where they are supposed to be.

KNOW THE LIMITS OF YOUR VISION

DETECTION

The detection of an airborne object depends upon six conditions: 1.) Image Size - the portion of the visual field filled by an object; 2.) Luminance - the amount of brightness of the object; 3.) Contrast - the difference between the object and the background brightness, color, and shape; 4.) Adaptation - the degree to which the eyes have adjusted to surrounding illumination; 5.) Motion - the velocity of the object, the observer, or both; 6.) Exposure Time - the length of time the object is exposed to view.

IMAGE SIZE

An aircraft seen at long range appears not as an identifiable shape but rather as a dot. Aircraft detection is different under conditions of day and night vision. During the day, the further from the fovea (center of vision) the object falls, the larger the image must be in order to be noticed. At night, on the other hand, detection is sometimes superior if the target image falls on the peripheral retina (off center) rather than on the fovea. The well-known phenomenon of a dim light disappearing when the observer looks directly at it and reappearing when he looks slightly to the side of it shows this.

LUMINANCE AND CONTRAST

Luminance and contrast are basically the same. An object will be visible only when it is sufficiently brighter or darker than its background - when, in other words, there is enough contrast.

In addition to brightness, contrast, color, and shape differences offer clues to the presence of aircraft. When object and background are contemporary colors (yellow and blue, green and red, black and white), detection becomes easier. Similarly, when objects are long and thin as opposed to round and flat, they are easier to detect. An aircraft seen alongside is easier to notice than a head-on aircraft of equal area.

DARKNESS ADAPTATION

The eye requires at least 30 minutes, sometimes much longer , in darkness to regenerate visual purple so that the eye can distinguish objects under low illumination. Conversely, when the eyes have been accustomed to darkness, they need time to adapt to bright light.

MOTION

Against a stationary irregular background, an aircraft needs only to move a few minutes of arc per second to reveal its presence to an alert observer. Against a featureless background, like a cloudless blue sky, however, the aircraft's perceived motion must be 10 minutes faster to be noticed. What complicates the detection of relative motion is the fact that the eyes themselves are constantly moving.

EXPOSURE TIME

An aircraft that darts in and out of clouds presents a special challenge to the viewer. When an aircraft is not continuously exposed to view, the pilot has to judge its speed and direction in order to follow its path behind cloud or horizon. A small, slow-moving object that presents little contrast against its background can easily be lost during intermittent observation.

As they become fatigued, a person's eyes grow less efficient at the task of seeing airborne aircraft. Only well rested eyes can ensure good vision.

Structural parts, windshield/canopy distortion, poor cockpit lighting, and instrument glare can limit a pilot's vision. Make your windshield spotless.

Total darkness, fog, total overcast, and cloudless blue skies, all present the viewer with a monotonous field. In such conditions, normal eyes constantly try to focus on infinity by actually focusing on a point 1 to 2 meters away. This is called search myopia and reduces the pilot's chances of seeing a distant aircraft.

Try to focus on objects at the maximum range you expect to see aircraft - focus on the ground at about 4 to 8 NM and move your gaze up to the sector of sky to be searched. Avoid, as much as possible, frequent refocusing in and out of the cockpit.

About 1/3 of a second is required for the eye to focus on each fixation. Your airborne searching scan should be slow and methodical. Learn to scan the visual field by dividing the area up into sectors of about 30 degrees each. Fix your gaze in that sector for a second or two. Investigate any movement, then move to the next sector. If you have trouble focusing at long ranges, try squinting. Squinting compresses the eyeball and changes the focal length, making long-range aircraft come into focus.

LOCATING THE BLIND SPOT

The optic nerve blind spot can be shown with this diagram. Hold the paper at about an arms distance away. Close the left eye and look at the black dot with your right eye. Slowly bring the paper towards you. Eventually the airplane, on the right side of the paper should disappear.

IN CONCLUSION

You are more likely to detect an aircraft...

- The larger it is.
- During daylight, the closer it falls to the center of vision. During evening, detection may be better if the image falls on the peripheral retina (off center).
- The more it contrasts with its background.
  - In brightness; ex. A dark aircraft against a white cloud.
  - In color; ex. A yellow airliner against a blue sky.
  - In shape; ex. A side view of an aircraft rather than a head on view.
- The more adapted the eyes are.
  - Adapting to light takes about 10 minutes from darkness to moderate light.
  - Adapting to light takes at least 30 minutes, from bright sunlight to darkness.
- Generally the faster an aircraft moves,; however, very fast aircraft cannot be clearly recognized.
- The greater the change in aircraft speed...
  - The less the head and eyes move (rapid scanning reduces the ability to discern the aircraft's relative motion).
  - The longer the aircraft remains in the field of view.

WAKE TURBULENCE

You may be able to see and avoid the big airplanes, but one thing you can't see is their wake turbulence! There is an area of potential disaster behind and below every commercial and military aircraft. Wake turbulence can be deadly, especially when it is encountered close to the ground. All pilots flying in the vicinity of large aircraft should exercise extreme caution and ensure up to 6 mile separation on landing and 2 minutes or 4-5 mile radar separation for takeoff, depending on the type of aircraft. Remember that wake turbulence can be so severe as to cause loss of aircraft control and/or catastrophic structural failure.

Please keep in mind that virtually all types of aircraft in the U.S. and NATO inventories can and do operate out of Hill AFB, the Utah Test and Training Range (UTTR), and SLIAP frequently. All possess varying degrees of performance, speed, gross weight, wake turbulence, visibility restrictions, maneuverability, and camouflage. All these factors can increase the potential for mid-air collision.

Additionally, remember that military aviators often train in formation flying. Even the heavy KC-135 flies formation missions with up to several aircraft launching 30 seconds apart and flying enroute with one-mile horizontal and 500 foot vertical separation. The F-16 frequently flies in two or four-ship formations at high rates of speed. If you see one aircraft, look for others!

Be aware of the locations of the IR and VR routes found on your Low Enroute Charts. On these routes, fast movers are cleared to operate at very low altitudes and very high airspeeds as they practice masking themselves with terrain during tactics training. This makes them harder to see so it behooves you to know where the routes are and what altitudes are included and avoid them! Even the old B-52 flies these routes as fast as 390 KIAS and as low as 200 feet AGL!

DEPARTURE AND ARRIVAL ROUTES

DEPARTURES:

Salt Lake International Airport (SLIAP) - VFR traffic departing SLIAP to the north or south follow I- 15 as a VFR corridor and to the west I-80 toward Wendover. IFR traffic is normally assigned one of five Standard Instrument Departures (SID's). These SID's are normally issued to commercial and military heavy traffic departing the airspace. See Jeppeson or Department of Defense Flight Information Publications for published routes and altitudes.

Hill AFB also uses SID's for their primary means of departure. There are four SID's with the DEVLIN 1 being the primary. See Jeppeson or Department of Defense Flight Information Publications for published routes and altitudes. Hill AFB also uses special procedures to facilitate Functional Check Flights, Flight Tests, DEMO, and local training which are included in this publication.

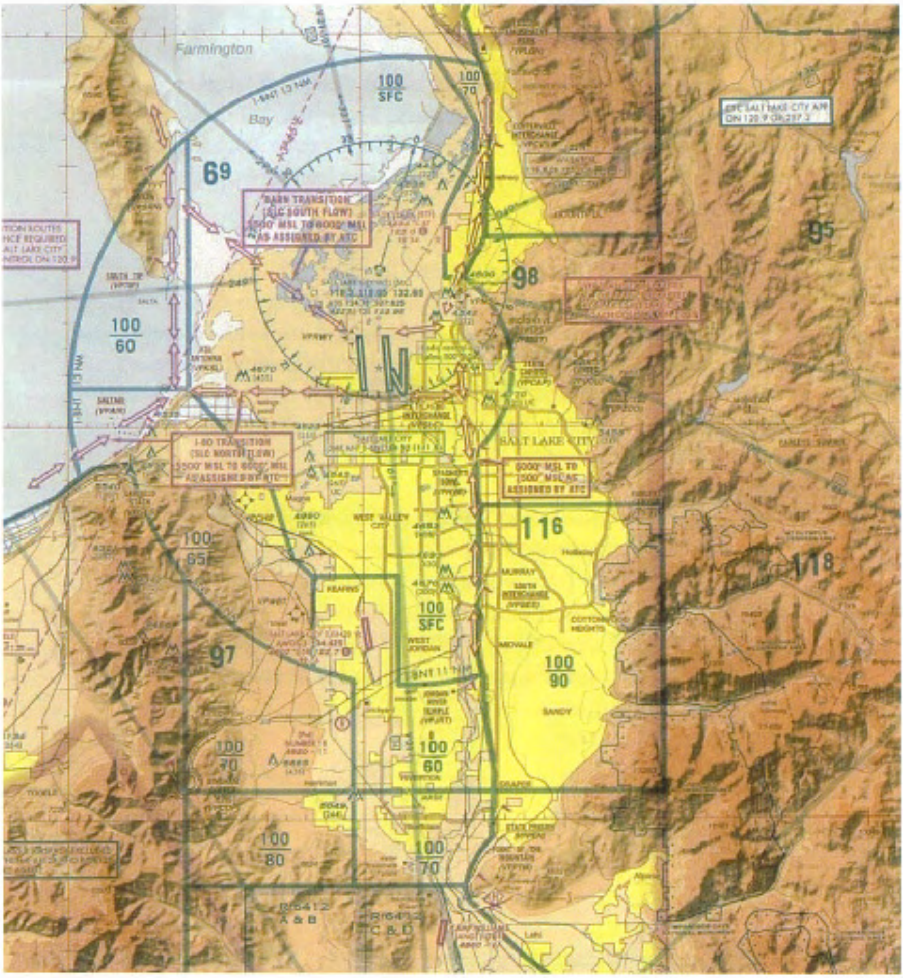
HELICOPTER VFR CORRIDORS:

Helicopters normally depart and arrive at the Hill AFB west boundary between 5000' and 5500' MSL at a point where 300 North in Clearfield butts against I-15. Often they fly directly to that point. Sometimes, however, they depart the south field boundary near the end of the runway, pass east of the trailer parks, then turn west to I-15 and follow it north until reaching the west corridor at 300 North. This departure is called the south loop. The helicopters are under Hill AFB Tower control while flying these departures. An east corridor departs Hill near the center of the runway and goes to the clover leaf intersection of I-84 and Hwy 89 at the mouth of Weber canyon. Helicopters flying east of the runway at Hill AFB stay at or below 5700' MSL unless specifically cleared by Hill Tower to do otherwise. There is a helicopter transition area east of the runway at Hill AFB called E-Z area. Pattern altitude is 5500' MSL and below. Occasionally, operations to 6500' MSL are flown for functional checks.

ARRIVALS:

SLIAP utilizes five Standard Terminal Arrivals (STARs) to bring commercial and military traffic into the valley in an orderly flow. These STARs are used during VMC as well as IMC due to the volume of traffic the airport experiences. In VMC, aircraft may be cleared for visual approaches once the airport is in sight, traffic permitting. See Jeppeson or Department of Defense Flight Information Publications for published routes and altitudes for IFR arrivals.

Hill AFB utilizes several recoveries for IMC or VMC conditions which are included in this publication as well as IFR recoveries that are published.



HILL AFB PROCEDURES:

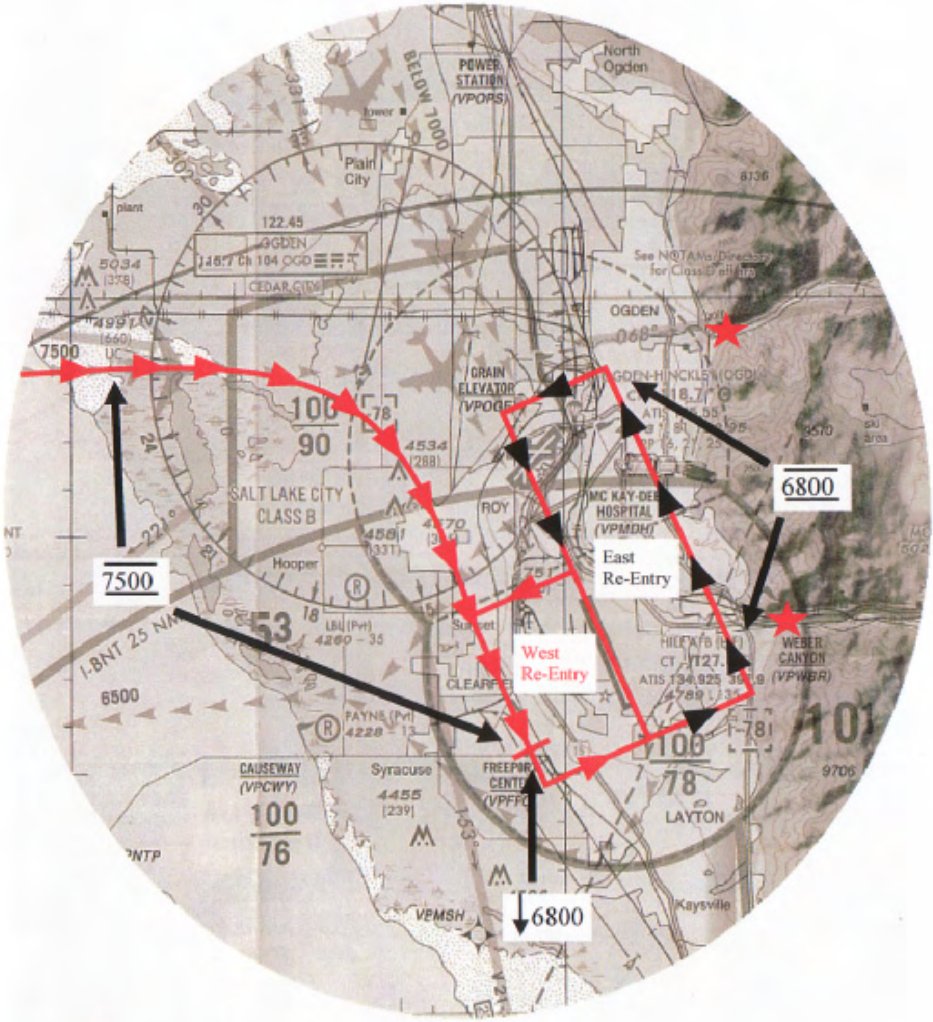
Hill AFB uses a VFR OVERHEAD PATTERN during VMC to expedite recovery and landing of fighter type aircraft. The pattern consists of two 180 degree turns and resembles a race track. It begins at approximately 3 to 5 NM from the approach end of the runway at an altitude of 6800' MSL. Normal airspeed for flying initial is 300 KIAS with speed decreasing through the turns. Over the approach end of the runway the pilot makes a 180 degree turn to downwind, then makes another 180 degree turn to complete the base to final portion of the pattern. The pattern is concluded either by a full stop or missed approach.

Hill AFB also utilizes a SIMULATED FLAMEOUT APPROACH (SFO) to simulate a loss of engine thrust on F-16 type aircraft. The approach begins above the airfield at 13,500' MSL (High Key). When the approach is started, the aircraft is in a steep, left-hand turn with the pilot looking for his landing point on the runway. **This pattern does not allow the pilot time to search for other aircraft once he begins.** The pilot will call Low Key approximately 7,000/10,000'MSL almost even with the approach end of the runway at which time he will be cleared for a low approach.

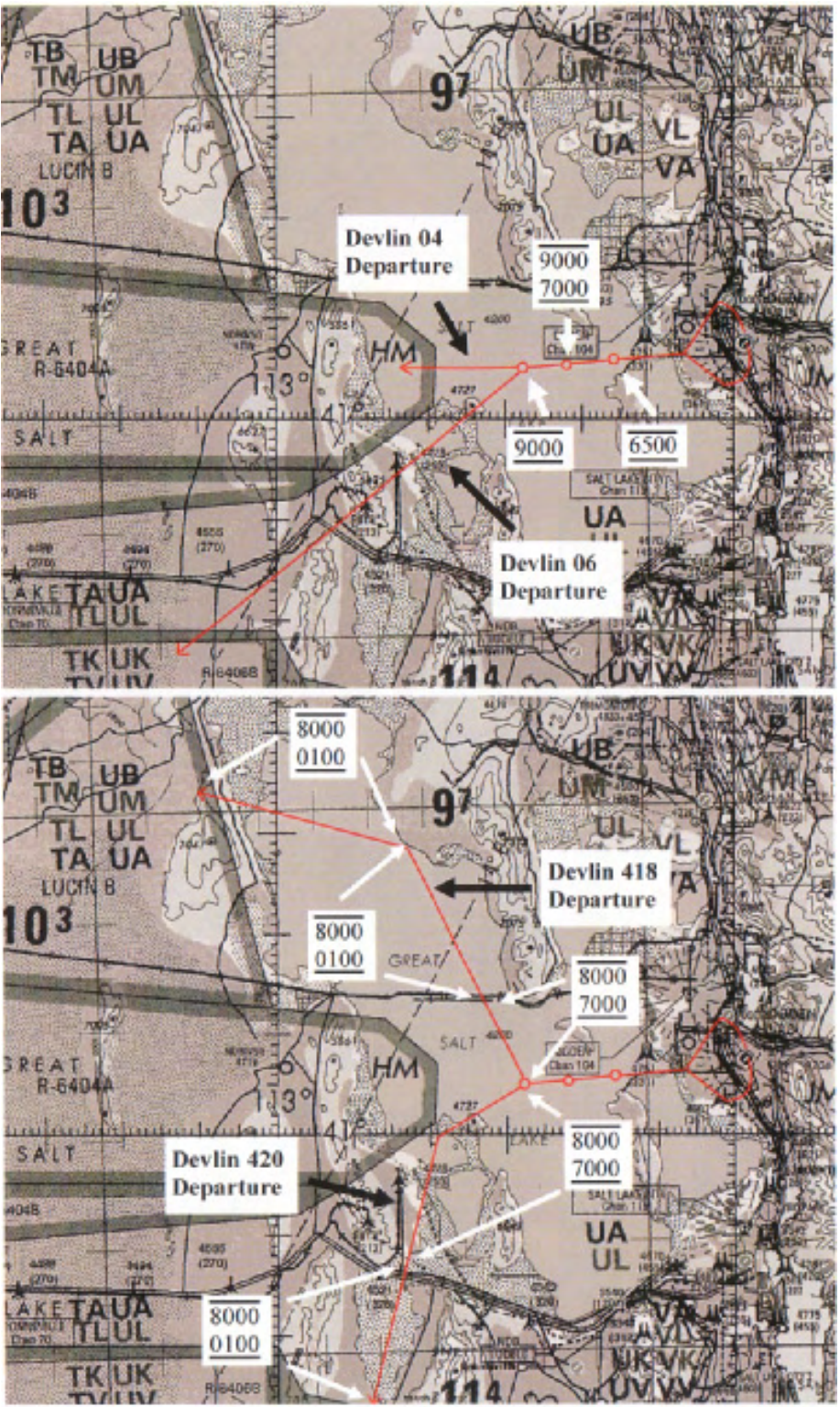
To RE-ENTER the Hill traffic pattern from a MISSED APPROACH, the aircraft will fly runway heading to the Hill TACAN 2 DME, then make a right turn crossing 1-15 above 6300'MSL. The fighter will then turn north around the Freeport Center and continue so his base turn places him I NM south of the Ogden Airport. Altitude and airspeed will be 6800'MSL and 300 KIAS respectively.

To remain in a CLOSED PATTERN, after a low/missed approach, the pilot will continue to the end of the runway and make a climbing left turn (towards the mountains) to an altitude of 6800' MSL. This will place him in the pattern on a left downwind. **Aircraft departing Weber Canyon should be aware of aircraft in this traffic pattern due to the aircraft being belly up to the mountains.**

HILL TRAFFIC PATTERNS



★— POTENTIAL CONFLICT AREAS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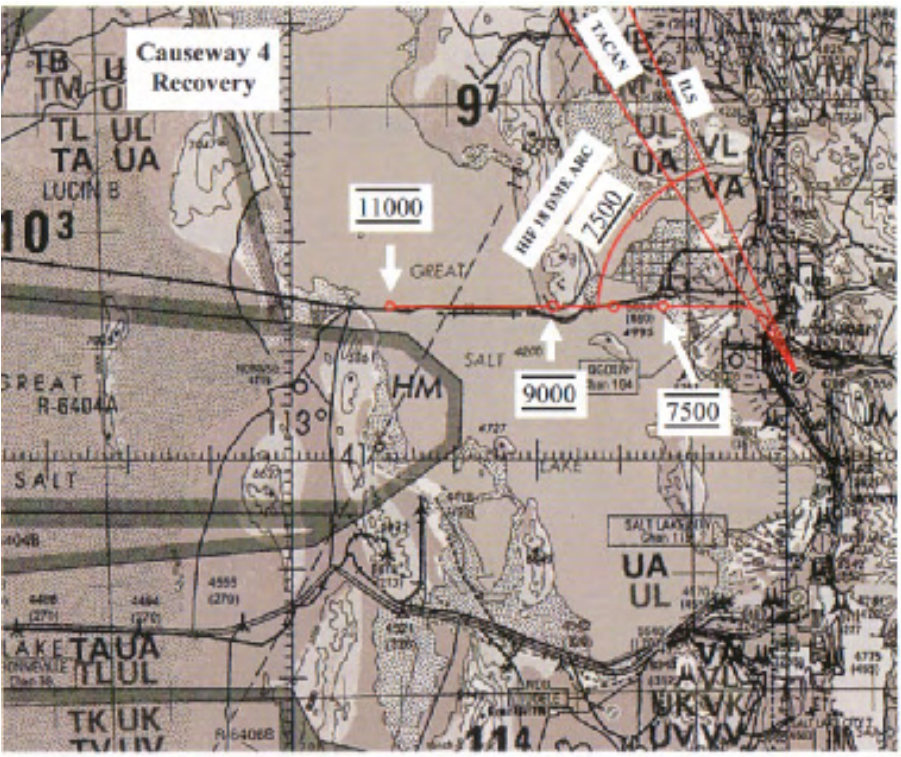
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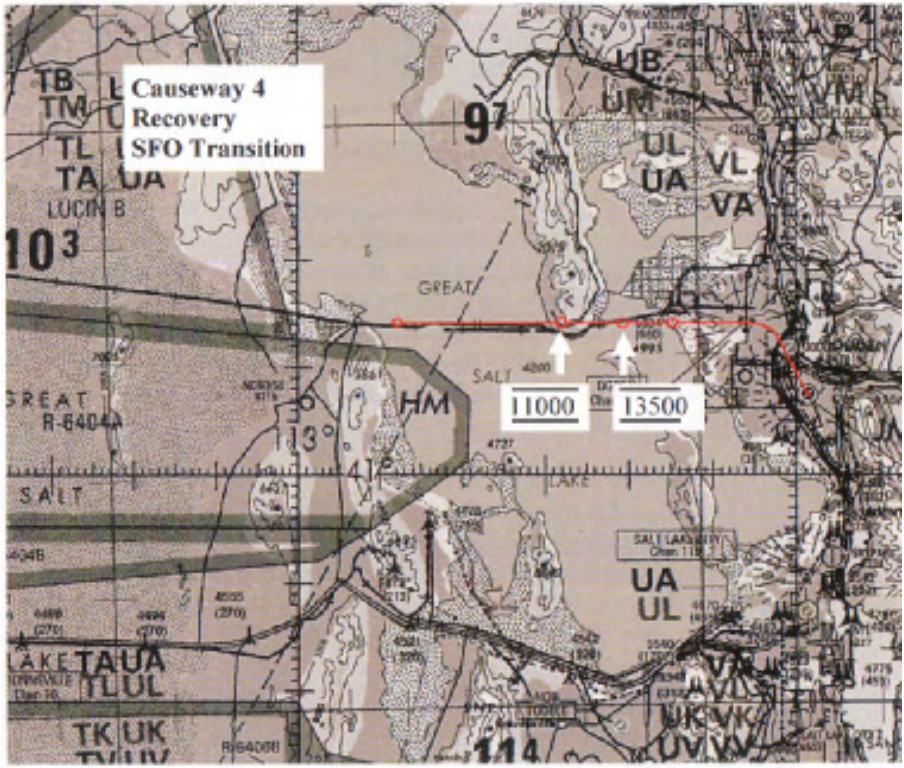
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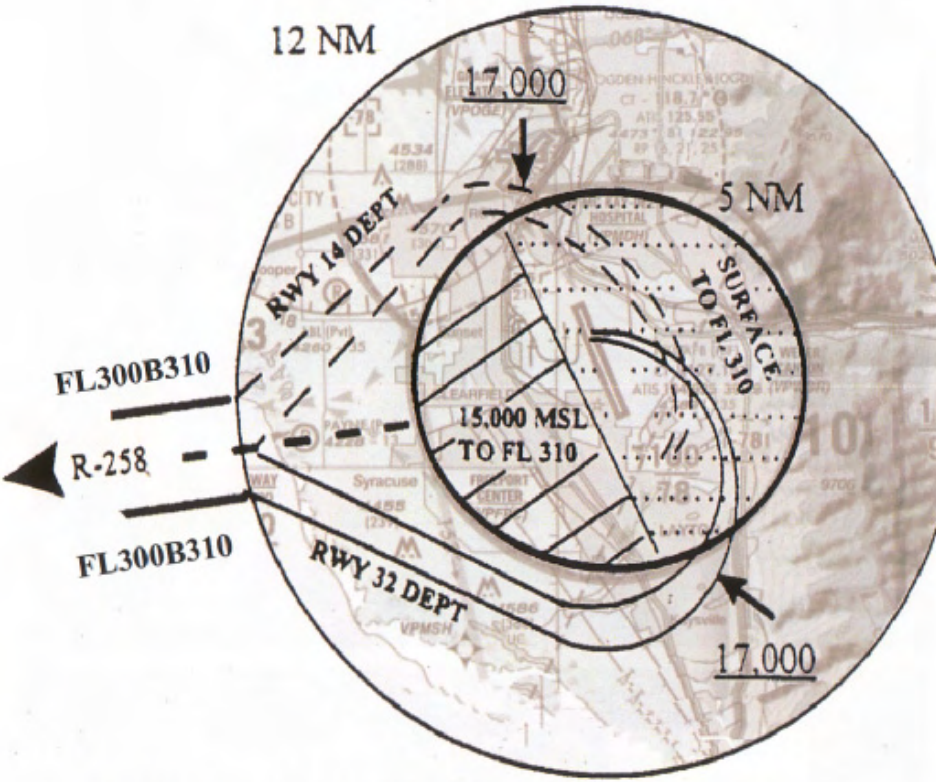
HIF ZOOM DEPARTURE



FLIGHT TEST DEPARTURE (QUICK CLIMB F-16)

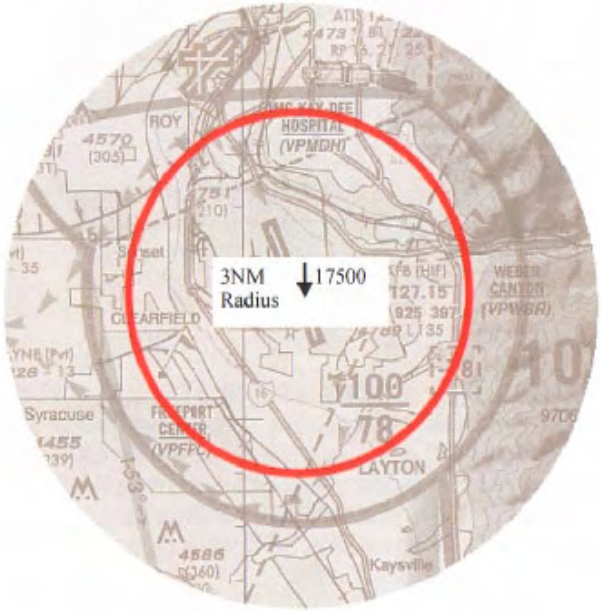
This departure is used to perform Functional Check Flights. The pilot will accelerate to 250 KIAS after takeoff, then climb to approximately 20-25 degrees nose high to an altitude of 11,000' MSL at which time he will turn to a 272 degree heading and climb to an altitude of 14,000'-16,000' MSL. The critical part of this departure is during the initial climb when the pilot is monitoring his instruments (head in the cockpit), and the climb angle degrades the visibility in front of the aircraft.

ZOOM CLIMB (FLIGHT TEST F- 16 ACFT): The departure is used by F-16 aircraft performing Functional Check Flights. The pilot maintains runway heading accelerating to approximately 400 KIAS, then climbs on runway heading or its reciprocal to 31,000' MSL staying within 5 NM of the field. The critical part of this departure is during the initial climb. The pilot is going straight up at 400 knots.

LAYTON/RIVERDALE CLIMBOUT

F-16 DEMO AIRSPACE

*DEMO AIRSPACE WILL BE NOTAMED



CLASS D AIRSPACE: The Ogden Class D airspace is located northwest of the Hill AFB Class D airspace and the two overlap. This overlap requires special consideration and the following items should be kept in mind: Ogden and Hill AFB Class D airspace extends from the surface to 7800'MSL.

VFR and Non-precision IFR approaches to Runway 14 at Hill AFB pass through the Ogden Class D airspace, but keeps military traffic at or above 5700'MSL until past the Ogden Airport.

Ogden Airport Tower hours of operation are 0700-2200. When Ogden is closed, the northwest portion (lined area) of the Hill Class D airspace becomes active. Aircraft entering this area while Ogden Tower is closed should contact Hill AFB Tower on 127.15 MHz for advisories.

RECOMMENDED VFR ALTITUDES FOR GENERAL AVIATION AIRCRAFT: To best avoid conflict with military aircraft departing and returning to Hill AFB, we recommend you fly 8500' MSL when west bound and 9500'MSL when east bound along the Southern Pacific Causeway or the Western Pacific Railroad and I-80). Stay above 7800'MSL or below 5800'MSL while flying along US 89 (The Mountain Hwy) east of Hill AFB.

RADAR SERVICES: Salt Lake Approach Control provides radar traffic advisory service to aircraft within 40 miles of the Salt Lake International Airport. Within this area Class B service is provided for aircraft operating to and from Ogden Airport. This service consists of traffic advisories and traffic sequencing.

Class B service is available to aircraft flying in the vicinity of SLIAP. This service provides separation, traffic advisories, and sequencing between the participating VFR aircraft and all IFR aircraft within the terminal radar service area.

VFR frequencies for contacting Salt Lake Approach Control vary according to location. Contact Approach Control as follows:

121.1 MHz	North of Ogden Airport
120.9 MHz	Between Ogden and SLIAP
126.8 MHz	West of SLIAP
124.3 MHz	South of SLIAP

SPECIAL USE AIRSPACE
UTAH TEST AND TRAINING RANGE (UTTR)

The airspace comprising the UTTR is a combination of restricted airspace and Military Operations Areas (MOA's) intersected by V32-200 (basically I-80 west of Salt Lake to Wendover). The UTTR is divided into a north (118.45) and south (134.1) range. The north range complex includes restricted areas R6404 A, B, C, and D and the Lucin MOA's, which are north of 1-80/V32. The south range complex includes the restricted areas R6406 A and R6407, R6402 A and B, and R 6405 and the Sevier and Gandy MOA's which are south of I-80. The restricted area altitudes extend upward to 58,000' MSL. The MOA altitudes are published below 18,000' MSL. UTTR activity and hours of operation are NOTAM'ed through Salt Lake Center. Clover Control (134.1 or 118.45) is the agency to contact for traffic advisories and clearance through the UTTR when the restricted airspace is in use. Also, the hours of activity can be obtained through Clover Control (801-777-7575) or the nearest Flight Service Station. If Clover Control is not operational the pilot can contact Salt Lake Center on 128.55 for transition through the UTTR at and above 11,000' MSL. **Due to safety restrictions, general aviation cannot transition through the UTTR below 11, 000' without Clover Controller being operational.**

RESTRICTED AREAS: Restricted areas denote the existence of unusual, often invisible hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of Restricted Areas without authorization from the using agency may be extremely hazardous to the aircraft and its occupants. Violations will be processed against intruders and forwarded to the Flight Standards District Office for investigation and possible prosecution.

MILITARY OPERATIONS AREAS (MOA's): Most training activities necessitate acrobatic or abrupt flight maneuvers. Military pilots conducting flight in Department of Defense aircraft within a designated and active Military Operating Area (MOA) are exempted from the provisions of FAR 91.303 (c) and (d) which prohibit acrobatic flight within Federal Airways and Control Zones.

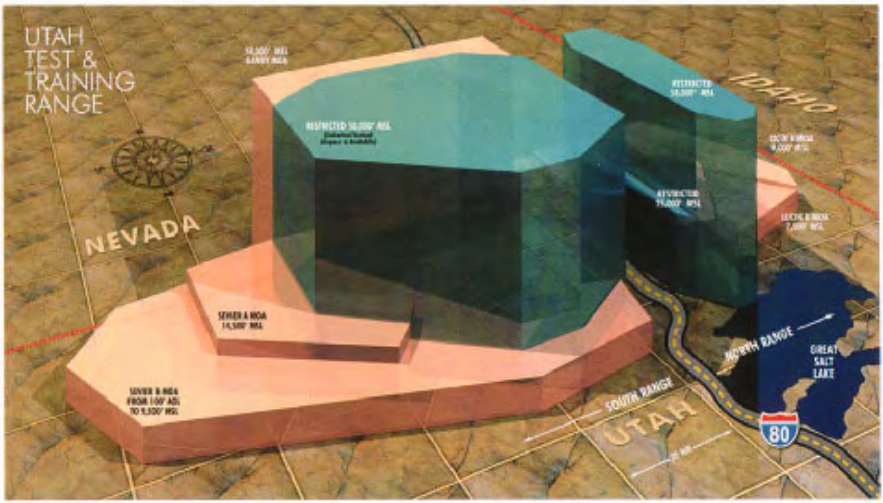
Pilots operating under VFR should exercise extreme caution while flying within a MOA when the military activity is being conducted. Therefore pilots should contact any FSS within 100 NM of the area to obtain accurate real-time information regarding the MOA hours of operation. Prior to entering an active MOA adjacent to the UTTR, pilots should contact Clover Control on VHF 134.1 or 118.45 (as depicted) for traffic advisories.

MILITARY TRAINING ROUTES (MTR's): Several MTR'S are located near the UTTR. Generally, MTR's are established below 10,000' MSL for operations at speeds in excess of 250 KIAS. However, some segments may extend to higher altitudes due to terrain or climb or descent requirements. There are IFR and VFR military training routes.

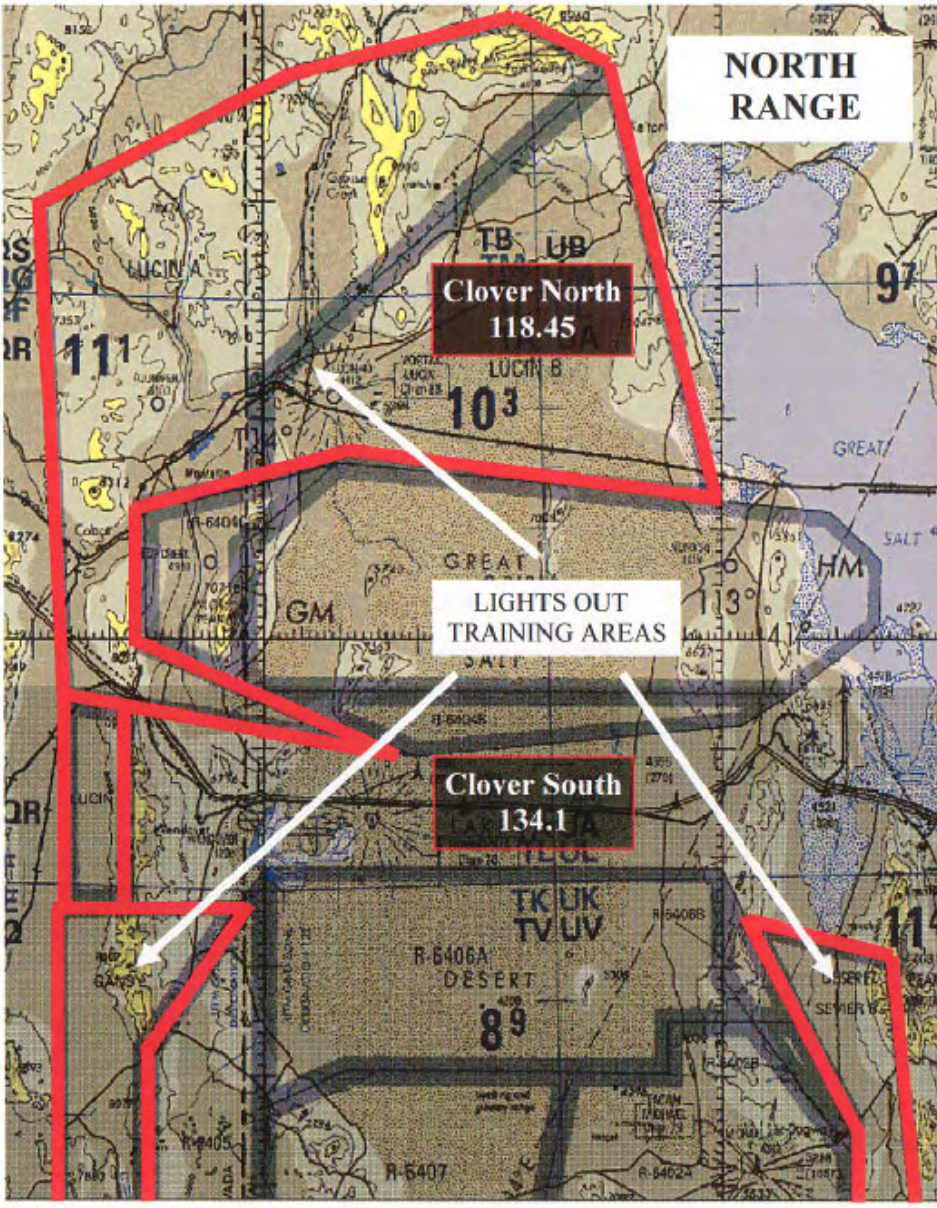
IFR Military Training Route (IR) Operations on IR routes are conducted under Instrument Flight Rules (IFR) regardless of weather conditions.

VFR Military Training Route (VR) Operations on VR routes are always conducted in accordance with Visual Flight Rules (VFR).

Military Training Routes are depicted on the VFR Sectional, and Low Altitude Enroute Charts. Normal width of the route is 10 NM or 5 NM each side of the centerline for IR routes and 5 to 10 NM for VR routes (although some of the segments of these routes may be as narrow as 2 NM or as wide as 20 NM). For current information on routes in your vicinity (to include times in use, altitudes, and actual width), contact any FSS within 100 NM of the route. Give the specialist your position, route of flight, and destination when requesting information on MTR's in your vicinity. This will permit the FSS specialist to identify any MTR's which could be a factor to you.

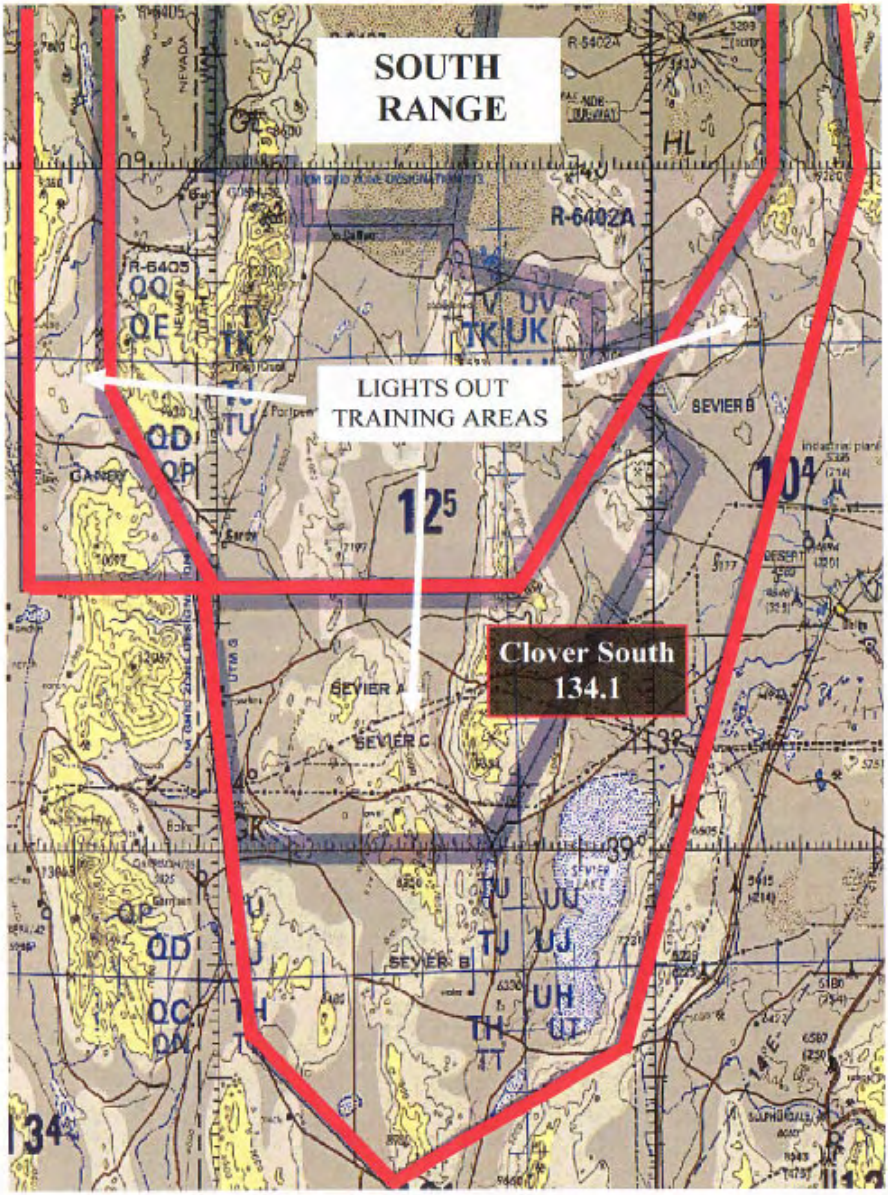


UTAH TEST AND TRAINING RANGE



LIGHTS OUT OPERATIONS IN THE MOA'S

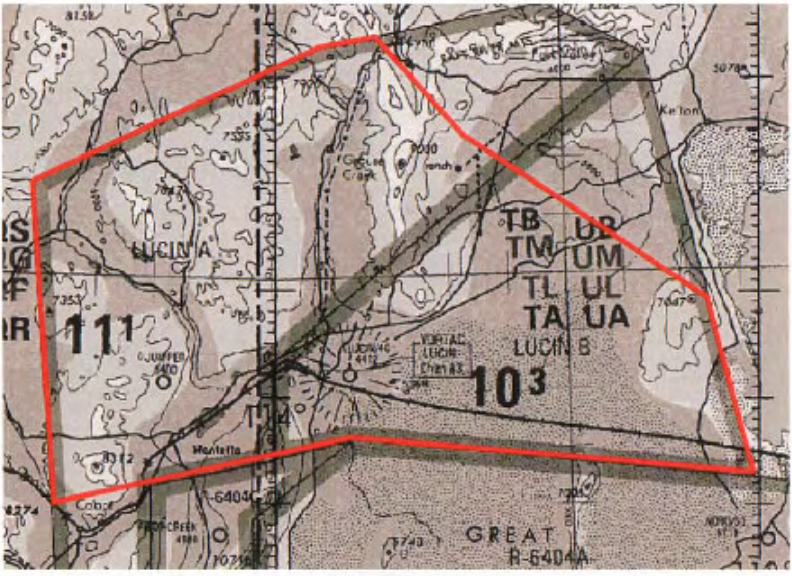
Military aircraft have been approved to conduct lights out training operations in the Lucin, Sevier, and Gandy MOA's. The training will be stopped for any observed traffic, however, the radar coverage in this area does not extend to the surface. Clover control can provide flight following on 118.45 or 134.1 (as depicted below)



LUCIN

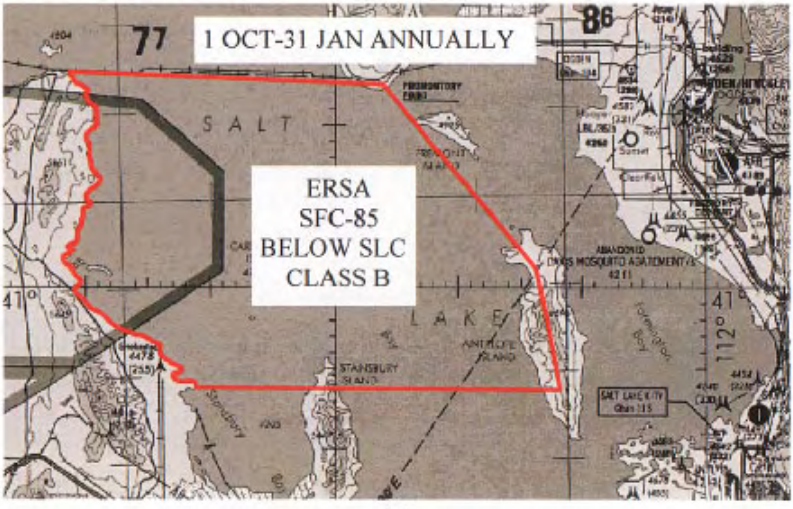
Altitude Reservation Area (ALTRV)

Vertically extends the Lucin MOA's up to but not including FL 180, as depicted below. The Lucin ALTRV is only active while Clover Control is operational.



ERSA

The expanded radar service area (ERSA) is an area on the west side of the Great Salt Lake where brine shrimp harvesting operations take place. During the harvesting season, this airspace becomes very crowded with "spotter" aircraft. Clover control provides flight following and traffic advisories on 118.45



WHAT A FIGHTER LOOKS LIKE

You might think it is easy to spot a military aircraft because they are usually larger than an airplane you might own or use. Certainly, large military transport, bomber, or air refueling aircraft are "airliner" sized, but what about a fighter? Take a look at the figure below—it might give you an idea of relative fighter size.

WHAT A FIGHTER LOOKS LIKE AT VARIOUS DISTANCES

To put things in perspective, if you are flying at 120 knots and are approaching an F-16 head-on traveling at 500 knots (a typical fighter speed flown on low-level routes) you will close at about 1000 feet per second. If your initial separation was 6000 feet, you would have about 6 seconds to react prior to impact. That is if you were able to recognize the "dot on the horizon" as a conflict. Not much time! It takes approximately 3-5 seconds for a pilot to recognize a threat, make a decision, and initiate action. Also keep in mind the F-16 pilot will have an even tougher time seeing you if your aircraft is smaller than his.

The bottom line: **keep your visual look-out honed!**

Common Military Aircraft that frequent the Salt Lake Valley

KC-135
Rate of Climb: 1,000 - 3,000 FPM
Approach Speeds: VFR 135-180 KIAS Final
Pattern Speed: 180 – 250 KIAS

C-17
Rate of Climb: 2,000 – 4,000 FPM
Approach Speeds: VFR 115 - 200 KIAS Final

T-38
Rate of Climb: 1,500 - 2,500 FPM
Approach Speeds: VFR 150 KIAS Final
Pattern: 250-300 KIAS

F-22

Rate of Climb: 10,000+ FPM
Approach Speeds: VFR 130 KIAS Final
Pattern: 300 KIAS

F-16

Rate of Climb: 10,000+ FPM
Approach Speeds: VFR 130 KIAS Final
Pattern: 300 KIAS

C-130

Rate of Climb: 1,500 FPM
Approach Speeds: VFR 140 KIAS Final
Pattern: 150 - 200 KIAS

A-10

Rate of Climb: 1,500 FPM
Approach Speeds: VFR 135 KIAS Final
Pattern: 150 - 250 KIAS

Chief of Flight Safety
Ogden Air Logistic Center
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