

LOCAL FACILITY FREQUENCIES

JOSHUA APPROACH: R-2508

ISABELLA 133.65
 PALMDALE 124.55
 PANAMINT 120.25
 OWENS 126.55
 SALINE 123.95

SPORT (R-2515) 132.75

CHINA LAKE CONTROL
 (R-2505/R-2506) 128.25

FLIGHT SERVICE STATION:

RIVERSIDE (NORTH) 122.15
 RIVERSIDE (SOUTH) 122.2/122.4

ATC COMMON FREQUENCIES:

BEATTY 124.62
 BFL 118.8
 BISHOP 125.75
 DAG-PMD 132.5
 FOOHILL 123.8
 O02-LAS 125.6
 PORTERVILLE 127.1
 VCV-WJF 124.55 (SFC-130)

LOCAL UNICOM/TOWER:

BAKERSFIELD 118.1
 BISHOP 123.0
 CALIFORNIA CITY 122.7
 DAGGETT 123.0
 FOX FIELD 120.3
 FRESNO 118.2
 INDEPENDENCE 122.9
 INYOKERN 122.8
 KERN VALLEY 122.8
 LONE PINE 122.8
 MOJAVE 127.6
 TEHACHAPI 123.0
 TRONA 122.8

WE REQUEST YOU FOLLOW THESE PROCEDURES PRIOR TO ENTERING THE EDWARDS AFB SPECIAL USE AIRSPACE:

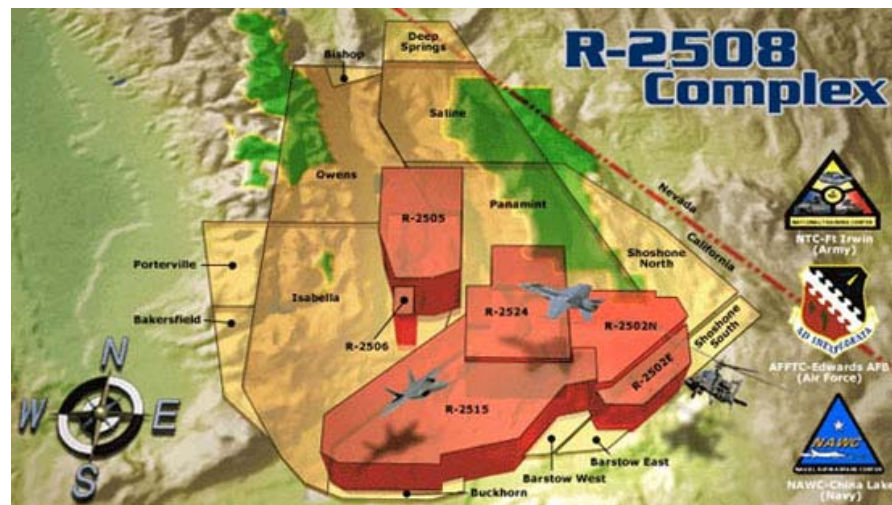
- CONTACT FSS FOR ANY NOTAMS
- SQUAWK 1200 OR AS ASSIGNED BY ATC
- TALK TO JOSHUA APPROACH
- TURN ON ALL EXTERNAL LIGHTS TO AID IN MID-AIR COLLISION AVOIDANCE
- CLEAR !

www.edwards.af.mil , click on "Flight Safety"

Edwards Air Force Base

Flight Safety Office

MIDAIR COLLISION AVOIDANCE



▶ A Civilian Pilot's Guide to Navigating the R-2508 Complex, surrounding Edwards AFB, China Lake NAS and Ft. Irwin

This publication includes:

- ▶ A description of the R-2508 Complex and resident missions
- ▶ Hazards to civilian pilots while flying in the Complex
- ▶ Procedures and techniques to safely fly through the Complex
- ▶ Techniques to identify and avoid midair collisions

Fellow Aviators,

This pamphlet is designed to increase your awareness of military operations in the R-2508 Complex, which supports the mission of Edwards AFB, China Lake NAS and Ft. Irwin. It includes information on restricted areas, military operating areas (MOAs), and low-level training routes. Additionally, it describes how to avoid the hazards in the R-2508 Complex and transit to your destinations safely. I hope this information will help you better understand our local military operations and will facilitate an enjoyable and safe flying environment for all concerned.

I solicit your comments and recommendations for improvement. If you have a group of 10 or more aviators and are interested in having my Flight Safety Officers visit your organization and provide a Midair Collision Avoidance (MACA) seminar, call us at (661) 277-2623 (DSN: 527-2623) or write us at:

412 TW/SEF
35 North Wolfe Ave.
Edwards AFB CA 93524-6755

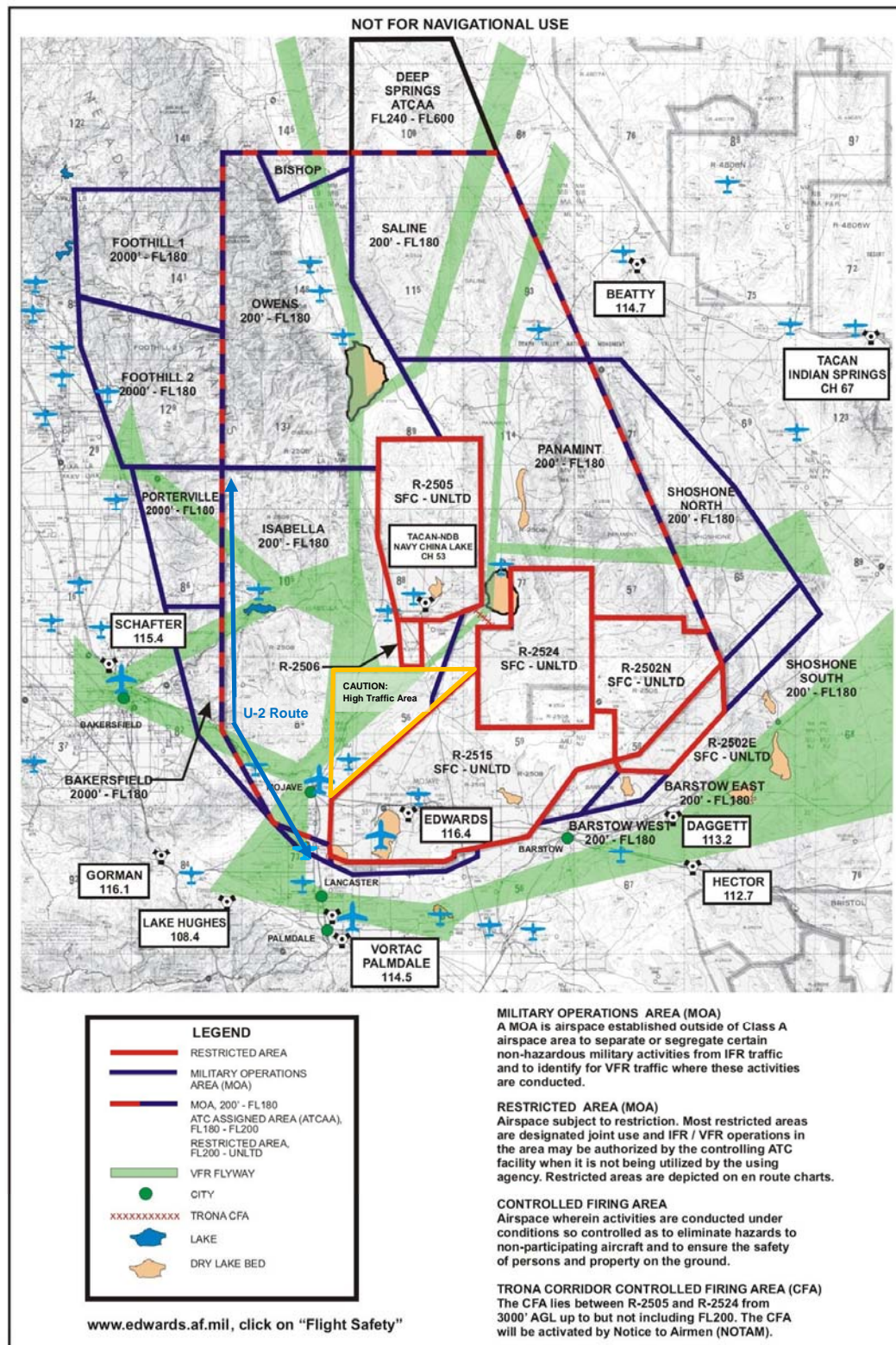
JAMES H. SPENCER, Lt Col, USAF
Chief of Safety, 412th Test Wing

SUMMARY OF REVISIONS

Changed designation from AFFTC/SE 11-103 to EAFB 11-103. Changed all references from AFFTC/SE to 412 TW/SE. Changed low level page to depict Sidewind-er Low Level instead of colored routes.

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412 TW/SEF.....1000



FIND US ON THE WEB!

Go to

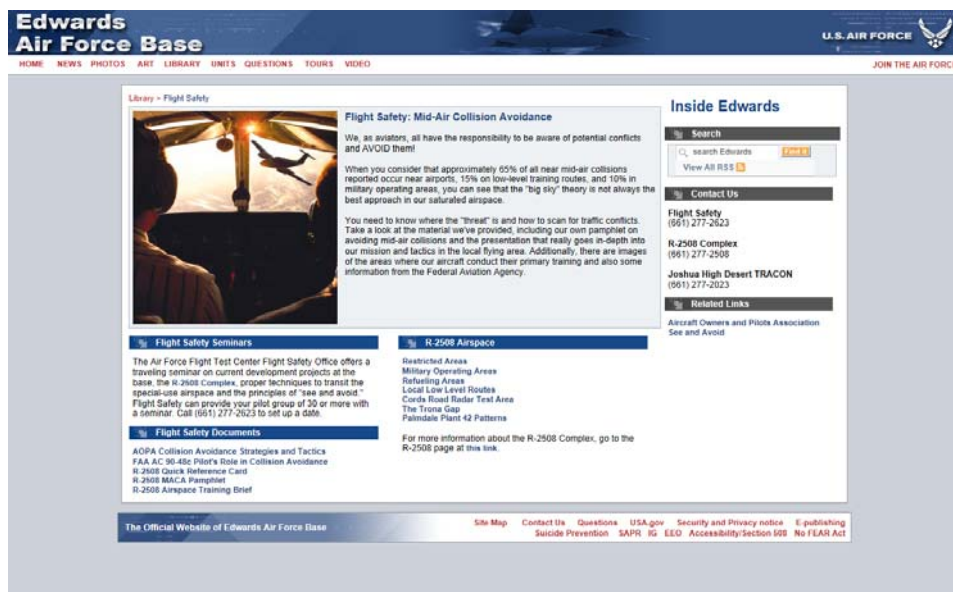
www.edwards.af.mil

then click on

“Flight Safety” or

“R-2508 Airspace”

E-Mail: 412tw.SEF@us.af.mil



You can access many resources on our web page, including the latest version of this pamphlet and various airspace charts. The R-2508 website has the most up-to-date guidance on the use of the complex and should be used for detailed route planning.

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Edwards Air Force Base

Edwards Air Force Base (AFB) is the world's premier flight test facility. Every day, aircraft of all types take to the skies around the famed Rogers Dry Lakebed to expand the capabilities of controlled flight. These hallowed skies have seen the conquering of supersonic flight, the expansion of jet speeds never imagined, the recovery of space-ships and the development of robot aircraft. Nearly every piece of technology used in your civilian aircraft was at one time flight tested at Edwards AFB.

Today, the base is testing the F-35 Joint Strike Fighter, expanding the capabilities of robot aircraft like the Global Hawk and Predator, and even testing a new jet fuel made from US coal, instead of imported oil. The expansion of current capabilities continue alongside these major programs, from envelope expansion of current jets, to avionics upgrades, and expanded weapons capabilities.

The base is also home to the USAF Test Pilot School. The school teaches highly experienced pilots, navigators and engineers from across the USAF and our allied air forces the procedures for safe and effective flight test, graduating two classes of flight test professionals each year.

At Edwards AFB, we are
Testing the Future—Today!

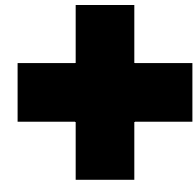
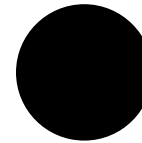


Finding the Traffic

THE BLIND SPOT

We all have a "blind spot." Potential for a midair collision lies within this blind spot. At one mile this area could be 800 feet by 500 feet, and at 5 miles, this area could be almost a mile wide. One way you can compensate for the blind spot is to move your head around while doing your scanning and look more than once in a given direction.

Here is a demonstration on locating your blind spot. With your right eye closed, look at the cross on the right. Move the paper back and forth about a foot away from your eye; the circle on the left will disappear. When that happens, the circle is in your blind spot.



FINDING THE TRAFFIC

Let's say you are navigating the R-2508 Complex at 6,500' MSL and Joshua gives you the following traffic call: "N1234AB, you have military traffic at your 2 o'clock, 8 miles 9,000 feet". The easiest way to find it is to first look at the 2 o'clock position, then focus your eyes to something on the ground at the approximate distance (8 miles in this case), then move your eyes up to the altitude (slightly above the horizon in this case). Works like a charm! Joshua may also tell you the traffic is "maneuvering" which means the position is changing rapidly. Keep asking for position reports if initially unable to acquire the traffic.



Scanning Techniques

EMPTY FIELD MYOPIA

When flying in clear, cloudless skies, like we mostly have here in the high desert regions of California, your eyes will focus on the instrument panel or the propeller, only 3'-6' in front of you. That means you will have to refocus your eyes to find traffic. Add that to the reaction time described on page 21 and now it will take you even longer to move out of danger.

DISTRACTIONS

That cool new GPS you have may be nice, the conversation with your friends may be engaging, the cool stuff on the ground may grab your interest, but all that may be diverting attention away from the traffic outside your airplane. Being a pilot means prioritizing. Keep most of your attention outside, especially when flying in a MOA.

BUGS

Clean that windshield. A traffic conflict will look like a bug when about 1 mile or more away from you. By the time a fast moving (fighter) traffic conflict is larger than the bugs on your windshield, it's already too late.

STANDARD SCANNING TECHNIQUE

Moving your eyes around the sky produces nothing but a blur for your brain to decipher. In order to see correctly, you must steady your eyes and focus on something other than the blue sky (Empty Field Myopia). Select about a 15 degree portion of the sky, focus your eyes on the ground at about 5 miles away, then move up and scan a few inches above and below the horizon. Move to the next 15 degree segment. Repeat often. This will keep your attention outside, and you can do this while talking to your friends. If you teach this to your passengers, they'll help out, and think you are cool...well, maybe not cool.

WHAT AFFECTS YOUR ABILITY TO SPOT TRAFFIC

1. **Image Size:** The bigger the jet, the easier it is to find.
2. **Luminance and Contrast:** Darkness, sunlight flare, haze and fog will affect contrast and reduce visibility.
3. **Darkness Adaptation:** It takes 30 minutes to adapt to darkness.
4. **Motion:** An object must move to interest the eye and the brain. A stationary object in the windshield is on a collision course.
5. **Exposure Time:** The more time to see, the better the odds of finding the traffic. Keep your attention outside in high traffic areas.

NASA Armstrong

The Armstrong Flight Research Center is co-located with Edwards AFB and is NASA's center for aeronautical flight research and atmospheric flight operations. NASA Armstrong is chartered to research, develop, and transfer advanced aeronautics, space and related technologies. The Center manages the Stratospheric Observatory for Infrared Astronomy (SOFIA) program, an airborne world-class observatory which complements space and major ground-based telescopes. In addition to space exploration, the Center manages launch abort systems testing and integration for the Orion Multi-Purpose Crew Vehicle. Aeronautical research and development programs include improved fuel efficiencies, noise reduction on takeoff and landing, and commercial flight supersonic boom mitigation. All of these programs are tailored to expand our aeronautical knowledge and discovery of our universe.

NASA Armstrong also operates an educational facility in the city of Palmdale, where adults and youngsters can learn about the world of space and aviation. The facility is next to the Palmdale City Hall on Palmdale Boulevard.

SOFIA



X-48



Autonomous Refueling



Naval Air Weapons Station China Lake

The Naval Air Weapons Station China Lake is located within a day's travel of both the highest (Mt. Whitney) and the lowest points (Badwater in Death Valley) in the contiguous 48 states. China Lake is located in the California Mojave Desert and is considered High Desert. The installation is the Navy's largest single landholding, representing 85 percent of the Navy's land for RDAT&E use and 38 percent of the Navy's land holdings worldwide. In total, its two ranges and main site cover more than 1.1 million acres, an area larger than the state of Rhode Island.

The Station was established in 1943 when the Navy was looking for a sparsely populated area with near perfect flying weather and practically unlimited visibility that could handle the mission of serving as a research, development and testing area for weapons. An early partnership established a pattern of cooperation and interaction between civilian scientists and engineers, the military, and defense contractors that continues to this day.

NAWS China Lake provides and maintains land, facilities and other assets that support the Navy's research, development, acquisition, testing and evaluation (RDAT&E) of cutting-edge weapons systems for the warfighter.

Pilot Reaction Time

HUMAN LIMITATIONS

Although you may think that you can react quickly to a traffic conflict, the truth is that most of us take about 4 seconds to recognize another aircraft as a threat to our flight path. Then, it takes another 2-3 seconds to actually move the flight controls and get the aircraft to do something. If you are flying a small GA aircraft, it may take another 10 seconds just to climb or descend 50 feet. That means it will take about 16 seconds from spotting a threat to moving your aircraft only 50 feet off altitude to avoid a midair. In those 16 seconds, a military jet can travel a long way at 500 KIAS.

HOW CLOSE IS TOO CLOSE?

Studies have shown that if two aircraft are closing at 600 KIAS, on a collision course (you at 100 KIAS and the jet fighter at 500 KIAS), there is no way to avoid a midair if they see each other at closer than 1.5 miles. This even assumes the jet fighter pulls 7 Gs to try to avoid the impact. Assuming both pilots see each other at 1.5 miles, and by the time they take the 6 seconds to move their aircraft, the impact will occur. No way out, none!

High speed jets keep their landing and taxi light retracted to avoid drag, therefore they cannot turn them on in flight. BUT, you can turn yours on! Step 3 on page 18 tells you to turn your lights on when transiting the airspace so we can see you at over 10 miles and easily maneuver. At 10 miles, a jet pilot has plenty of time to move out of your way.

MANEUVERING

It's no secret that a small GA aircraft can't perform like a jet fighter. But every airplane has its strengths. When a modern jet fighter goes into a 6 G turn, it has a turn radius of about 3,000 ft. However, most small GA aircraft can make the same turn in less than a 500 ft turn radius. That means you can out-turn a fighter!

How do you use this to your advantage? If you find you are on a collision course with a fast mover, big jet or small, you cannot out-climb or out-descend the higher performance jets, but you sure can turn tight and change your flight path quickly. Making a steep turn also exposes your entire wing, making you more visible. A tight turn may be your best option! Realize, if you turn to put a fast mover behind you, they will catch up quickly, and you'll lose sight too. Normally, turn to get the fast mover in front so they can cross your flight path as soon as possible. Just watch for wake turbulence after they have flown past.



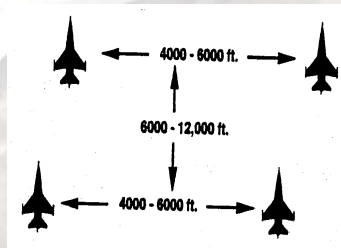
Military Flying

MILITARY FORMATIONS

Sage advice for anyone who spots a military aircraft is to look for another military aircraft nearby – often the same type as the first aircraft. Military aircraft flock together. It provides mutual support and tactical efficiency, and is the way the military does business. It is safe to assume if you see one C-130 flying down Panamint Valley at 500 feet, there may be another C-130 nearby. Some of the various military formations are shown below:

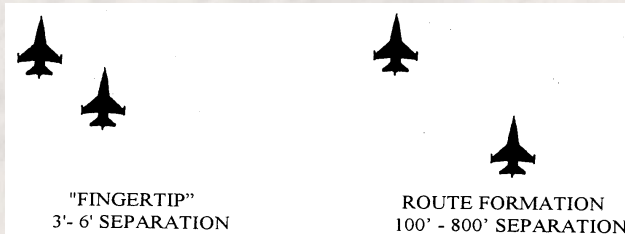
TACTICAL FORMATIONS:

Wartime formations are called “tactical formations.” This usually means the aircraft are flying a mile or so apart horizontally and may be split vertically by as much as 6000 feet. You could see as few as two aircraft in tactical formation or as many as eight or more. Here is an example:



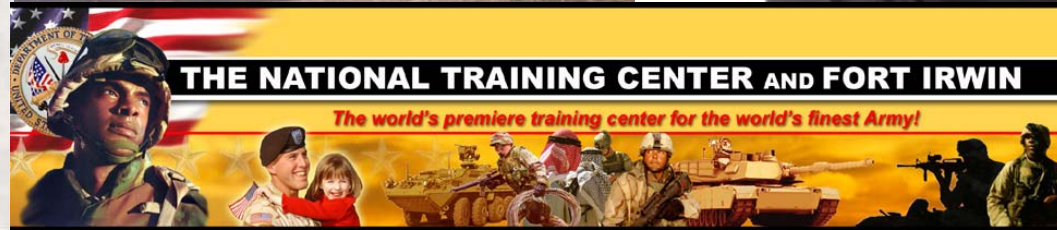
NON-TACTICAL FORMATIONS:

Military aircraft in a non-tactical formation (non-hostile) environment usually fly in a “standard” formation. By regulation, this means they must be within 1 mile horizontally and 100 feet vertically of each other. Usually the aircraft will be close enough together to spot them easily. Here are a few examples:



Fort Irwin

The Army's National Training Center (NTC) prepares soldiers for the rigors of combat in a desert environment. Located north of the Barstow area, Ft. Irwin is a wide expanse of land used for full scale combat training operations, including air support from Nellis AFB, NV. Thousands of soldiers have rotated through the NTC and then deployed to areas throughout the world in support of national defense objectives.





Mojave Spaceport

Mojave Air and Space Port emerged as the leading aerospace test center supporting commercial operations in North America. No longer a sleepy north desert general aviation destination, Mojave Air and Space Port amassed more first flights and significant newsworthy flight activity than any other airport in the world over the recent past. It is currently home to over 40 companies engaged in flight development of highly advanced aerospace designs, flight test and research and even heavy rail industrial manufacturing. Mojave Air and Space Port is the home of Burt Rutan's Scaled Composites; The Spaceship Company and Virgin Galactic; the National Test Pilot School; rocket companies like XCor and even a storage facility for unused airliners. What Edwards AFB is to the military, Mojave Air and Space Port is to civilian flight research.



Some Common Avoidance Tips

Studies on midair collisions show most accidents occur below 8000 feet MSL and near airports, navaids, and other high density traffic areas. Here are some ways to help reduce your midair collision potential:

1. Know where the high-density traffic is (Tehachapi, Mojave, Cal City area; Palmdale traffic pattern; Hwy 395 along the Owens Valley; Lake Isabella; Trona gap, among others)
2. Fly as high as practical.
3. Obtain an IFR clearance or participate in radar flight following whenever possible, and continue to practice "see and avoid" at all times.
4. Turn on all lights at lower altitudes, especially when near airports.
5. Announce your intentions on unicom and use standard traffic pattern procedures at uncontrolled fields. Try to present a "predictable target."
6. Always use your transponder with altitude reporting on (if available). Crosscheck accuracy with ATC whenever possible.
7. Use the appropriate hemispheric altitudes.
8. Constantly watch for other aircraft. Remember to "manage" your visual lookout as mentioned earlier in this pamphlet and understand the limitations of your eyes. Clear over the radio in addition to clearing visually.
9. Keep your windshield and windows clean and clear. A bug on the windscreen can obstruct and disrupt your visual lookout.
10. Learn proper task management in the air. Learn the proper methods to help you reduce your workload demands.
11. Do not get complacent during instruction. Instructors make mistakes too. Many midair collisions have occurred during periods of instruction or supervision.
12. When flying at night, do not use white light inside the aircraft. White light disrupts your night vision, even if used momentarily. Use a red light at night.
13. Beware of wake turbulence.
14. 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.
15. Execute appropriate clearing procedures before and during all climbs, descents, turns, abnormal maneuvers, or aerobatics.
16. Above all: AVOID COMPLACENCY!

Transiting The R-2508 Complex

Five Steps to a Safe VFR Flight in the R-2508 Complex (or any other MOA)

STEP

SQUAWK

1

Turn on your transponder so that Joshua Control can see where you are and give the military aircraft the proper traffic calls to avoid you. Without a transponder, you can disappear easily off ATC radar in the local mountainous terrain.

STEP

TALK

2

Request radar service while transiting the High Desert. Communicating your intentions helps Joshua warn you of possible problems and of traffic conflicts.

STEP

BE VISIBLE

3

Turn all your exterior aircraft lights on. Your lights make you significantly more visible to other traffic in the area.

STEP

BE PREDICTABLE

4

Fly VFR hemispheric altitudes. Also, use the Recommended VFR Flyways to remain in areas the military fliers expect to see you. The more predictable, the more the military pilots can predict where to look for you and how to avoid you.

STEP

PLAN BEFORE YOU GO

5

Get the NOTAMs for Los Angeles Center (ZLA), Victorville (KVCV), and all the airfields near your route of flight. Check the FAA Airfield Facility Directory for UAS special notices concerning RPA operations.

Other Users of the R-2508 Complex

US Navy aggressors, Fallon NAS, NV

US Navy combat training from Lemoore NAS, CA and various aircraft carriers off the coast as part of fleet certification

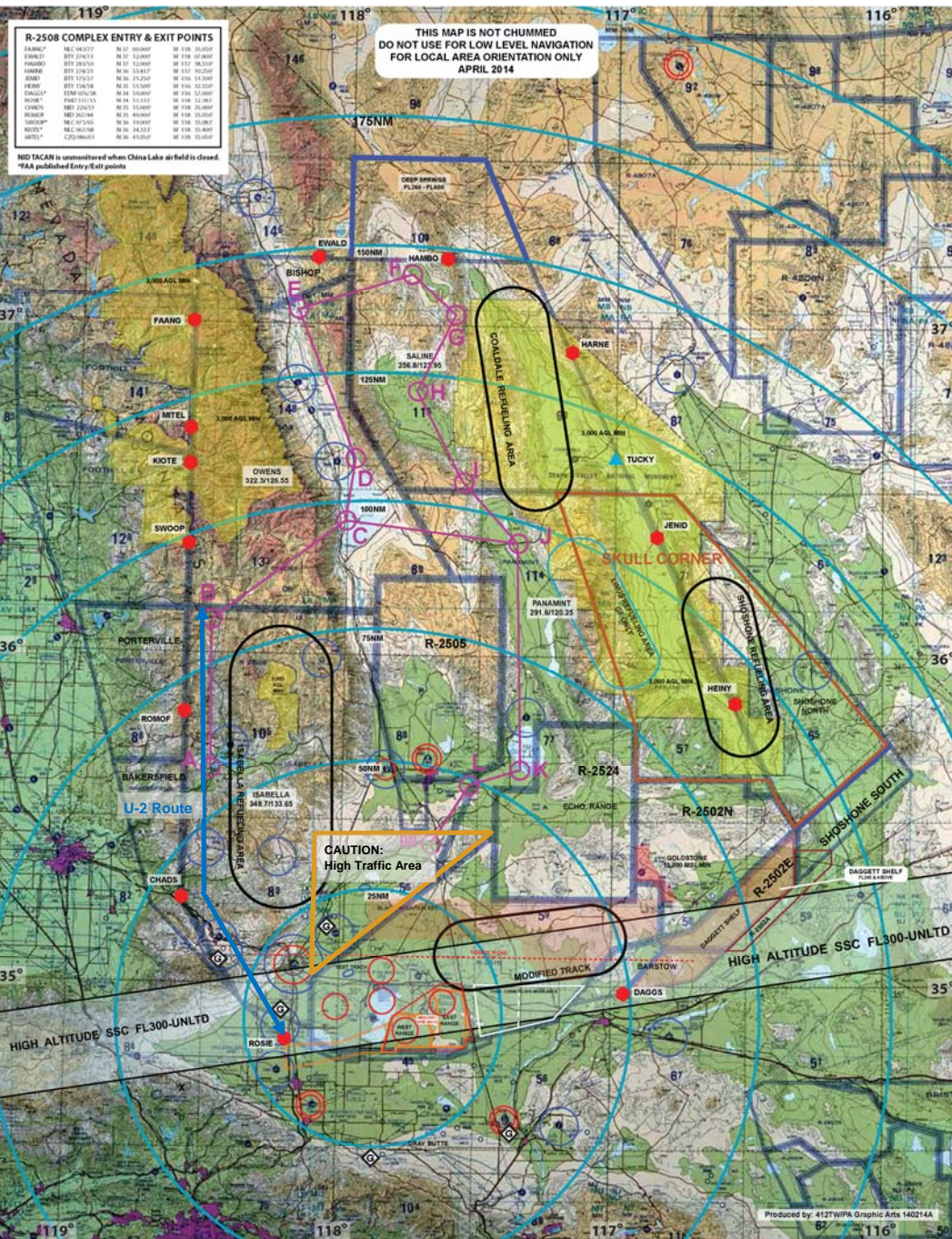
And YOU!

Gliders at Cal City and Tehachapi

AFRL Rocket Motor Test Lab

Commercial Jet Flight Test

USAF Weapons School, Nellis AFB, NV



Palmdale AF Plant 42

CAUTION! KPMD IS NOT PALMDALE REGIONAL AIRPORT

AF Plant 42 is an Air Force Production Flight Test Installation. Operations involve depot maintenance and industrial flight test by NASA, Boeing, Lockheed-Martin and Northrop-Grumman. Numerous high-performance aircraft types to include most military aircraft such as F-15, F-22, F-35, U-2, C-130, and UAVs. Plant 42 is also used as a training location for many Edwards AFB assigned aircraft usually transiting at 5,000' MSL.

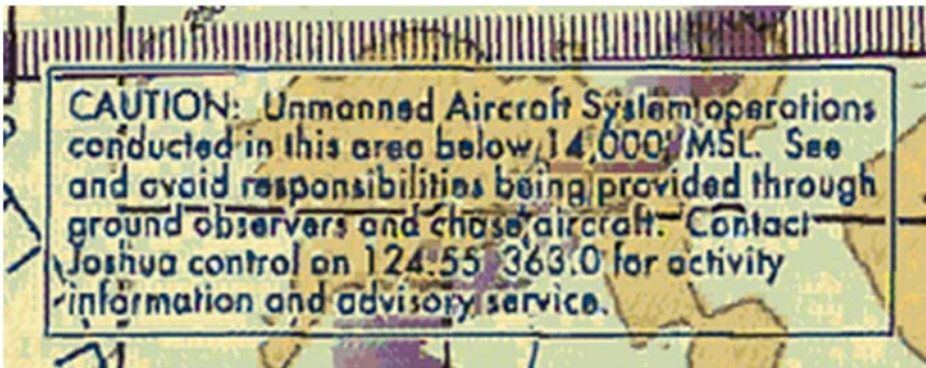


BE ON THE LOOKOUT FOR: WILLY ONE

A Law Enforcement C-172 that orbits Lancaster at 5,500' MSL. Monitors Joshua on 124.55. Static MODE 3/C code of 5240.

RPA Operations El Mirage & Gray Butte

In an effort to keep the National Airspace (NAS) as safe as possible for all users, this flyer is produced to help inform General Aviation Pilots about some of the Unmanned Aircraft System, (UAS) Operations in the High Deserts of Southern California. Currently, the Air Force, and several other entities operate Remotely Piloted Aircraft (RPA), in the NAS south of the R-2508 Range Complex. The "Los Angeles" VFR Sectional shows a "caution box" just south of Edwards Air Force Base and the "Buckhorn" MOA that "sums up" our message.



Traffic patterns are typically north of each airfield 5000' MSL and below. Holding patterns extend up to 9500' south of Gray Butte Flight Test Facility, and North of El Mirage airport in the event an RPA goes "lost link".

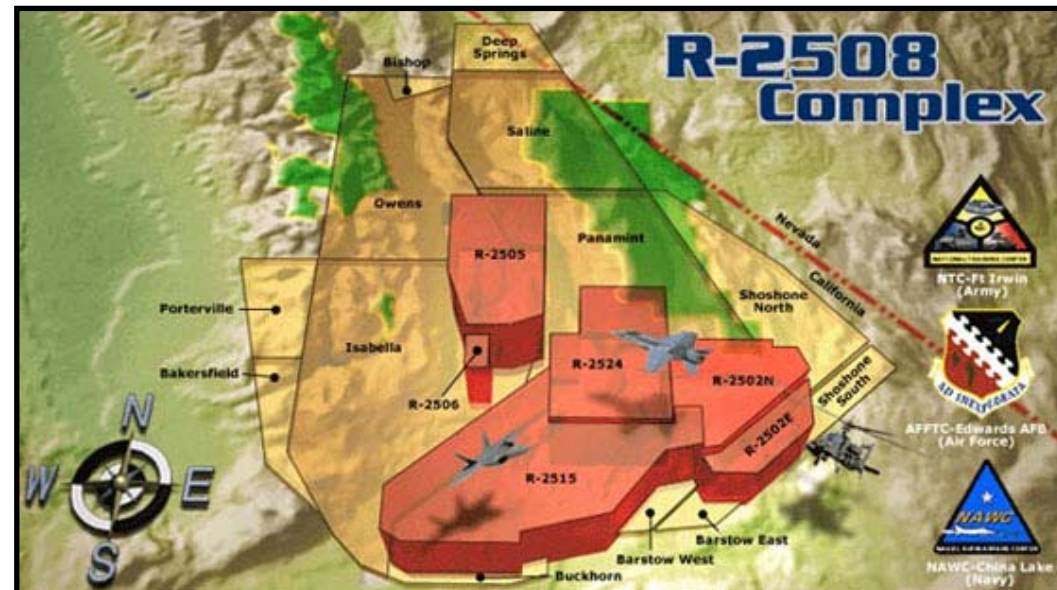
Operations outside of R-2515 are typically limited to:
East of Lake Los Angeles (117° 45' W)
North of Pearblossom Hwy (34° 30' N)
West of Victorville & Adelanto

The R-2508 Complex

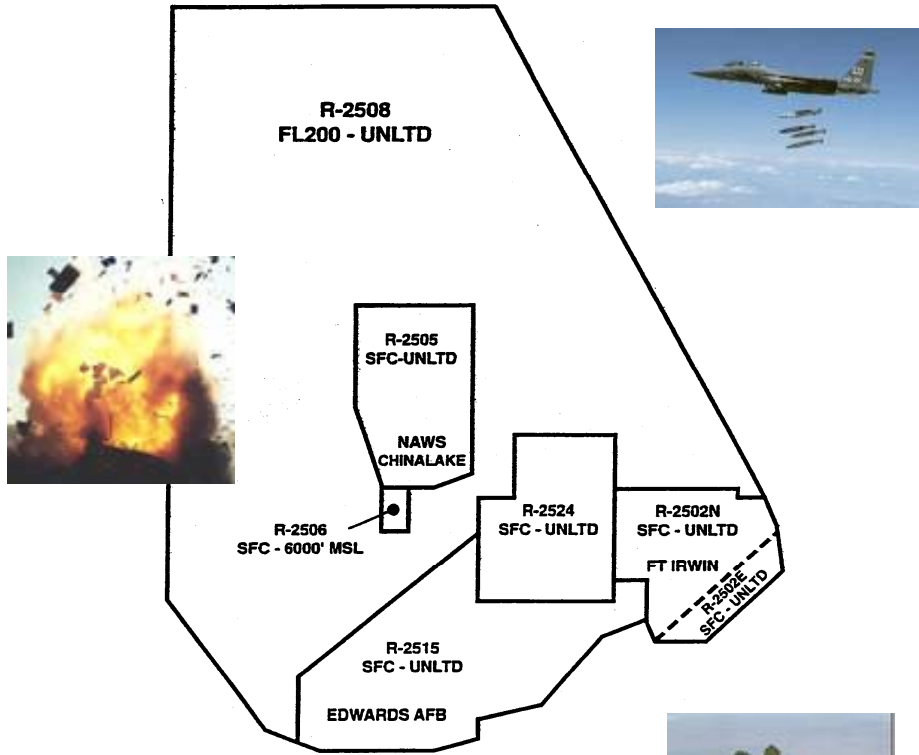
The R-2508 Complex is one of the largest military "special use" areas in the United States. Located around the Mojave Desert, it covers almost 16,000 square miles. Since this airspace is used extensively by all the military services, you need to be aware of the potential conflicts you might encounter when transiting the area. This knowledge will help reduce the risk of a midair collision. A number of civilian communities, airports, and recreational parks underlie the confines of the R-2508 Complex increasing the potential for a midair conflict.

For flights inside the complex, realize that borders between restricted areas and military operating areas (MOAs) are normally hard boundaries for general aviation aircraft. However, these borders may be soft boundaries for *military aircraft*. You may find fast moving aircraft coming from directions you don't anticipate.

For flights just outside the complex, avoid the airspace boundaries by at least 3 nautical miles as a rule of thumb. This provides you with some buffer airspace since military traffic may fly right up to the complex boundary.



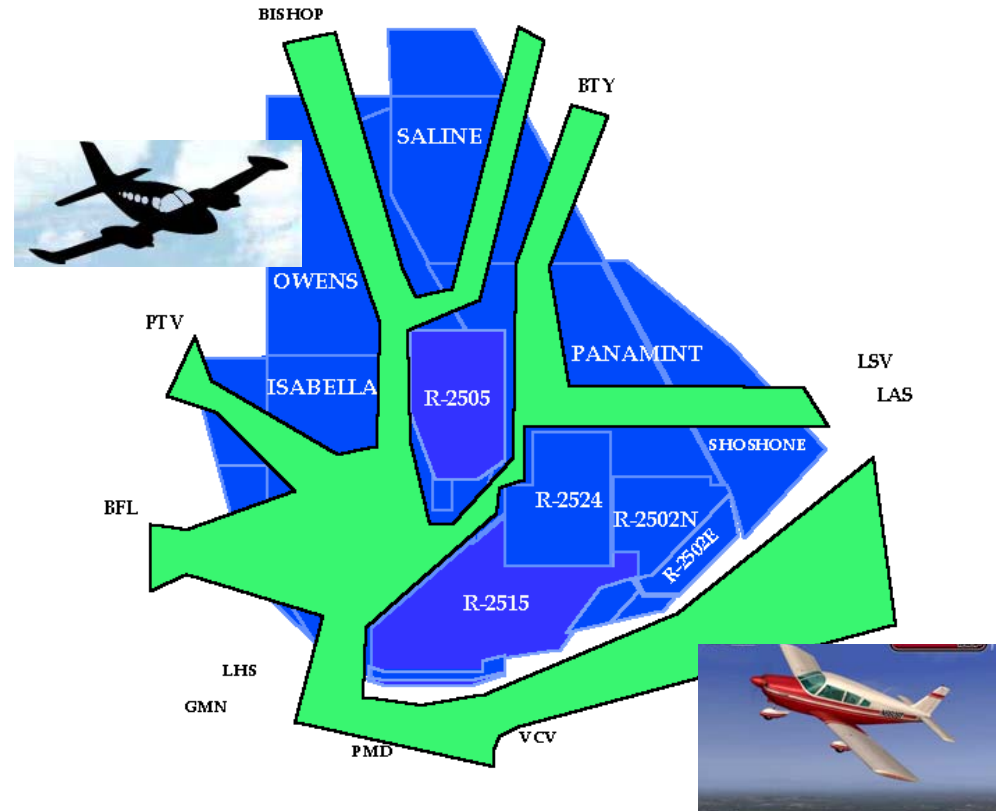
Restricted Areas



Extreme hazards exist in the form of unusual (and often “invisible”) threats to aircraft, such as artillery firing, aerial gunnery, laser firing, guided missiles, unmanned aircraft and flight test. These areas are active (“hot”) on a continuous basis unless released (“cold”). When hot, civilian non-participating aircraft may not enter the airspace due to hazardous operations. During cold periods the FAA controlling agency may permit aircraft to overfly certain restricted areas. During most late nights, weekends and federal holidays, the Complex may be cold. Get a clearance from Joshua BEFORE entering the airspace, even if cold.

Restricted areas are assigned a number. For example, R-2515 is the restricted area surrounding Edwards AFB. Further, some restricted areas are contained within larger restricted areas. For example, R-2515 (Edwards area) sits inside of the lateral boundaries of R-2508. The difference usually involves the specific altitude blocks you are to avoid.

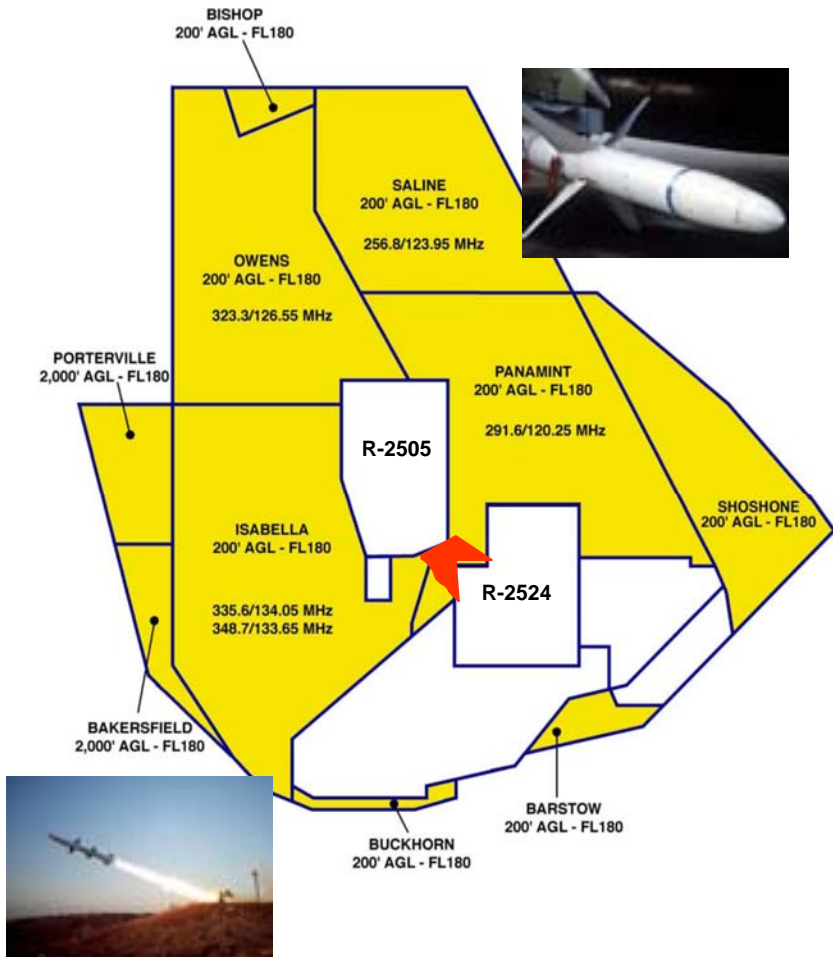
Recommended VFR Flyways



Civilian VFR traffic often transits the R-2508 Complex MOAs below 18,000’ MSL. Although the depicted flyways are not mandatory for transit, staying on them will make you predictable to the military missions and increase your chances of an event free trip. As you can see, the area west of R-2515 is a major VFR transit area, and military fliers usually avoid the lower altitudes since they expect high density VFR traffic. Military jets can still use these areas, but do so at a reduced frequency.

PLEASE SEE THE BACK INSIDE COVER FOR A DETAILED VERSION OF THIS CHART.

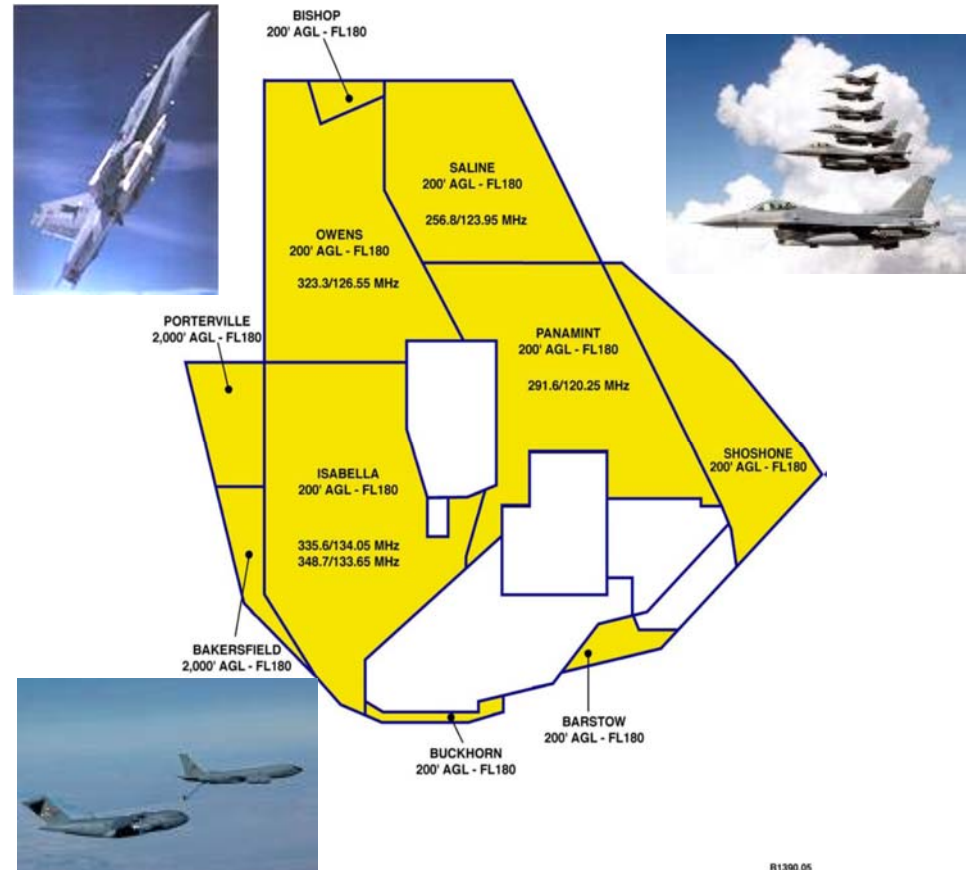
Controlled Firing Area (Trona Gap)



B1390.05

Between the R-2505 (China Lake) and R-2524 (Echo Range) exists a special piece of airspace called a Controlled Firing Area (CFA). The CFA is only activated by NOTAM and is normally part of the MOA. When activated, this section of airspace effectively becomes a restricted area, due to high risk activities between R-2505 and R-2524. The type of activities may include a missile firing or long range bombing. This is why checking the NOTAMs is very important. If the CFA is active, you may only be able to transit the Trona Gap below 3,000' AGL. In some cases, the test may be high risk and shut down the gap completely. Even if you plan on transiting outside the NOTAMed times, ask Joshua Control real time if the CFA is active, in case the firing times have changed after your takeoff time.

Military Operating Areas (MOAs)

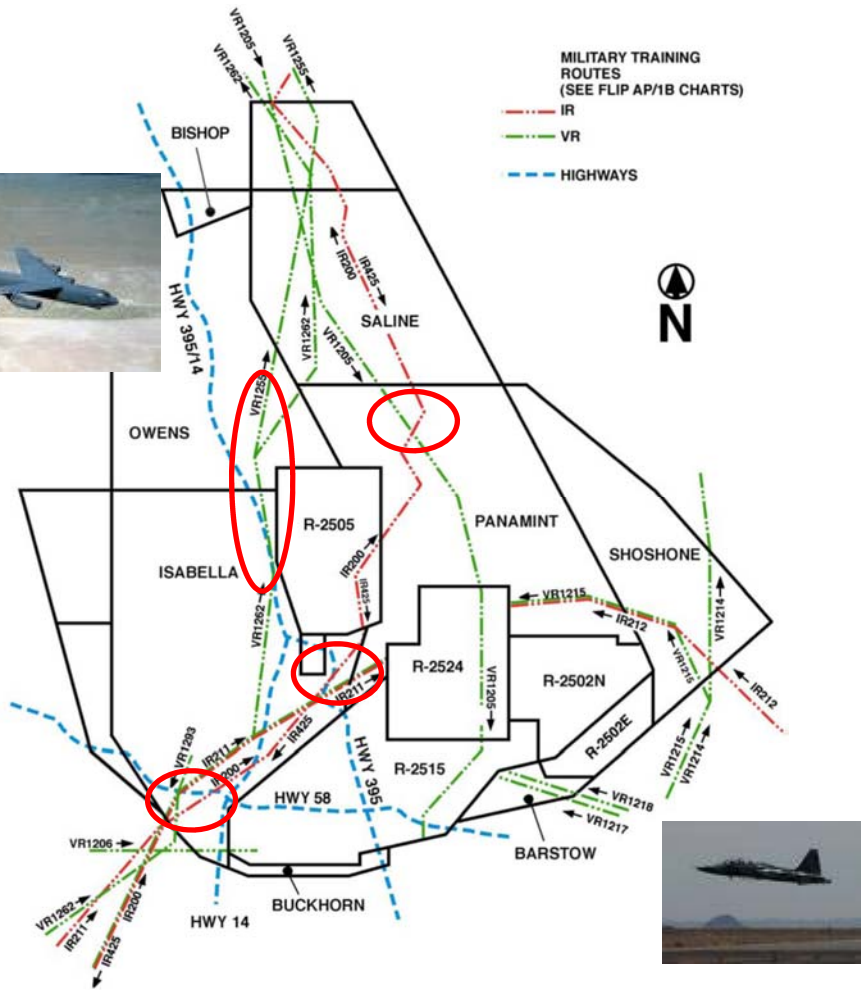


B1390.05

MOA airspace is established to separate/segregate certain military activities from IFR traffic and to identify for VFR traffic where these activities are conducted. These activities include air combat maneuvers, air intercepts, aerobatics, low altitude flight, etc. MOAs are depicted on your sectionals. The vertical dimensions of the four main MOAs (Isabella, Owens, Saline and Panamint) in the R-2508 Complex are from 200 feet AGL up to, but not including FL 180.

You may fly through a MOA any time you like, and you do not need to coordinate with anyone prior to or during your flight. However, considering the potential conflicts with military users, it is highly advisable to contact Joshua for traffic advisories; as well as squawk Mode 3/C and use landing/taxi lights for better visibility. (see page 18)

Military Training Routes (MTRs)



These routes, further classified as IR Routes and VR Routes, are low-level navigation routes running through and around the R-2508 Complex. On these routes, aircraft can travel in excess of 500 knots as low as 200 feet AGL. In fact, many of the military training routes have a base altitude designated as “surface,” and military aircraft may operate right on the deck! Many of the turn points along the military training routes are road intersections or other well-defined geographic points YOU might use yourself for a cross-country flight.

The red circles are areas where civilian traffic should be extra vigilant at lower altitudes.

Military Training Routes



Additionally, The USAF and the Navy have a route called the “Sidewinder” which does not appear on any sectional chart since it is confined within the R-2508 Complex and is only for local use. This route is flown in the “clockwise” direction only. The shortcut across Owens Valley to Panamint Valley is called the “Jedi Transition”. Since this route is for local use, military jets can enter or exit the route at any turn point.