Airspace Requirements: By: Darryl Kalthof – copyright 2011 www.bayareaflyinglessons.com

Any discussion about airspace necessarily involves aeronautical charts as well. Sectional and Terminal Area charts are current for 6 months, but you must also carry a current airport facility directory AFD to have all the required chart updates. (See the chart legend note.)

Airspace exists to provide separation and safe flight for IFR (instrument flight rules) aircraft which are allowed to fly through clouds and low visibility, and VFR (visual flight rules) aircraft which are not. Different types of airspace exist to provide different levels, or standards of separation between aircraft, and clouds.

When flying in VFR conditions in other than class A airspace both VFR and IFR aircraft are responsible to see and avoid each other. Where there is a greater likelihood of encountering IFR traffic or faster air traffic the visibility and cloud clearance requirements are greater. This allows time for both aircraft to see each other when an IFR plane pops out of a cloud. When flying close to the ground (below 1,200 above ground level – AGL), or in sparsely populated areas the likelihood of encountering an IFR aircraft is less, so the visibility and cloud clearance requirements are less as well, like in class G airspace.

Class A (A for high Altitude), or class alpha airspace exists from 18,000 feet MSL up to 60,000 feet MSL. Only IFR aircraft are permitted in class A airspace, and air traffic control is responsible for ensuring their separation both vertically and horizontally.

San Francisco airport is surrounded by class B airspace (B for Big). It is depicted by thick blue lines in concentric circles that go out to as far as 30 nautical miles from SFO airport. Class B airspace is shaped link and up-side down wedding cake. The standard spacing for class B rings is five nautical miles. The upper and lower limits of the class B airspace segments are depicted by altitudes in hundreds of feet MSL, like sfc/100 or 40/100.

San Jose and Oakland airports are surrounded by class C airspace (C for Crowded). The inner core for class C airspace has a 5 nautical mile radius, with standard vertical limits from the surface to 4000 feet AGL. The outer shelf for the C airspace extends from 5 to a 10 nautical mile radius, with standard vertical limits from 1500 to 4000 feet AGL. Depicted as sfc/40 or 15/40. Altitudes are giver in hundreds of feet MSL.

Note - The upper limit of Oakland's last c airspace is depicted in an unusual way. Instead of an altitude in hundreds of feet MSL a T is printed on the chart, 15/T. If you look northwest of the city of San Francisco you will see a note explaining the meaning of this T. the note states that the T. designates the ceiling of the Charlie is the floor of the overlying b. The team makes more sense if you consider that class b airspace used to be called TCA or terminal control area, so the top of the c airspace was the bottom of the TCA.

The smallest tower airports are surrounded by class D airspace (D for Dialog required). Class D airspace has a standard radius of 4 nautical miles, with standard vertical limits from the surface to 2500 feet AGL. Class D airspace is depicted by dashed blue lines surrounding the airport. The upper limit of the class D airspace is depicted by an altitude in hundreds of feet MSL inside a four-cornered box. A minus before the altitude means does not include that altitude. Some D airports in the Bay Area have a 3 NM radius.

General Aircraft Speed Limits: (FAR 91.117)

Below 10,000 msl:	Indicated airspeed of less than 250 knots.
Below the floors of class B airspace:	IAS of less than 200 knots.
Within 4 NM and below 2500 agl of class C or D airport:	IAS of less than 200 knots

There are many classes of airspace in **FAR 91.155**, but only five types of visibility and cloud clearances:

AIRSPACE CLASS	MY NICKNAME	MY MEMORY AID	VISIBILITY	CLOUD CLEARANCE
E & G above 10,000 MSL The visibility and cloud clearance requirements are greater above 10,000 MSL because aircraft can travel faster than 250 knots (up to 600 knots.)	**High Standard**	5-F111's	5 SM	1,000 above 1,000 below 1 SM horizontal
C, D, E & G below 10,000 at night	**Low Standard** Visibility/cloud clearance	3-152's	3 SM	1,000 above 500 below 2,000 horizontal
B- Bravo	Big (our largest airports)	3-clear	3 SM	Clear of clouds
G day below 10,000 msl, but above 1,200 AGL	1/2 Go For It	1-152	1 SM	1,000 above 500 below 2,000 horizontal
G day below 1,200 AGL And ops under SVFR	Full Go For It	1 clear	1 SM	Clear of clouds

Class E & G Airspace: (G Airspace is the <u>only</u> uncontrolled airspace (ATC does not control IFR traffic in G airspace)

The hardest thing to find on the charts is the floor of the class E, or the top of the class G. You can think of this as the transition altitude between these two airspace classes. You will have class G below this altitude to the surface, and have class E above this altitude up to 18,000 MSL. (Actually it's 17,999 MSL because Class A exists from 18,000 to 60,000 MSL.)

Look on the San Francisco sectional chart, turn to the north side, and find Reno airport. The Mustang VOR, or more accurately, vortac is located 6 miles northeast of the Reno airport. The VOR looks like a blue dot inside a triangle with the line projecting to magnetic north that's labeled zero. I will use the different radials of the Mustang VOR, the numbers that appear on the outside of the circle designate the magnetic direction or course from the VOR. For example there is a Victor airway labeled V6 that runs between Mustang VOR and squaw Valley VOR. This Victor airway is defined by the Mustang VOR 218° radial. I will use different airports all of which are located about 20 to 50 miles south of Reno, Nevada to show how different class E airspace floors are depicted on the aeronautical charts. One nautical mile or NM is equal to 1 minute of latitude (one tick to the next on the vertical lines.)

There are only <u>5 different ways</u> to depict the floor of the E airspace on an aeronautical chart.

If an area of the chart is:

Not shaded at all, hard side of the blue, floor of the E is 14,500 MSL. (see FAR 71.71, Class E above and Class G below to the surface.) See the Rosaschi airport ID N59, Mustang VOR radial 144, 43 nautical miles away.

Shaded BLUE, but with an MSL altitude printed inside the zipper symbol, then the floor of the E is that printed MSL altitude of 12,300 MSL. See Alpine County airport ID M45, Mustang VOR radial 170, 47 nautical miles away.

Shaded BLUE, on fuzzy side of blue boundary line, then the floor of the E is 1,200 AGL. Chart legend states this is default. See Dayton Valley airport ID A34, Mustang VOR radial 150, 18 nautical miles away.

Shaded MAGENTA, on the fuzzy side of the magenta boundary line, then the transition altitude is 700 AGL See Minden-Tahoe airport ID MEV, Mustang VOR radial 172, 37 nautical miles away.

Surrounded by a magenta dashed line, then the transition altitude is at the surface. (Class E exists from 0 AGL to 17,999 MSL.) See Lake Tahoe airport ID TVL, Mustang VOR radial 186, 42 nautical miles away.

Mode C Transponder Requirements (FAR 91.215):

You also need a Mode C transponder, one capable of transmitting a squawk code like 1200 or 4254 (mode A transponders transmit a squawk code only), and altitude to ATC in the following three areas:

1	Everywhere across the continental United States above 10,000 MSL, unless within 2,500 AGL.	
2	Class B	Within 30 nautical miles of a Class B airport (surface to 10,000 MSL)
3	Class C	Inside and above Class C up to 10,000 MSL, but not below the shelf.

If your Mode C or entire transponder is inoperative you can enter any airspace if you notify ATC and they approve.

Entry requirements for Class B, C and D Airspace:

It is critical that you can identify the lateral and vertical limits of class D, C, and B airspace. You must either avoid these airspace classes, or meet their entry requirements

For Class D – Establish two way radio contact, before entry. Two way contact = ATC says your call sign back to you, and does not say remain clear of airspace.

For class C – Establish two way radio contact with tower or approach control. Class B and C approach control frequency's are listed in boxes on chart, or in the airport facility directory.

For class B – Two way radio contact **and** get **specific clearance** to enter from tower or approach control.

Special VFR Weather Operations

FAR 91.155 c & d states that no person may operate, take off, or land under VFR within the lateral boundaries of the surface areas of class B, C, D and E designated for an airport when the ceiling is less than 1000 feet AGL or the ground visibility is less than 3 SM. So if an airport is experiencing these conditions the airport is below basic VFR weather minimums, or it is IFR. The only way to operate into, or out of such an airport is under IFR, or under Special VFR rules.

Special VFR continued:
It is possible to ask for a Special VFR Clearance from ATC. This clearance will allow you to operate as directed by ATC. A sample clearance might sound like this: Cessna 4849D is cleared out of the Palo Alto class D airspace to the north, maintain Special VFR conditions and report when clear of the Class D Airspace. Special VFR conditions are 1 SM visibility and clear of clouds. SVFR is only available within the lateral limits of the surface area of the controlled airspace your in.

Special Use Airspace:

This airspace is mainly airspace used by the military and the government. More information on many of these areas is given on our VFR charts on a strip at the top or side of a the chart like: time of operation, altitudes, and controlling agency. A pilot must be familiar with all these areas and know how they are depicted on the charts.

Prohibited: All flight except participating aircraft are prohibited. An example is the DC mall area (Capital bldg. And the white house)

Restricted Area: Various hazardous Activities: spaceflight, military gunnery, ECT. You MUST get a clearance from ATC to enter an active restricted area. Our nearest is by Tracy R-2531. Restricted area's start at the surface and go up to the table altitude.

Alert Area: Designates a high level of military training activity they want you to be alert for. You may fly through this area at any time. You should at least get radar service (flight following) Restricted area's start at the surface and go up to the table altitude.

Military Operations Area MOA: Areas for military practice: dogfights, acrobatic flight, high speed, ECT. You may fly through at any time. You should at least get radar service. A note at the end of the MOA table says all MOA go up to 17,999 MSL.

ADIZ: Air Defense Identification Zone: Along the east coast, west coast, and southern borders (Canadians are no threat EH!) You must file an IFR or Defense VFR flight plan and follow special notifications procedures to cross the ADIZ.

Warning Area: Like restricted areas but flight cannot be restricted as the area lies over international waters. They still recommend you avoid when active.

Controlled Firing Area: These areas contain live fire, but are not charted as all activity is suspended as you approach the area.

Military Training Route MTR: These routes allow military aircraft to exceed 250 KIAS below 10,000 MSL. The VR routes are restricted to visual metrological conditions (VMC), the IR's are not. 4 digit routes are restricted at or below 1500 AGL, 3 digit routes are not. MTR's are 8 NM wide. Some MTR's show this width when there are limiting altitudes, like 05/90 = 500 to 9000

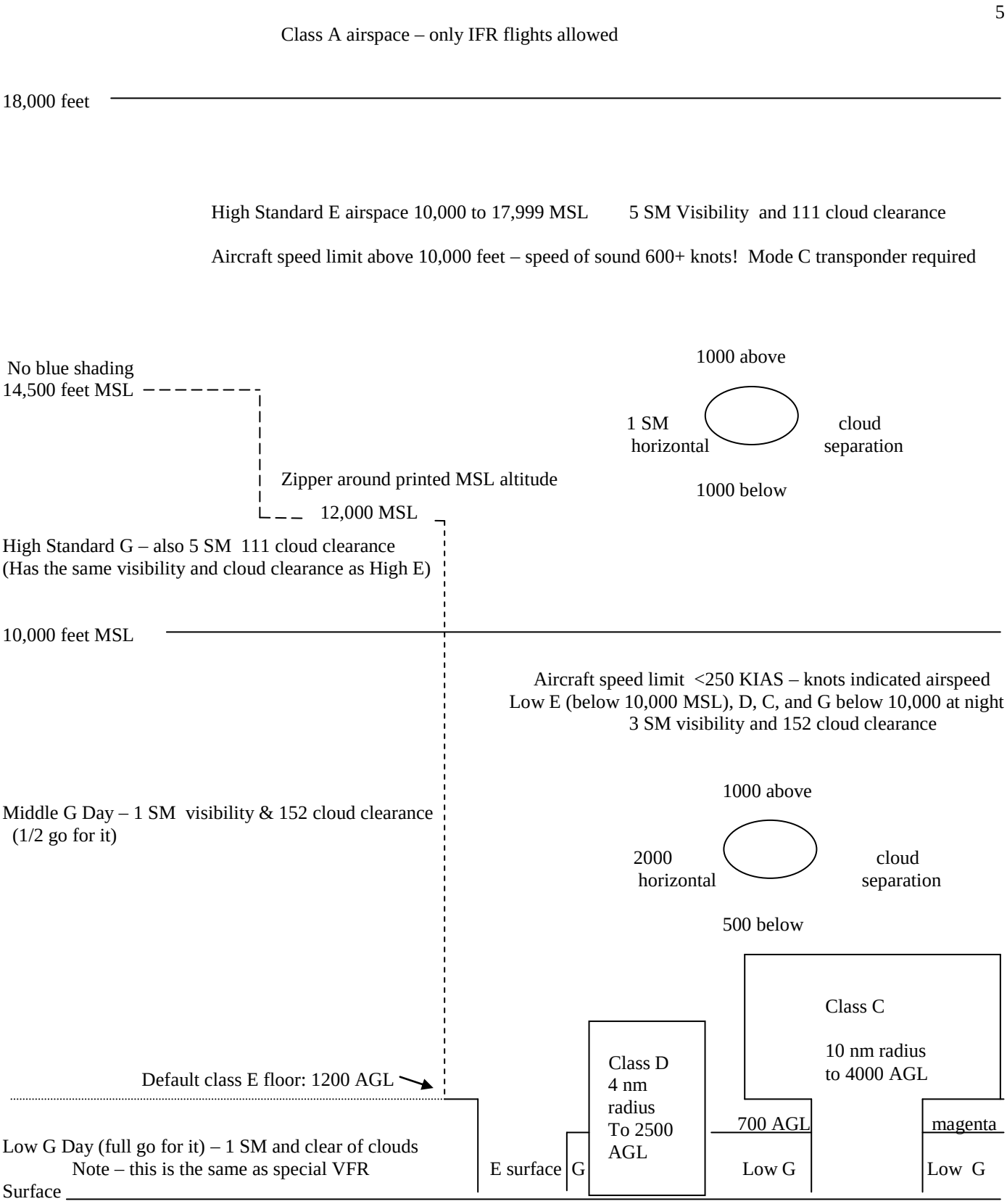
National Security Areas: Pilots are asked to avoid flight in these areas (I would!) See a small purple circle 5 NM east of LVK airport.

Terminal Radar Service Areas: Pilots are requested, but not required to receive radar service in these areas. Think of them as voluntary class C airspace. Many are round like class C as well, but Palm Springs is rectangular shaped.

Special Conservation Areas: Pilots are requested to avoid flight at less than 2000 AGL (usually) in these areas to lesson noise impact on nature areas and national parks. There are many of these along the coast and even one over the east bay.

Grand Canyon Special flight rules area and Chart: You need the chart in order to comply with the SFRA around the Grand Canyon.

Temporary Flight Restrictions TFR's: There are NOT charted. These are created for: forest fire fighting areas, natural disasters, air shows, volcanic eruptions, and presidential visits.
Pilots are notified through FDC (flight data center Notams). They usually come at the start of the 2nd set of notams on DUATS. You can also see they plotted if you choose the graphical TFRs on the DUATS main page. Of course you can also call FSS before departure or enroute as well. NOTE: you must remain clear of sporting events over 30,000 capacity by 3 NM and 3000 feet unless under direction of ATC and there ARE NOT listed with FDC notams!



Note: Special VFR is possible within the surface areas of Class E, D, C, and a few B airspaces (No SVFR in SFO B)
Under SVFR clearance obtained from tower or approach control you can fly with 1 SM visibility and clear of clouds

Other notes on aeronautical charts:

There are three types or scales of aeronautical charts. Terminal area charts depict the area around class B airports, and had a scale of 1 to 250,000. Sectional charts cover 4° degrees of latitude, or about 240 nautical miles from north to south, and have a scale of 1 to 500,000. World aeronautical charts or WAC charts cover 8° of latitude or about 480 miles from north to south, and have a scale of 1 to 1,000,000.

Aeronautical chart legends:

All charts have a date panel and a legend panel. Most have at least two additional panels with specific information about airspace on the chart. You must become familiar with not only the legend information but also the other panels and border information listed to the side or top of the chart.

All of the charts will have an effective date and an expiration date. All charts are valid for a period of six months, but there will be changes to aeronautical data every 56 days. The changes are listed in the chart bulletins section of the appropriate airport facility directory - AFD. A typical change might be a new approach control frequency or common traffic advisory frequency. Only some of these changes will be reflected by NOTAMS, or notice to airmen.

Topographical information:

Each chart provides a color-coded elevation key on the date panel. With this key it is possible to determine the approximate elevation of terrain by matching the color on the chart to the key. The key also shows the highest elevation on the chart at the top of the key. They are very hard to see in some places, but the charts also have contour lines showing places of equal elevation, with intervals of every 250 or 500 feet.

The charts also contain maximum elevation figures or MEF's. The maximum elevation figures provide at least 300 feet of terrain clearance (in thousands and hundreds of feet) for each quadrangle. One way I remember this 300-foot clearance value is that it is about the same height as a coastal redwood tree, the tallest tree in the world. The quadrangle is the area bounded by the charts longitude and latitude lines, and each quadrangle is 15 minutes of latitude tall and 15 minutes of longitude wide. Note-one minute of latitude equals 1/60 of 1° of latitude. One minute of latitude also is equivalent to one nautical mile or 6076 feet. A statute mile or road mile in the USA is 5280 feet. A kilometer is 3,281 feet. Statute miles are only used when reporting visibility otherwise nautical miles are used throughout aviation on airspeed indicators, sectional charts, and flight planning.

Obstructions like towers are depicted on the charts with a short tower symbol for towers less than 1000 feet AGL, or a tall tower symbol for towers over 1000 feet AGL height. The upper larger number is the MSL height of the tower and the lower number in parentheses is the AGL height of the tower.

Airport data blocks:

You can use the chart legend to decode the airport data block information. Blue color is used for controlled or tower airports, and magenta is used for non-Tower or uncontrolled airports. First comes the airport name, then the three letter identifier, if it's a Tower airport the Tower and ATIS frequencies (non-towers may have AWOS or ASOS automated weather broadcast frequency), the MSL elevation, airport lighting- sunset to sunrise or pilot controlled lighting- PCL, length of longest runway in hundreds of feet, and for non-Tower airports the common traffic advisory frequency, and lastly any runways which have right

patterns. Any information you need, like the traffic pattern altitude or a towered airports hours of operation, that are not listed in the airport data block can be obtained from the airport facility directory-AFD.

Miscellaneous items:

VFR waypoints or visual reporting points are landmarks depicted with a red flag. The chart panel states that these landmark names are used by air traffic control so a tower, approach, or center controller should recognize their name. Many visual reporting points have been given a five-letter GPS database identifier. All of these start with VP and can be entered into a GPS, DUATS flight planner, or other flight planner.

Any areas colored yellow on the charts our cities and should be considered congested areas where you should fly at least 1000 feet above the highest obstacle within 2000 feet horizontal.

The light blue lines between VOR navigation aids are called Victor Airways. They are used to route IFR traffic and are labeled with the letter V and a number. Normally IFR traffic would use these Airways at even altitudes like 4000 feet if westbound or 5000 feet in eastbound.

Because terminal charts provide greater detail many points visible on the terminal chart will not be visible on a sectional chart. On the backside of the San Francisco terminal area chart there is an alternate view without the topographical information. The site of the chart also depicts the VFR fly ways with very thick blue lines and altitudes. These flyways provide recommended flight paths and altitudes to avoid most of the control traffic. You can read the back panel for more information about them. There is also a smaller inset with a scale of 1 to 150,000 that shows a detailed view of the area between San Francisco and San Jose airport. This is the only place that the landmark Leslie salt actually appears on the chart.

The Los Angeles class B airspace has several VFR transition routes, which are depicted by double-headed hollow magenta arrows. All of the details concerning these routes are listed on the back of the Los Angeles terminal area chart. There is even a special flight rules area that passes right over Los Angeles airport where aircraft can travel southeast bound at 3500 feet or northwest bound at 4500 feet through the class b airspace without clearance from her traffic control. Pilot's self announce on a designated frequency.

Airspace and chart review questions:

What is the floor altitude of the class E airspace at half Moon Bay Airport? What kind of airspace lies under this E floor altitude?

If you are flying over half Moon Bay Airport at 3000 feet MSL what is your visibility and cloud clearance requirement per FAA regulations?

If you are flying over half Moon Bay Airport at 500 feet AGL what is your visibility and cloud clearance requirement during the daytime per FAA regulations?

What is the floor of class E airspace over the Farallon Islands, which are located 25 miles west of San Francisco?

What is the floor of the class E airspace over the Circle L. private airport located in the northeast corner on the south side of the San Francisco sectional chart?

On the San Francisco terminal area chart locate the visual reporting point called VPMID. It is at the middle of the San Mateo Bridge. List all the different types of airspace (and their altitudes) an airplane would climb to from the surface to 20,000 feet MSL.

What are the dimensions of your home airports airspace both lateral and vertical?

What are the operating hours of the air traffic control tower for your home airport?

What FAR's airport data is missing from a data block for a tower airport? A non-tower airport?

What type of airspace surrounds Livermore Airport? What are the vertical limits of Livermore's airspace?

What are the vertical limits of the restricted area 5 miles southwest of Tracy airport?

What frequency would you use to contact approach control in the Tracy area at about 4500 feet MSL?

Los Banos Airport is located about 60 miles southeast of San Francisco on the sectional chart. Is it legal per FAA requirements to fly VFR from loss Los Banos to Firebaugh airport (20 miles to the southeast) with 2 miles visibility during the daytime?

Is it legal per FAA requirements to fly from Los Banos airport to Merced's non-Tower airport (20 miles northeast) with a 900 foot ceiling at both airports and en-route?