An Introductory Guide to Airspace and Use of a VFR Sectional Chart

Office of Integrity, Safety, and Compliance UAS PIC Ground School

Getting Started

The airspace over the US encompasses every cubic inch of air from the ground to the edge of space at 60,000 feet above sea level, and all of it is controlled and regulated exclusively by the FAA. Within it there are many classifications for the airspace and structures that change not only as a function of space but as a function of time. Before we start to talk about airspace it is important to understand how to read the sectional charts and decode the seemingly overwhelming amount of information that can be found on them. The purpose of this handout is to serve as a guide to understanding airspace in the US and how to interpret the symbols on the sectional chart.

Understanding Altitudes

When we talk about airspace we will be using two different notations for the altitudes: AGL and MSL. As per FAR1.2, AGL refers to altitude above ground level, and MSL refers to altitude above mean sea level. These numbers are often very different from one another, and in turn knowing how to distinguish the two is very important. AGL references the altitude of the aircraft relative to the ground directly below it. This means even in level flight, the AGL altitude can vary a lot if the terrain below the aircraft varies as well. In the example below: the aircraft is always at an MSL altitude of 4300 feet. Moving from left to right, it starts off at 200 feet AGL, since it is 200 feet above the underlying terrain. The altitude then changes to 300 feet AGL as it flies over lower terrain. As it flies over the highest terrain, the AGL altitude is reduced to 100 feet. Note that FAR1.2 defines AGL as altitude above *ground* level. So if an aircraft is flying 50 feet above a 50-foot building, it is still at an altitude of 100 feet AGL.

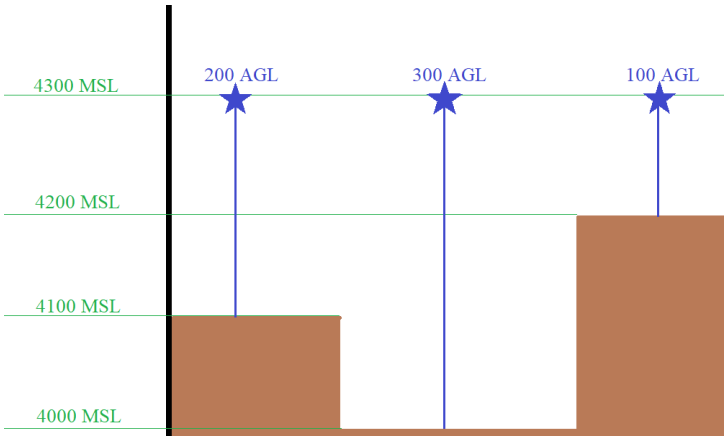

Figure 1 Graphic Depicting various scenarios described.

Altitude is often reported in hundreds of feet, since the sub-100-foot precision isn't needed. Note that altitudes between 18,000 and 60,000 feet MSL are referenced as *flight levels*. For example, FL350 would reference an altitude 35,000 feet MSL. In the example below, the upper altitude of the Vance 1B MOA is FL240 (24,000 feet MSL).

Figure 2 Information on the Vance 1B MOA.

Understanding Airports

Basic Airport Notation

When we go into airspace it will quickly become apparent that the purpose of airspace is to facilitate separation of manned traffic. To that, certain airspace structures are centered around airports. There are many airports that are indicated on sectional charts and understanding what each of them means will be important not only to facilitating an understanding of airspace but it is also relevant for airport proximity limitations. At this point, it is worth noting a trend that you will notice as we proceed: as a rule of thumb, items marked in blue tend to have more restrictions or rules than those marked in magenta. Thus, to talk from most complex to least, the first type of airport to discuss are airports that are printed in blue. These represent airports that have a manned air traffic control tower. Note that the tower might not be open all of the time - this will be relevant later. These airports have air traffic controllers that pilots must talk to as they arrive at or depart from that airport.

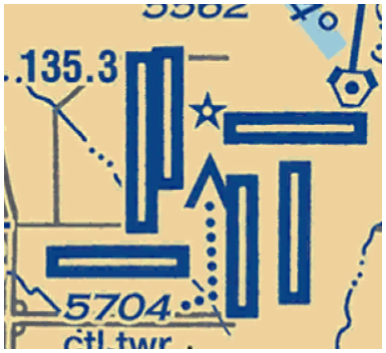

Figure 3 Denver International Airport.

The next airport to talk about are airports that are printed in magenta. This means the airport features no air traffic control tower. Further, airports notated as discrete runways (as opposed to circles) have runways longer than 8069 feet (FAA Chart User's Guide). This holds true regardless of whether the airport is towered or not.

Figure 4 Northern Colorado Regional Airport.

Likewise those inside circles have runways between 1500 and 8069 feet in length.

Figure 5 Boulder Municipal Airport.

In similar fashion airports that are magenta with an open symbol are airports that either have a runway that is less than 1500 feet or one that is made of dirt, grass, or simply unpaved.

Figure 6 Valley Mills Airfield.

Note here though that anything with the tag "Pvt" is a private airport. These airports are all magenta circles with a R inside of them or a corresponding "Pvt" label nearby.

Figure 7 Elk Park Airfield.

While these airports see significantly less traffic compared to other airports, still be conscious that small private aircraft could be operating in the vicinity. Additionally, there are airports that have been closed permanently. These will appear as a magenta circle with an X through them. These are considered inactive or abandoned and do not affect our operations.

Figure 8 Abandoned Airfield.

The last two airports that we need to discuss are heliports and seaplane bases. These are generally uncontrolled (magenta) airports, but always check the chart when you are planning your flight: a blue color for an airport on the chart always indicates that the facility is towered. Both are rare in Colorado but can be very prevalent depending on your location. Being aware of these on the sectional charts will help to keep you flying legally wherever you are. Note that the anchor representing a seaplane base points in the direction of takeoff/landing of the aircraft.

Figure 9 Warren Air Force Base Heliport.

Figure 10 Brooks Seaplane Base.

Airport Details

While not all of the details below are applicable to UAS flying, knowing what the airport-related symbols mean help avoid misconceptions.

Four tick marks around an airport indicate that fuel is available for purchase.

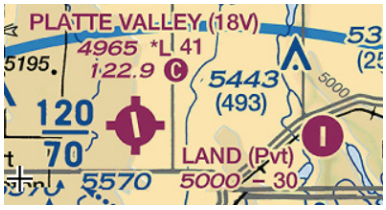

Figure 11 Airport With Fuel (left) and Without Fuel (right).

A star symbol near an airport gives the location of the rotating airport beacon, which is used to help manned aircraft navigate to the airport at night.

Each public use airport will have text near it indicating other details about the airport.

Figure 12 Airport Details - Longmont Vance Brand Airport.

Let's look at what each bit of the text means:

- "Vance Brand" is the name of the airport.
- "LMO" is the airport identifier.
- "AWOS-3 120.0" indicates that an automated weather broadcast can be listened to on 120.0 MHz.
- "*5055*" indicates the MSL altitude of the airport.
- "*L" means that the airport has pilot-controllable lighting.
- "48" means the longest (and in this case only) runway is 4800 feet long.
- "122.975 (C)" indicates that the frequency pilots use to talk to one another (the *Common Traffic Advisory Frequency)* is 122.975 MHz.

Understanding Airspace Classifications

There are 6 basic types of airspace in the US: A, B, C, D, E, and G. Before beginning to talk about what the airspace looks like, the procedures for handling conflicting airspace information need to be established. Higher classes of airspace overrule lower classes of airspace - A overrides B, B overrides C, and so on. Likewise, remember that airspace is a function of lateral position, altitude, and time.

Please refer to the airspace visualization guide for an idea of how these airspace structures look.

Class A: Airways

Class A airspace is the only airspace that doesn't change. It extends form FL180 to FL600 always and everywhere in the United States, regardless of location, time of day, or terrain. This means that if you are standing on top Denali in Alaska at 20,320 feet MSL you are in class A airspace.

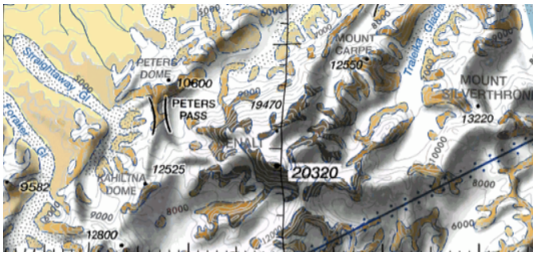

Figure 13 Peak of Denali above FL180.

Note that class A airspace is never explicitly denoted on the sectional charts.

Class B: Big Metropolitan Areas

Class B airspace is the first of the airspace class that sets aside airspace for a specific airport. Finding class B airspace on the sectional charts is very easy as it is designated by a thick solid blue line.

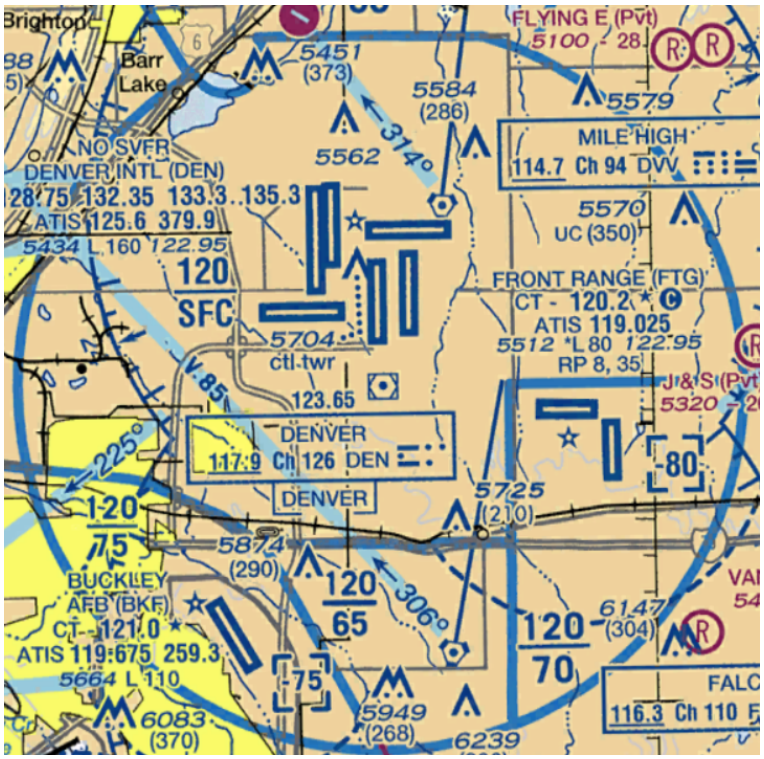

Figure 14 Denver International Airport inner class B airspace.

This class of airspace takes the form of an inverted wedding cake: there are multiple layers and its footprint increases with altitude. Note that this is a generalized idea of how class B airspace is structured; it is custom-made for each region in which it exists, but will always bear some resemblance to an inverted wedding cake. The various layers of class B airspace are often referred to as shelves. These ATC towers almost never shut down except in the case of national emergency. The following will always be true of class B airspace:

- The airspace structure is very large: typically the lateral boundaries cover a 30 nautical mile radius around the airport. In the case of Denver International Airport, the lateral boundaries extend as far north as Greeley and as far south as Castle Rock.
- The airspace is delineated by a thick blue line.
- The altitudes are noted in fractional format, and are printed in blue.

In order to read the altitudes of class B airspace, look for the fraction altitude representation for the specific shelf of airspace in question. On the top of the altitude indicator is the altitude of the top of that shelf of class B airspace in hundreds of feet MSL. Similarly, the bottom of the fraction indicates the altitude of the bottom of the shelf, again in hundreds of feet MSL. The bottom of the fraction might contain "SFC", indicating that the bottom of the shelf lies at the surface.

As an example, in figure 14, look for the highway interchange near the center of the figure. We see that this shelf of class B airspace has its altitude designated "120/SFC" which means, at that location, the class B airspace extends from the surface to 12,000 feet MSL. Similarly, the shelf of airspace near Buckley Air Force Base on the lower right of the figure shows its altitude as "120/75" which indicates class B airspace from 7500 to 12,000 feet MSL.

Class C: Cities of Notable Size

Class C airspace can be thought of as a smaller version of class B airspace. Like class B, class C is structured similarly to an inverted wedding cake but typically with only 2 shelves. Class C can be found on a sectional chart by looking for a solid magenta line. Class C airspace structures tend to be very similar in shape to each other, but are still custom-tailored to the region they exist in.

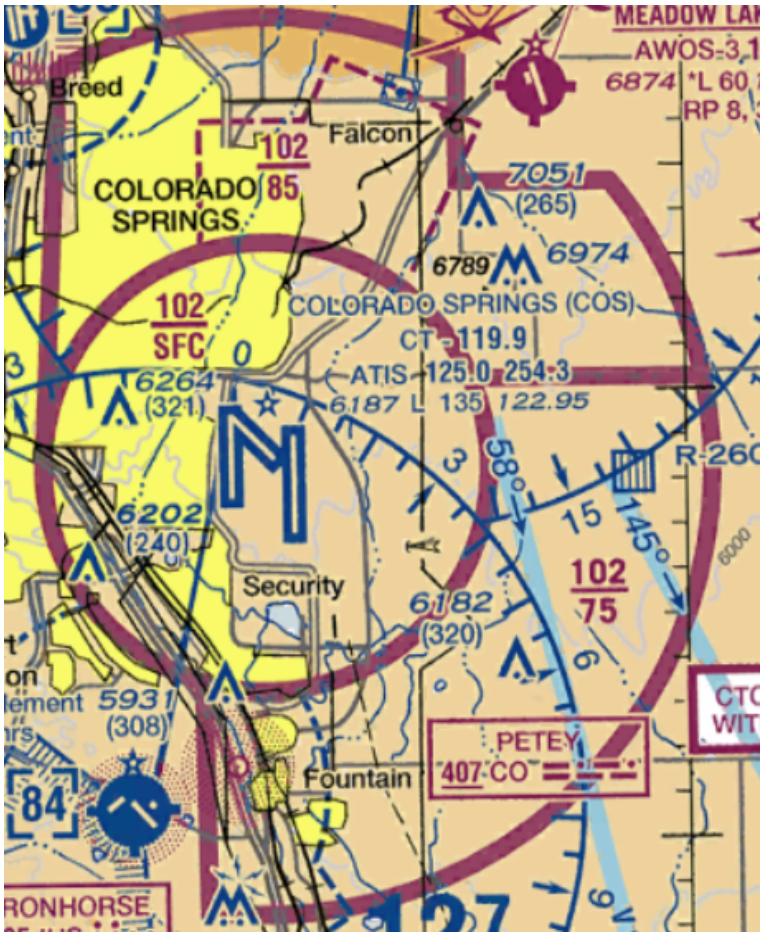

Figure 15 Colorado Springs Airport class C airspace.

These airspaces will be structured with a common maximum height. Like class B airspace, class C airspace is controlled by ATC towers that typically don't shut down. Typically, this airspace will be circular, save any interruptions by terrain. The following is true of class C airspace:

- It is always notated with a thick, solid magenta line.
- It is still relatively large, but significantly smaller than class B airspace. Typically, the lateral boundaries of class C extend to 10 nautical miles away from the airport around which it is centered.

The altitudes of class C airspace are denoted very similarly to that of class B airspace, except printed in magenta: look for a fraction within the shelf of class C airspace in question. Like class B, the top number designates the top of that shelf in hundreds of feet MSL, and the bottom number designates the bottom of that shelf in hundreds of feet MSL. However, unlike class B, there is one additional symbol used to denote the top of class C airspace. In some cases, class C airspace might underlay multiple shelves of class B airspace, and in turn there is no well-defined upper limit to class C. In this case, the top of the airspace will be represented as a "T", which means that the class C airspace extends upward until it impinges on the overlying class B airspace.

A word of caution in identifying class C airspace on a VFR chart: around class B airports, there exists what's referred to as a *Mode C Veil*. This is notated as a solid magenta line forming a 30-nautical-mile-radius circle around the class B airport. Compared to class C airspace, a mode C veil:

- Is notated using a thinner magenta line.
- Is much larger in terms of its lateral boundaries.
- Does not contain shelves.
- Is centered around an airport with class B airspace.

Class D: Daylight Hours Airports

Class D airspace is found around airports that are towered, but with non-continuous tower operation. While the phrase 'Daylight Hours' doesn't entirely describe their typical operating hours, it represents the idea these airports are likely to have a tower which closes at some point. This class of airspace is represented by a thick blue dashed line.

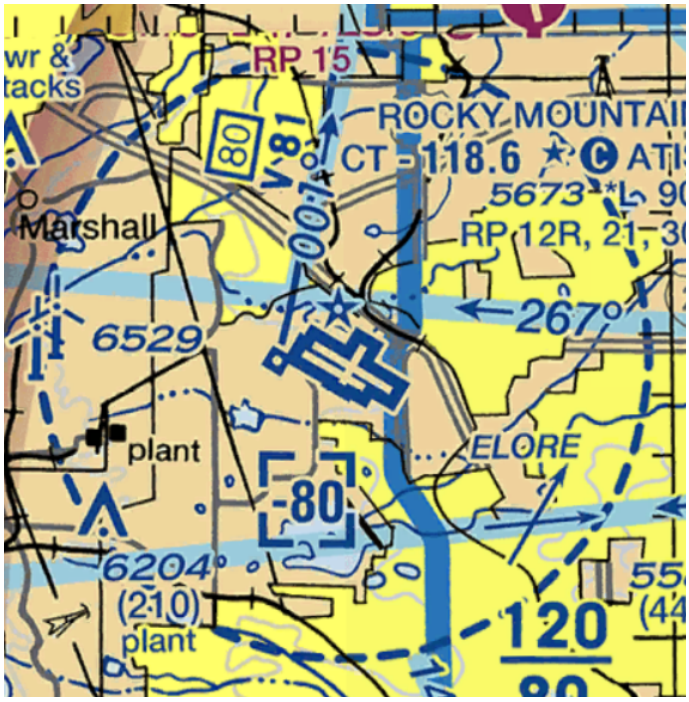

Figure 16 Rocky Mountain Metropolitan Airport class D airspace.

The airspace takes the shape of a cylinder: there are no shelves like there are in the case of B and C. The lateral boundaries of the airspace typically extend 5 nautical miles from the airport and the vertical boundaries tend to be approximately from surface to 2500 feet above the airport. That said: the altitude of the top of the class D airspace is always noted on the chart. This is shown in brackets with the altitude of the top of the airspace noted in hundreds of feet MSL. It might also contain a prefix "-", which indicates that the airspace extends to, but not including, the altitude shown in brackets. A good example of this is Rocky Mountain Metropolitan Airport. The denotation in the box reads "[−80]" indicating that the class D airspace runs from the surface to, but not including, 8000 feet MSL.

Class G: Ground Level

Covering G airspace first will make understanding E easier. Class G airspace is defined primarily by AGL altitudes. This airspace class exists typically from the surface to, but not including, 1200 feet AGL. However, there are plenty of circumstances where this is not the case:

- If another airspace class exists at the location/altitude in question instead.
- If the ceiling of class G airspace changes. This will be noted by a shaded magenta, shaded blue, or blue zipper line.

The shaded magenta line is the most common, so it will be covered first. The shaded magenta line will create a closed shape around an airport, set of airports, or metropolitan area containing many airports. On the faded side (inside) of the shaded magenta line, class G airspace extends from the surface to, but not including, 700 feet AGL. Note that the border exists at the hard edge. So in figure 17, at Larkspur, class G exists from the surface to, but not including, 1200 feet AGL. Near the "V81" designator, class G extends to, but not including, 700 feet AGL.

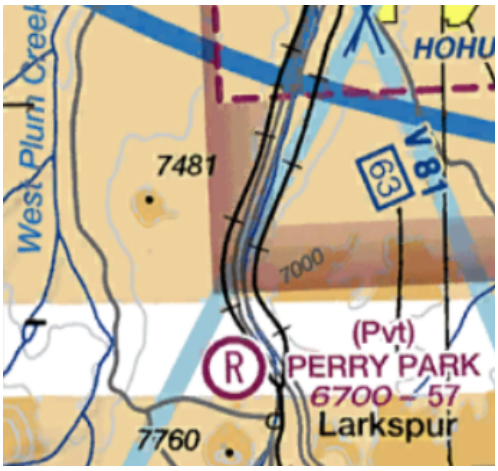

Figure 17 Shelf drop off of class E airspace near Castle Rock.

There are cases where class G extends higher than 1200 feet AGL. Looking at a sectional chart near Mt. Denali, there is a shaded blue line that indicates that the upper limit to class G airspace rises. Within the are outlined by the shaded blue line, class G airspace rises from surface to, but not including, 14,500 feet MSL. Just as in the case of the shaded magenta line, the boundary exists at the hard edge.

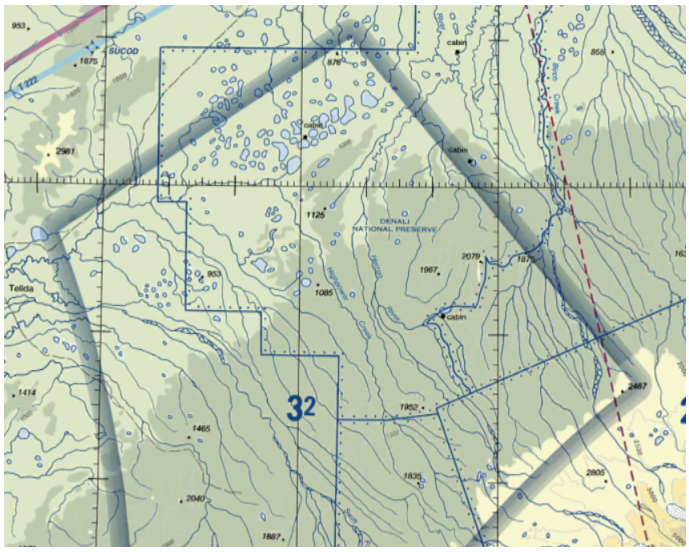

Figure 18 Raising of class G up to 14,500 MSL.

Class G airspace can also exist up to other altitudes. This will be designated by the so-called zipper line. Within the boundaries of the zipper line, the chart will be labeled with the ceiling of class G airspace; G extends to, but not including, this altitude. Looking at the example below:

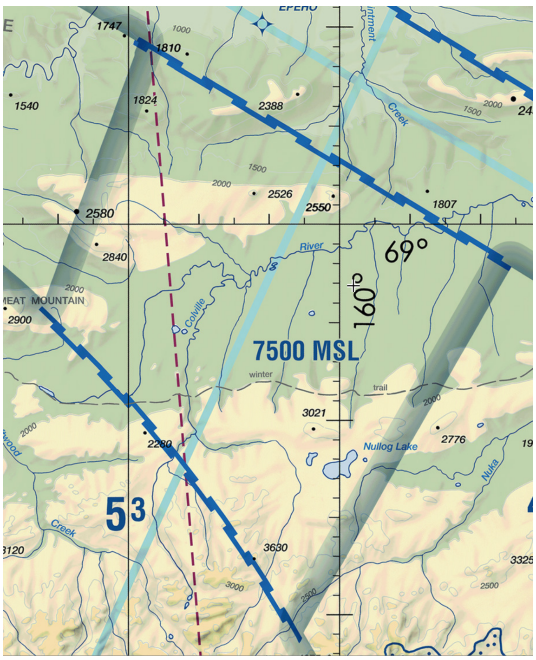

Figure 19 Class G to 7500 MSL.

Within the boundaries of the zipper line, class G airspace exists from the surface to, but not including, 7500 feet MSL.

Class E: Everywhere Else

Class E airspace is the last airspace type to discuss. Note that there is no class F airspace. Class E is the airspace that best represents the blank area behind a drawing: it fills in around all of the airspace previously discussed. However, there are cases where class E drops all the way to the surface. This is designated by a dashed magenta line. Class E to the surface can exist in 2 ways: (1) as the highest airspace class set aside for an airport, or (2) as an extension/augmentation for an airport which is associated with higher classes of airspace. This guide considers an example of each.

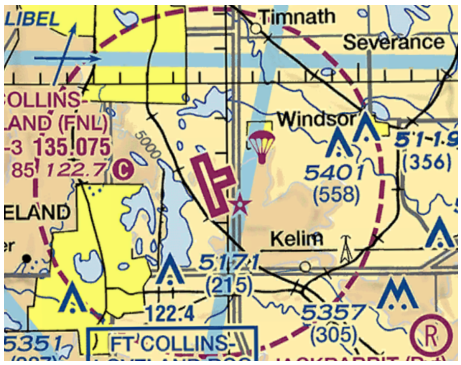

Figure 20 Northern Colorado Regional Airport class E airspace.

In figure 20, we see that around Northern Colorado Regional Airport, class E extends all the way to the ground. Further, there are no higher classes of airspace associated with this airport, so it falls into category (1) as defined above.

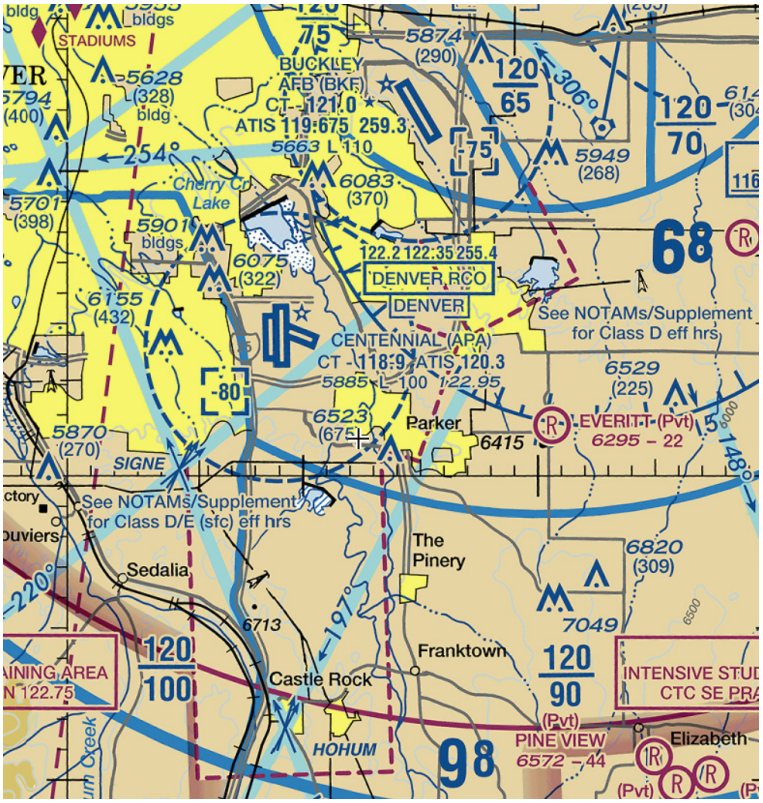

Figure 21 Centennial Airport with Class E (sfc) Extensions.

In figure 21, note that Centennial Airport has its own class D airspace. However, toward the south and east, it has class E (sfc) airspace. These are referred to as *class E surface extensions*. This meets the description of category (2) as defined above: the main airspace around Centennial Airport is its class D airspace, and the class E (sfc) augments it. Be alert to class E (sfc) extensions: they can sometimes be tricky to spot on the charts.
In summary:

- Class E (sfc) is indicated by a dashed magenta line.
- Class E beginning at 700 AGL exists within the boundaries of the shaded magenta line.
- Class E beginning at 14,500 MSL exists within the boundaries of the shaded blue line.
- Class E airspace beginning at any other altitude exists within the zipper line. The altitude will be labeled.

Airspace Reversions

Up until now, it is assumed that whatever airspace is depicted on the chart always exists as the airspace class it's depicted as. This isn't the case: airspace changes with time. So let's examine the 4 types of situations in which the airspace reverts to a lower class.

In order to find out information regarding how certain airspace classes revert, another FAA document is needed: the *Chart Supplement* (formerly called the Airport/Facility Directory). This contains a wealth of information about any given airport that isn't on the chart. This can be accessed in the following manner:

- Go to Skyvector.com and click on "Airports" on the top left.
- Enter the airport identifier.
- Click on the "Chart Supplement" item on the top left of the page.

Class C airspace

Although rare, class C airspace can sometimes revert to lower classes of airspace. An example of this is Kahului Airport on the island of Maui in Hawaii. A snippet of the sectional chart around that airport is shown below:

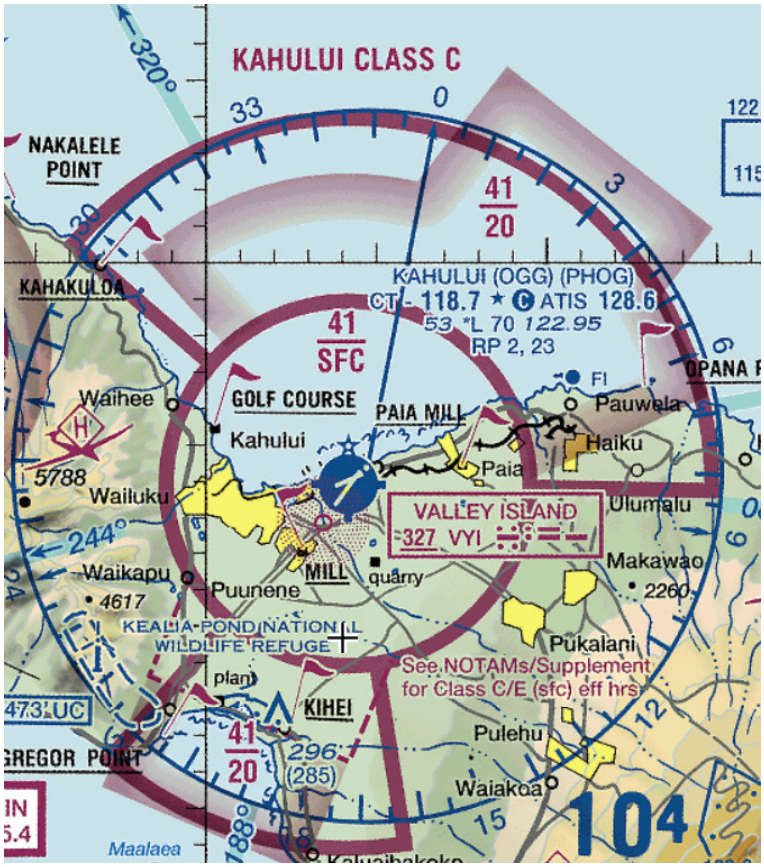

Figure 22 Kahului Airport on a VFR Sectional Chart.

Note the text on the bottom right which says "See NOTAMs/Supplement for class C/E (sfc) eff hrs". This note indicates that at some point the airspace reverts to a lower class, but doesn't indicate *when* and *to what class* it reverts. This is when one must look at the Chart Supplement to find out more information about the reversion. In the chart supplement, look for the "Airspace" section. In the case of Kahului Airport:

AIRSPACE: CLASS C svc (1600–0900Z, effective starting at 0200 local time the second Sunday in March through 0200 local time the first Sunday in November. 1600–1000Z, effective starting at 0200 local time the first Sunday in November through 0200 local time the second Sunday in March) ctc **APP CON** other times CLASS E..

Figure 23 Kahului Airport Chart Supplement - Airspace.

Based on the data in the chart supplement: if we were to fly near Kahului during June for example, the airspace for Kahului airport would be class C from 1600-0900Z; outside of those hours it would revert to class E.

Note that not every class C airport will revert to a different airspace class; in fact most don't. For example, Colorado Springs continuously has class C airspace. The chart supplement entry for it is shown below:

AIRSPACE: CLASS C svc ctc **APP CON**.

Figure 24 Colorado Springs Airport Chart Supplement - Airspace.

Class D airspace

Each class D reversion is a little bit different, so consider three airports as an example. Starting with Rocky Mountain Metropolitan Airport, whose depiction on a VFR sectional chart is shown in figure 16. This depiction on the chart doesn't even tell us *if* the airspace reverts, let alone *when* or *to what class*. Consulting the chart supplement:

COMMUNICATIONS: CTAF 118.6 **ATIS** 126.25 303–466–8744
DENVER APP/DEP CON 126.1
METRO TOWER 118.6 (1300–0500Z‡) **GND CON** 121.7 **CLNC DEL** 132.6
AIRSPACE: CLASS D svc 1300–0500Z‡; other times CLASS G.

Figure 25 Rocky Mountain Metropolitan Airport Chart Supplement - Communications and Airspace.

From the chart supplement, class D airspace is active from 1300-0500Z, which corresponds to the hours in which the tower is open. Outside of these hours, the airspace reverts to class G.

Next, consider Cheyenne Airport. Here is a VFR sectional depiction of it:

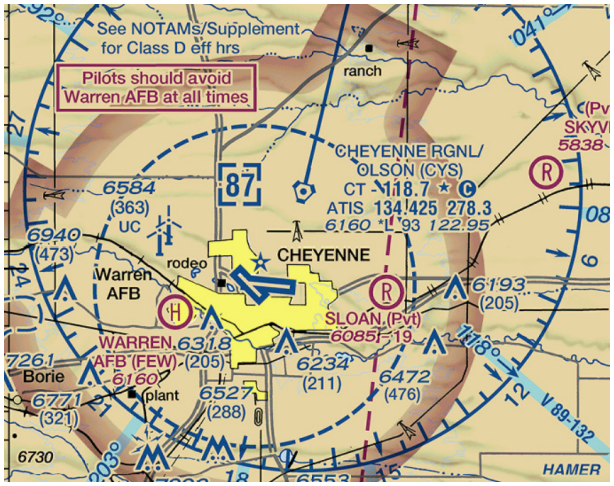

Figure 26 Cheyenne Airport on a VFR Sectional.

In this case, the chart indicates that the airspace reverts at some point (as indicated by the note in the top left corner). However, it is still not known when or what airspace class it reverts to. Again, the chart supplement holds the answers:

COMMUNICATIONS: CTAF 118.7 **ATIS** 134.425 **UNICOM** 122.95
RCO 122.3 (CASPER RADIO)
Ⓡ **CHEYENE APP/DEP CON** 124.55 (1300–0500Z‡)
Ⓡ **DENVER CENTER APP/DEP CON** 125.9 (0500–1300Z‡)
TOWER 118.7 (1300–0500Z‡) **GND CON** 121.9
CLEARANCE DELIVERY PHONE: For CD ctc Cheyenne Apch at 307-772-6032, when Apch clsd ctc Denver ARTCC at 303-651-4257.
AIRSPACE: CLASS D svc 1300–0500Z‡; other times CLASS E.

Figure 27 Cheyenne Airport Chart Supplement - Communications and Airspace.

The class D airspace is active from 1300-0500Z, again corresponding to the active times of the control tower. However, in contrast to the last example, outside of these hours it reverts to class E airspace.

Note, however, that *not every class D airport will revert*: some revert to E, some revert to G, some are continuously class D. As an example of the latter, the Chart Supplement entry for Centennial Airport is shown below, and from this entry, it can be shown that the airspace around Centennial Airport is continuously class D. Also note that the communications section indicates that the tower is always open:

COMMUNICATIONS: ATIS 120.3 303–799–6722 **UNICOM** 122.95
DENVER RCO 122.35 122.2 (DENVER RADIO)
DENVER APP/DEP CON 132.75
TOWER 118.9 **GND CON** 121.8 **CLNC DEL** 128.6
AIRSPACE: CLASS D svc continuous.

Figure 28 Centennial Airport Chart Supplement - Communications and Airspace.

Class E as the primary airspace for an airport

This section applies to airports whose highest class of airspace set aside specifically for that airport is class E. An example of this is Hayden Airport near Steamboat:

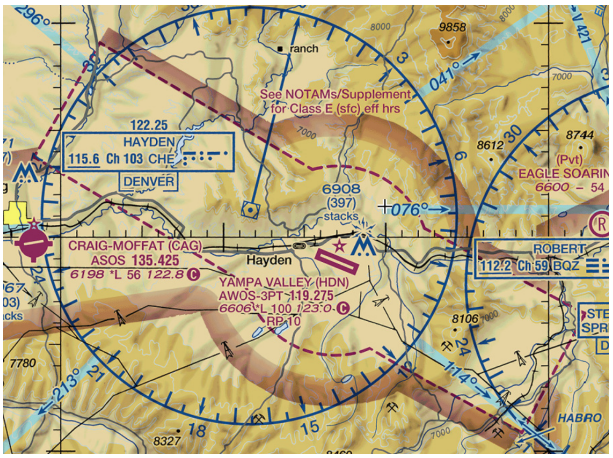

Figure 29 Hayden Airport on a VFR Sectional.

Toward the top of the chart snippet, there is a note indicating to check the chart supplement for the class E (sfc) effective hours. Consulting the supplement:

AIRSPACE: CLASS E svc 1400–0400Z‡; other times CLASS G.

Figure 30 Hayden Airport Chart Supplement - Airspace.

The chart supplement shows that the class E (sfc) is effective from 1400-0400Z; outside of those hours it reverts to class G.

Note that not all airports in this category revert. Looking at the chart supplement for Northern Colorado Regional Airport, we see that this airport has class E airspace continuously.

AIRSPACE: CLASS E.

Figure 31 Northern Colorado Regional Airport Chart Supplement - Airspace.

Class E surface extensions

The only type of reversion not yet covered has to do with class E (sfc) extensions around an airport whose primary airspace is C or D. In order to make sense of how these revert, yet another FAA publication needs to be invoked: the *Airman's Information Manual*, or AIM. Consulting section 3-2-6 (2) of the AIM reveals the following information:

- The surface extension airspace reverts at the same time as the main airspace for an airport.
- If an airport's airspace reverts to class G, any associated surface extensions similarly revert to class G.
- If an airport's airspace reverts to class E, any associated surface extensions remain in effect as class E airspace.

Understanding Special Use Airspace

Now that the 6 basic classes of airspace (A, B, C, D, E, G) have been discussed, the topic shifts to areas which have special activity going on within them, and how to find them on the sectional charts. This section discusses how to determine not only where these areas are located laterally, but how to identify when they take effect and what altitudes they cover. This is an important point: being within the lateral boundaries of special use airspace isn't all that meaningful: time and altitude must be considered as well.

Note that there are two collective terms that are used for special use airspace: the first being *regulatory special use airspace*, which includes restricted and prohibited areas. In contrast, MOAs, warning areas, and alert areas are collectively referred to as *non-regulatory special use airspace*. Restricted, prohibited, and warning areas are printed in blue; MOAs and alert areas are printed in magenta. This roughly follows the rule with sectional charts that more restrictive features of the airspace are printed in blue, and less restrictive features are printed in magenta. But, keep in mind that warning areas don't follow this rule: despite being non-regulatory, they are printed in blue.

Regulatory Special Use Airspace

This includes restricted and prohibited areas, of which many exist throughout the US. They exist due to national security concerns or due to the presence of an activity which poses an invisible hazard to flight. They are found over locations such as Washington, DC, Camp David, and the Cheyenne Mountain Complex in Colorado Springs. Restricted and prohibited areas will always be in blue with a comb-like pattern around the area that the restriction is in effect over. You will also see an identifier for the area, such as P-56 in the Washington DC area.

Figure 32 Area over Washington, DC where a prohibited area P-56 exists.

P in this case stands for prohibited. Restricted areas are labeled with an R. In any case, there will be a numerical identifier associated with the letter.

Figure 33 Bloodsworth Island restricted area.

Non-Regulatory Special Use Airspace

Non-regulatory SUA includes MOAs (military operation areas), warning areas, and alert areas. MOAs and alert areas are represented with a combed magenta line, and warning areas are represented with a combed blue line.

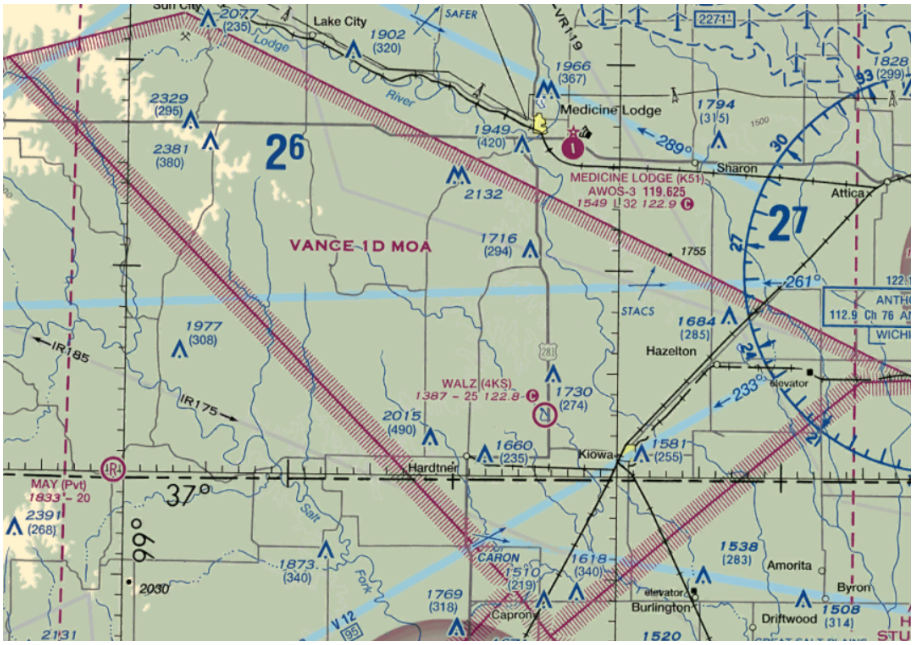

Figure 34 Vance 1D MOA.

MOAs, warning areas, and alert areas are not places where flight is prohibited in any sense, but within these areas, the military will be conducting more risky operations. This could include aerial intercepts, aerobatic maneuvers with high performance aircraft, or a similar activity.

Warning areas are generally identified with the letter W and an associated number. Similarly, alert areas are generally identified with the letter A and an associated number. In contrast, MOAs are generally given a name.

Active Times and Altitudes: Method 1

Recall one of the fundamentals of airspace: it is a function of lateral position, altitude, and time. The chart depiction of special use airspace will show the lateral boundaries, but not times or altitudes. The easiest way to look up active times and altitudes is to use the FAA's SUA website: sua.faa.gov. This will show all active special use airspace in the United States, in addition to temporary flight restrictions (TFRs). The website looks like so:

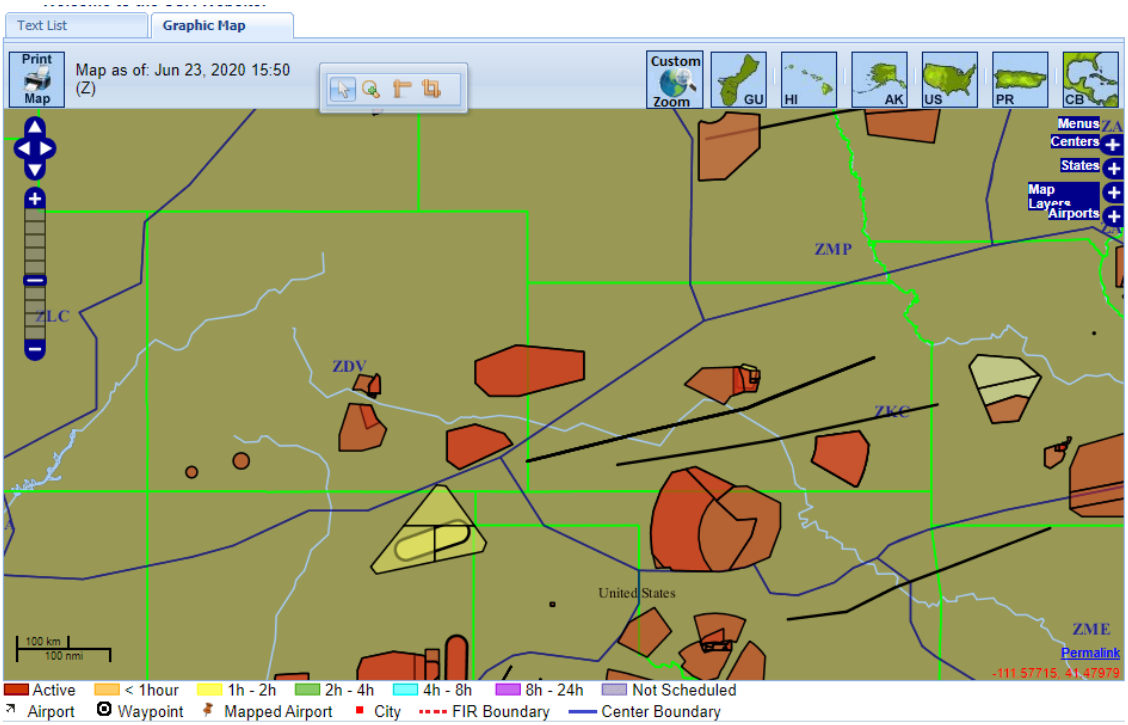

Figure 35 SUA map at sua.faa.gov

Let's consider the MOA in the center of the screen. Hovering over the MOA shows that the red area represents both the Cougar High and Cougar Low MOA. The legend indicates that the red color means the SUA in question is active at the current time. Clicking on the SUA can show the altitudes which the SUA covers:

Number of Records: 6 *AGL

Type	SAA / NOTAM ID	Start Time	End Time	Center ID	State	Min Alt (100s ft)	Max Alt (100s ft)	Group
M	COUGAR HIGH MOA	06/24/2020 15:00	06/24/2020 21:15	ZDV	CO	110	<180	SAA
A	COUGAR ATCAA	06/24/2020 15:00	06/24/2020 21:15	ZDV	CO	180	290	SAA
M	COUGAR LOW MOA	06/24/2020 15:00	06/24/2020 21:15	ZDV	CO	005	<110	SAA
M	COUGAR HIGH MOA	06/23/2020 15:00	06/23/2020 21:15	ZDV	CO	110	<180	SAA
M	COUGAR LOW MOA	06/23/2020 15:00	06/23/2020 21:15	ZDV	CO	005	<110	SAA
A	COUGAR ATCAA	06/23/2020 15:00	06/23/2020 21:15	ZDV	CO	180	290	SAA

Figure 36 Special use airspace details

This information shows that the Cougar Low MOA extends from 500 AGL to, but not including, 11000 MSL. The Cougar High MOA extends from 11000 MSL to, but not including, 18000 MSL. The active times are also shown.

Active Times and Altitudes: Method 2

In order to discuss how to look up special use airspace using a VFR sectional chart, knowledge of how to access the sectional chart legend is needed. There are several ways to do this, but the following is the easiest:

- On Skyvector, navigate to the location of the special use airspace in question. Make a note of the identifier for the special use airspace: for regulatory SUA, this will typically take the form of either the letter P or R and a number, such as "R-2601A". For non-regulatory SUA, this typically takes the form of a name, such as "Airbust X MOA." Caution: SUA can be stacked; one lateral area can have multiple SUA associated with it that will be active at different times and at different altitudes.

- On the upper right portion of the page, click the button that has a city name and nothing else. For instance, click "Denver" as opposed to "Denver TAC".
- Zoom out and navigate to where special use airspace is listed (see the figure below).
- Use the information contained in the chart legend to determine altitudes and times of use.

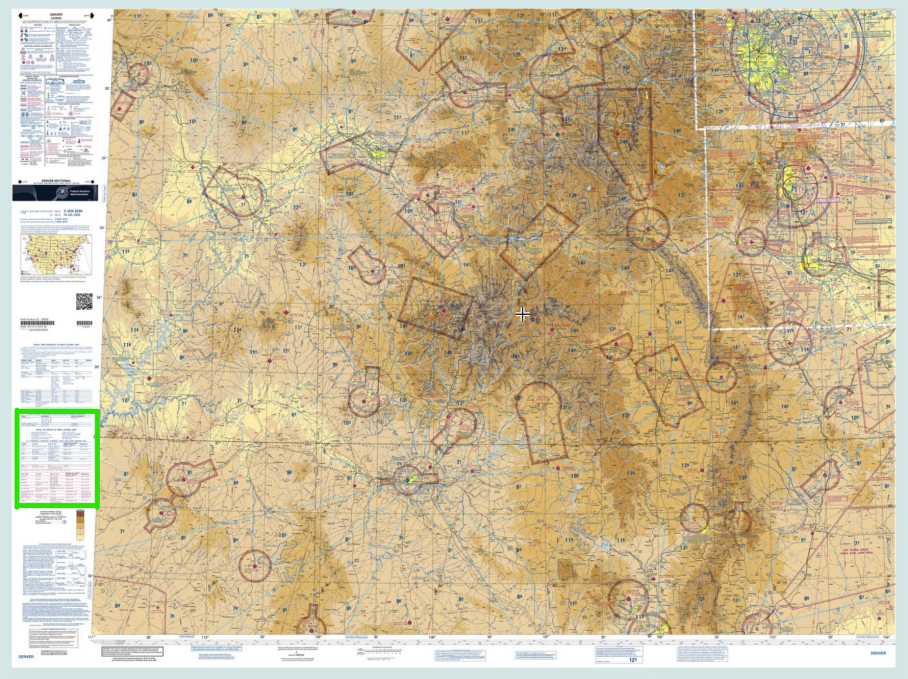

Figure 37 Typical Location of SUA Legend.

Consider the Airbust X MOA, near Colorado Springs. As described above, navigate to the legend that lists the SUA in question. From there we get the following information:

MOA NAME	ALTITUDE*	TIME OF USE†	CONTROLLING AGENCY/ CONTACT FACILITY	FREQUENCIES
AIRBURST X	1500 AGL	SR-SS TUE-SAT EXC 2200-0700	DENVER CNTR	128.37 379.95
AIRBURST Y	500 AGL	SR-SS TUE-SAT EXC 2200-0700	DENVER CNTR	128.37 379.95
AIRBURST Z	500 AGL TO BUT NOT INCL 8500	SR-SS TUE-SAT EXC 2200-0700	DENVER CNTR	128.37 379.95
LA VETA HIGH	13,000	0700-1600 MON-FRI EXC HOL	DENVER CNTR	128.375 379.95
LA VETA LOW	1500 AGL TO BUT NOT INCL 13,000	INTERMITTENT BY NOTAM	DENVER CNTR	128.375 379.95
MT DORA NORTH HIGH, WEST HIGH	11,000	BY NOTAM	ALBUQUERQUE CNTR	127.85 285.47 (E) 132.8 346.35 (W)
MT DORA NORTH LOW, WEST LOW	1500 AGL TO BUT NOT INCL 11,000	BY NOTAM	ALBUQUERQUE CNTR	127.85 285.47 (E) 132.8 346.35 (W)
PINON CANYON	100 AGL TO 10,000	0700-2200 INTERMITTENT BY NOTAM	DENVER CNTR	128.375 379.95
SUNNY	12,000	BY NOTAM 24 HRS IN ADVANCE	ALBUQUERQUE CNTR	124.5 306.2

*Altitudes indicate floor of MOA. All MOAs extend to but do not include FL 180 unless otherwise indicated in tabulation or on chart.
†Other times by DoD NOTAM.

Figure 38 SUA Legend.

A careful read of the legend indicates that the Airburst X MOA runs from 1500 feet AGL to, but not including, FL180. It is used from sunrise to sunset from Tuesday to Saturday, excluding the hours of 2200-0700 local time. From here, a determination can be made as to whether or not a flight will occur in an active MOA or not.

All SUA can be looked up in a very similar manner. Active times and altitudes will be different for each individual SUA. In turn, there is no substitute for a careful and thorough reading of the sectional chart legend.

For SUA active by NOTAM, NOTAMS for the relevant air route traffic control center (ARTCC) must be found. In order to do this, consult the map of the boundaries for various ARTCCs and the corresponding three-letter identifier for the center. Identify the center that the contains the relevant SUA. See the center map below:

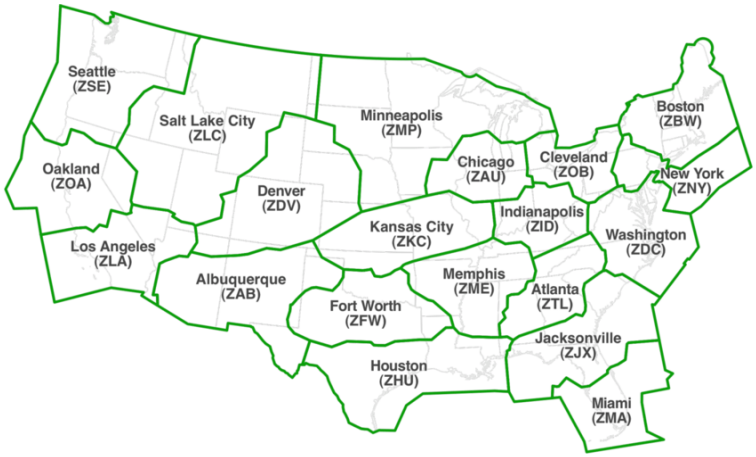

Figure 39 ARTCC map

From here, we need to find NOTAMs for the relevant air route traffic control center. Go to notams.aim.faa.gov/notamSearch and search based on the center identifier, for instance ZDV. This will show all applicable NOTAMs, including all applicable active SUA NOTAMs for SUA that is active by NOTAM. One of the NOTAMs for ZDV (Denver Center) indicates that the restricted area R2601B is active:

	ZDV	06/203	Airspace	06/19/2020 0600	06/26/2020 0600	AIRSPACE R2601B ACT 12500FT UP TO BUT NOT INCLUDING FL225 2006190600-2006260600

Figure 40 NOTAM showing R2601 active

This shows that R2601B is active from 12500 feet MSL up to, but not including, FL225 (22,500 feet MSL). The active times can be decoded as follows: '20' indicates the year (2020), '06' represents the the month, '19' and '26' represent the days of the month, and '0600' represents the time in Zulu time. So, in this case, R2601B is active from June 19, 2020 at 0600Z to June 26, 2020 at 0600Z.

Other Chart Symbols

Military Training Routes

In addition to SUA, MTRs (Military Training Routes) are a significant concern to UAS operations. MTRs can be particularly dangerous because aircraft can be traveling very close to Mach 1 at very low altitudes. The centerlines are always depicted in gray on the VFR sectional charts and in brown by number on the IFR Low Enroute charts.

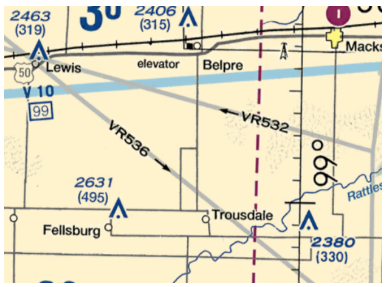

Figure 41 Example of MTRs on VFR Sectional.

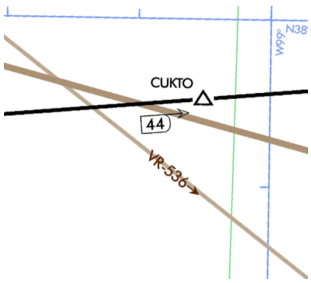

Figure 42 Example of MTRs on IFR Low Chart.

Note that MTRs are much easier to spot on an IFR chart than on a VFR chart. When looking for MTRs, it is always worth looking at IFR charts to double-check that no MTRs exist. Keep in mind that the line on the sectional does not directly correlate to where the aircraft will be. Instead you should understand that any aircraft traveling on the MTR could be as far as 8 nautical miles away from centerline (FAA Sectional Chart User's Guide). Military routes flown at or below 1500 AGL are identified with a 4-digit suffix; 3 or fewer digits indicate that the route exists at 1500 AGL and above.

Nature Preserves

The final area that must be discussed to understand the sectional chart in its completeness is National Parks and other areas which are a nature preserve of some sort. This may seem unintuitive in comparison to everything we have previously discussed: national parks do not exist for separation of manned traffic or for national security. However, they are important to identify because the National Park Service has a policy of prohibiting UAS flight over their land. Note that, since they don't own the airspace, this regulation effectively means that you cannot operate from their land. All areas meeting the description of a nature preserve - whether it is a national park, recreation area, wilderness area, etc - are represented on the chart with a solid blue line with dots on the interior. Further, the type of preserve will be labeled in blue text. Be careful though: the same symbol is used for all kinds of nature preserves. Be alert as to whether or not the area delineates a national park. If it isn't a national park, no additional regulations preclude or limit UAS flight in any way.

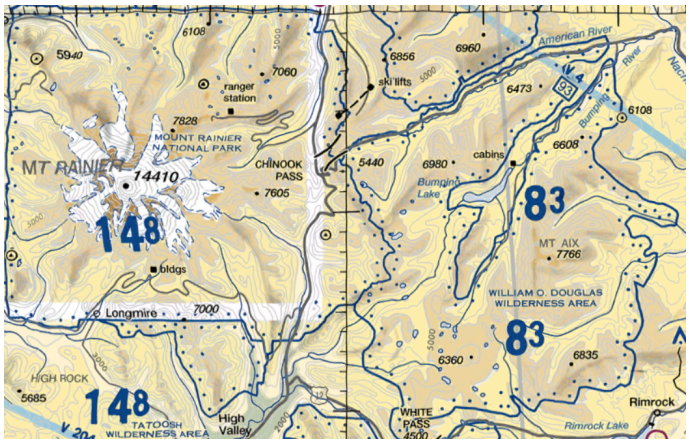

Figure 43 Wilderness Area adjacent to National Park.

Obstacles

Over many sections of the sectional chart you might see obstacles labeled as a mountain shape or a windmill. These indicate objects that are tall enough to be of note to aircraft. This includes the likes of radio towers, wind farms, and buildings.

Figure 44 Example of windmills and radio towers denoted of sectionals.

The objects that are marked will all be labeled with their height in MSL, with their AGL height listed below in parentheses. This can be useful for estimating the MSL altitude of the ground.

VORs

A VOR - or Very High Frequency Omnidirectional Radio - is a physical ground station that manned traffic use for navigation. On the chart, you will see a large compass rose with a box/hexagon shape in the center, as such:

Figure 45 VOR near Greeley.

The compass rose around the VOR is marked every 30 degrees, and is oriented relative to *magnetic* north. Note the blue box at the top right of the figure: this contains information about the VOR. At the top of the box is the name of the VOR - in this case, "GILL". In the lower-middle of the box is the 3-letter identifier - in this case, "GLL". Be able to identify the center of the VOR and the 3-letter VOR identifier.

Lines of Constant Magnetic Variation

Lines of constant magnetic variation are noted as long, straight, dashed magenta lines. They will have a numerical value for the magnetic variation printed next to them. These lines describe how magnetic north is offset from true north - the *magnetic variation*. As the name implies, magnetic variation is constant along these lines.

Figure 46 Line of Constant Magnetic Variation.

The figure shows a magnetic variation of 8 degrees 30 minutes East. Although these lines are notated similarly to class E (sfc) airspace, be alert to the differences. Class E (sfc) will be associated with an airport. Magnetic variation lines will span the entire chart and have a numerical magnetic variation value associated with them.

Concluding Remarks

Ultimately understanding airspace comes down to not just understanding the spacial structures discussed, but remembering that they have the potential to alter and change as a function of time. Often the question of where you can fly cannot be determined without understanding *when* you are flying. When determining where you can fly, a standardized checklist will help ensure you don't miss a detail. Use the COA Flight Checklist included in the training

packet. Once you have started to build this picture you can take into consideration various restrictions that may be imposed on you due to various sources. Ultimately practice and repetition of this process will help to make you comfortable with airspace in the US and confident in your decisions as to whether or not you can fly in a given scenario.