

Airspace & Airport Operations

The Foundation



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FL 600



EVERYTHING EXPLAINED for the Professional Pilot

Chap 1 — Airspace & Airport



Class E

FL 600



Class A
No VFR

DME (or suitable RNAV) required at and above FL 240 (91.205)

Class A
N/A in Hawaii



One-third of all Americans believe in aliens and UFOs.
(Apparently there are more than 100 million mentally challenged individuals living amongst us!)

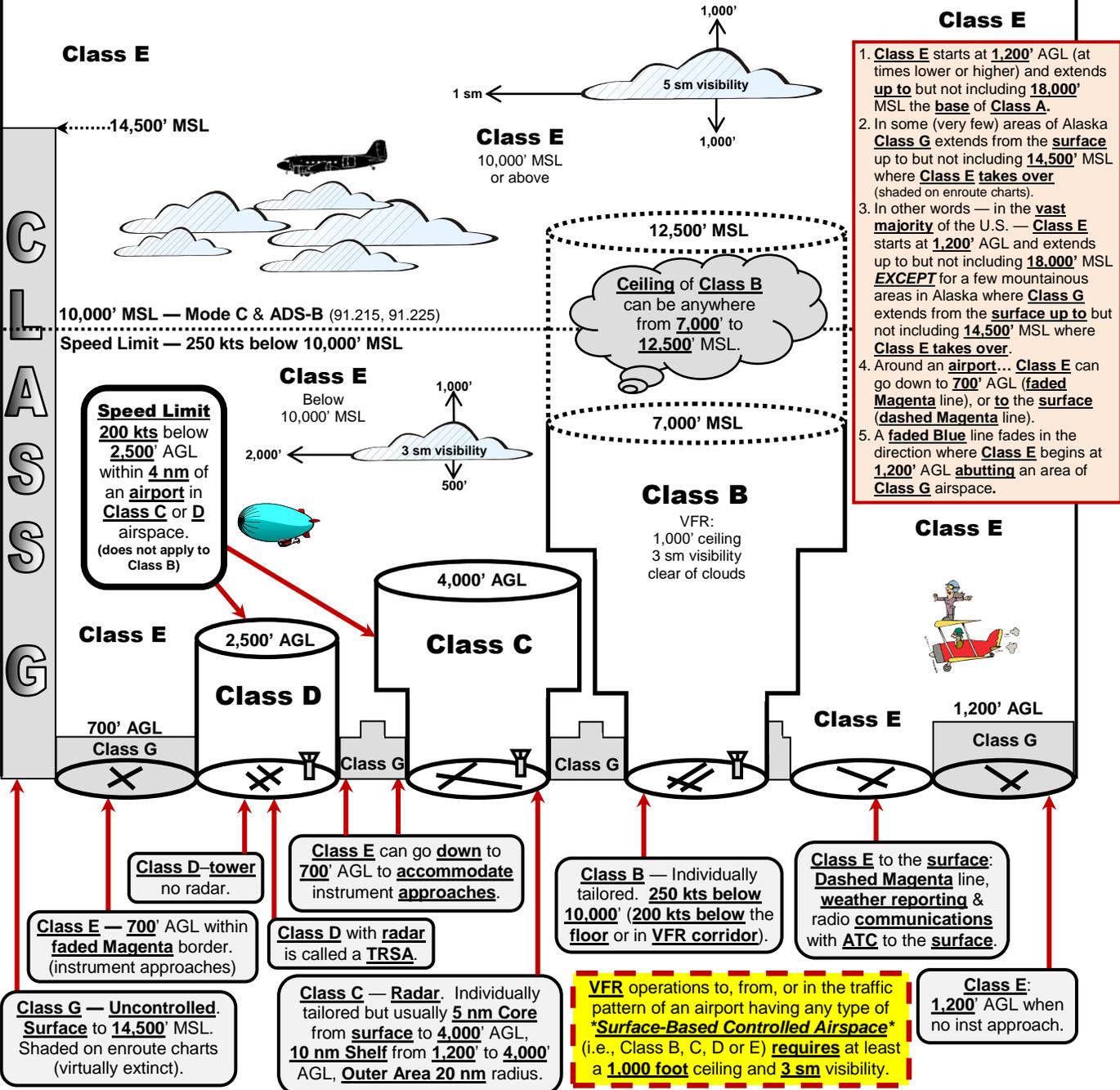


Unless otherwise authorized, you will need **ADS-B Out** to fly in:

1. **Class A, B, and C** airspace;
2. Within **30 nm** of **Class B** from the **surface to 10,000' MSL**;
3. Within the **lateral boundaries** of **Class B** or **C** upward to **10,000' MSL**;
4. All **Class E** at and **above 10,000' MSL** within the 48 CONUS (excluding at and below 2,500' AGL); and
5. **Class E** at and **above 3,000' MSL** over the **Gulf of Mexico** from the **coastline** of the US **out to 12 nm**. (91.225)

Anyone who operates a **non-equipped** aircraft in **ADS-B Out** airspace **without** obtaining a preflight **authorization** in accordance with **91.225** will be **presumed** to have **violated** the **regulations**.

18,000' MSL (FL 180) — Altimeter 29.92

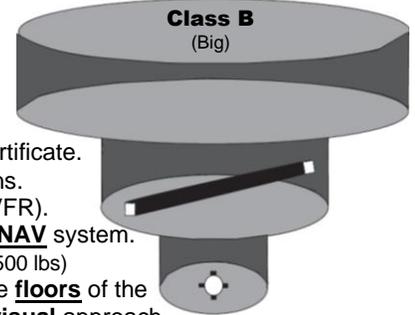


Class A Airspace: (71.1, 71.31, 71.33, 71.75, 71.133, 91.135, 91.155, AIM 3-2-1, 3-2-2, P/C Glossary, FAA-H-8083-25)

1. **All** airspace from **18,000 ft MSL (FL 180)** up to and including **FL 600** within the 48 contiguous States, District of Columbia, most of Alaska, and the airspace within 12 nm offshore. There is no Class A airspace over Hawaii and Victor airways have no upper limit in Hawaii.
2. **All** aircraft **MUST** be **IFR** unless otherwise authorized. Flight visibility and distance from clouds N/A.
3. **ADS-B** out 1090 MHz aka 1090 ES (Extended Squitter) is **required**.
4. Altimeter setting for all aircraft operating in US controlled Class A airspace — **29.92**.

Class B Airspace: (71.41, 91.117, 91.129, **91.131**, 91.155, 91.215, AIM 3-2-1, 3-2-3, 4-1-20, P/C Glossary, FAA-H-8083-25)

1. **Surface to 7,000 ft MSL (Miami) or up to** as high as **12,500 ft MSL (ATL)** surrounding the busiest airports.
2. Individually tailored **upside-down wedding cakes** — contain all instrument approaches.
3. When VFR **“CLEARED”** into **Class B required**. (91.131, Legal interp: Doremire 2010)
4. **All operations** require an operable two-way **radio**.
5. Airports listed in **“section 4 appendix D to Part 91”** require at least a **private pilot** certificate. Solo student, sport, and recreational pilot operations are not permitted at these locations.
6. **VFR** operations — Visibility: **3 sm** — Ceiling: **1,000 ft** — **Clear of Clouds** (or Special VFR).
7. **IFR** operations — An operable **VOR** or **TACAN** receiver or an operable and suitable **RNAV** system.
8. Unless otherwise authorized by ATC, a **large turbine-powered** airplane (more than 12,500 lbs) operating to or from a primary airport in Class B airspace **must operate at or above the floors** of the Class B airspace while within the lateral limits of that area **even when** operating on a **visual** approach.
9. A **large** (more than 12,500 lbs) **or turbine-powered** airplane shall, unless otherwise required by distance from cloud criteria, enter the **traffic pattern** at an altitude of at least **1,500 ft AGL** and maintain 1,500 ft AGL **until further descent is required** for a safe **landing**. [Noise abatement]
10. A **large or turbine-powered** airplane approaching to land on a runway served by an instrument approach procedure with **vertical guidance** (ILS, LPV), if the airplane is so equipped, must fly **at or above the GLIDE PATH** between the published **final approach fix** and the decision altitude (**DA**), or decision height (**DH**), as applicable.
11. **Any airplane** approaching to land on a runway served by a **VASI** shall maintain **at or above the glide path until a lower altitude is necessary** for a safe **landing**.
12. **Mode C veil** — All aircraft operating within **30 nm** of a Class B airport, from the surface to 10,000 ft MSL must have Mode C. That is **unless** the aircraft was originally certified **without an electrical system** and still doesn't have one, including balloons and gliders. *“The practical effect of 91.215(b)(3) is that it **allows non-equipped** aircraft to **enter the 30 nm circles surrounding Appendix D, Section 1 airports (Class B) between the surface and 10,000 ft MSL, and to operate beneath the floors** of the associated Class B airspace as they incrementally **ascend** from the **surface** in a shape commonly described as an **upside down wedding cake**.”* While not prohibited, operating an aircraft that is electronically invisible within close proximity to Class B airspace should be undertaken only with great care. (91.215, Legal interp: Knickerbocker 2006)
13. **ADS-B Out** — Required within Class B airspace and within **30 nm** of a Class B airport from the surface upward to 10,000 ft MSL. Relief for certain non-equipped aircraft is essentially the same as above. (91.225)
14. **SPEED LIMIT** — **250 KIAS** below **10,000 ft MSL (200 KIAS below the floor** or in VFR corridor).
 - a. **250 KIAS MUST NOT BE EXCEEDED** even if you are told to **“MAINTAIN BEST FORWARD SPEED.”** That is unless your AFM says your airplane will fall out of the sky at such an absurdly slow airspeed.
 - b. **“Maintain best** (or maximum) **forward speed”** — means — “maximum or best forward ***LEGAL*** speed.”
 - c. If **ATC assigns** a speed **greater** than **250 KIAS** while you are inbound (10,000 ft or above), and later descends you below 10,000 ft, it is **UNDERSTOOD** that you must **slow to 250 KIAS BEFORE descending below 10,000**.



“At or above the glide slope” does **not prohibit normal bracketing** maneuvers **above** or **below** the glide slope for the purpose of remaining on the glide slope.

“Normal bracketing maneuvers” are maneuvers which remain within the **limits** of the **higher** and **lower glide slope signals**.

Commercial turbojet operations — OpSpec C077: In order to accept a **Visual Approach** (or CVFP) (1) the airport must be VFR; (2) the flightcrew must remain within Class B airspace; and (3) maintain the basic cloud clearance specified in 91.155.

When VFR — Do I really have to hear the words “Cleared into Class B”?

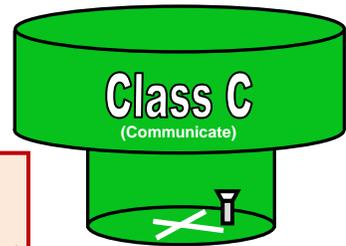
1. The short answer is **yes**. You must hear the magic word **“cleared”** at least **somewhere** in the **instructions** given to you by the approach controller. Radar identification and instructions to maintain a specific altitude and heading that will put you in their airspace can no longer be considered an implicit, implied, or understood clearance into Class B (although it happens *all* the time). A Letter of Interpretation addressed to my good friend Bridgette Doremire from the Office of Chief Counsel dated January 14, 2010 serves to rescind previous policy.
2. So... if you can get a word in edgewise, **always** ask for confirmation, just to get it on the tape.
3. That being said... **if** you've been **radar identified** by the **approach control** having jurisdiction (e.g., Charlotte **Approach**; NOTE: “flight following” from “center” cannot clear you into Class B); the terms **“cleared as requested”** or even **“proceed as requested,”** or a **clearance** to a specific **point inside** the **Class B** will also suffice. Example: **“Citation 5CM, radar contact, remain VFR, cleared direct Charlotte, climb and maintain four thousand, expect 36R.”**
4. 91.131 [Operations in Class B airspace] (a)(1) **“The operator must receive an ATC clearance from the ATC facility having jurisdiction for that area before operating an aircraft in that area.”** It **does NOT say** — “The operator **must** specifically **hear** the **magic words ‘Cleared into Class B’ in that precise order...**” If the frequency is totally saturated and you're truly paranoid about the magic words, then turn around and run away. Now **that** will get their attention! :o)

Chap 1 — Airspace & Airport

Class C Airspace: (71.51, 91.117, 91.129, **91.130**, 91.155, 91.215, 91.225, AIM 3-1-4, 3-2-1, **3-2-4**, 4-1-20, P/C Glossary, FAA-H-8083-25)

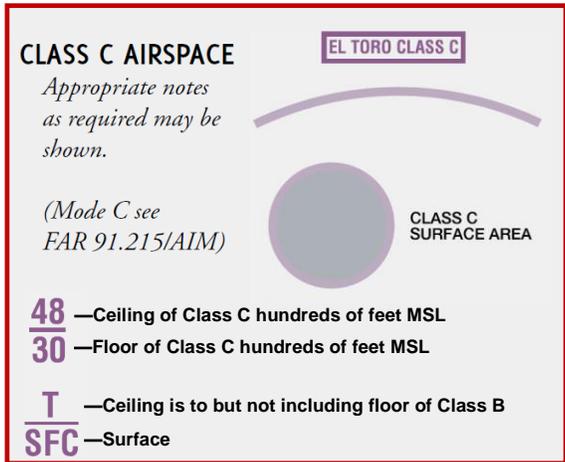
- Surface to 4,000 AGL** above an airport with:
 - An operating **Control Tower**, and
 - Radar** Approach Control.
- VFR** operations — Visibility: **3 sm** — Ceiling: **1,000 ft** — **Mnemonic 3-152s**
 Cloud Clearance: **1,000 ft** above, **500 ft** below, **2,000 ft** horizontally (or Special VFR).
- Individually tailored but typically consist of a:
 - 5 nm** radius **CORE** (aka inner circle, or inner ring) that extends from the **surface to 4,000 ft AGL** (rounded off to the nearest 100 ft);
 - 10 nm** radius **SHELF** (aka outer circle, or outer ring) that extends from **1,200 to 4,000 feet AGL** (rounded off to the nearest 100 ft); and a
 - 20 nm** radius **OUTER AREA** which extends from the lower limits of radar/radio coverage up to the ceiling of the approach control's airspace. Not charted. Communication strongly advised.
- Two-way communication** must be established before entry into shelf or core:
 - If Class C TRACON (Terminal Radar Approach Control) responds with “(callsign) standby”— Radio communication has been established and the aircraft **can enter** the Class C **unless** the controller has informed the pilot to **remain clear** of Class C.
 - If the controller responds to the initial call **WITHOUT** using the aircraft **CALLSIGN** — radio communications have not been established and the aircraft **may NOT enter** the Class C. (Legal interp: Granby 2006)
- A **large** (gross weight more than 12,500 lbs) **or turbine-powered** airplane shall, unless otherwise required by distance from cloud criteria, enter the **TRAFFIC PATTERN** at an altitude of at least **1,500 ft AGL** and maintain 1,500 ft AGL **until further descent is required** for a safe **landing**. [Noise abatement]
- A **large or turbine-powered** airplane approaching to land on a runway served by an instrument approach procedure with **vertical guidance** (e.g., **ILS, LPV**), if equipped, must fly **at or above** the **GLIDE PATH** between the published **final approach fix** and the decision altitude (**DA**), or decision height (**DH**), as applicable.
- Any airplane** approaching to land on a runway served by a **VASI** shall maintain **at or above** the **glide path until** a **lower altitude is necessary** for a safe **landing**.
- Mode C** and **ADS-B Out** required within and above all Class C up to 10,000 ft MSL where it is also required in Class E and Class A airspace.
- SPEED LIMIT** — Unless otherwise authorized or required by ATC, no aircraft may operate at or below **2,500 ft AGL** within **4 nm** of the primary airport of a Class C at an indicated airspeed of more than **200 kts**.
 “...**maintain best forward speed**” is **NOT** an **authorization to exceed** the **200 kts** in Class C (or Class D). **Any speed deviation above 200 kts** must be **SPECIFICALLY assigned** by ATC (e.g., “...**maintain 220 kts**”).

Mode C and ADS-B required within and above all Class C airspace.



Radio Call
 • **Who** you are
 • **Where** you are
 • **What** do you want

When receiving VFR **flight following** from “Center,” they may not always remember to **hand you off to Class C TRACON** before you enter the Class C airspace (whoops!).
 The **pilot** may need to **initiate** that **exchange** or the pilot will be in **violation** of **91.130** (dang!). (Legal interp: Granby 2006)



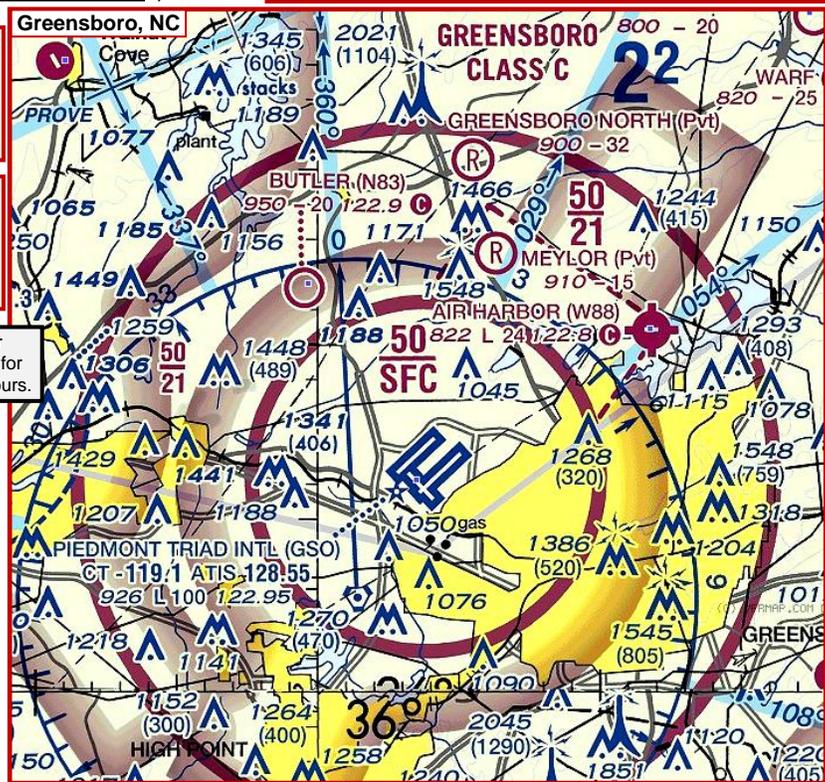
Aircraft are **not required** to be equipped with a **transponder** or **ADS-B** when operating **under** the **5 to 10 mile shelf** of Class C airspace. However, note that if you **are** transponder/ADS-B **equipped**, you **must operate** that equipment anytime you are in **controlled airspace**.

“Pilots approaching an airport with **Class C** service should be aware that if they **descend below** the **base altitude** of the **5 to 10 mile shelf** during an instrument or visual approach, they **may encounter** non-transponder/**non-ADS-B VFR aircraft**.” (AIM 3-2-4)

When departing a **satellite airport** within **Class C** or **D** airspace, you must establish radio contact “as soon as practical” after departing.

See NOTAMS or Chart Supplement for Class C effective hours.

Commercial Turbojet Operations
 OpSpec C077 — In order to accept a **Visual Approach** or a Charted Visual Flight Procedure Approach (**CVFP**):
 (1) The airport must be VFR;
 (2) The flightcrew must remain within Class C airspace; and
 (3) Maintain the basic cloud clearance specified in 91.155.



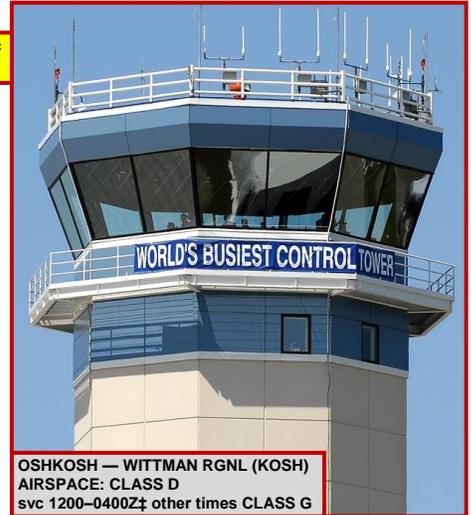
Class D Airspace — Non-Federal Control Towers:

(71.61, 91.117, 91.126 thru 91.129, 91.155, 103.17, 103.23, AIM 3-1-3, 3-1-4, 3-2-1, 3-2-5, 3-5-6, 4-3-2, 8-1-8, P/C Glossary, FAA-H-8083-15, 8083-16, 8083-25)

- Generally, controlled airspace from the **surface** to **2,500 feet AGL** (charted in MSL rounded to the nearest 100 feet) surrounding an airport with an operating **Control Tower** (but often **no radar**). Delineated with a **dashed Blue line** surrounding the airport on VFR sectional and terminal charts and a boxed **D** in the airport information on IFR Enroute Low Altitude Charts. The **ceiling** is marked with a **blue number** (MSL altitude in hundreds of feet) surrounded by blue **brackets**. Class D can include some of the busiest general aviation airports in the world (as we see below).
- Individually tailored, but normally a circular area with a **radius** of approximately **5 sm** around the primary airport and any **extensions** necessary to include instrument **approach** and **departure** paths. These arrival/departure extensions may be Class D or Class E airspace.
- The shape can also be modified to accommodate Class B or Class C airspace in the area.
- VFR operations** — Visibility: **3 sm** — Ceiling: **1,000 ft** — Cloud clearance: **1,000 ft** above, **500 ft** below, **2,000 ft** horizontally (or Special VFR).
- Two-way communication** must be established before entry:
 - If the controller responds with “**(callsign) standby**” — Radio communication has been established and the aircraft **can enter** the Class D. [Note: ADS-B Out not required]
 - If you **do not hear** the **tail number** you **cannot enter** the airspace.
 - If the controller is overwhelmed by traffic he can instruct the pilot to **remain clear** of Class D.
- A **large** or **turbine-powered** airplane shall, unless otherwise required by distance from cloud criteria, enter the **traffic pattern** at an altitude of at least **1,500 ft AGL** and maintain 1,500 ft AGL **until further descent is required** for a **safe landing**.
- A **large** or **turbine-powered** airplane approaching to land on a runway served by an instrument approach procedure with **vertical guidance** (e.g., ILS, LPV), if the airplane is so equipped, must fly **at** or **above** the **glide path** between the published **final approach fix** and the decision altitude (**DA**), or decision height (**DH**), as applicable.
- Any airplane** approaching to land on a runway served by a **VASI** shall maintain **at** or **above** the **glide path until a lower altitude is necessary** for a safe **landing**.
- SPEED LIMIT** — Unless otherwise authorized or required by ATC, no aircraft may operate at or **below 2,500' AGL** within **4 nm** of the primary airport of a Class D at an indicated airspeed of more than **200 kts**. “...**MAINTAIN BEST FORWARD SPEED**” is **NOT** an **authorization** to **exceed the 200 kts** in Class C or D. **Any speed** deviation **above 200 kts** must be **SPECIFICALLY assigned** by ATC (e.g., “...**maintain 220 kts**”).
- By definition, **Class D** airspace **must** have **WEATHER REPORTING**. After the tower closes for the evening, the **airspace** will **revert** to either **Class E** (controlled), or **Class G** (uncontrolled) usually **depending** on the **availability** of a certified **weather** observer or automated system (AWOS, ASOS). Again by definition, surface-based **Class E** airspace **cannot exist without weather reporting**. Therefore, when the **TOWER CLOSES** for the evening:
 - The **Chart Supplement** shows which **type** of **airspace** will exist **after** the **tower ceases operations**.
 - If continuous **WEATHER REPORTING** is **maintained**, the Class D airspace will normally **revert** to **Class E** (controlled) (i.e., “**other times CLASS E**”).
 - If **WEATHER REPORTING** is **NOT available** after the tower closes, the Class D airspace will **revert** to **Class G** (uncontrolled) (i.e., “**other times CLASS G**”).



Mnemonic 3-152s



The majority of Class D towers now have an approved **radar** display they use to monitor inbound traffic, but mostly they just look out the window. Controllers don't necessarily provide “separation” per se between all aircraft but they do provide “**sequencing**” and information about known traffic.

Often the controllers who work **Class D** airports are **not FAA employees**. These “**VFR towers**” can handle IFR traffic and are referred to as “**NFCT**” on sectional charts (Non Federal Control Tower).

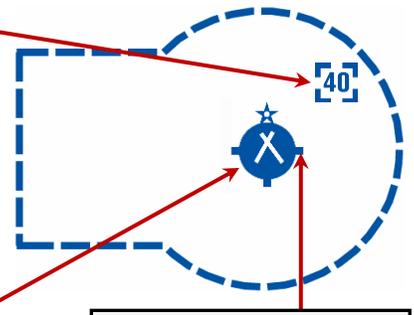
Commercial turbojet operations — OpSpec C077: In order to accept a **Visual Approach** (or CVFP) (1) the airport must be VFR; (2) the flightcrew must remain within Class D airspace; and (3) maintain the basic cloud clearance specified in 91.155.

Ceiling of Class D airspace in hundreds of feet MSL. In this example **40 = 4,000' MSL** inclusive (i.e., if you're flying at 4,000' MSL you are in Class D. A minus ceiling value (e.g., **-40**) indicates surface up to but not including that value. This is common when the Class D airspace is located under Class B (or C) airspace (i.e., when you reach 4,000' MSL you will be in the Class B (or C) airspace).

Airports having **Control Towers** are shown in **Blue**, all others **Magenta**.

Aircraft departing **satellite airports** within the **Class D** airspace must contact the tower **as soon as practical** after departure.

Class D—Dashed Blue line.



Tick marks around the airport symbol indicate **fuel** is **available**.

See Chart Supplement or NOTAMS for Class D effective hours.

Chap 1 — Airspace & Airport

Class E Airspace:

(71.71, 91.126, 91.127, 91.155, 91.225, 135.205, AIM 3-1-4,

ADS-B Out is required in **Class A, B, and C** airspace; within **30 nm** of **Class B** from the **surface** to **10,000' MSL**; within the lateral boundaries of **Class B** or **C** upward to **10,000' MSL**; all **Class E** at and above **10,000' MSL** within the 48 CONUS (excluding at and below 2,500' AGL); and **Class E** at and above **3,000' MSL** over the **Gulf of Mexico** from the **coastline** of the US out to **12 nm**.

AIM 3-2-1, 3-2-5, 3-2-6, 4-1-18, 4-1-20, 4-3-26, 4-4-12, 5-5-6, P/C Glossary, FAA-H-8083-15, 8083-16, 8083-25, Chart Users Guide)

- CONTROLLED** airspace that is not Class A, B, C, or D. **Class E begins at 1,200 ft AGL** "unless designated otherwise."
- All **IFR** aircraft are **controlled** by ATC and must operate on an **ATC clearance**. VFR aircraft are on their own.
- The vast majority of the time **Class E begins at 1,200 ft AGL** and includes **upwards** to, but not including **18,000 ft** (Flight Level 180, the base of Class A). Class E airspace **begins again** above **FL 600**.

4. Types of Class E:

- Surface-Based Class E** designated for an **AIRPORT** designed to contain all instrument approaches. The primary requirements for a Class E airport are approved **weather reporting** (FSS or ASOS/AWOS) and a means of **communications** with **ATC** all the way to the ground. Area surrounded by a **dashed Magenta line**.
- Extensions** to a **surface area** of **Class B, C, D,** or **E** airspace to contain instrument approaches.
- Transition Areas** used to transition to/from the enroute environment usually beginning at **700 ft AGL**. See **page 8**.
- Federal Airways** from **1,200 ft AGL upward** to but **not including 18,000 ft MSL**.
- Enroute Areas** that provide **controlled airspace** for **IFR** but are **NOT Federal airways** (most of the country).
- Class E begins at 1,200 ft AGL** for virtually the **entire country** (referred to as **enroute Class E**). However in some remote, usually mountainous areas—**Class E begins at 14,500' MSL** up to, but not including, **18,000' MSL**.

Surface-Based Class E:

(71.71, 91.126, 91.127, AC 90-66, FAA-H-8083-3, 8083-15, 8083-16, 8083-25)

- Brings** Class E, **controlled airspace, to the surface** in order to raise the weather minimums and **restrict VFR traffic** during poor weather. Especially important for **ILS** or **LPV approaches**.
- Must have approved **weather reporting** and **communications** with **ATC to the surface**.
- The airport manager must also request and receive Class E approval from the FAA.
- Most airports with weather reporting and communications with ATC never request Class E status because it would make VFR traffic illegal when the visibility drops below 3 sm and/or ceiling below 1,000 ft. Not good for business, especially if there's a flight school on the field.
- When **weather reporting** is **unavailable**, surface based Class E **reverts to Class G** with **Class E** beginning at **700 ft AGL** (magenta shading encircling the area), or **1200 ft AGL** (blue shading).
- Represented by **dashed Magenta lines** on **sectionals** and **enroute** charts.
- "RECOMMENDED"** traffic pattern **SPEED LIMIT** is **200 kts**.

Blue scalloped lines differentiate floors of Class E airspace greater than 700 ft AGL. (Class E at & above—Class G below)

2400 AGL
4500 MSL

Dashed Magenta: Class E to the Surface

Up to, but not including 18,000 ft MSL

Class E airspace includes virtually **ALL airspace above 1,200' AGL** that is not designated Class A, B, C, D, or special use — with the **exception** of certain **areas** of Alaska where Class G airspace extends from the **surface to 14,500' MSL** (shaded brown on enroute charts) — or where floor altitudes are specifically noted by blue **zipper lines** on sectional charts.

Mode C and ADS-B required at and above **10,000' MSL** excluding at and below **2,500' AGL**. (91.215, 91.225)

Class E

Between the altitudes **14,500' MSL**—up to but not including **18,000' MSL**—Class E excludes the airspace below **1,500' AGL**.

1,200 ft AGL

Class G

Faded Magenta line

700 ft AGL

Class G

Dashed Magenta line

Surface

The Alaska peninsula west of longitude 160° W is also excluded.



Possible reasons why many airports with weather reporting and a way to communicate with ATC to the surface **do not apply** for Surface-Based **Class E** status. Thoughts to consider:

- The **expense** and **hassle** of **dealing** with the **FAA's** out of control **bureaucracy**(?).
- Class E** VFR weather minimums are: **1,000 ft** ceiling and **3 miles** visibility.
- Class G** VFR weather minimums are:
 - Day**—**1 mile, clear of clouds**.
 - Night**—**3 miles, or 1 mile** when operating in an airport **traffic pattern within 1/2 mile of the runway, clear of clouds**.
- So it's **legal** to fly **VFR** in the airport traffic area at or below **700 ft** with only **one mile** visibility. Not necessarily a safe practice, but flight schools and instructors make more money when they can fly airplanes. There are also quite a few daredevils that enjoy the adrenaline rush of scud running at or below **1,200 ft AGL** around the hills, valleys, high-voltage power lines, and broadcast towers **enroute** to their favorite burger joint. Hey, if it's legal it must be safe, right?

A **VFR takeoff** or **landing** at an airport having any type of **surface-based controlled airspace** requires at least a **1,000 ft** ceiling and **3 miles** visibility unless you have requested and received a Special VFR clearance.

Commercial turbojet operations — OpSpec C077:

- In order to accept a **Visual Approach** (or CVFP) for an **IFR arrival** to a Class E airport (1) the airport must be VFR and the flightcrew must maintain the basic cloud clearance specified in 91.155; (2) the flight must be operated within **35 nm** of a destination airport in Class E.
- Terminal VFR arrival** — In order to **Cancel IFR** to an **uncontrolled airport** (1) the airport must be reporting **VFR** and the flightcrew must maintain the **basic cloud clearance** specified in 91.155; (2) The flightcrew must be in **direct communications** with an air/ground communication facility (or agent); and (3) the flight must be operated within **10 nm** of the destination airport **or visual reference** with the **landing surface** is established and can be **maintained** throughout the approach and landing.
- VFR departures** have to maintain VFR as specified in 91.155 and get an **IFR** clearance within **50 nm** of the departure airport.