

PRINT, CUT & STUDY

Real two-sided flashcards you can clip to your kneeboard — question on the front, answer on the back. Print once and you have the whole deck in your flight bag.

- 1 Print **double-sided** (book-style). Use heavier paper or card stock if you have it.
set to **flip on the LONG edge**
- 2 Check one sheet first — the answer should line up behind its question. If it doesn't, switch your printer to flip on the long edge and reprint.
- 3 Cut along the dashed lines. A paper cutter is fastest; scissors work fine.
- 4 Shuffle, quiz yourself, and set aside the ones you know. Round-corner punch optional.



STUDY THESE ONLINE, FREE

Same cards, tap-to-flip, with shuffle and progress tracking — great between lessons.

flightperformancecalc.com/flashcards.html

METAR

Q

What are the parts of a METAR, in order?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 01

METAR

Q

How is the date/time reported? Decode "121853Z".

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 02

WIND

Q

Decode the wind group "24016G28KT".

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 03

VISIBILITY

Q

Decode visibility "1 1/2SM", "10SM", and "M1/4SM".

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 04

SKY

Q

List the METAR sky-cover codes and their coverage in oktas (eighths).

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 05

SKY

Q

What defines a "ceiling"?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 06

TEMP

Q

Decode temperature/dewpoint "M04/M07" and "28/19".

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 07

PRESSURE

Q

Decode the altimeter group "A2992".

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 08

METAR

A

Two-digit day of the month plus four-digit time in UTC/Zulu. 121853Z = the 12th at 1853 Zulu.

WEATHER · 02

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**METAR**

A

Type, station (ICAO ident), day/time (Zulu), wind, visibility, weather, sky condition, temperature/dewpoint, altimeter, then remarks (RMK). Example: METAR KJFK 121853Z 18012KT 10SM FEW050 28/19 A2992 RMK AO2.

WEATHER · 01

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**VISIBILITY**

A

Prevailing visibility in statute miles: 1.5 SM, 10 (or more) SM, and less than 1/4 SM. M means "less than."

WEATHER · 04

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**WIND**

A

Wind from 240° true at 16 knots, gusting to 28 knots. VRB = variable direction; 00000KT = calm; a group like 180V240 in remarks shows variable direction limits.

WEATHER · 03

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**SKY**

A

The height AGL of the lowest BROKEN or OVERCAST layer (or the vertical visibility into an obscuration). FEW and SCT layers are not ceilings.

WEATHER · 06

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**SKY**

A

SKC/CLR = clear, FEW = 1–2/8, SCT (scattered) = 3–4/8, BKN (broken) = 5–7/8, OVC (overcast) = 8/8. Heights are in hundreds of feet AGL (BKN035 = 3,500 ft).

WEATHER · 05

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**PRESSURE**

A

Altimeter setting 29.92 inHg. Standard sea-level pressure is 29.92 inHg (1013.2 hPa).

WEATHER · 08

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**TEMP**

A

Temperature/dewpoint in °C, M = minus. So –4°C/–7°C, and 28°C/19°C.

WEATHER · 07

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

TEMP

Q

What does a small temperature–dewpoint spread tell you?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 09

WEATHER

Q

What do the intensity/proximity prefixes "-", "+", and "VC" mean?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 10

WEATHER

Q

Decode common weather codes: RA, SN, DZ, TSRA, FG, BR, FZRA, GR, HZ.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 11

TAF

Q

METAR vs TAF — what's the difference?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 12

CATEGORIES

Q

Give the ceiling/visibility limits for VFR, MVFR, IFR, and LIFR.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 13

MINIMUMS

Q

Basic VFR weather minimums in Class B airspace?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 14

MINIMUMS

Q

VFR visibility and cloud clearance in Class C, D, and E below 10,000 ft MSL?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 15

MINIMUMS

Q

VFR minimums in Class E at or above 10,000 ft MSL?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 16

WEATHER

A

"-" = light, no sign = moderate, "+" = heavy, and VC = in the vicinity (5–10 SM from the field, not at it).

WEATHER · 10

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**TEMP**

A

The air is near saturation (high humidity). A spread within a few degrees means fog, mist, or low clouds are likely — expect reduced visibility and ceilings.

WEATHER · 09

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**TAF**

A

A METAR reports OBSERVED current conditions at an airport (issued about hourly). A TAF is a FORECAST for roughly a 5 SM radius of the airport, usually valid 24–30 hours.

WEATHER · 12

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**WEATHER**

A

RA rain, SN snow, DZ drizzle, TSRA thunderstorm with rain, FG fog, BR mist, FZRA freezing rain, GR hail, HZ haze. Descriptors add detail: SH showers, TS thunderstorm, FZ freezing, BL blowing.

WEATHER · 11

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**MINIMUMS**

A

3 SM flight visibility and remain CLEAR OF CLOUDS.

WEATHER · 14

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**CATEGORIES**

A

VFR: ceiling > 3,000 ft AND vis > 5 SM.
MVFR: 1,000–3,000 ft and/or 3–5 SM. IFR: 500 to < 1,000 ft and/or 1 to < 3 SM. LIFR: < 500 ft and/or < 1 SM.

WEATHER · 13

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**MINIMUMS**

A

5 SM visibility; 1,000 ft below, 1,000 ft above, and 1 SM horizontally from clouds (aircraft go faster up high, so bigger margins).

WEATHER · 16

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**MINIMUMS**

A

3 SM visibility; stay 500 ft below, 1,000 ft above, and 2,000 ft horizontally from clouds. Mnemonic: "3-152."

WEATHER · 15

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

MINIMUMS

Q

VFR minimums in Class G, daytime, at or below 1,200 ft AGL?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 17

ATMOSPHERE

Q

State the standard atmosphere (ISA) sea-level values and lapse rates.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 18

ATMOSPHERE

Q

What is density altitude and why does it matter?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 19

REMARKS

Q

What does "RMK" begin, and what is the difference between AO1 and AO2?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 20

VISIBILITY

Q

What is RVR and how is it reported?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 21

FOG

Q

Name the main fog types a pilot should recognize.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 22

STABILITY

Q

What is a temperature inversion, and why care?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 23

TAF

Q

Decode the TAF change groups FM, BECMG, and TEMPO.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

WEATHER · 24

ATMOSPHERE

A

15°C and 29.92 inHg (1013.2 hPa) at sea level. Temperature lapses about 2°C per 1,000 ft; pressure drops about 1 inHg per 1,000 ft.

WEATHER · 18

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

MINIMUMS

A

1 SM visibility and clear of clouds. At night, or higher up, the requirements increase (generally 3 SM and 152 cloud clearance).

WEATHER · 17

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

REMARKS

A

RMK begins the remarks section. AO2 = an automated station WITH a precipitation discriminator; AO1 = automated WITHOUT one.

WEATHER · 20

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

ATMOSPHERE

A

Pressure altitude corrected for nonstandard temperature — the altitude the airplane "feels." High density altitude (hot, high, humid) means less lift and thrust: longer takeoff rolls and weaker climb.

WEATHER · 19

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

FOG

A

Radiation (clear, calm nights), advection (warm moist air over a cool surface, needs wind), upslope (moist air forced up terrain), steam fog (cold air over warm water), and freezing fog (FZFG).

WEATHER · 22

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

VISIBILITY

A

Runway Visual Range — visibility measured down a specific runway by a transmissometer, reported in feet (e.g., R06/2400FT). Used in low-visibility operations.

WEATHER · 21

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

TAF

A

FM = a rapid change FROM a stated time.
BECMG = a gradual, lasting change over a period.
TEMPO = temporary fluctuations lasting under an hour each, expected less than half the period.

WEATHER · 24

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

STABILITY

A

Temperature increases with altitude instead of decreasing — very stable air. It traps haze/smoke (poor visibility), gives smooth air, and can cause fog and low-level wind shear.

WEATHER · 23

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

CLASS A

Q

Class A airspace — altitudes and rules?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 01

CLASS B

Q

Class B — shape, altitudes, and how you enter.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 02

CLASS B

Q

Equipment and pilot requirements for Class B?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 03

CLASS C

Q

Class C — dimensions and entry requirement?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 04

CLASS C

Q

When is two-way radio communication "established"?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 05

CLASS D

Q

Class D — dimensions and entry?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 06

CLASS E

Q

What is Class E airspace?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 07

CLASS G

Q

What is Class G airspace?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 08

CLASS B

A

Surrounds the nation's busiest airports; surface to about 10,000 ft MSL, shaped like an upside-down wedding cake. You must receive a specific clearance — "cleared into the Bravo" — before entering.

AIRSPACE · 02

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**CLASS A**

A

18,000 ft MSL up to and including FL600. IFR only — an instrument rating and an ATC clearance are required. No VFR flight.

AIRSPACE · 01

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**CLASS C**

A

Around airports with a tower, radar approach control, and moderate traffic. Typically surface–4,000 ft AGL: a 5 NM inner core and a 10 NM outer shelf (1,200–4,000 AGL). Two-way radio communication must be ESTABLISHED before entry.

AIRSPACE · 04

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**CLASS B**

A

Two-way radio, a Mode C transponder, and ADS-B Out. At least a private certificate — or a student/sport/recreational pilot with the required endorsement (student solo is prohibited at ~12 of the busiest Class B airports).

AIRSPACE · 03

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**CLASS D**

A

Surrounds a towered airport (no radar service by the tower). Roughly surface to 2,500 ft AGL and about 4 NM radius, tailored to the instrument approaches. Two-way radio communication must be established.

AIRSPACE · 06

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**CLASS C**

A

When ATC replies using your call sign. "N123, standby" = established (you may enter). "Aircraft calling, standby" without your call sign = NOT established — remain clear.

AIRSPACE · 05

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**CLASS G**

A

Uncontrolled airspace — from the surface up to the overlying Class E floor. ATC has no authority there, and VFR weather minimums are the lowest. Common in remote and low-altitude areas.

AIRSPACE · 08

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**CLASS E**

A

Controlled airspace that isn't A, B, C, or D. Floors are commonly 700 ft AGL (magenta shading), 1,200 ft AGL (blue shading), or the surface; it extends up to but not including 18,000 ft MSL. No clearance is needed for VFR.

AIRSPACE · 07

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

SPECIAL USE

Q

Prohibited vs Restricted areas?

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

AIRSPACE · 09

SPECIAL USE

Q

What is an MOA (Military Operations Area)?

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

AIRSPACE · 10

SPECIAL USE

Q

Warning Area vs Alert Area?

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

AIRSPACE · 11

EQUIPMENT

Q

Where are a transponder and ADS-B Out required (91.215 / 91.225)?

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

AIRSPACE · 12

EQUIPMENT

Q

What is the Mode C Veil?

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

AIRSPACE · 13

SPEED

Q

Maximum speed below 10,000 ft MSL?

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

AIRSPACE · 14

SPEED

Q

Speed limit beneath a Class B shelf or in a VFR corridor through Class B?

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

AIRSPACE · 15

SPEED

Q

Speed limit within 4 NM of a Class C or D primary airport at or below 2,500 ft AGL?

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

AIRSPACE · 16

SPECIAL USE

A

Airspace that separates military training from IFR traffic. VFR flight through an active MOA is legal without a clearance, but use extreme caution and request advisories; verify whether it is active.

AIRSPACE · 10

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**SPECIAL USE**

A

Prohibited (P-): flight is banned entirely (e.g., P-56 over the U.S. Capitol/White House). Restricted (R-): invisible hazards such as artillery or missiles — you may transit only with the controlling agency's permission, and only when it is not "hot."

AIRSPACE · 09

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**EQUIPMENT**

A

In Class A, B, and C; above the lateral limits of Class B or C up to 10,000 ft MSL; within the Mode C Veil (30 NM of a Class B primary airport); and generally at and above 10,000 ft MSL (except at or below 2,500 ft AGL).

AIRSPACE · 12

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**SPECIAL USE**

A

Warning Area (W-): hazardous activity starting 3 NM or more offshore over international waters. Alert Area (A-): high volume of pilot training or unusual activity — every pilot shares equal responsibility for see-and-avoid.

AIRSPACE · 11

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**SPEED**

A

250 knots indicated airspeed (KIAS).

AIRSPACE · 14

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**EQUIPMENT**

A

A 30 NM radius ring around a Class B primary airport, within which a Mode C transponder and ADS-B Out are required from the surface upward.

AIRSPACE · 13

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**SPEED**

A

200 knots indicated airspeed (KIAS).

AIRSPACE · 16

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)**SPEED**

A

200 knots indicated airspeed (KIAS).

AIRSPACE · 15

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

CHARTS

Q

How are Class B, C, D, and surface Class E drawn on a sectional?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 17

CHARTS

Q

What do the fuzzy magenta and fuzzy blue vignettes mean?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 18

CHARTS

Q

What is a TRSA?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 19

SVFR

Q

What is Special VFR and where can you get it?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 20

TFR

Q

What is a TFR and why check for them?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 21

MINIMUMS

Q

What airspace does the "3-152" cloud-clearance rule cover?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 22

SERVICES

Q

What service does Class C provide that Class D does not?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 23

CLASS B

Q

What certificate does a student pilot need to enter certain Class B airports?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AIRSPACE · 24

CHARTS

A

Fuzzy magenta shading = Class E floor begins at 700 ft AGL. Fuzzy blue shading = Class E floor begins at 1,200 ft AGL. The airspace is on the shaded side of the line.

AIRSPACE · 18

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

CHARTS

A

Class B = solid blue lines. Class C = solid magenta lines. Class D = dashed blue lines. Class E to the surface = dashed magenta lines.

AIRSPACE · 17

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

SVFR

A

An ATC clearance to fly VFR in controlled airspace to the surface below normal VFR minimums (at least 1 SM visibility, clear of clouds), within the lateral limits at/below the airspace. Not offered at some busy airports; night SVFR requires an instrument rating and a properly equipped aircraft.

AIRSPACE · 20

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

CHARTS

A

Terminal Radar Service Area — overlays certain Class D/E airports and offers radar sequencing and separation. Participation is voluntary but recommended; depicted with solid gray lines.

AIRSPACE · 19

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

MINIMUMS

A

Class C, D, and E below 10,000 ft MSL: 3 SM visibility, 500 ft below, 1,000 ft above, and 2,000 ft horizontal from clouds.

AIRSPACE · 22

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

TFR

A

A Temporary Flight Restriction — published by NOTAM around hazards, VIP movement, major sporting events, or disasters. Check NOTAMs before every flight; busting a TFR risks interception and enforcement action.

AIRSPACE · 21

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

CLASS B

A

A logbook endorsement for that specific Class B airspace after ground and flight training. At about a dozen of the busiest Class B airports (listed in 91.131), student solo operations are prohibited entirely.

AIRSPACE · 24

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

SERVICES

A

Class C has radar approach control providing sequencing and separation from IFR traffic plus traffic advisories to VFR aircraft. A Class D tower sequences runway traffic but does not provide radar separation itself.

AIRSPACE · 23

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

PHONETICS

Q

NATO phonetic alphabet, A through M.

FLIGHTPERFORMANCECALC.COM

RADIO, · 01

PHONETICS

Q

NATO phonetic alphabet, N through Z.

FLIGHTPERFORMANCECALC.COM

RADIO, · 02

PHONETICS

Q

How are the numbers 3, 5, and 9 spoken on the radio?

FLIGHTPERFORMANCECALC.COM

RADIO, · 03

PHRASEOLOGY

Q

What are the four parts of an initial radio call?

FLIGHTPERFORMANCECALC.COM

RADIO, · 04

PHRASEOLOGY

Q

Define Roger, Wilco, Affirmative, and Negative.

FLIGHTPERFORMANCECALC.COM

RADIO, · 05

PHRASEOLOGY

Q

Define "Say again," "Standby," "Unable," and "Say intentions."

FLIGHTPERFORMANCECALC.COM

RADIO, · 06

ATIS

Q

What is ATIS and how do you use it?

FLIGHTPERFORMANCECALC.COM

RADIO, · 07

WEATHER

Q

ASOS vs AWOS?

FLIGHTPERFORMANCECALC.COM

RADIO, · 08

PHONETICS

A

November, Oscar, Papa, Quebec, Romeo, Sierra, Tango, Uniform, Victor, Whiskey, X-ray, Yankee, Zulu.

RADIO, · 02

FLIGHTPERFORMANCECALC.COM

PHONETICS

A

Alfa, Bravo, Charlie, Delta, Echo, Foxtrot, Golf, Hotel, India, Juliett, Kilo, Lima, Mike.

RADIO, · 01

FLIGHTPERFORMANCECALC.COM

PHRASEOLOGY

A

Who you're calling, who you are, where you are, and what you want. Example: "Palo Alto Tower, Skyhawk 12345, ten miles south, landing with information Bravo."

RADIO, · 04

FLIGHTPERFORMANCECALC.COM

PHONETICS

A

Three = "tree," five = "fife," nine = "niner."
Digits are usually spoken individually; altitudes are grouped (e.g., "ten thousand five hundred").

RADIO, · 03

FLIGHTPERFORMANCECALC.COM

PHRASEOLOGY

A

Say again = repeat your last transmission.
Standby = wait, I'll get back to you. Unable = I cannot comply. Say intentions = tell me what you plan to do.

RADIO, · 06

FLIGHTPERFORMANCECALC.COM

PHRASEOLOGY

A

Roger = I received all of your last transmission (it does NOT mean "yes").
Wilco = will comply. Affirmative = yes.
Negative = no.

RADIO, · 05

FLIGHTPERFORMANCECALC.COM

WEATHER

A

Automated weather stations that broadcast observations over a frequency or by phone at airports without ATIS. ASOS is the primary U.S. network (NWS/FAA); AWOS systems are often airport-owned and vary in what they report.

RADIO, · 08

FLIGHTPERFORMANCECALC.COM

ATIS

A

Automatic Terminal Information Service — a recorded loop of weather and airport information at busy fields, updated hourly and labeled with a phonetic letter ("information Alpha"). Tell ATC you "have information Alpha" on first contact.

RADIO, · 07

FLIGHTPERFORMANCECALC.COM

TRANSPONDER

Q

What does transponder code 1200 mean?

FLIGHTPERFORMANCECALC.COM

RADIO, · 09

TRANSPONDER

Q

Meaning of emergency codes 7500, 7600, and 7700?

FLIGHTPERFORMANCECALC.COM

RADIO, · 10

TRANSPONDER

Q

Define "squawk," "ident," and "squawk standby."

FLIGHTPERFORMANCECALC.COM

RADIO, · 11

LIGHT GUN

Q

STEADY GREEN light gun — in flight vs on the ground?

FLIGHTPERFORMANCECALC.COM

RADIO, · 12

LIGHT GUN

Q

FLASHING GREEN light gun — in flight vs on the ground?

FLIGHTPERFORMANCECALC.COM

RADIO, · 13

LIGHT GUN

Q

STEADY RED light gun — in flight vs on the ground?

FLIGHTPERFORMANCECALC.COM

RADIO, · 14

LIGHT GUN

Q

FLASHING RED light gun — in flight vs on the ground?

FLIGHTPERFORMANCECALC.COM

RADIO, · 15

LIGHT GUN

Q

FLASHING WHITE and ALTERNATING RED-AND-GREEN light gun signals?

FLIGHTPERFORMANCECALC.COM

RADIO, · 16

TRANSPONDER

A

7500 = hijack/unlawful interference. 7600 = lost communications (radio failure). 7700 = emergency. Memory aid: "7500 taken alive, 7600 radio nix, 7700 going to heaven."

RADIO, · 10

FLIGHTPERFORMANCECALC.COM

TRANSPONDER

A

The standard VFR squawk code in the United States.

RADIO, · 09

FLIGHTPERFORMANCECALC.COM

LIGHT GUN

A

In flight: cleared to land. On the ground: cleared for takeoff.

RADIO, · 12

FLIGHTPERFORMANCECALC.COM

TRANSPONDER

A

Squawk = set this transponder code. Ident = press the IDENT button to highlight your target on the controller's scope. Squawk standby = set the transponder to standby (no return transmitted).

RADIO, · 11

FLIGHTPERFORMANCECALC.COM

LIGHT GUN

A

In flight: give way to other aircraft and continue circling. On the ground: stop.

RADIO, · 14

FLIGHTPERFORMANCECALC.COM

LIGHT GUN

A

In flight: return for landing (to be followed by a steady green). On the ground: cleared to taxi.

RADIO, · 13

FLIGHTPERFORMANCECALC.COM

LIGHT GUN

A

Flashing white (ground only): return to your starting point on the airport. Alternating red-and-green: exercise extreme caution (applies in flight and on the ground).

RADIO, · 16

FLIGHTPERFORMANCECALC.COM

LIGHT GUN

A

In flight: airport unsafe, do not land. On the ground: taxi clear of the runway in use.

RADIO, · 15

FLIGHTPERFORMANCECALC.COM

CLEARANCES

Q

The components of an IFR clearance — the "CRAFT" mnemonic?

FLIGHTPERFORMANCECALC.COM

RADIO, · 17

LOST COMMS

Q

VFR lost-communications procedure at a towered airport.

FLIGHTPERFORMANCECALC.COM

RADIO, · 18

LOST COMMS

Q

IFR lost comms — how do you choose route and altitude (91.185)?

FLIGHTPERFORMANCECALC.COM

RADIO, · 19

NON-TOWERED

Q

What is the CTAF and how is it used?

FLIGHTPERFORMANCECALC.COM

RADIO, · 20

NON-TOWERED

Q

UNICOM vs MULTICOM?

FLIGHTPERFORMANCECALC.COM

RADIO, · 21

SAFETY

Q

Which ATC instructions must be read back verbatim, and why?

FLIGHTPERFORMANCECALC.COM

RADIO, · 22

PHRASEOLOGY

Q

What does "line up and wait" mean?

FLIGHTPERFORMANCECALC.COM

RADIO, · 23

EMERGENCY

Q

What is the emergency / guard frequency?

FLIGHTPERFORMANCECALC.COM

RADIO, · 24

LOST COMMS

A

Squawk 7600, stay clear as needed, and watch the tower for light-gun signals. Acknowledge by rocking your wings (day) or flashing your landing light (night).

RADIO, · 18

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)**CLEARANCES**

A

Clearance limit, Route, Altitude, Frequency (departure), Transponder code. Copy it down and read it back.

RADIO, · 17

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)**NON-TOWERED**

A

Common Traffic Advisory Frequency — the frequency for self-announcing position and intentions at a non-towered airport. It may be a UNICOM, MULTICOM, or the tower frequency when the tower is closed.

RADIO, · 20

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)**LOST COMMS**

A

Route "AVE-F": Assigned, Vectored (toward), Expected, or Filed — in that priority. Altitude "MEA": fly the HIGHEST of the Minimum En route Altitude, the Expected altitude, or the Assigned altitude for each segment.

RADIO, · 19

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)**SAFETY**

A

Runway hold-short instructions, runway crossings, and any clearance onto or across a runway — read back with your call sign. Verbatim readback is the primary defense against runway incursions.

RADIO, · 22

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)**NON-TOWERED**

A

UNICOM = a non-government air/ground station giving advisories and services (often 122.7–123.0). MULTICOM (122.9) = used where there is no UNICOM or tower.

RADIO, · 21

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)**EMERGENCY**

A

121.5 MHz — the VHF international air distress "guard" frequency. Monitor it when able; use it for emergencies or when you cannot reach ATC.

RADIO, · 24

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)**PHRASEOLOGY**

A

Taxi onto the departure runway and hold in position, ready for takeoff. It is NOT a takeoff clearance — wait for "cleared for takeoff."

RADIO, · 23

[FLIGHTPERFORMANCECALC.COM](https://www.flightperformancecalc.com)

FOUR FORCES

Q

Name the four forces acting on an airplane in flight.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 01

LIFT

Q

How does a wing produce lift? (two complementary explanations)

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 02

LIFT

Q

State the lift equation and its variables.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 03

AOA

Q

Define angle of attack.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 04

STALL

Q

What is the critical angle of attack, and what is a stall?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 05

AOA

Q

Distinguish chord line, relative wind, and flight path.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 06

DRAG

Q

Induced drag vs parasite drag — and where each dominates.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 07

PERFORMANCE

Q

What is L/D max?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 08

LIFT

A

It deflects air downward — Newton's third law gives an equal and opposite upward reaction — AND it creates lower pressure over the curved upper surface than beneath (Bernoulli). Both describe the same net upward force.

AERODYNAMICS · 02

FLIGHTPERFORMANCECALC.COM

FOUR FORCES

A

Lift (up), Weight/gravity (down), Thrust (forward), and Drag (rearward). In unaccelerated straight-and-level flight they balance: lift = weight and thrust = drag.

AERODYNAMICS · 01

FLIGHTPERFORMANCECALC.COM

AOA

A

The angle between the wing's chord line and the relative wind. It is NOT the same as pitch attitude — a wing can be at a high angle of attack at any pitch or airspeed.

AERODYNAMICS · 04

FLIGHTPERFORMANCECALC.COM

LIFT

A

$L = C_L \times \frac{1}{2} \rho V^2 \times S$. C_L = coefficient of lift (airfoil shape and angle of attack), ρ = air density, V = velocity, S = wing area. Lift varies with the SQUARE of airspeed.

AERODYNAMICS · 03

FLIGHTPERFORMANCECALC.COM

AOA

A

The chord line runs from the leading to the trailing edge. The relative wind is the airflow opposite the flight path. Angle of attack is the angle between the chord line and the relative wind.

AERODYNAMICS · 06

FLIGHTPERFORMANCECALC.COM

STALL

A

The critical AOA (about 16–18° for many airfoils) is where airflow separates and lift drops sharply. A stall is ALWAYS the result of exceeding the critical angle of attack — it can happen at any airspeed, weight, or attitude.

AERODYNAMICS · 05

FLIGHTPERFORMANCECALC.COM

PERFORMANCE

A

The angle of attack (and corresponding airspeed) that gives the greatest lift-to-drag ratio — the point of minimum total drag. It yields best glide range and underlies best-endurance/economy speeds.

AERODYNAMICS · 08

FLIGHTPERFORMANCECALC.COM

DRAG

A

Induced drag is a by-product of producing lift (wingtip vortices); it is greatest at low speed / high AOA. Parasite drag (form, skin friction, interference) rises with the square of airspeed; it dominates at high speed.

AERODYNAMICS · 07

FLIGHTPERFORMANCECALC.COM

GROUND EFFECT

Q

What is ground effect?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 09

LEFT TURN

Q

Name the four left-turning tendencies.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 10

LEFT TURN

Q

What is P-factor?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 11

TURNS

Q

What is adverse yaw and how do you counter it?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 12

LOAD FACTOR

Q

How does stall speed change with load factor in a level turn?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 13

LOAD FACTOR

Q

Define load factor and give the values at 30°, 45°, and 60° of bank.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 14

STABILITY

Q

Center of gravity vs center of pressure?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 15

STABILITY

Q

Effects of a forward vs an aft CG?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 16

LEFT TURN

A

Torque (reaction to prop rotation), spiraling slipstream (strikes the tail on the left), P-factor (descending blade makes more thrust at high AOA), and gyroscopic precession (felt during pitch changes, e.g., a tailwheel takeoff).

AERODYNAMICS · 10

FLIGHTPERFORMANCECALC.COM

GROUND EFFECT

A

Within about one wingspan of the surface, wingtip vortices and induced drag are reduced. It can let an airplane lift off below normal flying speed or float during landing.

AERODYNAMICS · 09

FLIGHTPERFORMANCECALC.COM

TURNS

A

When rolling into a bank, the rising (outside) wing has more lift and therefore more induced drag, yawing the nose away from the turn. Counter it with coordinated rudder into the turn.

AERODYNAMICS · 12

FLIGHTPERFORMANCECALC.COM

LEFT TURN

A

Asymmetric propeller thrust. At a high angle of attack the descending (right) blade takes a larger bite of air than the ascending blade, producing more thrust on the right and yawing the nose left.

AERODYNAMICS · 11

FLIGHTPERFORMANCECALC.COM

LOAD FACTOR

A

Load factor = lift ÷ weight (in G). In a level turn $n = 1/\cos(\text{bank angle})$: $30^\circ \approx 1.15$ G, $45^\circ \approx 1.41$ G, $60^\circ = 2.0$ G.

AERODYNAMICS · 14

FLIGHTPERFORMANCECALC.COM

LOAD FACTOR

A

Stall speed increases with the square root of the load factor: $V_{s(\text{new})} = V_s \times \sqrt{n}$. At a 60° bank the load factor is 2 G, so the stall speed rises about 41% ($\times 1.41$).

AERODYNAMICS · 13

FLIGHTPERFORMANCECALC.COM

STABILITY

A

Forward CG: more stable, higher stall speed, heavier control forces, more tail-down force and drag. Aft CG: less stable, lower stall speed, lighter controls — and if too far aft, dangerously unstable and hard to recover from a spin.

AERODYNAMICS · 16

FLIGHTPERFORMANCECALC.COM

STABILITY

A

The CG is the airplane's weight balance point. The center of pressure is where the wing's total lift acts, and it moves fore/aft with angle of attack. Their relationship drives pitch stability.

AERODYNAMICS · 15

FLIGHTPERFORMANCECALC.COM

HIGH LIFT

Q

What do flaps do aerodynamically?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 17

STABILITY

Q

Name the three stability axes and their control surfaces.

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 18

SPINS

Q

What is a spin, and what is the PARE recovery?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 19

V-SPEEDS

Q

What is maneuvering speed (V_a), and why does it change with weight?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 20

AOA

Q

Angle of incidence vs angle of attack?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 21

STALL

Q

Why is stall speed (in indicated airspeed) about the same at any altitude?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 22

WAKE

Q

What are wingtip vortices, and when are they strongest?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 23

PERFORMANCE

Q

What is the region of reversed command ("behind the power curve")?

[FLIGHTPERFORMANCECALC.COM](https://flightperformancecalc.com)

AERODYNAMICS · 24

STABILITY

A

Longitudinal stability = pitch about the lateral axis (elevator, CG, horizontal stabilizer). Lateral stability = roll about the longitudinal axis (dihedral). Directional stability = yaw about the vertical axis (vertical fin).

AERODYNAMICS · 18

FLIGHTPERFORMANCECALC.COM

HIGH LIFT

A

They increase wing camber (and, on some types, area) to raise the coefficient of lift — allowing slower flight and steeper approaches. They also add drag, which is greatest at high flap settings.

AERODYNAMICS · 17

FLIGHTPERFORMANCECALC.COM

V-SPEEDS

A

The maximum speed at which full, abrupt control deflection won't overstress the airframe — the wing stalls before it breaks. V_a DECREASES as weight decreases, so a lighter airplane has a lower maneuvering speed.

AERODYNAMICS · 20

FLIGHTPERFORMANCECALC.COM

SPINS

A

An aggravated stall with autorotation — one wing more deeply stalled than the other (yaw present at the stall). PARE: Power idle, Ailerons neutral, Rudder full opposite the spin, Elevator forward to break the stall, then recover from the dive.

AERODYNAMICS · 19

FLIGHTPERFORMANCECALC.COM

STALL

A

A wing stalls at a fixed angle of attack, which corresponds to a fixed INDICATED airspeed (dynamic pressure). So the stall IAS stays nearly constant with altitude even though true airspeed increases.

AERODYNAMICS · 22

FLIGHTPERFORMANCECALC.COM

AOA

A

Angle of incidence is the FIXED angle at which the wing is mounted to the fuselage (built in by the designer). Angle of attack is variable and set by the pilot through pitch relative to the relative wind.

AERODYNAMICS · 21

FLIGHTPERFORMANCECALC.COM

PERFORMANCE

A

The low-speed, high-AOA regime where MORE power is required to fly SLOWER because induced drag dominates. On approach it means correcting a low, slow condition may require adding power rather than only pitching down.

AERODYNAMICS · 24

FLIGHTPERFORMANCECALC.COM

WAKE

A

Circulating air spilling from the high-pressure area below the wingtip to the low-pressure area above — the source of induced drag and wake turbulence. They are strongest when an aircraft is heavy, clean (no flaps/gear), and slow.

AERODYNAMICS · 23

FLIGHTPERFORMANCECALC.COM