

Current Info and Forecasts

VFR Minimums

METARs and TAFs

Types of Clouds

Snow, Sleet, or Rain?

Fog

Fronts

Weather Advisories

Winds Aloft

Graphical Forecasts for Aviation (GFA) Help

[Pilot Institute – Mastering Weather](#)

[Understanding Skew T Diagrams](#)

[Definitive Guide to Skew-Ts and](#)

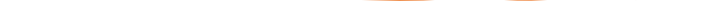
[Hodographs](#)

Weather Current
Info and Forecasts



Lesson Objective

To develop understanding of how to find current weather info
and how to see what is likely to happen in the near future



Inflight Aviation Weather Advisories

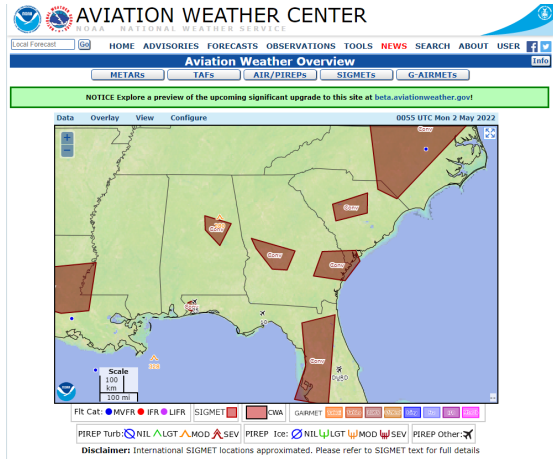
anything .gov is official

<https://aviationweather.gov/gfa>

Fit Cat: ● IVFR ● IFR ● LFR SIGMET ■ CWA ■ GARNET ■ ■ ■ ■ ■ ■ ■ ■ ■ ■

PIREP Turb: N I L A L G T A M O B A S E V PIREP Ice: N I L I L G T A M O B A S E V PIREP Other: A

Disclaimer: International SIGMET locations approximated. Please refer to SIGMET text for full details



Atlanta Tracon Briefing

<https://www.weather.gov/ztl/atltraconbrf>

ions Radar Forecasts Strategic Planning Aids Tactical Planning Aids Additional Info

ZTL Pre-Duty
Video Weather
Briefing

0:00



METARs/TAFs

As time gets closer

https://aviationweather.gov/adds/metars/?station_ids=katl%2Ckffc%2Ckhmp%2Ck6a2%2CKCCO&std_trans=standard&chk_metars=on&hoursStr=most+recent+only&chk_tafs=on&submitmet=Submit

Aviation Digital Data Service (ADDs)

Output produced by METARs form (0047 UTC 02 May 2022)
found at <http://aviationweather.gov/metar/data/>

KATL 012352Z 20007KT 10SM FEW050 FEW080 FEW250 25/17 A3002 RMK A02 SLP157 TCU DSNT SE MDT CU DSNT E-SE-S

KATL 012325Z 0200/0306 22010KT P6SM SCT050 SCT150
FM020100 24003KT P6SM SCT150
FM021600 26007KT P6SM SCT040 SCT250
FM021900 24008KT P6SM SCT060 SCT150
FM030000 22004KT P6SM SCT150

KFFC 012353Z AUTO 00000KT 10SM CLR 26/18 A3002 RMK A02 SLP161 T02560178 10278 20244 58002
KHMP 020035Z AUTO 00000KT 10SM CLR 21/18 A3007 RMK A02 T02070179
K6A2 020035Z AUTO 00000KT 10SM SCT042 SCT070 22/17 A3004 RMK A02
KCCO 020035Z AUTO 00000KT 10SM CLR 23/18 A3004 RMK A02 T02250175

1800wxbrief.com

AIM 7-1-2

c. Other Sources of Weather Information

Weather and aeronautical information are available from numerous private industry sources on an individual or contract pay basis. Prior to every flight, pilots should gather all information vital to the nature of the flight. Pilots can receive a regulatory compliant briefing without contacting Flight Service. Pilots are encouraged to use automated resources and review AC 91-92, Pilot's Guide to a Preflight Briefing, for more information. Pilots can access Leidos Flight Services via the Internet at <http://www.1800wxbrief.com>. Pilots can receive preflight weather data and file VFR and IFR flight plans.

FlightService Home Dashboard Map Wx Charts Plan & Brief Airports Account Features Links Help Logout

Welcome GARY VEDUCCIO Sun May 01 21:22:31 EDT | 1:22:31 Z

Draft ICAO Domestic

Recent Flight Plans Favorite Flight Plans Save as Favorite

Notice: Per FAA Guidance, all civilian flight plans must be filed as ICAO flight plans.

* Click field names for help

Aircraft ID N658LM	Flight Rule ▼	Flight Type ▼	No. of Aircraft 1	Aircraft Type C172	Wake Turbulence L	Aircraft Equipment
Departure 	Airport Info Area Brief	Departure Date & Time 05/01/2022 HHMM EDT 1-120 Apply Minutes From Now	Evaluate	Cruising Speed 	Level 	Optimize Surveillance Equipment
Route of Flight DCT				Other Information (Optional) 		
Destination 	Airport Info Area Brief	Est Elapsed Time HHMM Calculate	Alternate 1 (Optional) 	Airport Info Area Brief	Alternate 2 (Optional) 	Airport Info Area Brief
Fuel Endurance HHMM	Persons on Board 	Aircraft Color & Markings (Optional) W	Supplemental Remarks (Optional) 		Pilot In Command (Optional) 	
Emergency Radios ☐ UHF ☐ VHF ☐ ELBA	Survival Equipment ☐ Polar ☐ Desert ☐ Maritime ☐ Jungle	Jackets ☐ Light ☐ Fluorescent ☐ UHF ☐ VHF	Dinghies (Optional) Number Capacity Color Covered 		Pilot Contact Information VEDUCCIO, GARY, (401)261-5334 KRY, (401)261-5334	

Route Brief File NavLog Return Flight Plan Next Leg Clear

1800wxbrief.com

Prior to every flight, pilots should gather all information vital to the nature of the flight.

This site is informational in nature and is designed to assist pilots and aircrews for flight planning and weather familiarization.

It may be used in conjunction with other preflight information sources needed to satisfy all the requirements of 14 CFR 91.103 and is not to be considered as a sole source of information to meet all preflight action.

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<u>Route of Flight</u> DCT				<u>Other Information (Optional)</u> 		
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<u>Emergency Radios</u> ☐ UHF ☐ VHF ☐ ELBA	<u>Survival Equipment</u> ☐ Polar ☐ Desert ☐ Maritime ☐ Jungle	<u>Jackets</u> ☐ Light ☐ Fluorescent ☐ UHF ☐ VHF	<u>Dinghies (Optional)</u> Number Capacity Color Covered 		<u>Pilot Contact Information</u> VEDUCCIO, GARY, (401)261-5334 KRY, (401)261-5334	

Route Brief File NavLog Return Flight Plan Next Leg Clear

1800wxbrief.com

Pilots can complete their regulatory-compliant preflight briefing by using other automated resources or from Flight Service at www.1800wxbrief.com or by calling 1-800-WX-BRIEF.”

GRV Note: It is a .com domain but it is the official briefing source by the federal government...they got the contract

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Route Brief File NavLog Return Flight Plan Next Leg Clear

Air Sports Net

<https://www.usairnet.com/cgi-bin/launch/code.cgi?Submit=Go&sta=KFFC&state=GA>

The data comes from the National Weather Service's National Blend of Models

They put it in a quick way to digest

Aviation Weather Forecast at Peachtree, Georgia

Station: KFFC North: 33.35 West: -84.57 Timezone: Eastern Daylight Saving Time UTC: -4 Model: National Blend of Models - Aviation Format

DATE	MONDAY MAY 2										TUESDAY MAY 3						WEDNESDAY MAY 4					
HOUR	8:00 PM	11:00 PM	2:00 AM	5:00 AM	8:00 AM	11:00 AM	2:00 PM	5:00 PM	8:00 PM	11:00 PM	2:00 AM	5:00 AM	8:00 AM	11:00 AM	2:00 PM	5:00 PM	8:00 PM	11:00 PM	2:00 AM	5:00 AM	8:00 AM	11:00 AM
SKY	Clear  12% Clouds	Partly Cloudy  48% Clouds	Mostly Cloudy  65% Clouds	Partly Cloudy  54% Clouds	Partly Cloudy  46% Clouds	Partly Cloudy  43% Clouds	Partly Cloudy  56% Clouds	Partly Cloudy  45% Clouds	Partly Cloudy  45% Clouds	Mostly Clear  36% Clouds	Partly Cloudy  41% Clouds	Partly Cloudy  57% Clouds	Partly Cloudy  60% Clouds	Partly Cloudy  55% Clouds	Partly Cloudy  50% Clouds	Partly Cloudy  39% Clouds	Mostly Clear  30% Clouds	Partly Cloudy  43% Clouds	Partly Cloudy  51% Clouds	Partly Cloudy  49% Clouds	Partly Cloudy  43% Clouds	Mostly Clear  24% Clouds
TEMP (F)	76	67	64	62	63	77	83	84	77	68	65	63	64	77	83	85	79	69	67	65	66	78
WIND DIRECTION (AZIMUTH)	230 	CALM	CALM	CALM	CALM	260 	230 	220 	230 	CALM	CALM	CALM	CALM	210 	210 	210 	210 	210 	210 	CALM	240 	250 
AVERAGE WIND SPEEDS (MPH)	1	0	0	0	0	2	5	4	1	0	0	0	0	5	8	7	2	1	1	0	1	5
MAXIMUM WIND GUST SPEEDS (MPH)	9	6	4	4	3	6	10	9	9	4	5	4	4	13	15	13	10	6	6	6	6	11

Weather.com

<https://weather.com/weather/tenday/l/2ba735a534270d73e8b1f7e9c1c3d658f40d92999301cce304d273c9dd6e1370>

Hourly

10 Day

Weekend

Monthly

Radar

Day Weather

- Griffin, GA

as of 8:35 pm EDT

Sun 01 | Night

60°

19%

WSW 1 mph

Mostly cloudy skies. A stray shower or thunderstorm is possible. Low near 60F. Winds light and variable.

Humidity

87%

UV Index

0 of 10

Moonrise

7:17 am

Waxing Crescent

Moonset

9:21 pm

Mon 02

83°/62°

Partly Cloudy

18%

WSW 4 mph

Tue 03

86°/64°

Partly Cloudy

15%

SW 9 mph

Wed 04

86°/62°

Partly Cloudy

24%

W 7 mph

Thu 05

88°/65°

Partly Cloudy

9%

SW 6 mph

Fri 06

78°/57°

Scattered Thunderstorms

51%

WSW 13 mph

Sat 07

78°/56°

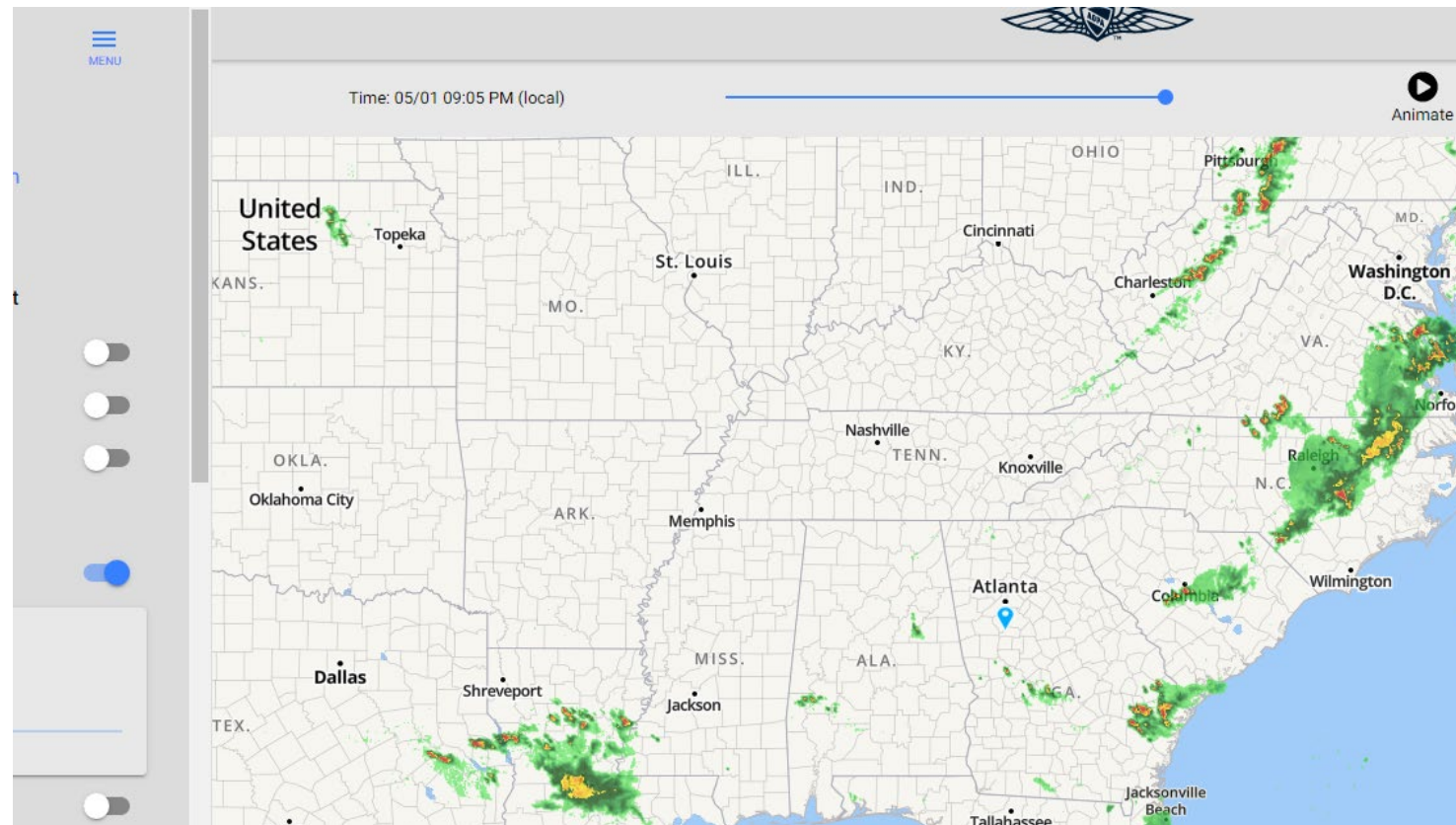
Partly Cloudy

15%

WNW 11 mph

AOPA Weather Radar

<https://www.aopa.org/weather/>

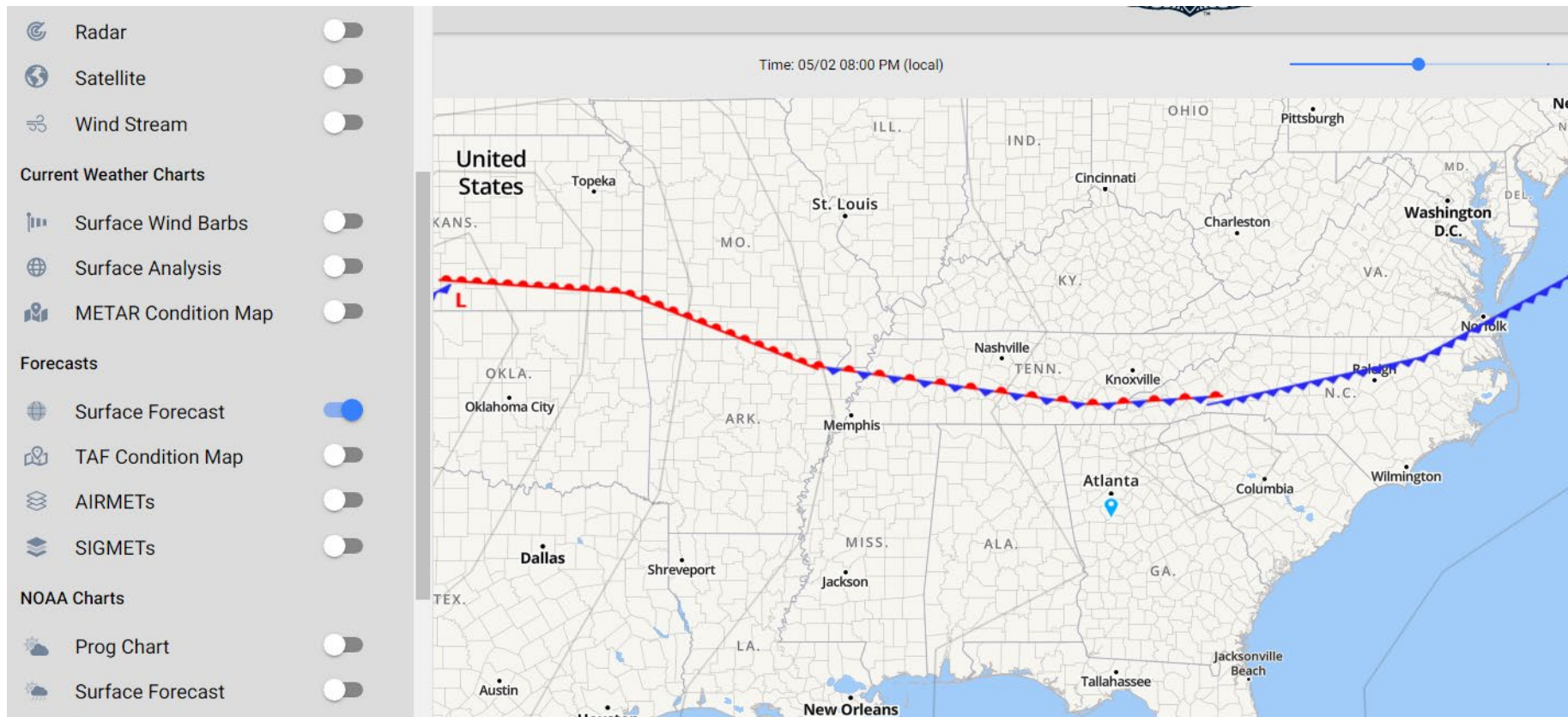


AOPA Weather Surface Analysis



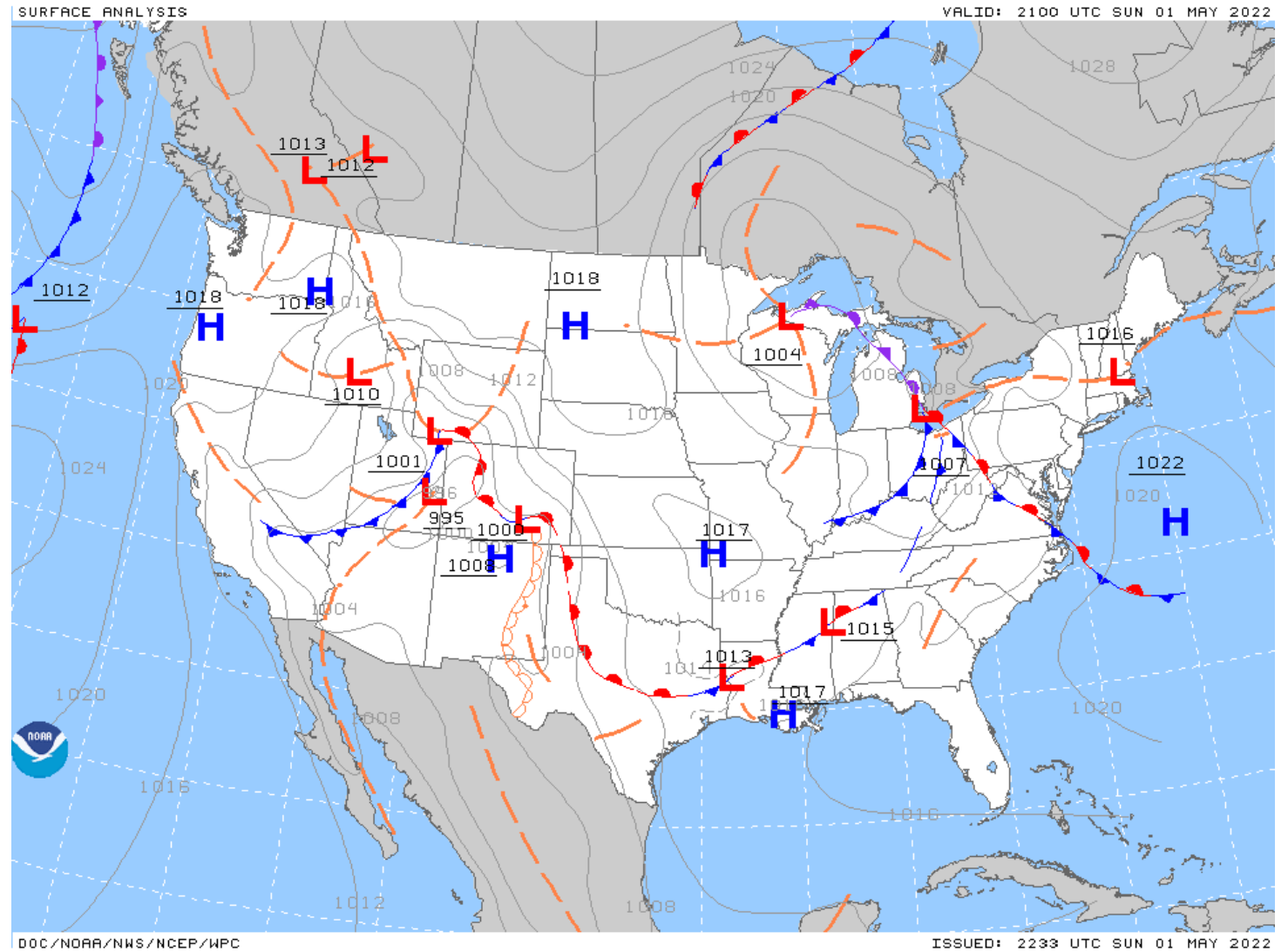
AOPA Weather

Surface Forecast



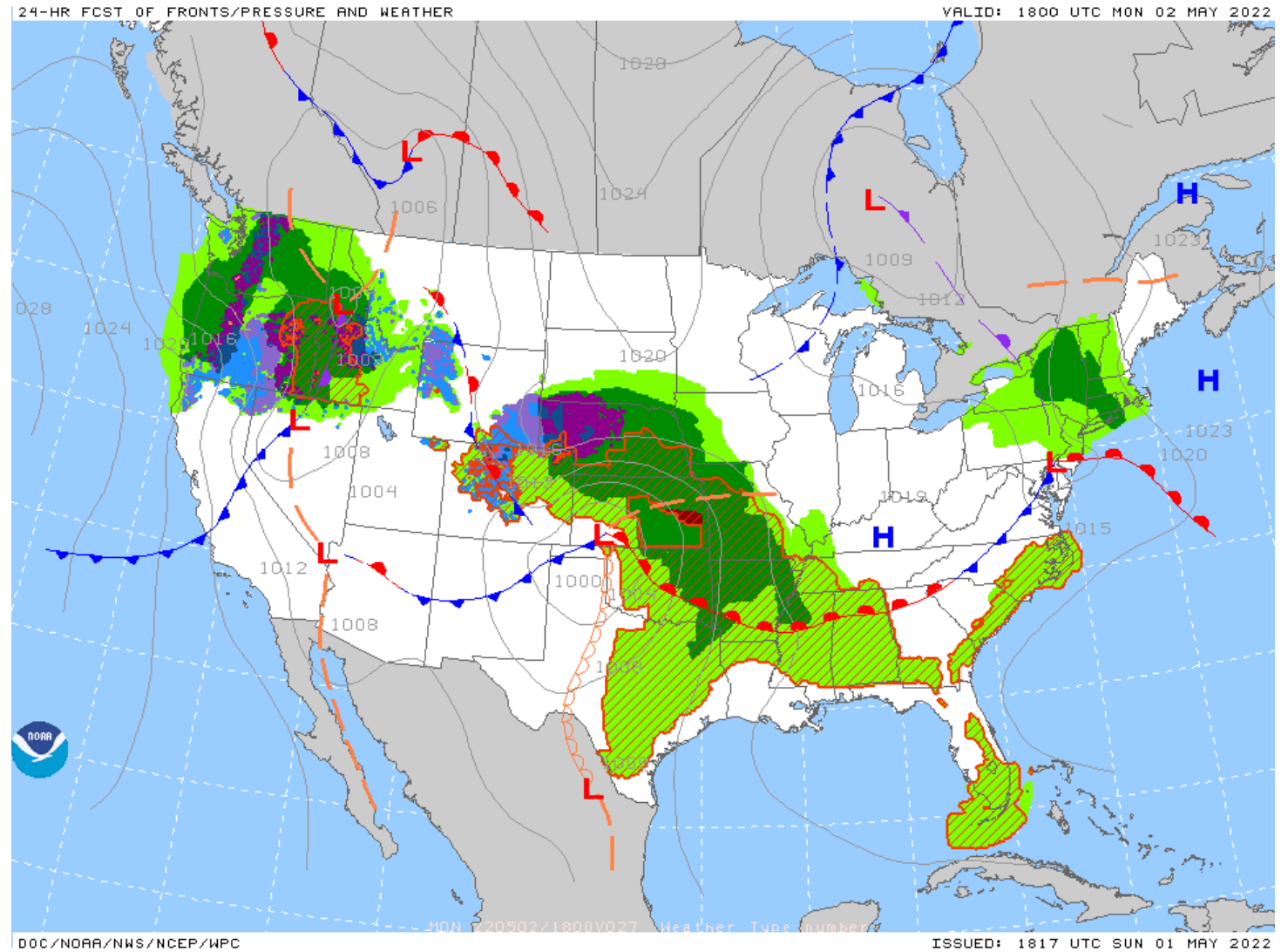
AOPA Weather Prog Chart

Current



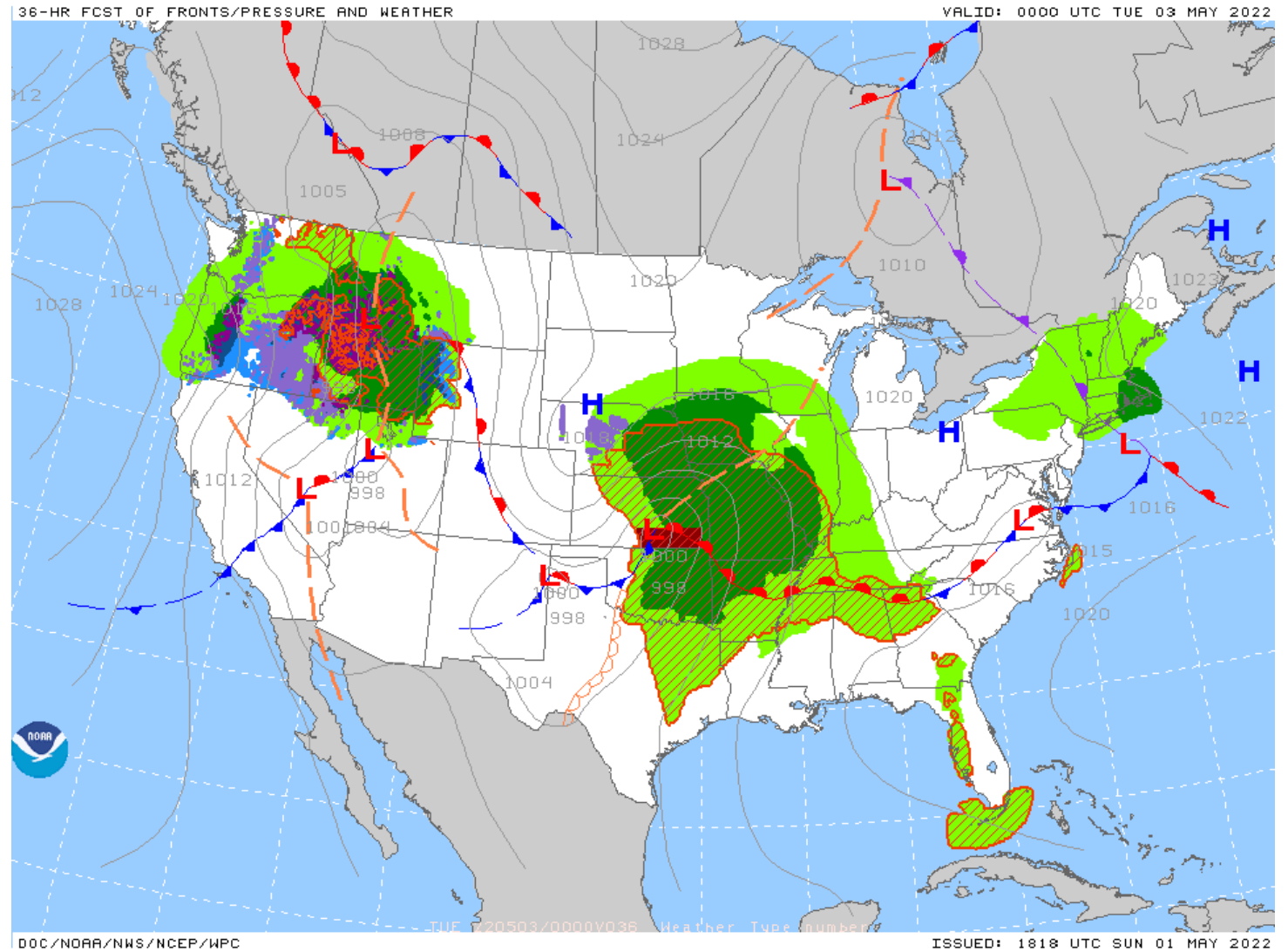
AOPA Weather Prog Chart

24 Hour Forecast



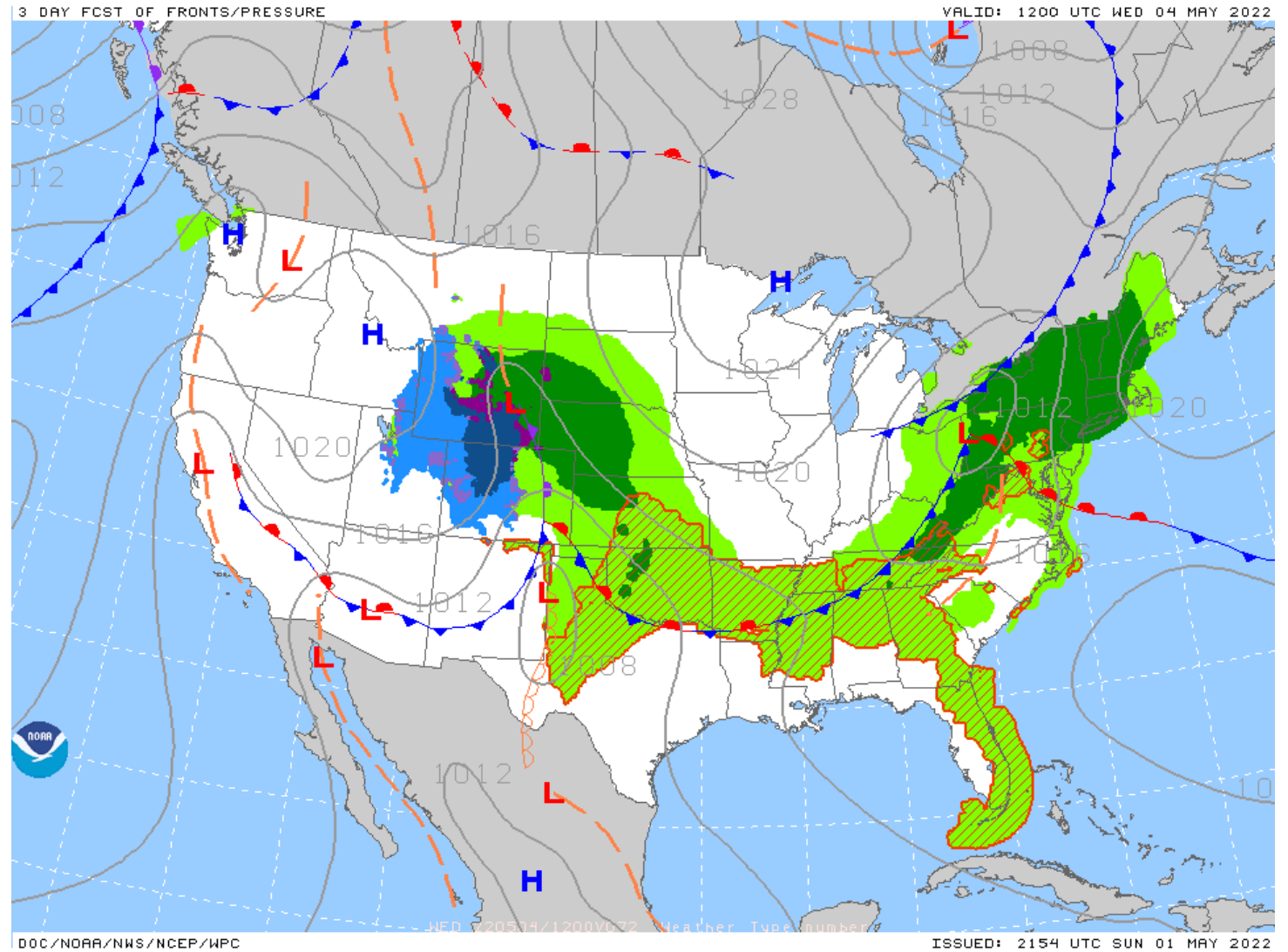
AOPA Weather Prog Chart

36 Hour Forecast



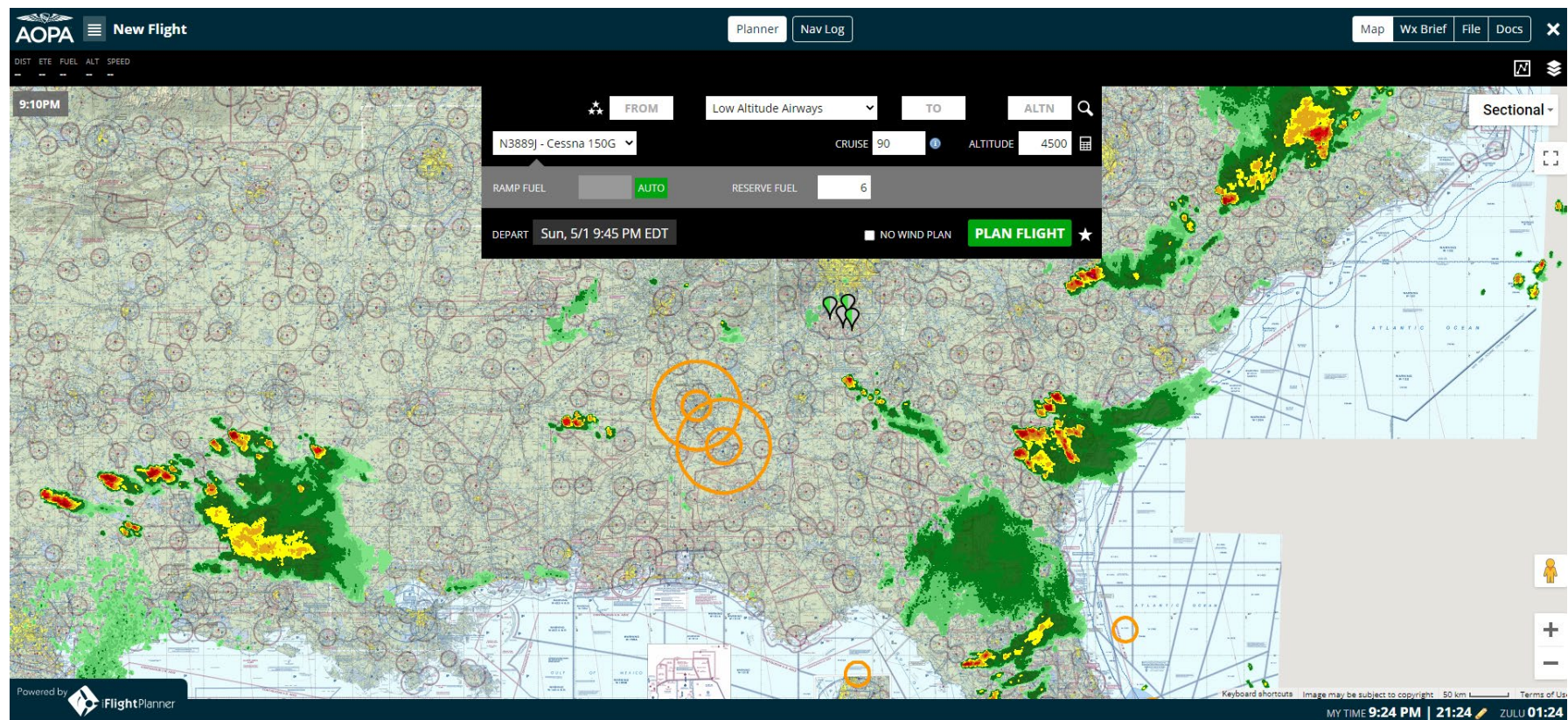
AOPA Weather Prog Chart

3 Day Forecast



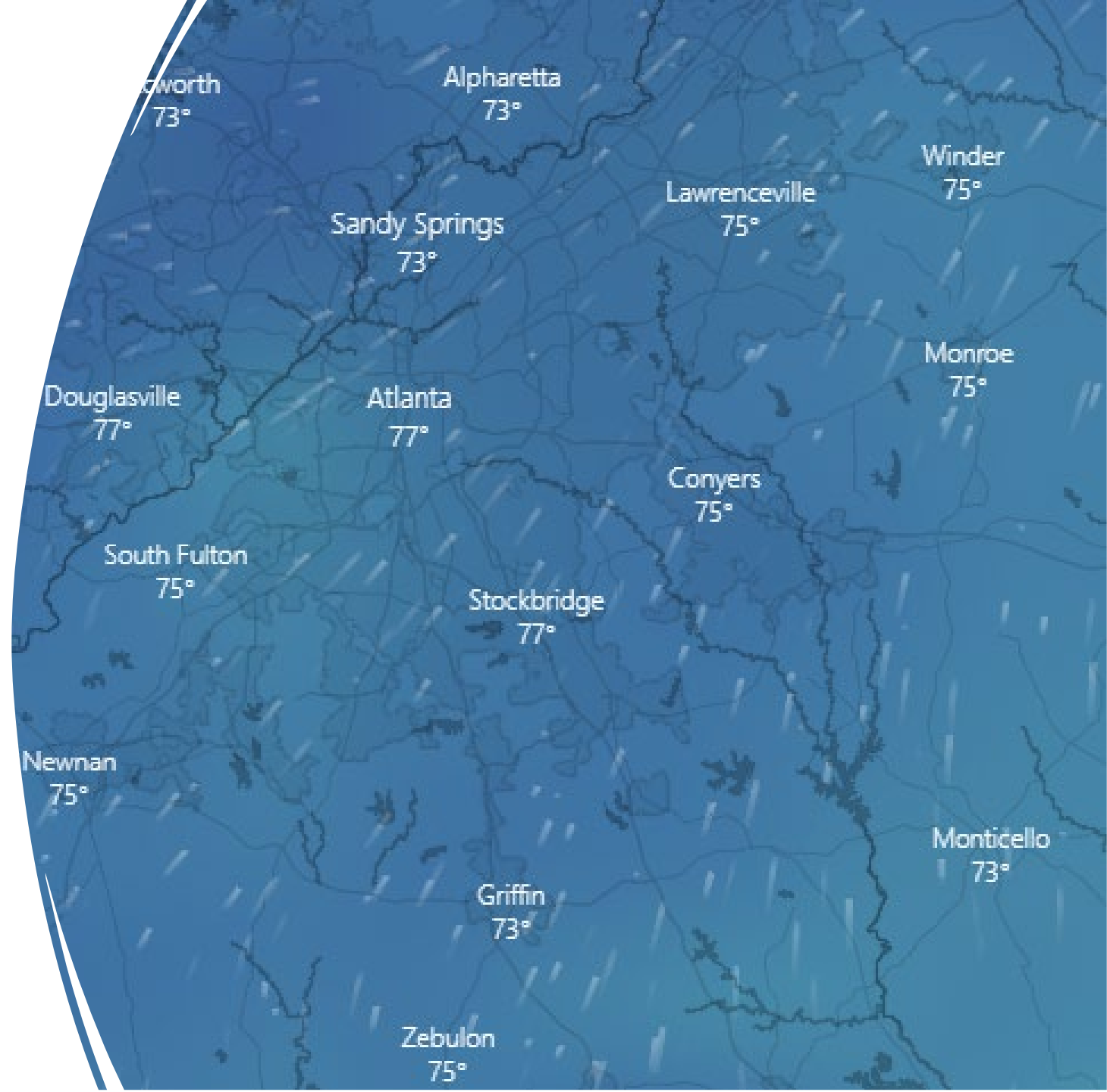
AOPA iFlightPlanner

<https://iflightplanner.aopa.org/My/Trip/>



Windy.com

<https://www.windy.com/?34.013,-84.433,9>



AC 91-92

6.2 The FAA encourages innovation in the delivery of services to pilots. User preferences for automation and new distribution methods make communication with pilots easier and faster. Pilots are encouraged to utilize online automated weather resources to conduct self-briefings prior to contacting Flight Service. Pilots who have preflight weather/risk assessment and risk mitigation skills are better prepared to make in-flight decisions as real-time weather information is consumed. This allows Flight Service to become a consultative resource that can be utilized when needed.

AC 91-92

7.1 For many GA pilots, the Flight Service Station (FSS) remains an important source of comprehensive weather and aeronautical information. However, most pilots have become more accustomed to performing a self-briefing than calling an FSS. The FAA considers that a self-briefing may be compliant with current Federal aviation regulations. By self-briefing, pilots can often improve their knowledge of weather and aeronautical information. Flight Service personnel are available should a pilot need assistance.

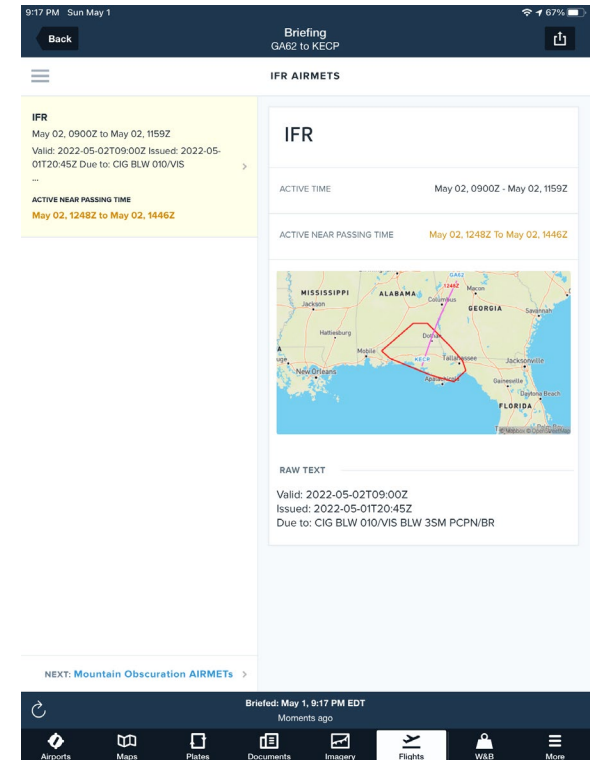
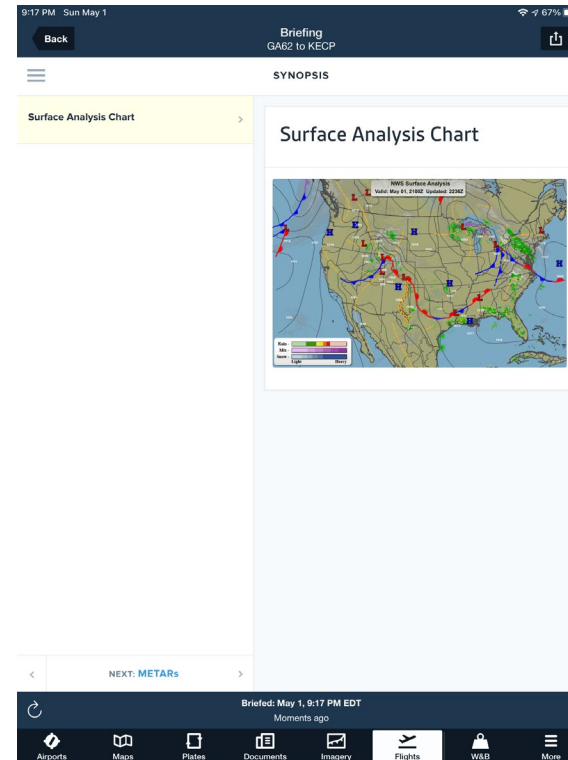
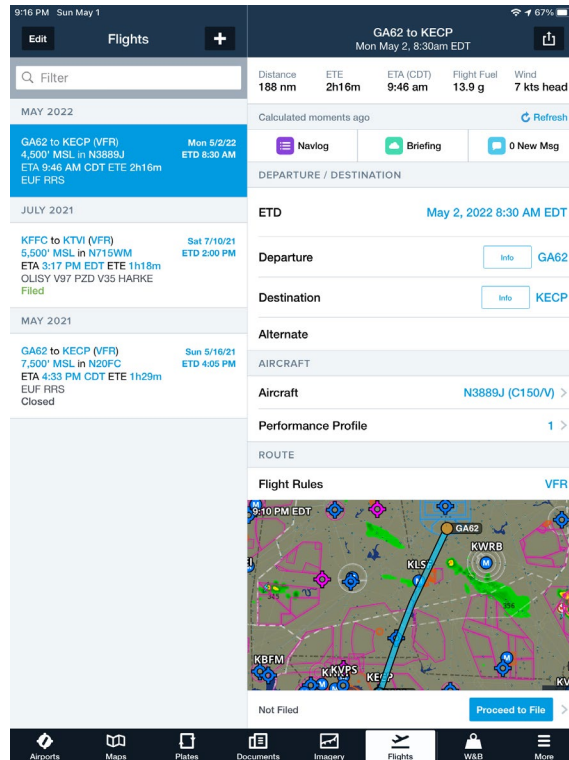
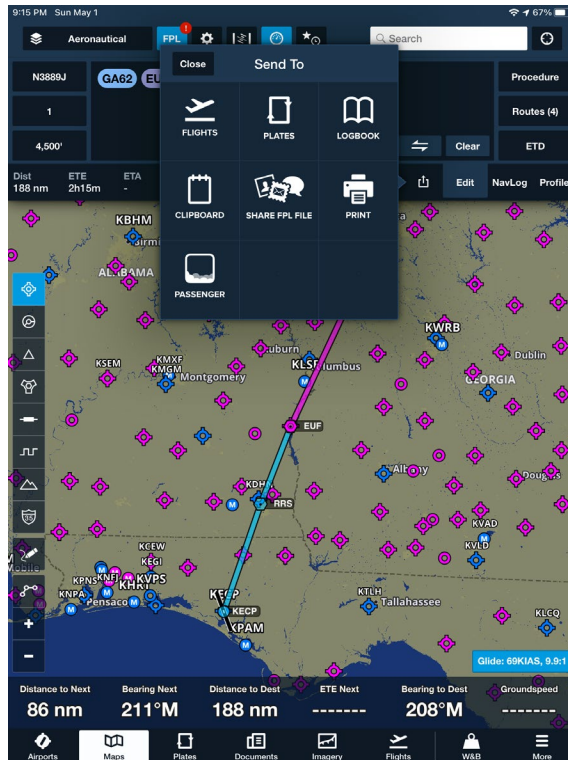


What is the legality of the weather briefing for Part 91 operations?

ForeFlight's weather, NOTAM, and airport information comes from federal regulatory agencies.

ForeFlight stores a record of the briefing you get for 120 days, provided you tap the Briefing button on the Flights page. If you simply look at METARs and TAFs on the Airports or Maps page, we don't keep a record of that.

ForeFlight Weather Briefing



Back in the Day

METARs/TAFs

The Weather Channel

NBC/ABC/CBS

1 800 WX BRIEF...as in call them...night before and before the flight

“VFR flight not recommended”

HOW TO INTERPRET A STANDARD WEATHER BRIEFING IPAD+FOREFLIGHT



Any questions I can answer or
follow up later on?

BASIC VFR WEATHER MINIMUMS		
Airspace	Visibility	Cloud Clearance
Class A	No VFR	No VFR
Class B	3 statute miles	Clear of clouds
Class C	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
Class D	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
Class E Less than 10,000 feet msl	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
	At or above 10,000 feet msl	5 statute miles 1,000 feet below 1,000 feet above 1 statute mile horizontal
Class G 1,200 feet above the surface or less (regardless of msl alt.) Day, except as provided in section 91.155(b). Night, except as provided in section 91.155(b).	1 statute mile	Clear of clouds
	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
	More than 1,200 feet above the surface but less than 10,000 feet msl	
	Day	1 statute mile 500 feet below 1,000 feet above 2,000 feet horizontal
	Night	3 statute miles 500 feet below 1,000 feet above 2,000 feet horizontal
More than 1,200 feet above the surface and at or above 10,000 feet msl	5 statute miles	1,000 feet below 1,000 feet above 1 statute mile horizontal

Airspace	Entry Requirements	Equipment	Minimum Pilot Certificate
Class A	ATC Clearance	IFR Equipped	Instrument Rating
Class B	ATC Clearance	Two-Way Radio, Transponder with Altitude Reporting Capability	Private – except a student, sport, or recreational pilot if regulatory requirements are met.
Class C	Two-Way Radio Communications Prior to Entry	Two-Way Radio, Transponder with Altitude Reporting Capability	No Specific Requirement
Class D	Two-Way Radio Communications Prior to Entry	Two-Way Radio	No Specific Requirement
Class E	None for VFR	No Specific Requirement	No Specific Requirement
Class G	None	No Specific Requirement	No Specific Requirement

§ 91.155 Basic VFR weather minimums.

<u>Class</u>	<u>Day/Night</u>	<u>AGL (ft)</u>	<u>MSL (ft)</u>	<u>Visibility (SM)</u>	<u>Above Clouds (ft)</u>	<u>Below Clouds (ft)</u>	<u>Horizontal (ft)</u>	<u>Nickname</u>
B				3	clear	clear	clear	
C				3	1000	500	2000	3-152
D				3	1000	500	2000	3-152
E			under 10000	3	1000	500	2000	3-152
			10000+	5	1000	1000	1 SM	5-1-1-1
G	Day	under 1201	Any	1	clear	clear	clear	
	Night	under 1201	Any	3	1000	500	2000	3-152
	Day	1201+	under 10000	1	1000	500	2000	
	Night	1201+	under 10000	3	1000	500	2000	3-152
	Day & Night	1201+	10000+	5	1000	1000	1 SM	5-1-1-1

(c) Except as provided in § 91.157, no person may operate an aircraft beneath the ceiling under VFR within the lateral boundaries of controlled airspace designated to the surface for an airport when the ceiling is less than 1,000 feet.

E	Day	G	Night
5-111	5-111	5-111	10000 MSL
3-152	1-152	3-152	
3-152	1, clear	3-152	1200 AGL

Weather Reporting



Cleared For
the Option!

Lesson Objective

To develop understanding of weather reporting methods

In the United States, there are several varieties of automated weather stations that have somewhat subtle but important differences.

These include the Automated Weather Observing System (AWOS), the Automated Surface Observing System (ASOS), and the Automated Weather Sensor System (AWSS).

AWOS/ASOS/ATIS

The Automated Weather Observing System (AWOS) units are mostly operated, maintained and controlled by the Federal Aviation Administration (FAA) in the United States, although there are AWOS units that are also operated by state or local governments and some private agencies.

The American National Weather Service (NWS) and Department of Defense (DOD) play little to no role in the operation, maintenance or deployment of AWOS units.

These systems are among the oldest automated weather stations in the United States, and many of them predate ASOS.

AWOS/ASOS/ATIS

AWOS

AWOS systems disseminate weather data in a variety of ways:

A computer-generated voice message which is broadcast via radio frequency to pilots in the vicinity of an airport. The message is updated at least once per minute, and this is the only mandatory form of weather reporting for an AWOS.

AWOS A: barometric pressure and altimeter setting (in inches of Mercury).

AWOS I: wind speed and wind gusts (in knots), wind direction (from which the wind is blowing) and variable wind direction (in degrees of the compass), temperature and dew point (in degrees Celsius), altimeter setting and density altitude.

AWOS II: all AWOS I parameters, plus visibility and variable visibility (in miles).



AWOS

AWOS III: all AWOS II parameters, plus sky condition (in oktas), cloud ceiling height (in feet), and liquid precipitation accumulation (in inches).

AWOS III P: all AWOS III parameters, plus precipitation type (rain, snow and sometimes drizzle) identification.

AWOS III T: all AWOS III parameters, plus thunderstorm detection (via a cloud-to-ground lightning detector).

AWOS III P/T: all AWOS III parameters, plus precipitation type identification and thunderstorm detection.



The Automated Surface Observing System (ASOS) units are operated and controlled cooperatively in the United States by the NWS, FAA, and DOD.

After many years of research and development, the deployment of ASOS units began in 1991 and was completed in 2004.

These systems generally report at hourly intervals, but also report special observations if weather conditions change rapidly and cross aviation operation thresholds.

They generally report all the parameters of the AWOS-III, while also having the additional capabilities of reporting temperature and dew point in degrees Fahrenheit, present weather, icing, lightning, sea level pressure and precipitation accumulation.

Want to hear one? 404-559-5166

ASOS

Automatic terminal information service, or ATIS, is a continuous broadcast of recorded aeronautical information in busier terminal (i.e. airport) areas.

ATIS broadcasts contain essential information, such as weather information, which runways are active, available approaches, and any other information required by the pilots, such as important NOTAMs.

Pilots usually listen to an available ATIS broadcast before contacting the local control unit, in order to reduce the controllers' workload and relieve frequency congestion.

ATIS

The recording is updated in fixed intervals or when there is a significant change in the information, e.g. a change in the active runway.

It is given a letter designation (e.g. bravo) from the ICAO spelling alphabet.

The letter progresses through the alphabet with every update and starts at alpha after a break in service of 12 hours or more.

When contacting the local control unit, a pilot will indicate he/she has "information <letter>", where <letter> is the ATIS identification letter of the ATIS transmission the pilot received.

This allows the ATC controller to verify whether the pilot has all the current information.

Want to hear one? 770-425-3406

ATIS

Cloud categories

Cloud categories:

Clear

Few 0–25%

Scattered 26-50%

Broken 51-75%

Overcast 76-100%

Winds

0-9 kts not to worry

10-19 kts you will have work to do

20+ stay on the ground if you can

Station Identifier, Date and Time, Wind, Visibility, Phenomena, Clouds, Temperature / Dew Point, Altimeter, Remarks

KRYY 151447Z 28006KT 10SM FEW038 28/25 A3007

Station = KRY Y

Date and Time = 151447Z => June 15th 1447 Zulu => June 15th 10:47 Eastern

Wind = 28006KT => Wind is from 280 degrees @ 6 kts

Visibility = 10SM

METARs Example 1

KRYY 151447Z 28006KT 10SM FEW038 28/25 A3007

Clouds = FEW038

Few clouds the bottom is 3800 ft AGL

Temperature / Dew Point = 28/25 => 28 degrees C / 25 degrees C

Altimeter = A3007

Remarks = blank

METARs Example 1

METARs Example 2

KPUJ 151435Z AUTO 33005KT 10SM SCT050 28/25 A3007 RMK AO2

Station = KPUJ

Date and Time = June 15 1453 Zulu

AUTO means no human is involved

Winds = 33005KT

=> from 330 @ 5 kts

Visibility = 10SM

Clouds = SCT050

⇒ Scattered at 5000 ft AGL

AO2 means that the site is automated and HAS a precipitation sensor.

Variable speed winds

It will have two numbers for the speed and a 'G'.

22015G25KT

=> from 220 degrees @ 15 kts gusting 25 kts

This means when you land it could be at 15 kts or 25 kts

It could be 15 kts as you are coming in then suddenly 25 kts as you are touching the wheels.

You have to literally be on your toes (and arms) when this is happening.

Variable direction

It will have two numbers and a 'V'.

180V260

=> Anywhere from 180 degrees to 260 degrees

I would suggest if you know this is the situation before you takeoff...you don't takeoff.

Terminal Aerodrome Forecasts as good for 5 miles. TAFs are just forecasted METARs.

TAFs are scheduled four times daily (0000Z, 06000Z, 1200Z, 1800Z)

At most locations, TAFs have a 24 hour forecast period

TAFs

KRYY 151120Z 1512/1612 VRB03KT P6SM FEW060 BKN150

FM151400 28003KT P6SM FEW030

FM151600 29004KT P6SM SCT040

FM151800 25006KT P6SM VCSH SCT040 BKN080

PROB30 1522/1602 4SM TSRA BKN030CB

FM160200 28003KT P6SM FEW060 SCT200

FM151400 = From June 15th 1400 Zulu

PROB30 1522/1602 = Probably between June 15th 2200 Zulu and June 16th 0200 Zulu

TAFs

Maintaining ATIS

Controllers shall maintain an ATIS message that reflects the most current arrival and departure information.

a. Make a new recording when any of the following occur:

1. Upon receipt of any new official weather regardless of whether there is or is not a change in values.
2. When runway braking action reports are received that indicate runway braking is worse than that which is included in the current ATIS broadcast.
3. When there is a change in any other pertinent data, such as runway change, instrument approach in use, new or canceled NOTAMs/PIREPs/HIWAS update, etc.

Maintaining ATIS

- b. When a pilot acknowledges that he/she has received the ATIS broadcast, controllers may omit those items contained in the broadcasts if they are current. Rapidly changing conditions will be issued by ATC, and the ATIS will contain the following:
- c. Broadcast on all appropriate frequencies to advise aircraft of a change in the ATIS code/message.
- d. Controllers shall ensure that pilots receive the most current pertinent information. Ask the pilot to confirm receipt of the current ATIS information if the pilot does not initially state the appropriate ATIS code. Controllers shall ensure that changes to pertinent operational information is provided after the initial confirmation of ATIS information is established. Issue the current weather, runway in use, approach information, and pertinent NOTAMs to pilots who are unable to receive the ATIS.

ATIS Examples

“Verify you have information ALPHA.”

“Information BRAVO now current, visibility three miles.”

“Information CHARLIE now current, Ceiling 1500 Broken.”

“Information CHARLIE now current, advise when you have CHARLIE.”

ATIS practice on the ground

<https://www.liveatc.net/search/?icao=klas>

<https://www.liveatc.net/search/?icao=kjfk>

<https://www.liveatc.net/search/?icao=ksfb>

<https://www.liveatc.net/search/?icao=katl>

<https://www.liveatc.net/search/?icao=kmia>

Magnetic or True

All charts and textual sources (METAR, TAF, winds aloft, surface analysis charts, etc) use true north as the reference

ATIS/AWOS/ASOS broadcasts, or any information a controller gives you over the radio, is magnetic

Weather depiction chart

Shows VFR, MVFR, IFR areas

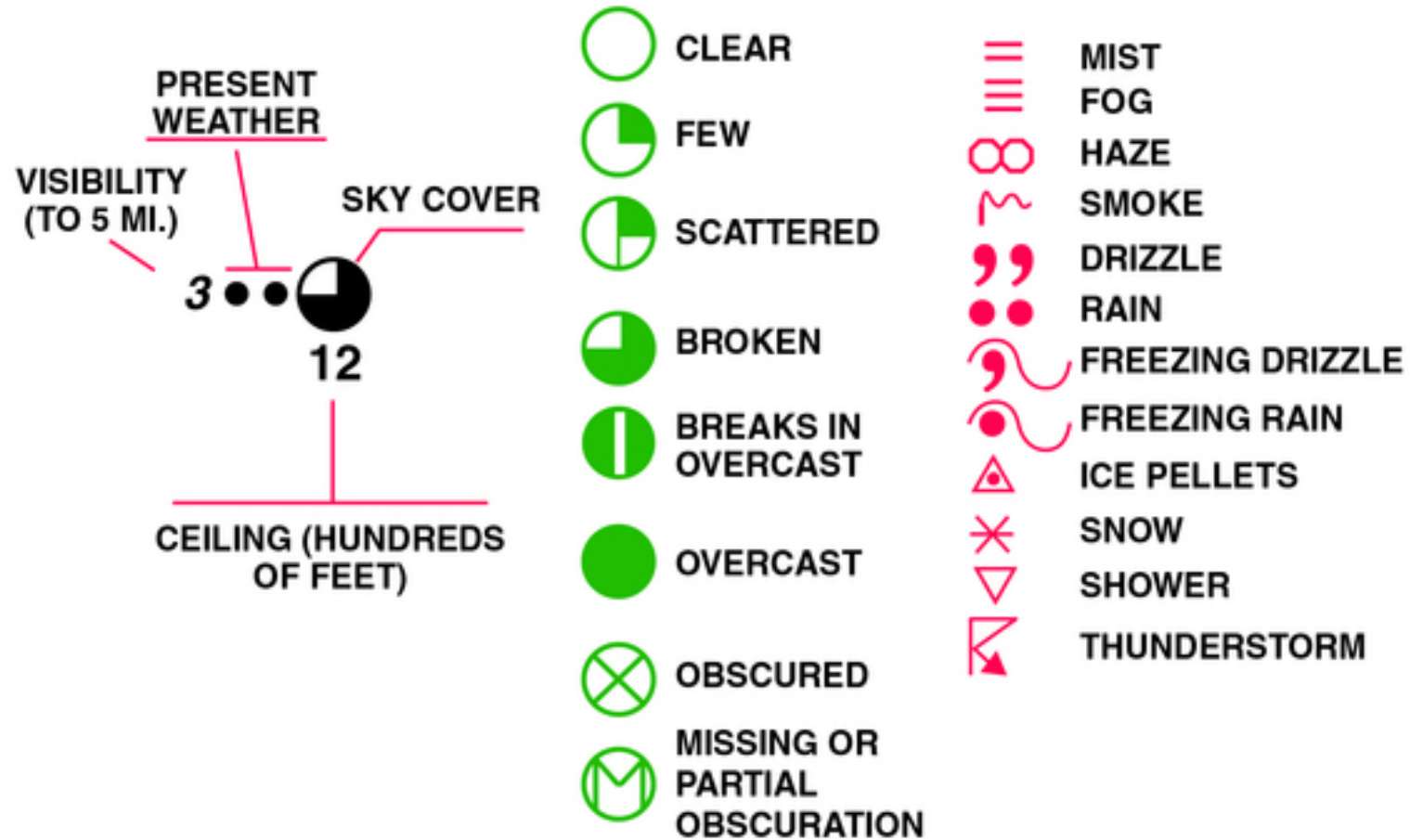
Weather Depiction Charts is a product derived from the Service Records Retention System (SRRS) data stream. The data plotted on these charts comes from the National Weather Service (NWS). The plotting model on each station circle is an abbreviated version of the complete aviation observation and includes significant weather, visibility, total sky cover, and ceiling height. Fronts, types of precipitation, areas of precipitation, and squall lines from the previous hour are also depicted. Chart times are 01, 04, 07, 10, 13, 16, 19, and 22 GMT.

(GRV note: They are good only the moment they come out...anything after could have changed)

https://www.1800wxbrief.com/Website/weather/graphics/viewer?product=CURRENT_WX_DEPICTION_SYP&seed

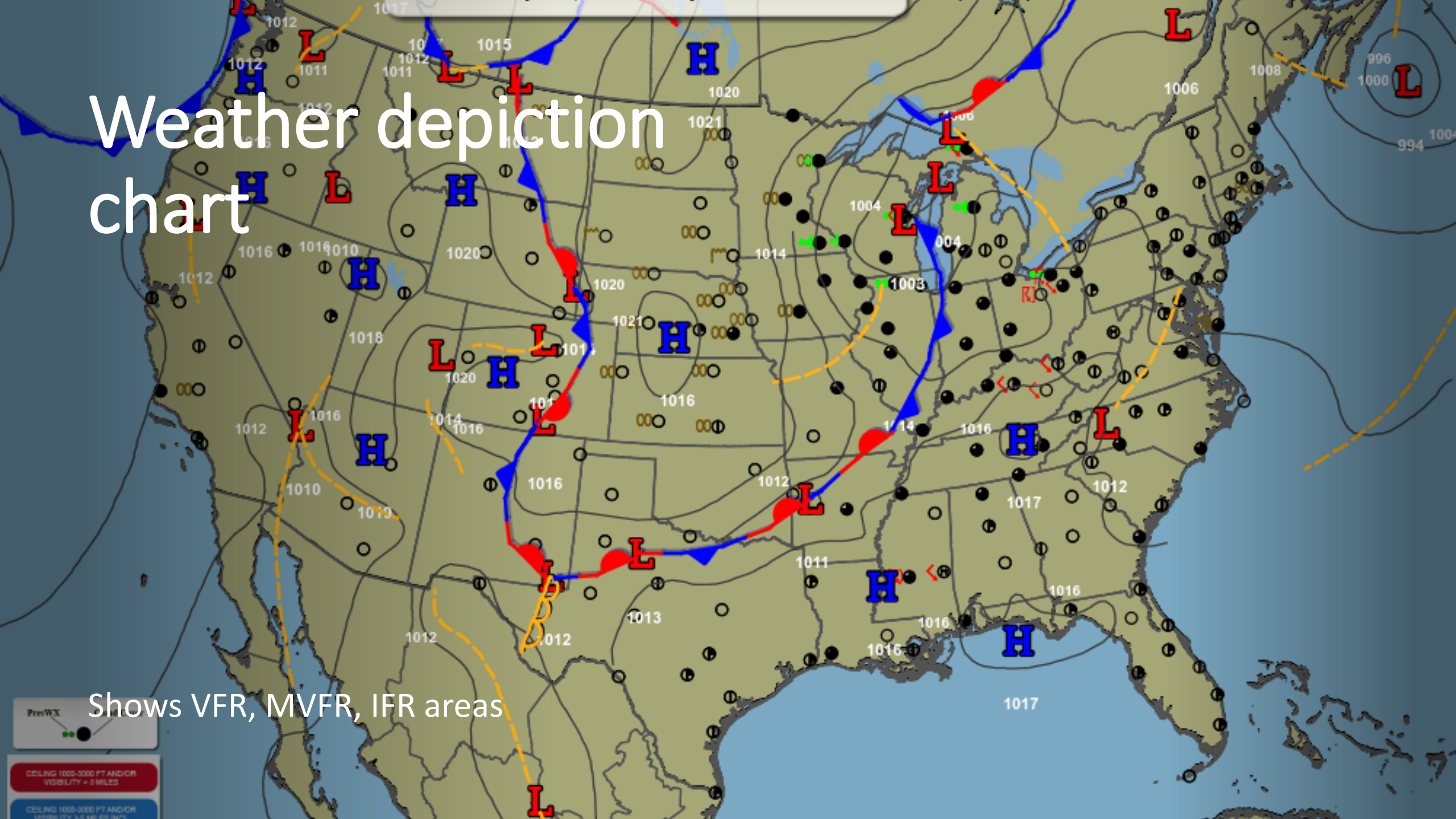
Weather depiction chart

Shows VFR, MVFR, IFR areas



Weather depiction chart

Shows VFR, MVFR, IFR areas



HIWAS

Hazardous Inflight Weather Advisory Service (HIWAS) is a continuous broadcast of hazardous weather information which is transmitted over selected VORs. This hazardous weather includes AIRMETs, SIGMETs, Convective SIGMETs, and urgent PIREPs.

The presence of HIWAS information on a VOR is indicated on a sectional or terminal area chart by an "H" in the upper-right corner of the box surrounding the NAVAID frequency.



Any questions I can answer or
follow up later on?

Weather Phenomena

**KPIT 301551Z 23009KT 6SM -RA HZ FEW048 BKN080 OVC130
27/19 A2984 RMK AO2 RAB46 SLP103**

Qualifier		Weather Phenomena		
INTENSITY/PROXIMITY 1	DESCRIPTOR 2	PRECIPITATION 3	OBSCURATION 4	OTHER 5
- Light Moderate (see note 2)	MI Shallow	DZ Drizzle	BR Mist	PO Dust Whirls
	PR Partial	RA Rain	FG Fog	SQ Squalls
	BC Patches	SN Snow	FU Smoke	FC Funnel Cloud
+ Heavy	DR Low Drifting	SG Snow Grains	VA Volcanic Ash	(see note 3)
	BL Blowing	IC Ice Crystals	DU Widespread	SS Sandstorm
VC In the Vicinity (see note 3)	SH Shower(s)	PL Ice Pellets	Dust	/Duststorm
	TS Thunderstorm	GR Hail	SA Sand	
	FZ Freezing	GS Small Hail/pellets	HZ Haze	
		UP Unknown Precip	PY Spray	

1. The weather groups shall be constructed by considering columns 1 to 5 in the table above in sequence, i.e. intensity, followed by description, followed by weather phenomena, e.g. heavy rain shower(s) is coded as +SHRA
2. To denote moderate intensity no entry or symbol is used.
3. Tornadoes and waterspouts shall be coded as +FC.

Aviation Weather Decode Card

//*	Weather is clear or current weather is not detectable
///*	Cloud is detected, no CB / TCU identified
-	Light
(Blank space)	Moderate (when included before a weather phenomenon)
+	Heavy
9999	Visibility 10 km or greater
ABT	About
AC	Altostratus
AGL	Above ground level
AIP	Aeronautical Information Package
AIREP	Air report – from aircraft in flight
AMD	Amended
AMSL	Above mean sea level
ARFOR	Area forecast
AS	Altostratus
ATIS	Automatic terminal information service
ATS	Air traffic services
AWIB	Automatic weather information service
AWS	Automatic weather station
BC	Patches
BECMG	Becoming
BKN	Broken (5-7 oktas)
BL	Blowing
BR	Mist
BWR	Basic weather report
CAT	Clear air turbulence
CAVOK	Cloud and visibility OK
CB	Cumulonimbus
CLD	Cloud
CNL	Cancelled
COR	Corrected
CU	Cumulus
DP	Dew point temperature
DR	Drifting

DS	Dust storm
DU	Dust
DZ	Drizzle
EMBD	Embedded
FC	Funnel Cloud
FCST	Forecast
FEW	Few (1 -2 oktas)
FG	Fog (visibility less than 1000 metres)
FIR	Flight information region
FL	Flight level
FM	From
FRQ	Frequent
FU	Smoke
FZ	Freezing
FZL	Freezing level
G	Gusts
GOOD	Visibility greater than 10km over the entire forecast area
GR	Hail (5mm or more)
GS	Hail (smaller than 5 mm)
HVY	Heavy
HZ	Haze
IC	Ice crystals
ICAO	International Civil Aviation Organisation
ICE	Icing
IFR	Instrument flight rules
IMC	Instrument meteorological conditions
INTER	Intermittently (less than 30 minutes duration)
ISOL	Isolated
KM	Kilometres
KT	Knots
LYR	Layer
M	Metres
METAR	Aerodrome routine meteorological report
METAR	Automatic aerodrome

AUTO	meteorological report
MI	Shallow
MOD	Moderate
MOV	Moving
MS	Minus
MTW	Mountain waves
NC	No change
NCD	No cloud detected (METAR AUTO Only)
NDV	No directional variation available (METAR AUTO only)
NM	Nautical miles
NOSIG	No significant change
NOTAM	Notice to airmen
NS	Nimbostratus
NSC	No significant cloud
NSW	No significant weather
OBSC	Obscured
OCNL	Occasional
OVC	Overcast (8 oktas)
PIREP	Pilot report
PL	Ice pellets
PO	Dust devils
PR	Partially covered with fog
PROB	Probability
PROV	Provisional
PS	Plus
QNH	Altimeter sub-scale setting
RA	Rain
RE	Recent
RMK	Remark
RVR	Runway visual range
SA	Sand
SC	Stratocumulus
SCT	Scattered (3-4 oktas)
SEV	Severe
SFC	Surface
SG	Snow grains

SH	Shower
SIG	Significant
SIGMET	Significant meteorological information
SKC	Sky Clear
SN	Snow
SPECI	Aerodrome special meteorological report
SQ	Squall
SS	Sandstorm
ST	Stratus
STNR	Stationary
T	Temperature in degrees celsius
TAF	Aerodrome forecast
TC	Tropical cyclone
TCU	Towering cumulus
TEMPO	Temporarily (30 – 60 minutes duration)
TIL	Until
TL	Till
TREND	Trend forecast
TS	Thunderstorm
TURB	Turbulence
UTC	Coordinated universal time
V	Variations from mean wind direction
VA	Volcanic Ash
VC	Vicinity of aerodrome (within 10 NM)
VFR	Visual flight rules
VMC	Visual meteorological conditions
VRB	Variable
WKN	Weakening
WDSPR	Widespread
WS	Windshear
WX	Weather
Z	Coordinated universal time

METAR/TAF LIST OF ABBREVIATIONS AND ACRONYMS

\$	maintenance check indicator	-	light intensity
+	heavy intensity	/	indicator that visual range data follows; separator between temperature and dew point data.
ACC	altocumulus castellanus	ACFT MSHP	aircraft mishap
ACSL	altocumulus standing lenticular cloud	AO1	automated station without precipitation discriminator
AO2	automated station with precipitation discriminator	ALP	airport location point
APCH	approach	APRNT	apparent
APRX	approximately	ATCT	airport traffic control tower
AUTO	fully automated report	B	began
BC	patches	BKN	broken
BL	blowing	BR	mist
C	center (with reference to runway designation)	CA	cloud-air lightning
CB	cumulonimbus cloud	CBMAM	cumulonimbus mammatus cloud
CC	cloud-cloud lightning	CCSL	cirrocumulus standing lenticular cloud
cd	candela	CG	cloud-ground lightning
CHI	cloud-height indicator	CHINO	sky condition at secondary location not available
CIG	ceiling	CLR	clear
CONS	continuous	COR	correction to a previously disseminated observation
DOC	Department of Commerce	DOD	Department of Defense
DOT	Department of Transportation	DR	low drifting
DS	duststorm	DSIPTG	dissipating
DSNT	distant	DU	widespread dust
		DVR	dispatch visual range
DZ	drizzle	E	east, ended, estimated ceiling (SAO)
FAA	Federal Aviation Administration	FC	funnel cloud
FEW	few clouds	FG	fog
FIBI	filed but impracticable to transmit	FIRST	first observation after a break in coverage at manual station
FMH-1	Federal Meteorological Handbook No.1, <i>Surface Weather Observations & Reports (METAR)</i>	FMH2	Federal Meteorological Handbook No.2, <i>Surface Synoptic Codes</i>

FRQ	frequent	FROPA	frontal passage
FT	feet	FU	smoke
FZ	freezing	FZRANO	freezing rain sensor not available
G	gust	GR	hail
GS	small hail and/or snow pellets	HLSTO	HLSTO hailstone
HZ	haze	IC	ice crystals, in-cloud lightning
ICAO	International Civil Aviation Organization	INCRG	increasing
INTMT	intermittent	KT	KNOTS
L	left (with reference to runway designation)	LAST	last observation before a break in coverage at a manual station
LST	Local Standard Time	LTG	lightning
LWR	lower	M	minus, less than
max	maximum	METAR	routine weather report provided at fixed intervals
MI	shallow	min	minimum
MOV	moved/moving/movement	MT	mountains
N	north	N/A	not applicable
NCDC	National Climatic Data Center	NE	northeast
NOS	National Ocean Survey	NOSPECI	no SPECI reports are taken at the station
NOTAM	Notice to Airmen	NW	northwest
NWS	National Weather Service	OCNL	occasional
OFCM	Office of the Federal Coordinator for Meteorology	OHD	overhead
OVC	overcast	OVR	over
P	indicates greater than the highest reportable value	PCPN	precipitation
PL	ice pellets	PK WND	peak wind
PNO	precipitation amount not available	PO	dust/sand whirls (dust devils)
PRES	pressure	PR	partial
PRESFR	pressure falling rapidly	PRESRR	pressure rising rapidly
PWINO	precipitation identifier sensor not available	PY	spray
R	right (with reference to runway designation), runway	RA	rain
RTD	Routine Delayed (late) observation	RV	reportable value
RVR	Runway Visual Range	RVRNO	RVR system values not available
RY	runway	S	snow, south
SA	sand	SCSL	stratocumulus standing lenticular cloud

SCT	scattered	SE	southeast
SFC	surface	SG	snow grains
SH	shower(s)	SKC	sky clear
SLP	sea-level pressure	SLPNO	sea-level pressure not available
SM	statute miles	SN	snow
SNINCR	snow increasing rapidly	SP	snow pellets
SPECI	an unscheduled report taken when certain criteria have been met	SQ	squalls
SS	sandstorm	STN	station
SW	snow shower, southwest	TCU	towering cumulus
TS	thunderstorm	TSNO	thunderstorm information not available
TWR	tower	UNKN	unknown
UP	unknown precipitation	UTC	Coordinated Universal Time
V	variable	VA	volcanic ash
VC	in the vicinity	VIS	visibility
VISNO	visibility at secondary location not available	VR	visual range
VRB	variable	VV	vertical visibility
W	west	WG/SO	Working Group for Surface Observations
WMO	World Meteorological Organization	WND	wind
WSHFT	wind shift	Z	zulu, i.e., Coordinated Universal Time

APPENDIX C

Content of ASOS-Generated METAR

A Quick Reference Guide

ASOS User's Guide Manual, Appendix C

KEY TO DECODE AN ASOS (METAR) OBSERVATION

METAR KABC 121755Z AUTO 21016G24KT 180V240 1SM R11/P6000FT -RA BR BKN015 OVC025 06/04 A2990
 RMK A02 PK WND 20032/25 WSHFT 1715 VIS 3/4V1 1/2 VIS 3/4 RWY11 RAB07 CIG 013V017 CIG 017 RWY11 PRESFR
 SLP125 P0003 60009 T00640036 10066 21012 58033 TSNO \$

TYPE OF REPORT	METAR: hourly (scheduled) report; SPECI: special (unscheduled) report.	METAR
STATION IDENTIFIER	Four alphabetic characters; ICAO location identifier.	KABC
DATE/TIME	All dates and times in UTC using a 24-hour clock; two-digit date and four-digit time; always appended with <u>Z</u> to indicate UTC.	121755Z
REPORT MODIFIER	Fully automated report, no human intervention; removed when observer signed-on.	AUTO
WIND DIRECTION AND SPEED	Direction in tens of degrees from true north (first three digits); next two digits: speed in whole knots; as needed Gusts (character) followed by maximum observed speed; always appended with <u>KT</u> to indicate knots; 00000KT for calm; if direction varies by 60° or more a <u>Variable</u> wind direction group is reported.	21016G24KT 180V240
VISIBILITY	Prevailing visibility in statute miles and fractions (space between whole miles and fractions); always appended with <u>SM</u> to indicate statute miles; values <1/4 reported as M1/4.	1SM
RUNWAY VISUAL RANGE	10-minute RVR value in hundreds of feet; reported if prevailing visibility is ≤ one mile or RVR ≤ 6000 feet; always appended with <u>FT</u> to indicate feet; value prefixed with <u>M</u> or <u>P</u> to indicate value is lower or higher than the reportable RVR value .	R11/P6000FT
WEATHER PHENOMENA	RA: liquid precipitation that does not freeze; SN: frozen precipitation other than hail; UP: precipitation of unknown type; intensity prefixed to precipitation: light (-), moderate (no sign), heavy (+); FG: fog; FZFG: freezing fog (temperature below 0°C); BR: mist; HZ: haze; SQ: squall; maximum of three groups reported; augmented by observer: FC (funnel cloud/tornado/waterspout); TS (thunderstorm); GR (hail); GS (small hail; <1/4 inch); FZRA (intensity; freezing rain); VA (volcanic ash).	-RA BR
SKY CONDITION	Cloud amount and height: CLR (no clouds detected below 12000 feet); FEW (few); SCT (scattered); BKN (broken); OVC (overcast); followed by 3-digit height in hundreds of feet; or vertical visibility (<u>VV</u>) followed by height for indefinite ceiling.	BKN015 OVC025
TEMPERATURE/DEW POINT	Each is reported in whole degrees Celsius using two digits; values are separated by a solidus; sub-zero values are prefixed with an <u>M</u> (minus).	06/04
ALTIMETER	Altimeter always prefixed with an <u>A</u> indicating inches of mercury; reported using four digits: tens, units, tenths, and hundredths.	A2990

REMARKS ON REVERSE SIDE

REMARKS IDENTIFIER: RMK	RMK
TORNADIC ACTIVITY: Augmented; report should include TORNADO, FUNNEL CLOUD, or WATERSPOUT, time begin/end, location, movement; e.g., TORNADO B25 N MOV E.	
TYPE OF AUTOMATED STATION: AO2; automated station with precipitation discriminator.	A02
PEAK WIND: PK WND dddff(f)/(hh)mm; direction in tens of degrees, speed in whole knots, and time.	PK WND 20032/25
WIND SHIFT: WSHFT (hh)mm	WSHFT 1715
TOWER OR SURFACE VISIBILITY: TWR VIS vvvvv: visibility reported by tower personnel, e.g., TWR VIS 2; SFC VIS vvvvv: visibility reported by ASOS, e.g., SFC VIS 2.	
VARIABLE PREVAILING VISIBILITY: VIS v _n v _n v _n v _n V _x v _x v _x v _x ; reported if prevailing visibility is < 3 miles and variable.	VIS 3/4V1 1/2
VISIBILITY AT SECOND LOCATION: VIS vvvvv [LOC]; reported if different than the reported prevailing visibility in body of report.	VIS 3/4 RWY11
LIGHTNING: [FREQ] LTG [LOC]; when detected the frequency and location is reported, e.g., FRQ LTG NE.	
BEGINNING AND ENDING OF PRECIPITATION AND THUNDERSTORMS: w'w'B(hh)mmE(hh)mm; TSB(hh)mmE(hh)mm	RAB07
VIRGA: Augmented; precipitation not reaching the ground, e.g., VIRGA.	
VARIABLE CEILING HEIGHT: CIG h _n h _n h _n Vh _x h _x h _x ; reported if ceiling in body of report is < 3000 feet and variable.	CIG 013V017
CEILING HEIGHT AT SECOND LOCATION: CIG hhh [LOC]; Ceiling height reported if secondary ceilometer site is different than the ceiling height in the body of the report.	CIG 017 RWY11
PRESSURE RISING OR FALLING RAPIDLY: PRESRR or PRESFR; pressure rising or falling rapidly at time of observation.	PRESFR
SEA-LEVEL PRESSURE: SLPppp; tens, units, and tenths of SLP in hPa.	SLP125
HOURLY PRECIPITATION AMOUNT: Prrrr; in .01 inches since last METAR; a trace is P0000.	P0003
3- AND 6-HOUR PRECIPITATION AMOUNT: 6RRRR; precipitation amount in .01 inches for past 6 hours reported in 00, 06, 12, and 18 UTC observations and for past 3 hours in 03, 09, 15, and 21 UTC observations; a trace is 60000.	60009
24-HOUR PRECIPITATION AMOUNT: 7R ₂₄ R ₂₄ R ₂₄ R ₂₄ ; precipitation amount in .01 inches for past 24 hours reported in 12 UTC observation, e.g., 70015.	
HOURLY TEMPERATURE AND DEW POINT: Ts _n T _a T _a T _a T _a s _n T' _a T' _a T' _a ; tenth of degree Celsius; s _n : 1 if temperature below 0°C and 0 if temperature 0°C or higher.	T00640036
6-HOUR MAXIMUM TEMPERATURE: 1s _n T _x T _x T _x ; tenth of degree Celsius; 00, 06, 12, 18 UTC; s _n : 1 if temperature below 0°C and 0 if temperature 0°C or higher.	10066
6-HOUR MINIMUM TEMPERATURE: 2s _n T _n T _n T _n ; tenth of degree Celsius; 00, 06, 12, 18 UTC; s _n : 1 if temperature below 0°C and 0 if temperature 0°C or higher.	21012
24-HOUR MAXIMUM AND MINIMUM TEMPERATURE: 4s _n T _x T _x T _x s _n T _n T _n T _n ; tenth of degree Celsius; reported at midnight local standard time; 1 if temperature below 0°C and 0 if temperature 0°C or higher, e.g., 400461006.	
PRESSURE TENDENCY: 5appp; the character (a) and change in pressure (ppp; tenths of hPa) the past 3 hours.	58033
SENSOR STATUS INDICATORS: RVRNO: RVR missing; PWINO: precipitation identifier information not available; PNO: precipitation amount not available; FZRANO: freezing rain information not available; TSNO: thunderstorm information not available; VISNO [LOC]: visibility at secondary location not available, e.g., VISNO RWY06; CHINO [LOC]: (cloud-height-indicator) sky condition at secondary location not available, e.g., CHINO RWY06.	TSNO
MAINTENANCE CHECK INDICATOR: Maintenance needed on the system.	\$
If an element or phenomena does not occur, is missing, or cannot be observed, the corresponding group and space are omitted (body and/or remarks) from that particular report, except for Sea-Level Pressure (SLPppp). SLPNO shall be reported in a METAR when the SLP is not available.	

Clouds



Cleared For
the Option!

Lesson Objective

To develop understanding of all the types of clouds

Attention

See over there how you can see through the clouds to some blue?
We could fly through that no problem.

Now see the ones where they look like giant cotton balls?
Those would toss the plane around.
Avoid those if you can.

Material

Clouds are made up of very light water droplets or ice crystals.

These particles can float in the air.

When warm air rises, swells and cools, it forms clouds.

The different types of clouds are cumulus, cirrus, stratus and nimbus.

Cirrus Clouds

Cirrus clouds are the thin, wispy clouds seen high in the sky.

They look as if someone took a cloud, stretched it, and pulled pieces off...like a cotton ball when it is pulled apart.

They are thin because they are made of ice crystals instead of water droplets.

A blue sky and a few cirrus clouds high in the sky, usually means it is going to be a nice day.



Cumulus Clouds

Cumulus clouds are the puffy clouds that are usually scattered throughout the sky.

In Latin, the word cumulus means pile. Just like when we say “accumulate,” it means things pile up.

This type of cloud is formed when warm air rises carrying water vapor with it by evaporation.

Cumulus clouds can be white or gray.

White fluffy clouds means no rain, but when they form into dark or gray clouds, it is going to rain.



Associated Conditions with Cumulus Clouds

Unstable turbulent air

Good visibility

(except snow or sand)

Showery precipitation



Stratus Clouds

Stratus clouds look like a huge thick blanket covering the sky.

These clouds are a sure sign of rain if it is warm and snow if it is cold.

If stratus clouds are near the ground, they form fog.

These clouds form when the weather has been cold and warmer moist air blows in.

The amount of moisture in the air and the difference between warm and cold air determine how thick the cloud or fog is.



Associated Conditions with Stratus Clouds

Stable air

Temperature Inversions

Smooth air

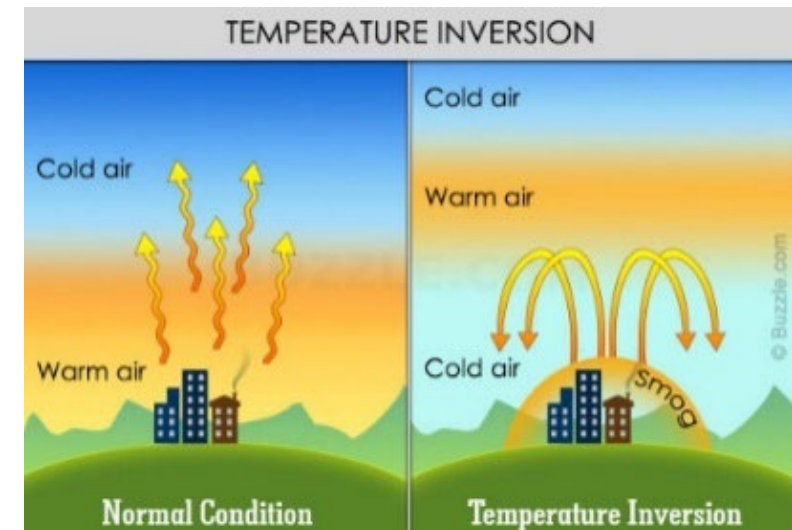
Poor visibility

Fog

Haze

Continuous precipitation

High humidity



Nimbus Clouds

The word nimbus means a cloud that already has rain or snow falling from it.

These clouds are dark and seen during a thunderstorm along with thunder and lightning.

They can be a combination of two clouds, like a cumulonimbus, which means a puffy black cloud with rain falling out of it, or a stratonimbus, which is a dark blanket with rain falling out of it.

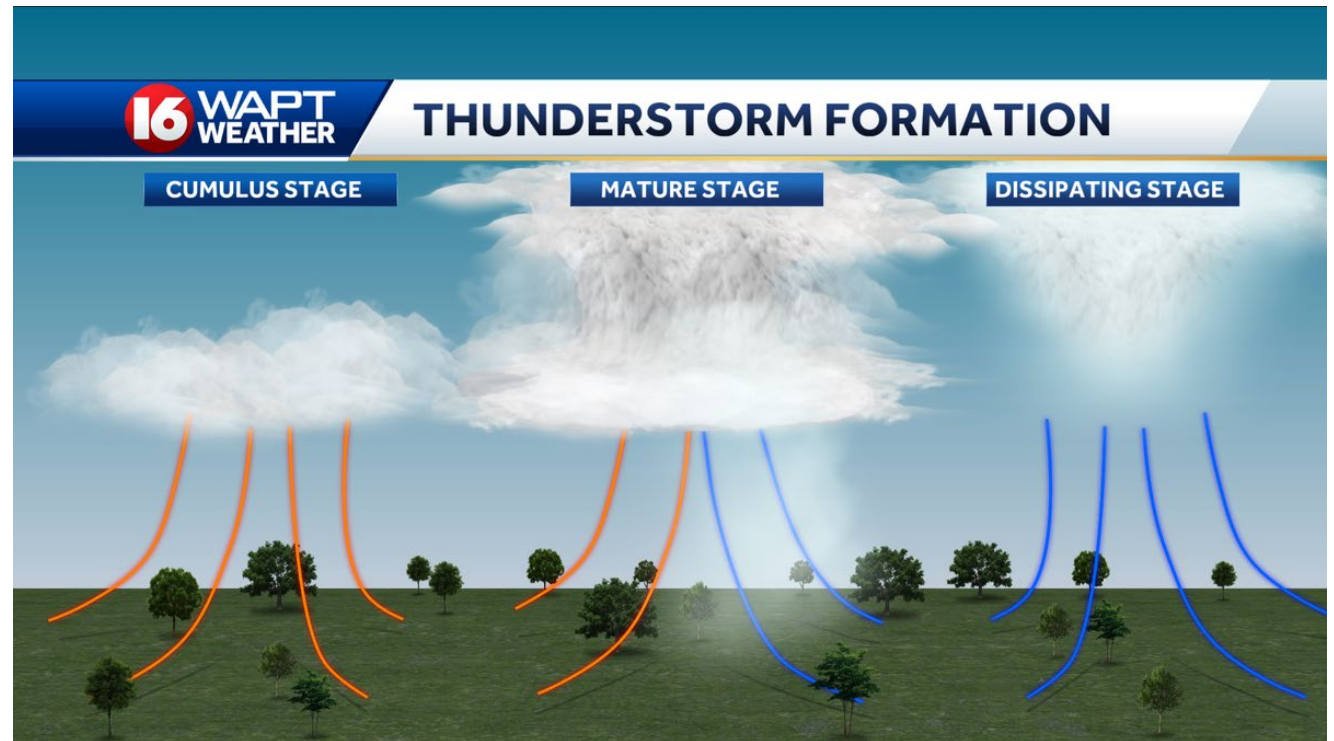


Stages of Rain

Cumulous

Mature

Dissipating



Cumulus (Low Level)

Detached, generally dense clouds and with sharp outlines that develop vertically in the form of rising mounds, domes or towers with bulging upper parts often resembling a cauliflower.

The sunlit parts of these clouds are mostly brilliant white while their bases are relatively dark and horizontal.

Over land, cumulus develops on days of clear skies, and is due diurnal convection; it appears in the morning, grows, and then more or less dissolves again toward evening.



Stratus (Low Level)

A generally gray cloud layer with a uniform base which may, if thick enough, produce drizzle, ice prisms, or snow grains. When the sun is visible through this cloud, its outline is clearly discernible.

Often when a layer of Stratus breaks up and dissipates blue sky is seen.



Cumulonimbus (Low Level)

The thunderstorm cloud, this is a heavy and dense cloud in the form of a mountain or huge tower. The upper portion is usually smoothed, fibrous or striated and nearly always flattened in the shape of an anvil or vast plume.

Under the base of this cloud which is often very dark, there are often low ragged clouds that may or may not merge with the base. They produce precipitation, which sometimes is in the form of virga.

Cumulonimbus clouds also produce hail and tornadoes.



Stratocumulus (Low Level)

Gray or whitish patch, sheet, or layered clouds which almost always have dark tessellations (honeycomb appearance), rounded masses or rolls. Except for virga they are non-fibrous and may or may not be merged.

They also have regularly arranged small elements with an apparent width of more than five degrees (three fingers - at arm's length).



Altostratus (Mid Level)

Gray or bluish cloud sheets or layers of striated or fibrous clouds that totally or partially covers the sky. They are thin enough to regularly reveal the sun as if seen through ground glass.

Altostratus clouds do not produce a halo phenomenon nor are the shadows of objects on the ground visible. Sometime virga is seen hanging from Altostratus, and at times may even reach the ground causing very light precipitation.



Alto cumulus (Mid Level)

White and/or gray patch, sheet or layered clouds, generally composed of laminae (plates), rounded masses or rolls. They may be partly fibrous or diffuse.

When the edge or a thin semitransparent patch of alto cumulus passes in front of the sun or moon a corona appears. This colored ring has red on the outside and blue inside and occurs within a few degrees of the sun or moon.

The most common mid cloud, more than one layer of Alto cumulus often appears at different levels at the same time. Many times Alto cumulus will appear with other cloud types.



Nimbostratus (Mid Level)

The continuous rain cloud. Resulting from thickening Altostratus, This is a dark gray cloud layer diffused by falling rain or snow. It is thick enough throughout to blot out the sun. The cloud base lowers into the low level of clouds as precipitation continues. Also, low, ragged clouds frequently occur beneath this cloud which sometimes merges with its base.



Cirrus (High Level)

Detached clouds in the form of white, delicate filaments, mostly white patches or narrow bands. They may have a fibrous (hair-like) and/or silky sheen appearance.

Cirrus clouds are always composed of ice crystals, and their transparent character depends upon the degree of separation of the crystals.

As a rule when these clouds cross the sun's disk they hardly diminish its brightness. Before sunrise and after sunset, cirrus is often colored bright yellow or red. These clouds are lit up long before other clouds and fade out much later.



Cirrostratus (High Level)

Transparent, whitish veil clouds with a fibrous (hair-like) or smooth appearance. A sheet of cirrostratus which is very extensive, nearly always ends by covering the whole sky. A milky veil of fog (or thin Stratus) is distinguished from a veil of Cirrostratus of a similar appearance by the halo phenomena which the sun or the moon nearly always produces in a layer of cirrostratus.



Cirrocumulus (High Level)

Thin, white patch, sheet, or layered of clouds without shading. They are composed of very small elements in the form of more or less regularly arranged grains or ripples.

In general Cirrocumulus represents a degraded state of cirrus and cirrostratus both of which may change into it and is an uncommon cloud. There will be a connection with cirrus or cirrostratus and will show some characteristics of ice crystal clouds.



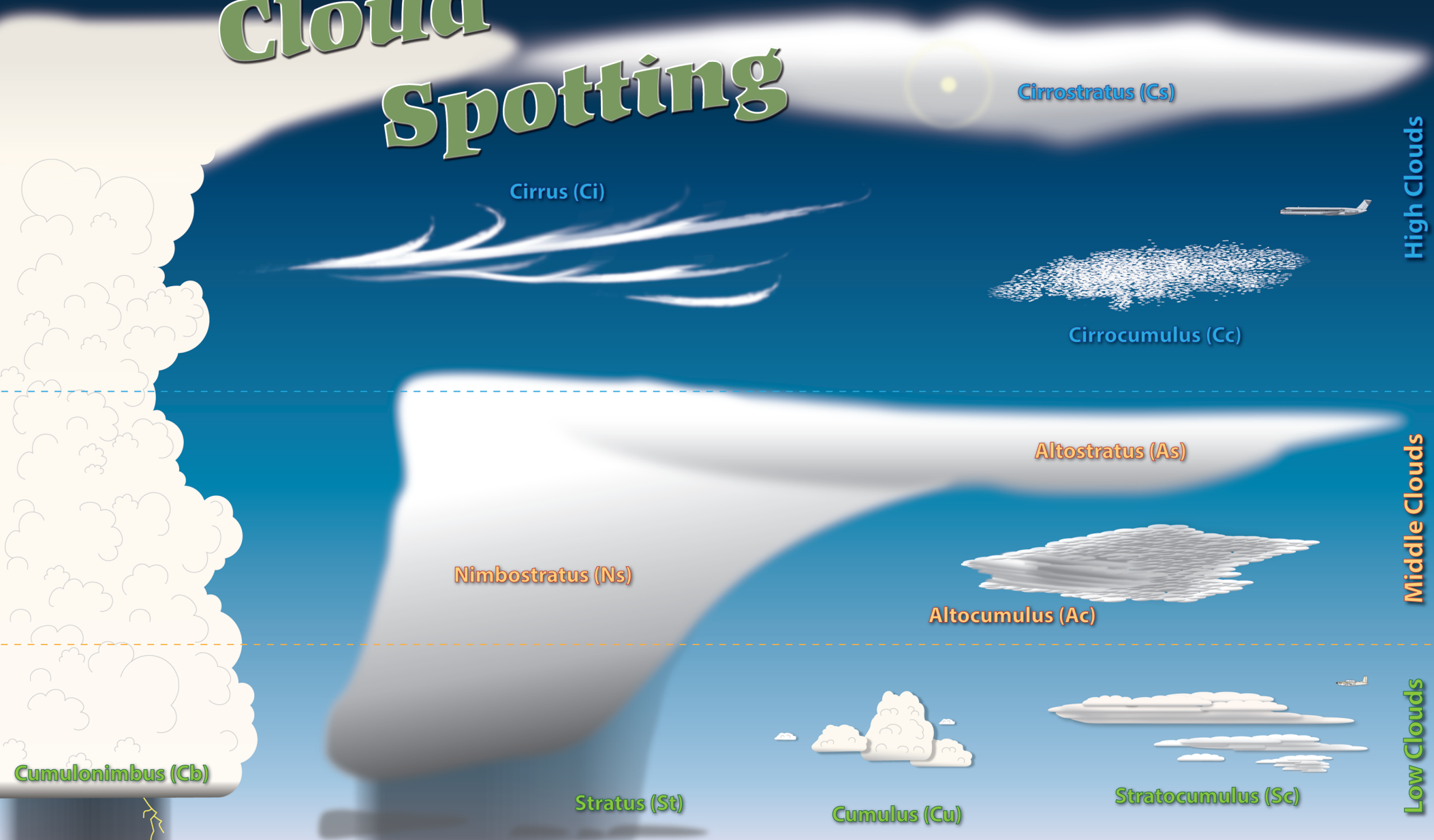




Any questions I can answer or
follow up later on?

Cloud Spotting

Reading the Signposts of the Sky



High Clouds

10,000 ft. – 60,000 ft. AGL

Middle Clouds

6,500 ft. – 13,000 ft. AGL

Low Clouds

Surface – 6,500 ft. AGL

Paul Cianciolo

Cirrus

These wispy filament-like clouds form mostly white patches or narrow bands in high-altitude stable air. They are composed of ice crystals and their transparent character depends upon the degree of separation of the crystals.



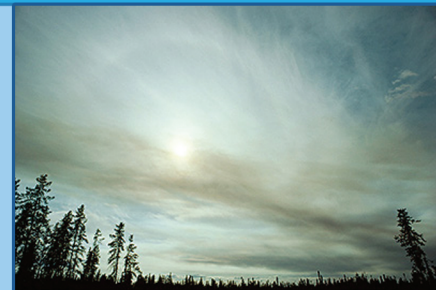
Cirrocumulus

These thin, layered clouds without shading are composed of very small elements in the form of regularly arranged grains or ripples. Generally, they represent a degraded state of cirrus and cirrostratus clouds and are uncommon.



Cirrostratus

These transparent, whitish veil clouds with a fibrous (hair-like) or smooth appearance usually cover the whole sky. During the day, they are thin enough to still see shadows on the ground and can produce a halo around the sun or moon.



Altostratus

These white/gray patch or layered clouds have a roll-like appearance and can cause some turbulence and small amounts of icing. This common middle cloud often appears at different levels at the same time and with other cloud types.



Altostratus

These gray/bluish layers totally or partially cover the sky, with the sun being dimly visible. They are frequently associated with approaching frontal systems and contain little or no turbulence and moderate amounts of icing.



Nimbostratus

These clouds result from thickening altostratus layers, are dark gray, and diffused by falling rain or snow. The cloud base lowers as precipitation continues. Low, ragged clouds frequently occur beneath, which may merge with its base.



Cumulus

These puffy clouds are formed of liquid water droplets near the ground and can be turbulent. Over land, they develop on clear days due to daytime convection. They typically appear in the morning, grow, and then dissipate in the evening.



Stratocumulus

These gray or whitish patch, sheet, or layered clouds almost always have dark tessellations (honeycomb appearance), rounded masses, or rolls. They are often found in marine environments and can form from the breakup of stratus layers.



Stratus

These “good IFR” clouds tend to be smooth but moderate icing and some turbulence may exist. Stratus layers have a uniform base, which, if thick enough, may produce drizzle, ice, or snow.



Cumulonimbus

These towering giants can produce tornados, thunderstorms, lightning, hail, icing conditions, and devastating turbulence. The FAA recommends keeping a distance of 20 nautical miles from these clouds.



The cloud graphic has been adapted from NOAA's National Weather Service.

**FIRST ALERT
WEATHER DAY**

SNOW, SLEET OR RAIN?

COOLRAY
Cooling · Heating
Humidity · Electrical



ANF

ANF

HOFFMAN
FINANCIAL GROUP

CLOSINGS

FRIDAY

CLEBURNE COUNTY SCHOOLS: CLOSED FRIDAY

COBB COUN

9:11

31°

Fog



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the Option!



Fog

Fog is a cloud that is on the surface. It typically occurs when the temperature of the air near the ground is cooled to the air dew point, causing water vapor in the air to condense and become visible in the form of fog.

Fog is made by reducing the temp or adding moisture.

Advection Fog

Advection fog occurs when moist air passes over a **cool** surface by advection (**wind**) and is **cooled**.

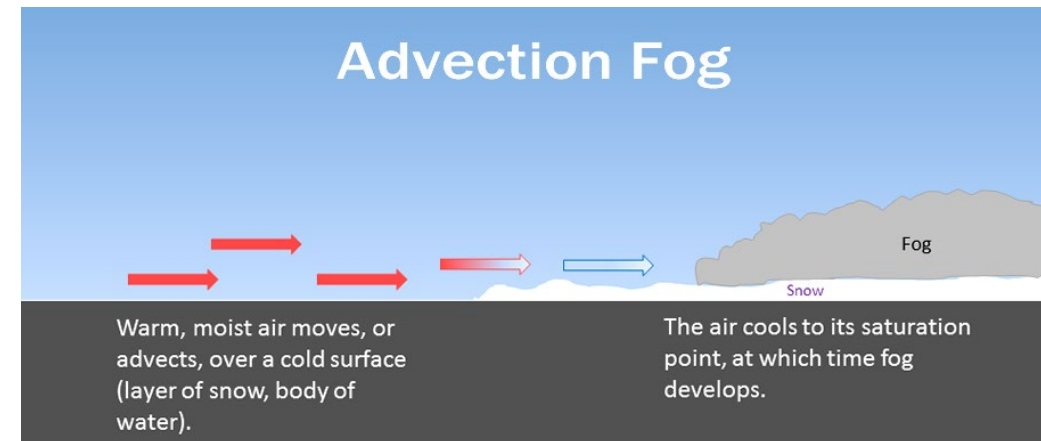
It is common as a **warm** front passes over an area with significant snow-pack.

It is most common at sea when moist air encounters cooler waters, including areas of **cold** water upwelling, such as along the California coast (San Francisco).

Summary:

Horizontal movement

Moist over **cold**



Radiation Fog

Radiation fog is formed by the **cooling** of land after sunset by thermal radiation in **calm conditions** with clear sky.

The **cool** ground produces condensation in the nearby air by heat conduction.

In perfect calm, the fog layer can be less than a meter deep but turbulence can promote a thicker layer.

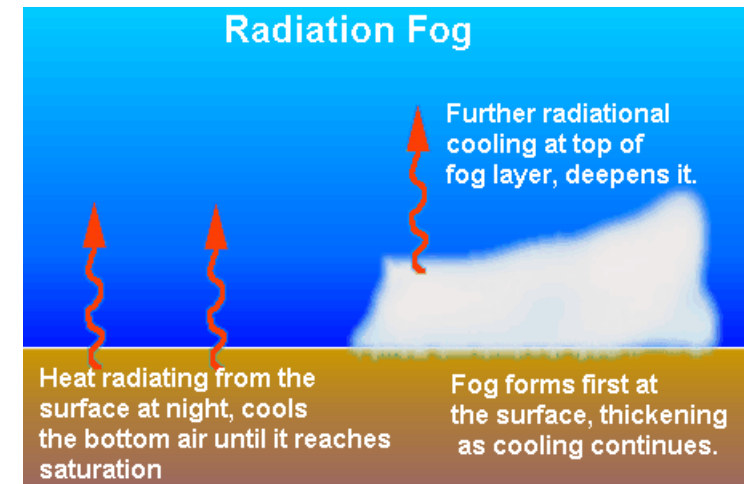
Radiation fogs occur at night, and usually do not last long after sunrise, but they can persist all day in the winter months.

Radiation fog is most common in autumn and early winter.

Summary:

High humidity early evening

Cool nights, low winds



Precipitation Fog

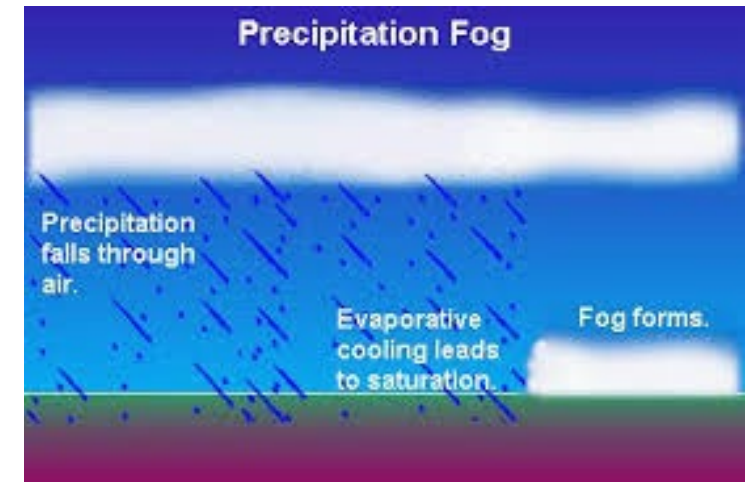
Precipitation fog (or frontal fog) forms as precipitation falls into drier air below the cloud, the liquid droplets evaporate into water vapor.

The water vapor **cools** and at the dew point it condenses and fog forms.

Summary:

Saturation due to evaporation

Common with **warm** fronts



Steam Fog (Sea Smoke)

This type of fog is commonly seen in the Great Lakes but can be seen on any lake.

This forms during the fall season.

As summer ends, water temperatures don't cool right away but air temperature does.

As a mass of dry, cold air moves over a warmer lake the warm lake conducts warm, moist air into the air mass above.

This transport between the lake and air evens out.

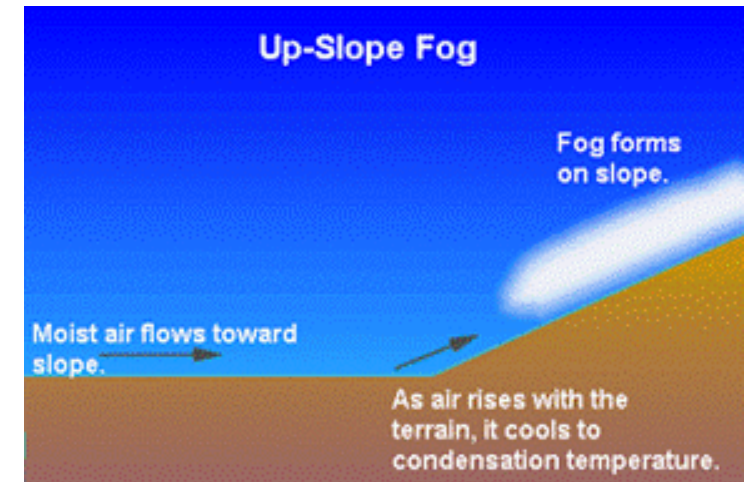
This corresponds to the second law of thermodynamics and this law states "any two bodies that come into contact, the system will become equilibrium state."

Steam fog does not become very deep but enough to block some of the sunlight.



Upslope Fog

Upslope fog forms when moist air is going up the slope of a mountain or hill which condenses into fog on account of adiabatic **cooling**, and to a lesser extent the drop in pressure with altitude.







Any questions I can answer or
follow up later on?

Weather Fronts



Lesson Objective

To develop understanding of weather fronts

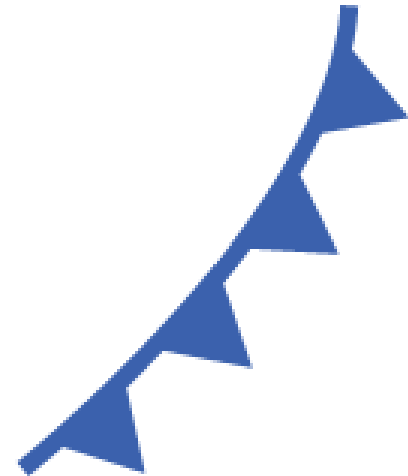
Cold Fronts

Cold fronts are depicted by blue line with triangles pointing in the direction of motion. Cold fronts demarcate the leading edge of a cold air mass displacing a warmer air mass.

Phrases like "ahead of the front" and "behind of the front" refer to its motion. So being "ahead of the cold front" is being in the "warm" air mass and "behind of the cold front" is in the cold air mass.

Also remember however, the terms "cold" and "warm" are relative. So, it is still called a cold front even in summer if the temperature only lowers from, for example, 95°F (35°C) ahead of the front to near 90°F (32°C) behind the front.

Cold fronts nearly always extend anywhere from a south direction to a west direction from the center of low-pressure areas and never from the center of high-pressure systems.



Cold Fronts

Cold fronts are cold, dense air masses that encounter warm, light air masses, pushing the warm air up into the atmosphere.

You can think of a cold front as a snowplow on a truck, pushing the snow, or in this case warm air, up and out of the way.

Along the steep edge of a cold front, you'll often find cumulus and cumulonimbus clouds, because of the rapidly rising warm air.

Therefore, cold fronts are associated with squall lines, thunderstorms, frontal turbulence, and overall bad weather like what's pictured below.



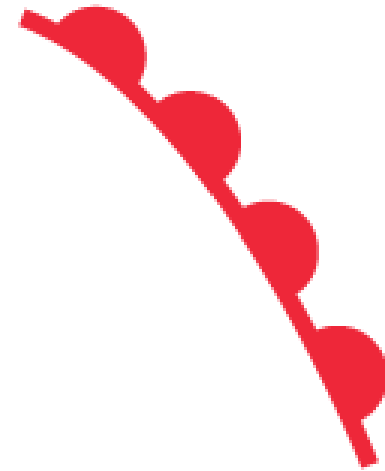
Warm Fronts

A warm front is the leading edge of a relatively warmer air mass replacing a colder air mass. A warm front is depicted by a red line with half-moons located on the side of the direction of its motion.

Like cold front, warm fronts also extend from the center of low-pressure areas but on nearly always on the east side of the low.

Here is an example of a location that experiences typical warm frontal passage followed by a cold frontal passage: Clouds lower and thicken as the warm front approaches with several hours of light to moderate rain. Temperatures are in the 50s with winds from the east.

As the warm front passes, the rain ends, skies become partly cloudy and temperatures warm into the mid 70s. Winds become gusty from the south. A few hours later, a line of thunderstorms sweeps across the area just ahead of the cold front. After the rain ends and the front passes, winds shift to the northwest and temperatures fall into the 40s and skies clear.



Warm Fronts

When a faster-moving warm front encounters a slower cold front, the warm air pushes up and over the colder air, because it's less dense.

Lifting action with warm fronts is much more gradual than what's found with cold fronts.

There's also some bad weather associated with warm fronts.

Rain or other precipitation from a warm front falls into the colder air below, causing widespread precipitation, fog, low ceilings/visibilities, and heavy snow.

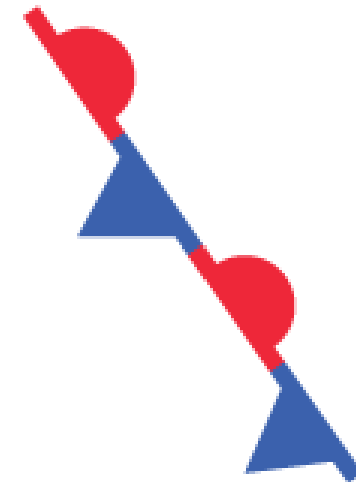
If the warm front moves slowly across the ground, you'll often find several days of poor weather and IFR conditions.



Stationary Fronts

If the front is essentially not moving (i.e. the two air masses on either side are not moving perpendicular to the front) it is called a stationary front. A stationary front is depicted by an alternating red and blue line with a triangle on the blue portion and half-moon on the opposite side of the red portion of the line.

A cold front (or warm front) that stops moving becomes a stationary front. The difference in temperature and wind direction from one side of a stationary front to the other is generally not large but there can be times where the difference is stark.



Stationary Fronts

They're shown on a surface analysis chart with alternating cold and warm front symbols, because the frontal boundary of a stationary front can be thought of as a tug of war game between the cold and warm air masses, with characteristics from both.

Weather found along the front usually reflects the more dominant air mass.

While thunderstorms are possible, you're more likely to find stratus clouds and steady, light rain or drizzle.

Stationary fronts tend to cover large areas in IMC, with calm surface winds that parallel the frontal boundary.

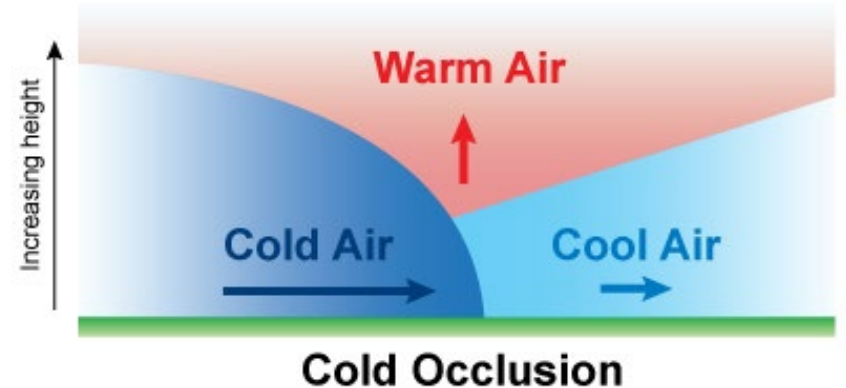
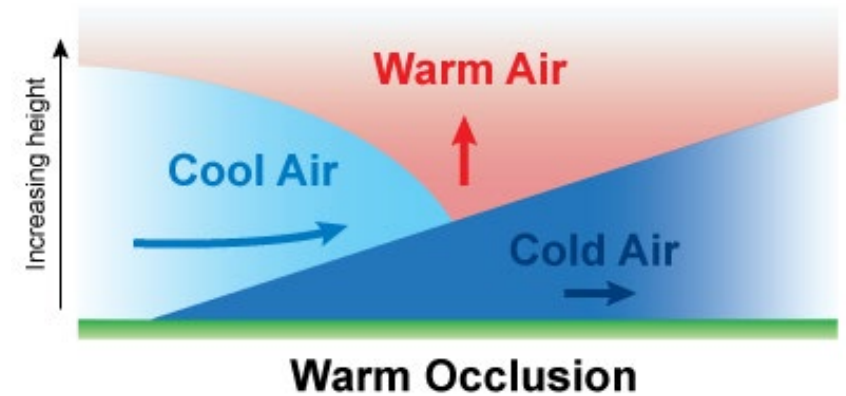


Occluded Fronts

While there is no difference in how they are depicted on a weather map, there are two types of occlusions; cold and warm.

Cold occlusions are the most common where the cold front overtakes the warm front and also undercuts the cooler air mass ahead of the warm front.

Warm occlusions occur when the air associated with the "cold" front is actually not a cold as the air mass associated with the warm front. The warm air is forced up as before but the colder, denser air mass, ahead of the warm front, remains at the surface forcing the air mass associated with the cold front up as well.

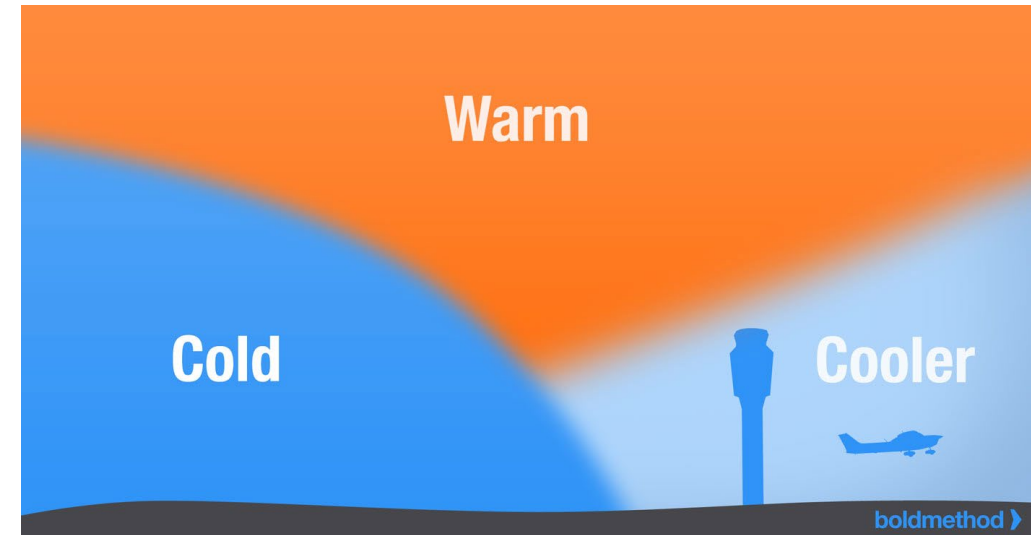


Occluded Fronts

They happen when cold fronts catch up and overtake warm fronts ahead of them.

The end result is two fronts in one area, one at the surface, and one aloft/above the other.

Since this type of front is so unstable, you often see widespread cloudiness, precipitation, and thunderstorms (some of which may be embedded, or hidden within clouds).



Occluded Fronts

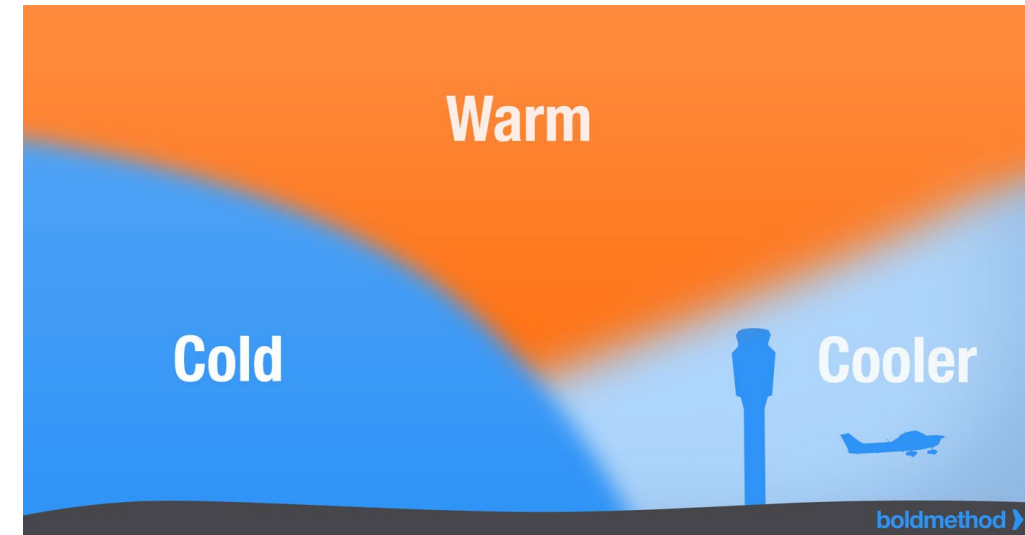
There are two types of occluded fronts:

1) In a cold front occlusion, cold air pushes underneath a warm air mass, forcing it skyward.

Just like in the diagram above.

2) On the contrary, in a warm front occlusion, warmer air overruns colder air.

But in both cases, warmer air is lifted between the two air masses.

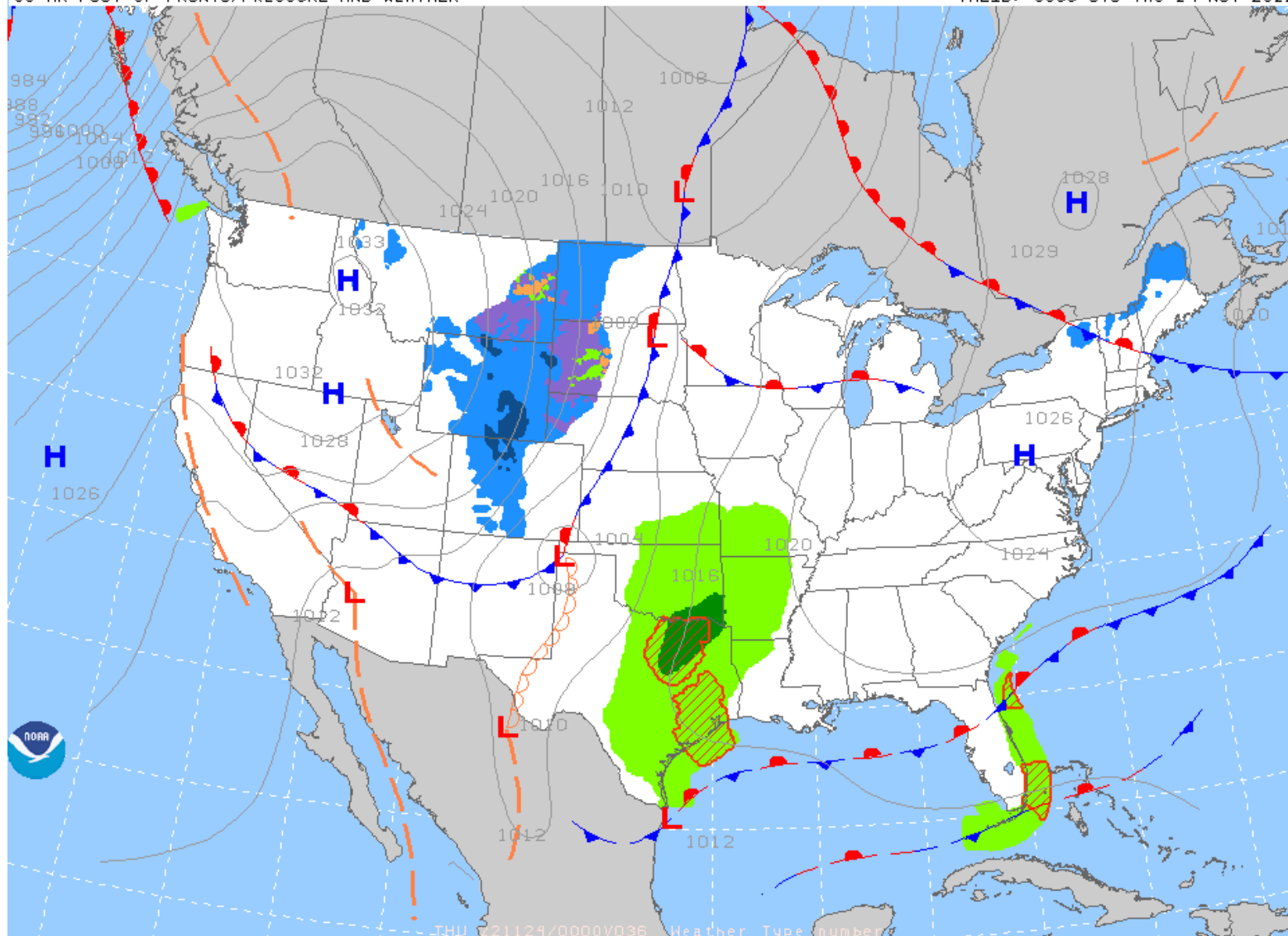


Stable vs Unstable

UNSTABLE AIR	STABLE AIR
Cumuloform Clouds Showery Precipitation Rough Air (Turbulence) Good Visibility (Except with blowing obstructions) Clear Ice	Stratiform Clouds and Fog Continuous Precipitation Smooth Air Fair to Poor Visibility in Smoke and Haze Rime Ice

36-HR FCST OF FRONTS/PRESSURE AND WEATHER

VALID: 0000 UTC THU 24 NOV 2022



DOC/NOAA/NWS/NCEP/WPC

ISSUED: 1859 UTC TUE 22 NOV 2022

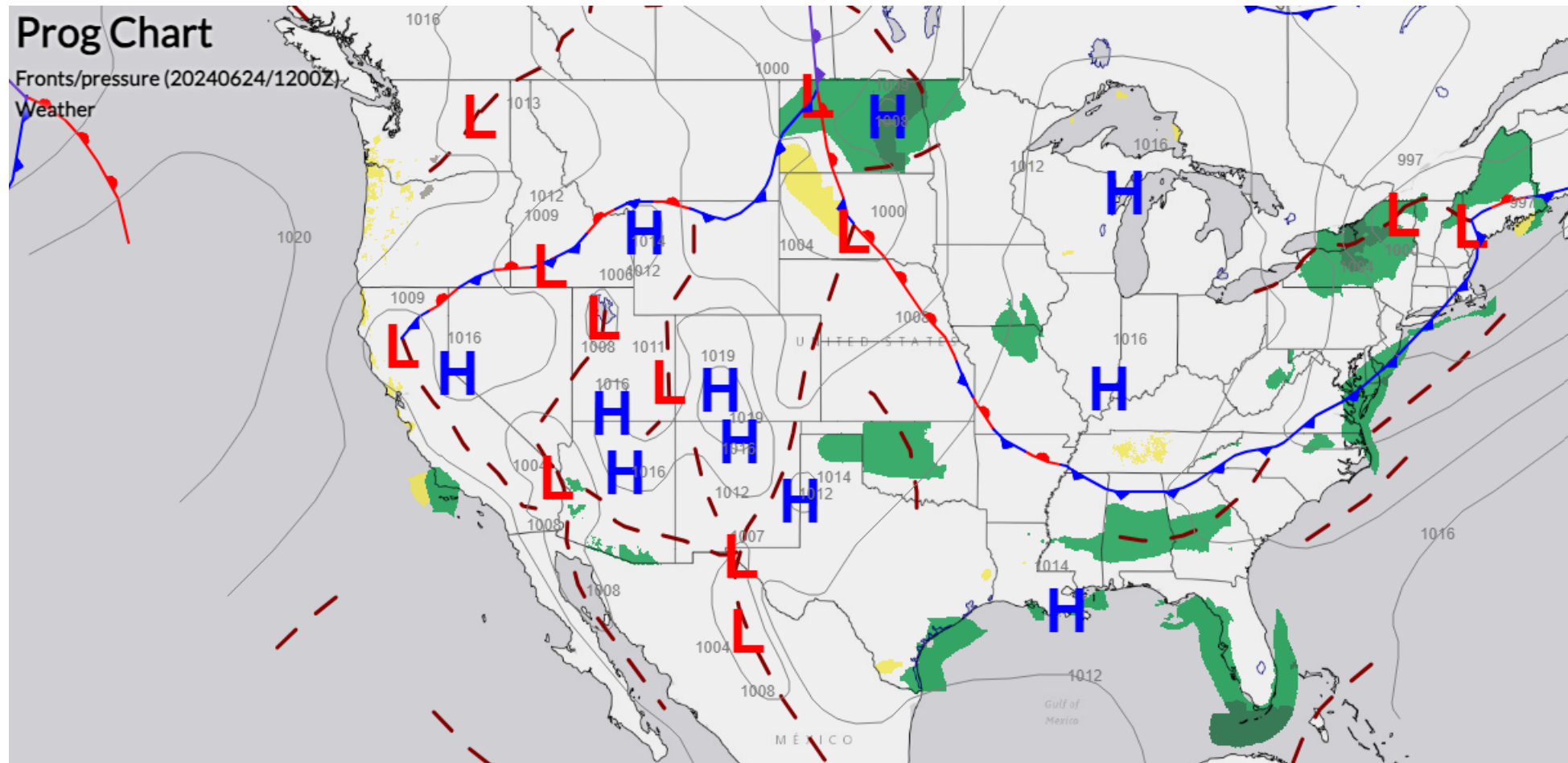
Cold vs Warm Front Characteristics

FRONTAL CHARACTERISTICS	
COLD FRONTS	WARM FRONTS
Rapid movement (30 kts average)	Slow movement (15 kts average)
-- Pushes under the warm air	-- Rides over the cold air
-- Temperature inversion at and behind surface front	-- Temperature inversion at and ahead of surface front
-- Steep frontal slope	-- Shallow frontal slope
-- Narrow frontal zone at and behind the front	-- Wide frontal zone at and ahead the front
-- Thunderstorms & showers	-- Drizzle and steady precipitation
-- Cumuliform clouds	-- Stratiform clouds
-- Turbulent	-- Smooth
-- Good visibility outside of showers	-- Poor visibility

Prog Chart

Fronts/pressure (20240624/1200Z)

Weather



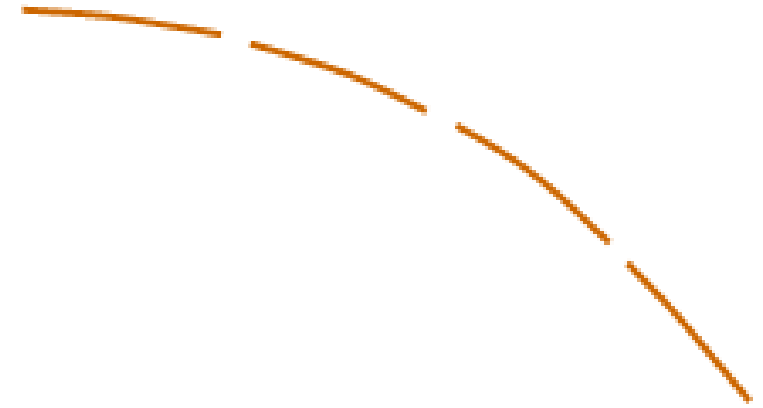
Troughs

Lines of low pressure.

In some cases, the isobars have elongated shapes that are not closed. If these shapes represent low pressure, they're called troughs. Their high-pressure equivalents are ridges.

Surface analysis charts show troughs as brown or yellow dashed lines. Troughs feature typical low-pressure weather, including gusty winds, clouds, and precipitation.

Most surface analysis charts don't show ridges. Charts that do display ridges depict them as yellow or brown zig-zag lines. Ridges have typical high-pressure weather with clear skies and light winds.

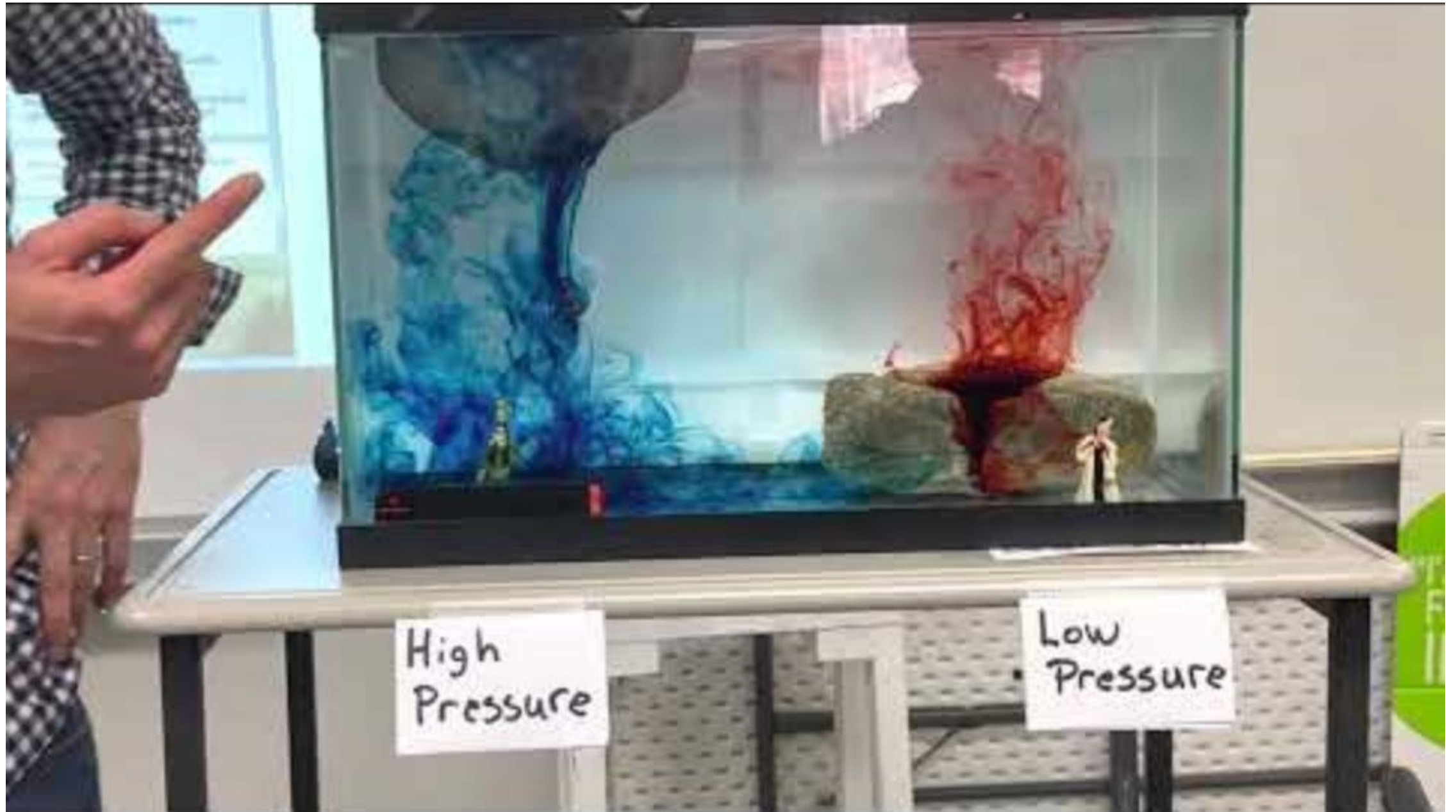


FRONTS





<https://youtu.be/XajpHV66jIY>



<https://youtu.be/bTQ4-okqm6Y>







Any questions I can answer or
follow up later on?

Weather Advisories



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the Option!

Lesson Objective

To develop understanding of weather advisories

AIRMETs

AIRMETs (Airmen's Meteorological Information) warn of hazards primarily to small aircraft; they are issued every 6-hours beginning at 0245 UTC with intermediate updates as needed.

There are three types of AIRMETs: Tango, Sierra, and Zulu available in either textual form (WA) or graphics (G-AIRMET).

AIRMET Types

AIRMET Tango—turbulence—a forecast of non-convective activity related to turbulence of moderate intensity, low-level wind shear, or sustained surface winds of 30 knots and greater

AIRMET Sierra—IFR Weather and Mountain Obscuration—a forecast that identifies aviation weather hazards that meet in-flight advisory criteria

AIRMET Zulu—icing—a forecast of non-thunderstorm-related icing of light or greater intensity, often using VOR points to outline the area of icing (it sometimes extends beyond the FA boundary).

AIRMET Types

When checking the AIRMETs, look for VORs along or within 100 miles or so either side of your planned route.

If you find such a VOR listed, then you can look closer to see if your flight is likely to be affected.

Be aware that hyphens in weather data can be used for three purposes:

To indicate a range—e.g., VSBY 3-5, “visibility 3 to 5 miles”

For spacing—VSBY 3-F, “visibility 3 miles in fog”

To condition a phenomenon as lighter —RW-, “light rain showers”.

SIGMETs (WS) and Convective SIGMETs (WST)

SIGMETs (Significant Meteorological Information) warn of conditions that could be dangerous to all aircraft (severe icing, and severe/extreme turbulence).

Convective SIGMETs are observations and/or forecasts that warn of conditions associated with thunderstorms that could be dangerous to all aircraft—tornados, large hail, embedded thunderstorms, large areas (and with severe icing, severe turbulence and low-level windshear implied).

AIRMETs vs SIGMETs

With AIRMETs, airlines will keep on flying.

With SIGMETs the airlines will need to at least detour over or around.

AIM 7-1-6 Inflight Aviation Weather Advisories

(b) SIGMET (WS)/AIRMET (WA or G-AIRMET)

SIGMETs/AIRMET text (WA) products are issued corresponding to the Area Forecast (FA) areas described in FIG 7-1-4 and FIG 7-1-5.

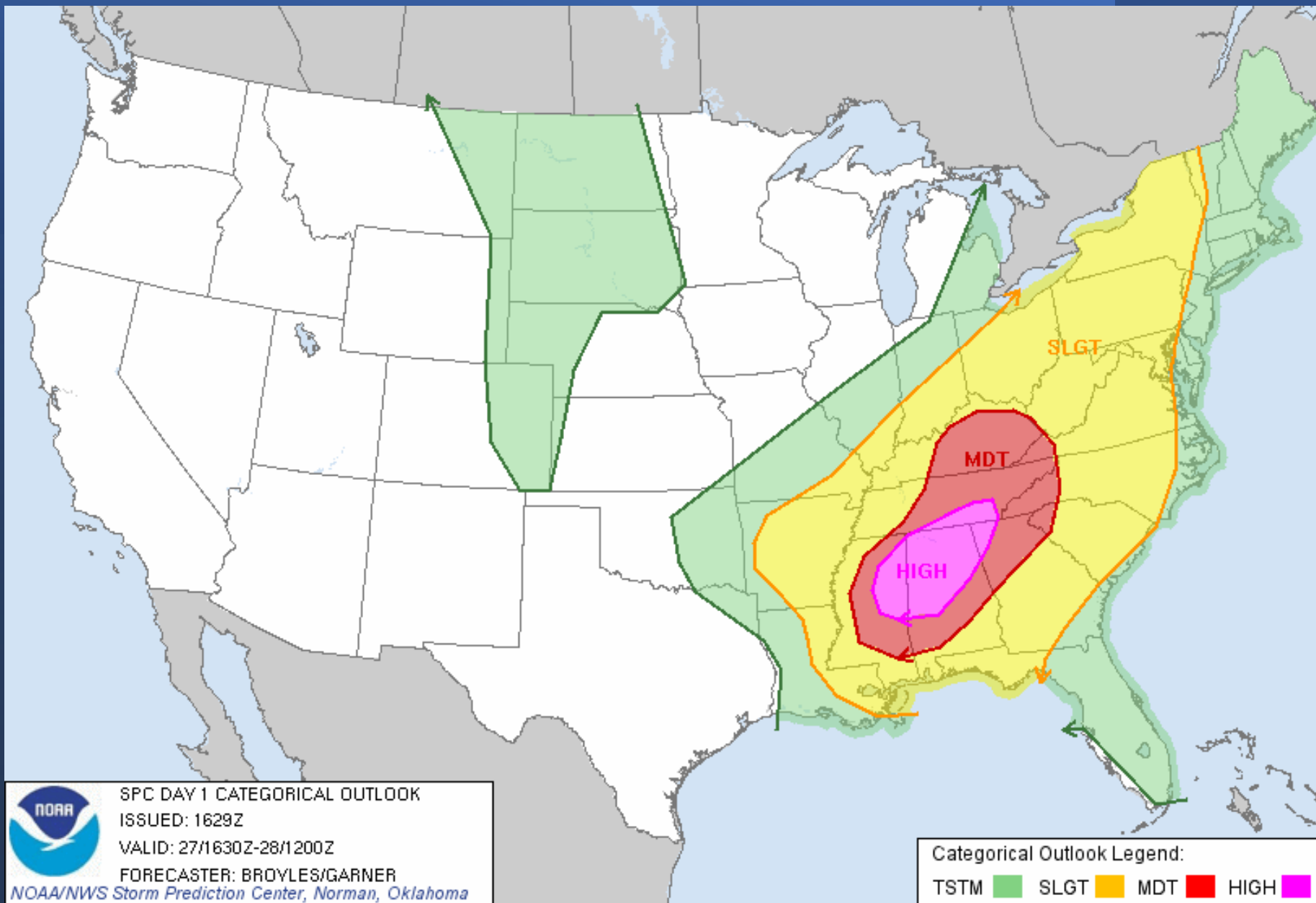
The maximum forecast period is 4 hours for SIGMETs and 6 hours for AIRMETs.

The G-AIRMET is issued over the CONUS every 6 hours, valid at 3-hour increments through 12 hours with optional forecasts possible during the first 6 hours.

The first 6 hours of the G-AIRMET correspond to the 6-hour period of the AIRMET. SIGMETs and AIRMETs are considered “widespread” because they must be either affecting or be forecasted to affect an area of at least 3,000 square miles at any one time.

However, if the total area to be affected during the forecast period is very large, it could be that in actuality only a small portion of this total area would be affected at any one time.

The U.S. issues a special category of SIGMETs for convective weather called Convective SIGMETs.



Understanding Severe Thunderstorm Risks

0	1	2	3	4	5
GENERAL THUNDERSTORMS	MARGINAL RISK	SLIGHT RISK	ENHANCED RISK	MODERATE RISK	HIGH RISK
Very Common	Common	Somewhat Common	Somewhat Common	Uncommon	Rare
No severe thunderstorms	A few storms could be close to severe	Scattered severe storms possible	Numerous severe storms possible	Numerous severe storms likely	Widespread severe storms likely
No damaging or life-threatening storms expected	No damaging or life-threatening storms expected	Significant damage or life-threatening storms unlikely	Significant damage or life-threatening storms possible	Significant damage or life-threatening storms possible	Significant damage or life-threatening storms likely!
EXAMPLES					
• Winds to 40 mph • Small hail	• Winds to 50 mph • Hail under 1" • Weakening storms	• One or two tornadoes • A few reports of wind damage • Large hail > 1"	• A few tornadoes • Several reports of wind damage • Large hail > 2"	• Several tornadoes • Widespread wind damage • Large Hail > 2"	• Tornado outbreak • Derecho
					

National Weather Service – Kansas City, MO

Thunderstorms

<https://www.noaa.gov/jetstream/thunderstorms/ingredients-for-thunderstorm>

All thunderstorms require three ingredients for their formation:

- Moisture
- Instability
- Lifting mechanism

Thunderstorms

The Towering Cumulus Stage

A cumulus cloud begins to grow vertically, perhaps to a height of 20,000 feet (6 km). Air within the cloud is dominated by upwardly-moving, warm, moist air currents called updrafts with some turbulent eddies around the edges.

The Mature Cumulus Stage

The storm has considerable depth, often reaching 40,000 to 60,000 feet (12 to 18 km). Strong updrafts and downdrafts coexist. This is the most dangerous stage, when tornadoes, large hail, damaging winds, and flash flooding may occur.

The Dissipating Stage

The downdraft cuts off the updraft. The storm no longer has a supply of warm moist air to maintain itself and, therefore, dissipates. Light rain and weak outflow winds may remain for a while during this stage before leaving behind just a remnant anvil top.

Center Weather Advisories (CWA)

Advice of the sudden development in the weather situation will often first be issued in the form of a Center Weather Advisory, for conditions beginning within 2 hours.

This may be used to supplement an area forecast or prior to the issue of the appropriate AIRMET or SIGMET.



Any questions I can answer or
follow up later on?

Winds Aloft



Cleared For
the Option!

Lesson Objective

To develop understanding of winds up above

Material

Example used for purposes of discussion:

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
STL	2113	2325+07	2332+02	2339-04	2356-16	2373-27	239440	730649	731960

A four-digit group shows wind direction, in reference to true north, and wind speed.

The first two digits give direction in tens of degrees

The second two digits are the wind speed in knots

STL 3000 2113 -> wind is from 210° true at 13 kt.

A six-digit group includes forecast temperatures.

9,000 2332+02 -> wind is from 230° true at 32 kt. and the temperature is plus 2°C.

Material

Example used for purposes of discussion:

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
STL	2113	2325+07	2332+02	2339-04	2356-16	2373-27	239440	730649	731960

If the wind speed is forecast to be from 100 to 199 kt., the forecaster will add 50 to the wind direction and subtract 100 from the wind speed. To decode, you must subtract 50 from the wind direction and add 100 to the wind speed.

STL 39000 731960 -> wind is from 230° true ($73 - 50 = 23$) at 119 kt. ($100 + 19 = 119$), and the temp is -60°C.

If the wind direction is between 51 and 86, the wind speed will be 100 kt. or more.

If the wind speed is forecast to be 200 kt. or greater, the wind group is coded at 199 kt.

EXAMPLE: 7799 is decoded as 270° true at 199 kt. or greater.

Material

Example used for purposes of discussion:

FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
STL	2113	2325+07	2332+02	2339-04	2356-16	2373-27	239440	730649	731960

When the forecast speed is less than 5 kt., the coded group is 9900 and is read “LIGHT AND VARIABLE.”

To find the temperature relative to ISA, multiply the standard temperature lapse rate (-2°C per 1,000 feet) times the altitude in thousands of feet, then add $+15^{\circ}\text{C}$ for standard day conditions:

Using -27 @ 24000

1. $-2^{\circ}\text{C} \times 24 = -48^{\circ}\text{C}$

2. $-48^{\circ}\text{C} + 15 = -33^{\circ}\text{C}$ (ISA)

Therefore, -27°C (today) is 6°C warmer than -33°C , so the temperature is ISA + 6°C .



Any questions I can answer or
follow up later on?

Example of a Winds and Temperature Aloft Forecast

DATA BASED ON 151200Z									
VALID 151800Z FOR USE 1700-2100Z TEMPS NEG ABV 24000									
FT	3000	6000	9000	12000	18000	24000	30000	34000	39000
ALA			2420	2635-08	2535-18	2444-30	245945	246755	246862
AMA		2714	2725+00	2625-04	2531-15	2542-27	265842	256352	256762
DEN			2321-04	2532-08	2434-19	2441-31	235347	236056	236262
HLC		1707-01	2113-03	2219-07	2330-17	2435-30	244145	244854	245561
MKC	0507	2006+03	2215-01	2322-06	2338-17	2348-29	236143	237252	238160
STL	2113	2325+07	2332+02	2339-04	2356-16	2373-27	239440	730649	731960

Decoding

1. A four-digit group shows wind direction, in reference to true north, and wind speed.
 - a. The first two digits give direction in tens of degrees, and the second two digits are the wind speed in knots.
 - b. Look at the St. Louis (STL) forecast for 3,000 ft. The group 2113 means the wind is from 210° true at 13 kt.
2. A six-digit group includes forecast temperatures.
 - a. In the STL forecast, the coded group for 9,000 ft. is 2332+02. The wind is from 230° true at 32 kt., and the temperature is plus 2°C.
3. If the wind speed is forecast to be from 100 to 199 kt., the forecaster will add 50 to the wind direction and subtract 100 from the wind speed. To decode, you must subtract 50 from the wind direction and add 100 to the wind speed.
 - a. In the STL forecast, the coded group at 39,000 ft. is 731960. The wind is from 230° true ($73 - 50 = 23$) at 119 kt. ($100 + 19 = 119$), and the temperature is -60°C.
 - b. If the wind direction is between 51 and 86, the wind speed will be 100 kt. or more.
4. If the wind speed is forecast to be 200 kt. or greater, the wind group is coded at 199 kt.
 - a. EXAMPLE: 7799 is decoded as 270° true at 199 kt. or greater.
5. When the forecast speed is less than 5 kt., the coded group is 9900 and is read "LIGHT AND VARIABLE."



Graphical Forecasts for Aviation (GFA) Help

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[Symbols](#)
[FAQ](#)
[Back to map](#)

Weather Symbols

Symbol	Station code	Description
Rain and Snow		
••	-RA	Light Rain
•••	RA	Moderate Rain
••••	+RA	Heavy Rain
☞	-FZRA	Light Freezing Rain
☞☞	FZRA +FZRA	Moderate to Heavy Freezing Rain
• *	-RASN	Light Rain and Snow
* • *	RASN +RASN	Moderate to Heavy Rain and Snow
**	-SN	Light Snow
* **	SN	Snow

Symbol	Station code	Description
Fog and Mist		
==	BR	Mist or Light Fog
≡	FG	Fog, sky indiscernible
≡	MIFG	More or less continuous shallow fog
(≡)	VCFG	Vicinity Fog
≡	BCFG	Patchy Fog
≡	PRFG	Fog, sky discernible
≡	FZFG	Freezing Fog
””	-DZ	Light Drizzle
•••	DZ	Drizzle

[Top](#)

	+SN	Heavy Snow
	BLSN	Blowing Snow
	DRSN	Drifting Snow
	SG	Snow Grains
	IC	Ice Crystals
	PE PL	Ice Pellets
Showers and Storms		
	-SHRA	Light Rain Showers
	SHRA +SHRA	Moderate to Heavy Rain Showers
	-SHRASN	Light Rain and Snow Showers
	SHRASN +SHRASN	Moderate to heavy rain and snow showers
	-SHSN	Light Snow Showers
	SHSN +SHSN	Moderate to heavy snow showers
	-GR	Light showers with hail, not with thunder
	GR	Moderate to heavy showers with hail, not with thunder

	+DZ	Heavy Drizzle
	-FZDZ	Light Freezing Drizzle
	FZDZ +FZDZ	Moderate to heavy freezing drizzle
	-DZRA	Light drizzle and rain
	DZRA	Moderate to heavy drizzle and rain
	VIRGA	Virga or precipitation not hitting ground
Dust, Sand, Other		
	FU VA	Smoke or Volcanic Ash
	HZ	Haze
	DU SA	Dust or Sand
	BLDU/BLSA	Blowing Dust/Blowing Sand
	PO	Dust Devil
	VCSS	Vicinity Sand Storm
	SS	Sand Storm
	+SS	Strong Sand Storm
	UP	Unknown Precipitation/Weather

	VCSH	Vicinity showers
	VCTS	Vicinity thunderstorm
	VCTSRA	Vicinity thunderstorm with rain
	TS	Thunderstorm with or without precipitation
	TSRA	Thunderstorm with light to moderate rain
	+TSRA	Thunderstorm with heavy rain
	TSGR	Thunderstorm with light to moderate hail
	TSSN	Thunderstorm with light to moderate snow
	SQ	Squalls
	FC	Funnel Cloud or Tornado

Pilot Reports

Symbol	Description
	Turbulence not encountered
	Smooth-light turbulence

Symbol	Description
	Icing not encountered
	Trace icing

	Light turbulence
	Light-moderate turbulence
	Moderate turbulence
	Moderate-severe turbulence
	Severe turbulence
	Extreme turbulence
	Low-level wind shear

	Trace to light icing
	Light icing
	Light to moderate icing
	Moderate icing
	Moderate to severe icing
	Severe icing
	Other

Prog chart (fronts)

Symbol	Description
	Cold front (dashed: frontogenesis/frontolysis)
	Warm front (dashed: frontogenesis/frontolysis)
	Stationary front
	Occluded front
	Trough
	Dry line
	Squall
	Hurricane / tropical storm

Map features

Symbol	Name
	Stadium
	Tall obstacle
	Medium or small obstacle
	Wind farm
	Mountain
	Volcano
	Pass
	Camera

Navigational aids

Symbol	Name	Description
	VOR	VHF omnidirectional range
	DME	Distance measuring equipment
	VOR/DME	Co-located VOR and DME
	TACAN	Tactical air navigation system
	VORTAC	Co-located VOR and TACAN
	NDB	Non-directional beacon
	RNAV	Area navigation
	Fix	Other navigation fix

Clouds

Symbol	Code	Description
	CLR	Clear
	FEW	Few
	SCT	Scattered
	BKN	Broken
	OVC	Overcast
	VV/OVX	Vertical visibility
		Missing

Flight Category

Symbol	Category	Description
	VFR	No ceiling or ceiling greater than 3,000 feet AGL and greater than 5 mile visibility
	VFR*	VFR with non-ceiling clouds below 3,000 ft AGL
	MVFR	1,000 to 3,000 feet AGL and/or 3 to 5 miles
	IFR	500 to below 1,000 feet AGL and/or 1 mile

Airports

Symbol	Description
	Airport
	Heliport
	Seaplane base
	Private

		to less than 3 miles
	LIFR	Below 500 feet AGL and/or less than 1 mile