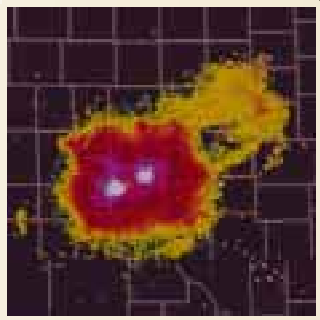
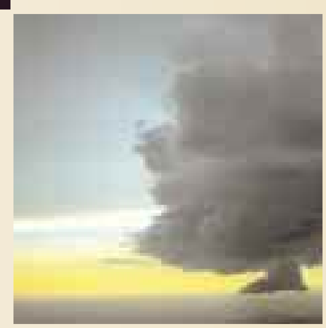
Weather Strategies





Weather, ATC, and You

AIR SAFETY AOPA FOUNDATION

"Weather Strategies," an AOPA Air Safety Foundation safety seminar, takes pilots through the planning portion of a flight that seems, at first glance, impossible to fly. But, is it? Join us as we study the weather, think about our options, and decide whether to go.

AOPA Air Safety Foundation

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Foreword

What do you do when the forecast for the day you plan to fly contains thunderstorms, icing, or marginal VFR? Have you ever canceled a flight because you weren't sure if the weather enroute or at the destination would be good enough to make it? Do you wish you could have a better understanding of what's likely to happen enroute?

"Weather Strategies," an AOPA Air Safety Foundation safety seminar, takes pilots through the planning portion of a flight that seems, at first glance, impossible to fly. This booklet was developed in conjunction with the seminar but is also useful to pilots who have not been able to attend.

You'll learn how to:

- Find online weather information for flight planning (and not just DUAT);
- "Test" the forecast by comparing forecasts to actual conditions; and
- Incorporate all this information logically into a flight planning sequence that will enable you to make more educated go/no-go decisions.

Fig. 1 Terrain can modify the weather.

Our Greatest Challenge

Weather is aviation's most challenging variable. As pilots, we recognize the need for continuing education, both to maintain our flying skills and to keep up with new technology in the cockpit. The same principle applies to pilots' ability to acquire and interpret weather information. New weather data resources, a greater understanding of hazardous weather phenomena, and new reporting formats enable today's pilot to picture actual and forecast weather better than ever before. Many pilots do not know how to take advantage of these resources and take off with far less information than is available.

The Stats

The number-one cause of all weather-related fatal accidents is (and has been for many years) pilots' attempted or continued VFR flight into instrument meteorological conditions (IMC). An instrument ticket is not necessarily a guarantee of safety—more than one quarter (27%) of VFR-into-IMC accident victims are instrument rated. Experience doesn't provide much comfort, either; 44% of these fatalities involve pilots who've logged more than 1,000 hours.

Why Bother to Learn Weather?

Most pilots aren't students of weather by choice. It's a matter of survival, a resentful capitulation to the forces of nature that can keep us on the ground. Why not just listen to the briefer, the prudent pilot might say: If the forecast calls for a 50% chance of thunderstorms, stay home; if it says that an approaching front will be no factor, hit the airway. Answer: If we stayed on the ground every time the word "thunderstorm" or "icing" was uttered in a forecast, there would be remarkably few airplanes in the air. We also know skies forecast to be clear can turn angry in a hurry when weather doesn't behave as the computer model predicted a few hours ago. That's why pilots need to be familiar with the weather-producing forces at work in the atmosphere, know how to acquire the information they need, and interpret the data they get.

Getting the Big Picture

A basic understanding of weather helps a pilot visualize the data that are the raw ingredients of briefings. Major factors influencing the big picture include atmospheric pressure, upper atmospheric airflows, stability of the atmosphere, and moisture content.

Atmospheric Pressure

Much of the weather pilots contend with is associated with areas of relatively high and low pressure colliding. In areas of *low pressure* in the Northern Hemisphere, air enters at the surface and spirals upward counterclockwise, cooling as it rises. The moisture in the cooling air condenses into clouds and precipitation. That is why low pressure is usually associated with bad weather. The moisture content and strength of the low pressure system determines the severity of the conditions.

In *high pressure* areas, air descends in a clockwise spiral in the Northern Hemisphere and flows out when it reaches the surface. The air warms as it sinks, and the condensed water that makes clouds evaporates. Thus, high pressure areas are usually associated with clear skies and good weather.

Upper Atmospheric Airflows

Air typically flows from west to east in the upper atmosphere and often detours to the south and north while on its way. The bends in this easterly flow that curve south are called *upper air troughs*. The bends that bow north are called *upper air ridges*. Upper air troughs are generally associated with cold surface temperatures, clouds, and precipitation. Upper air ridges are associated with warmer surface temperatures and good weather.

The Stats

The number-one cause of all weather- related fatal accidents is (and has been for many years) pilots' attempted or continued VFR flight into instrument meteorological conditions (IMC).

Sky Maps

Maps of the sky are updated several times a day and show high and low pressure areas, wind direction and speed, temperature, and dew point for many different altitudes beginning at 5,000 feet agl.

Additionally, troughs and ridges provide "upper air support" that influence the high and low pressure areas beneath them. An upper atmosphere trough can cause rain, clouds, and marginal VFR or IFR conditions in a high pressure area, and an upper air ridge can reduce the weather problems typical of a low.

Almost everyone is familiar with the surface weather maps that are seen daily on television and in newspapers. They show the actual and the forecast weather both nationally and locally and are useful to us on the ground but are of limited use when in the air.

Some of these maps show isobars—the lines that sweep across the map—curving as they connect points of equal barometric pressure. They picture the highs and lows, and some maps give additional wind information. When the isobars are close together, the wind speed is higher than when they are farther apart. Wind follows the direction of the isobars and flows counterclockwise around a low and clockwise around a high.

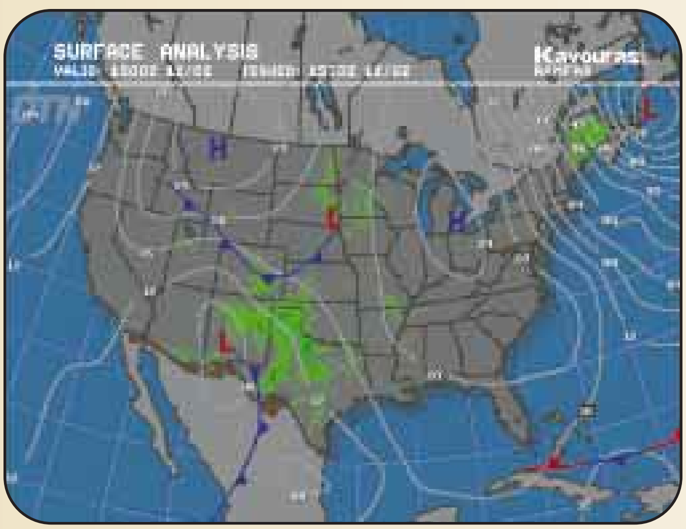

Fig. 2 DTN Surface Analysis

Sky Maps

There are also maps of the sky that show high and low pressure areas, wind direction and speed, temperature, and dew point for many different altitudes beginning at 5,000 feet agl. These are meteorological weather maps—pressure level charts with the pressure measured in millibars—and are very valuable to pilots because each specific millibar level equates to a specific altitude. The trick is to know what they are called, where to find them, and what they mean.

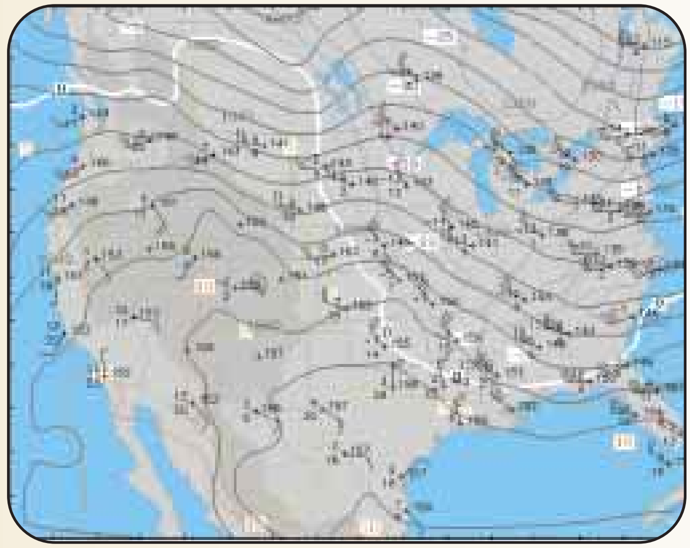

Fig. 3 UCAR 850 mb Chart

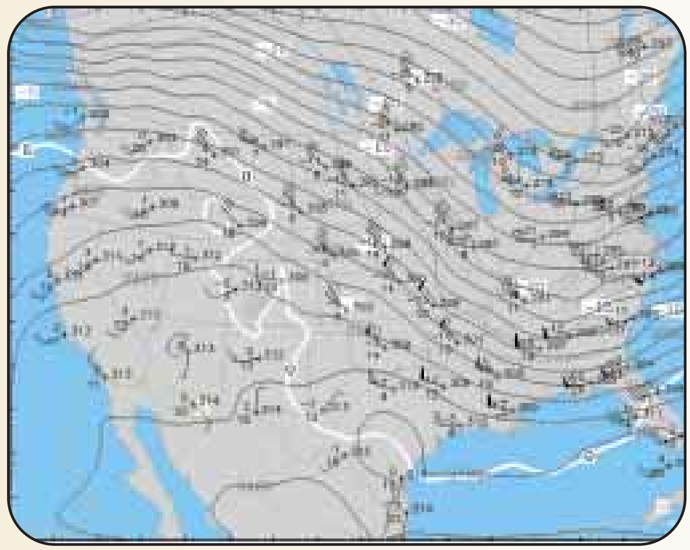

Fig. 4 UCAR 700 mb Chart

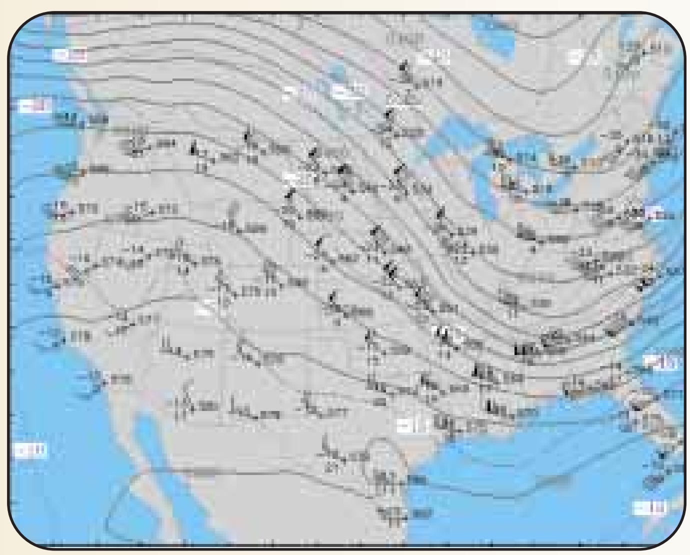

Fig. 5 UCAR 500 mb Chart

Pressure charts are made for:

Millibar Level	Altitude (feet agl)
850	5,000
700	10,000
500	18,000
300	30,000
250	35,000

There are several other pressure charts for higher altitudes, but we typically don't fly way up there. The 850-, 700-, and 500-mb charts are most useful to general aviation pilots. Look at the sample pressure charts for 5,000-, 10,000-, and 18,000-feet-agl altitudes. They are all for the same day. Compare them and see how the winds and pressure areas change with altitude.

The 850- and 700-mb charts tell us what to expect at typical general aviation flight altitudes. The 500-mb chart gives a good idea of where major weather systems are going. Winds at this level are often called *steering winds* because they influence the movement of weather systems above and, to a greater degree, below them.

Stability

Warm air over cooler air results in a stable air mass. This is because warm air rises and, in this case, has already risen. Conversely, cooler air above that warmer air produces an unstable air mass because that warm air will attempt to rise.

Vertical instability increases the potential for bad weather. It causes rapid heating and cooling that can feed on itself, providing the energy needed to fuel a thunderstorm. If the air is very moist, this can create a line of severe thunderstorms stretching across several states.

Stable air is smooth because there is little vertical movement, but this also traps haze and pollutants, so visibility can be poor in stable air.

Temperatures aloft are another good indicator of potential storms. If air is cooling faster than the standard lapse rate of 2 degrees Celsius every 1,000 feet, that cooler air above will produce

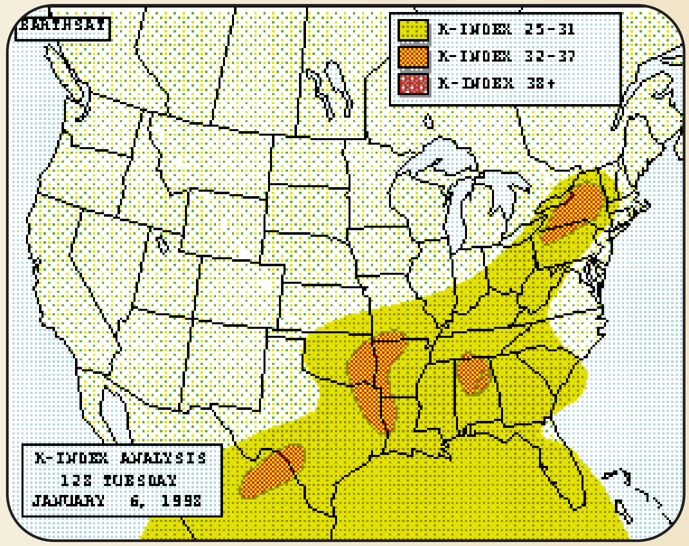

Fig. 6 Contel DUAT Composite Moisture Stability Chart

instability and a higher probability of stormy weather. If temperatures aloft decline at less than 2 degrees Celsius per 1,000 feet, there is less chance of a thunderstorm.

Temperature Tip: Weather-wise pilots record temperatures at 1,000-foot intervals during climb and descent. That way, they have an idea of how stable the air mass is.

The classic "K," or lifted index chart, gives pilots preflight stability information, but it is hard to find and not that easy to interpret. The DUAT composite moisture stability chart shows air stability and is easier to understand. This information is available in text form in the convective outlook.

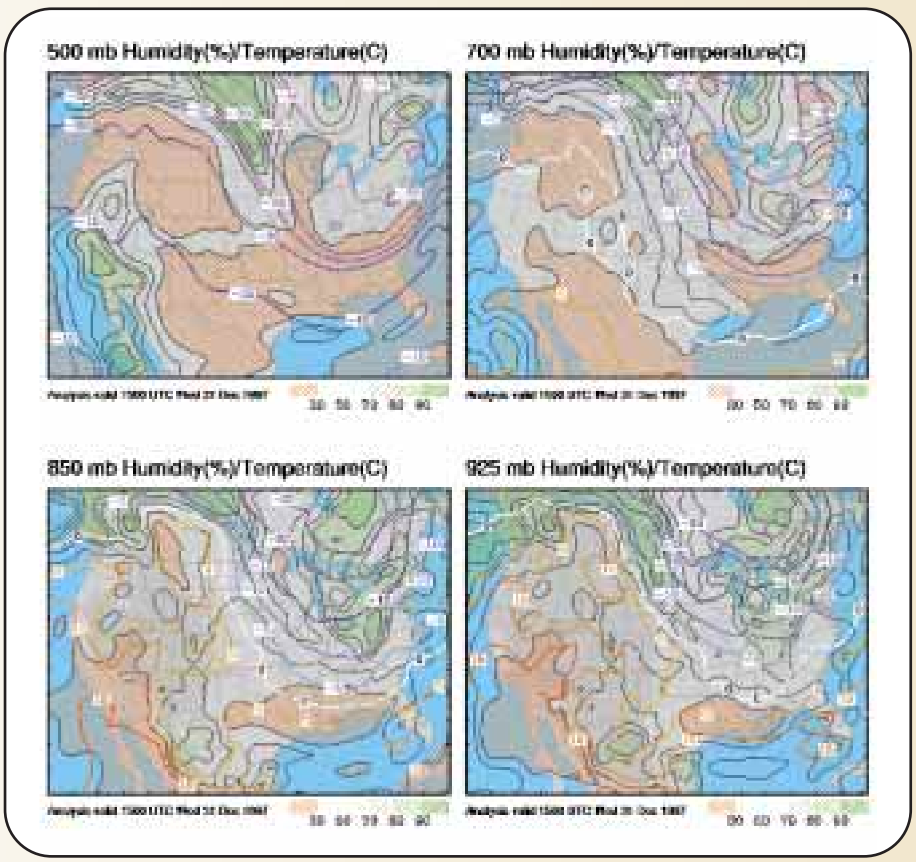

Fig. 7 UCAR Temperature Moisture Aloft 4-panel

Stability

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Moisture

Much weather is associated with water in the atmosphere changing from gas to liquid (rain) or liquid to solid (ice). Knowing where the air mass came from can give you an idea about the moisture content.

Moisture

Much weather is associated with water in the atmosphere changing from gas to liquid (rain) or liquid to solid (ice). The less moisture in the air, the less is available to condense as clouds, rain, or ice, and less for the frontal action of lifting and cooling that produces thunderstorms. Bodies of water, such as the oceans, the Great Lakes, and the Gulf of Mexico, pump massive amounts of moisture into the air, influencing the weather for hundreds of miles. Knowing where the air mass came from can give you an idea about the moisture content.

A better indicator is the dew point. The dew point is the temperature at which the air is 100% saturated. Warm air can hold more moisture than cold air. The higher the dew point (the warmer it is when the air is saturated), the more moisture is available for creating clouds, fog, and precipitation.

Organizing the Information

The ability to formulate a "big picture" image of atmospheric conditions, a synopsis, is one of the keys to successful weather planning. The synopsis must be fine-tuned for the specific route by addressing three questions:

1. What adverse or hazardous weather exists that could affect the flight?
2. What are the current conditions along the route? What's happening *now?*
3. What are the forecast conditions for the route? What's predicted (but not guaranteed) to happen?

A flight planning form, such as the ASF Flight Planner reproduced in this booklet, makes an ideal template for recording key weather components. It includes a section for noting adverse conditions; a section for the synopsis, or "big picture"; a section for current conditions; and a section for forecast conditions.

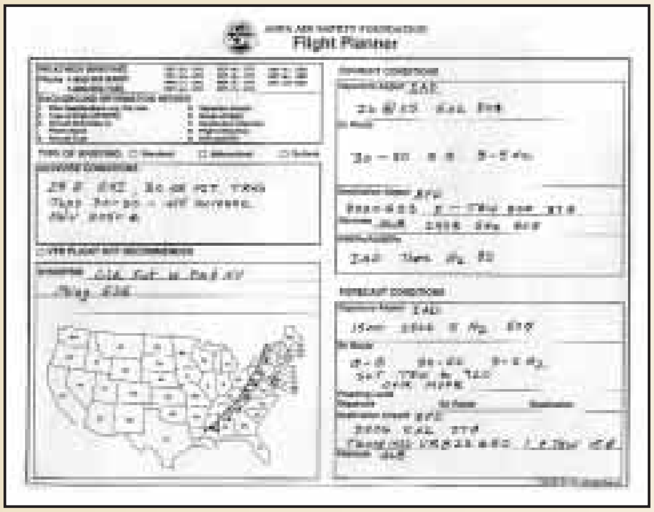


Fig. 8 AOPA ASF Flight Planner Form

Adverse Conditions

In some areas of the country, forecasts of thunderstorms are almost a routine part of summer briefings, and forecasts for icing are just as common in the winter. Because FAA weather briefings tend to be conservative, pilots need an understanding of these conditions to determine the extent of these hazards whenever they're contained in a forecast.

Most of what pilots are required to learn about thunderstorms comes from *Aviation Weather,* a book more than 20 years old. Much has been learned about hazardous weather since then, underscoring the need for weather recurrency training. For example, the single-cell storm used to illustrate the generic thunderstorm and serve as the model for convective activity is actually rare. Flying safely through areas where the possibility of convective activity is forecast requires familiarity with newer storm models. They include:

Multi-cell storms—These are the most common form of thunderstorms and are clusters of single-cell storms that feed off each other's energy. Air coming from one nearby cell can trigger another cell to form directly under, over, or around your airplane.

Mesoscale convective complexes, or MCCs—Mainly occurring in the Midwest, these organized clusters of thunderstorms can be hundreds of miles in diameter.

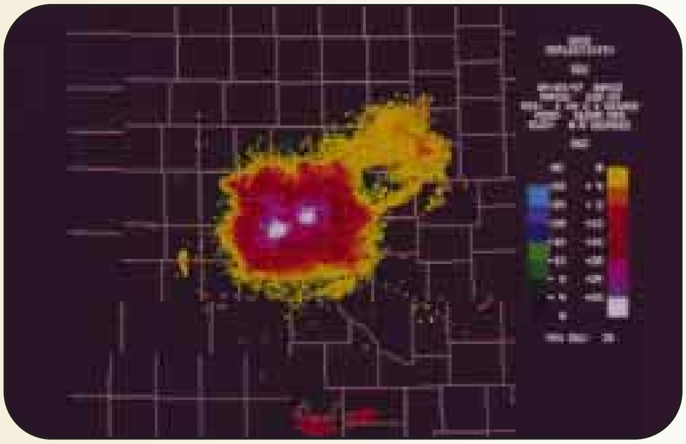


Fig. 9 NEXRAD MCC. Each square is a county in the Midwest.

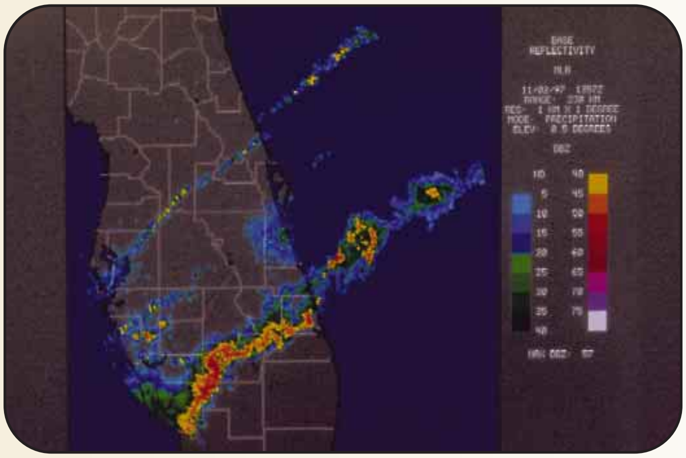


Fig. 10 NEXRAD squall line storms

Air mass thunderstorms—Single- or multi-celled, they "pop up" during warm, humid afternoons in the absence of fronts or low pressure systems. They can usually be avoided. In the eastern United States, however, they can be embedded in clouds or haze and difficult to see.

Squall line storms—These storms may precede the advance of a cold front. For the general aviation pilot, there's not much chance of getting around these systems. They can form in lines stretching hundreds of miles.

Super cell thunderstorms—Called "steady state storms" in *Aviation Weather*, super cells are characterized by microbursts, large hail, lightning, heavy rain, and tornadoes. Unlike most storms, where cold air descending with rain gradually cuts off the warm, humid air that feeds the convective activity, here the complex interaction of winds at all levels can keep super cell thunderstorms active for hours.

Synopsis (Big Picture)

Flight planning forms often include a map of the United States. Sketch the weather here, showing areas of high and low pressure, frontal lines, significant weather, and upper air currents affecting conditions along the route. This will give you a good understanding of the big weather picture.

Current Conditions

What's the point of getting a report on the current weather if you're not flying now? Why not just get a forecast of conditions expected for your flight time? Current weather provides a base for comparing trends. Unlike a forecast, it is not a guesstimate, but a valid report of current weather conditions. When combined with the forecast, pilots can see how conditions are expected to change and at what rate.

Just as our understanding of weather has evolved recently, so has the format for reporting these conditions. This is also the way to test a forecast. Are storms or strong winds developing as advertised? If not, why not?

METAR and TAF

Airport surface observations and airport terminal weather forecasts are reported in the International Civil Aviation Organization (ICAO) format. Winds aloft, area forecasts, and pilot reports also incorporate this new code. Hourly surface observations are known as METARs, an acronym for the French term meteorological aviation routine weather report, and the terminal area forecast is the TAF, an acronym for terminal aerodrome forecast. The METAR/TAF Decoder Card in the back of this booklet contains the reporting code and shows examples of weather reports and forecasts.

ASOS

In the 1980s, the National Weather Service (NWS), with the FAA's approval, decided to replace human weather observers with an automated system. The system NWS developed is ASOS (automated surface observing system), and it's playing a growing role in aviation weather reporting. When the system is complete, more than 900 airports will have ASOS units. Pilots get ASOS reports during preflight briefings in the form of METARs and while airborne in weather updates from Flight Watch and when approaching airports that use ASOS for ATIS. You need to be aware of the benefits and limitations of ASOS to make the best use of the system.

Fig. 11 ASOS sensors

ASOS uses a suite of electronic and mechanical sensors to measure the weather. A wind vane and anemometer measures wind speed and direction; temperature is measured with an electronic thermometer, called a thermister; a barometer provides the altimeter setting; a ceilometer reports cloud height; a laser measures visibility; a hygrothermometer registers the dew point; and a device called a "light-emitting-diode weather identifier" identifies precipitation. Detectors to identify freezing rain and lightning are available at many ASOS stations.

However, ASOS and human observers don't see things the same way. When observing the same phenomena—cloud height, sky cover, precipitation type, and visibility—man and machine often issue significantly different reports of conditions, and the difference is greatest when the weather goes down. Experienced weather observers say ASOS can issue unrepresentative reports when IFR and low IFR conditions prevail—in other words, when you need it most. It's at its worst when moisture-laden fronts move through an airport. Being aware of how ASOS systems operate can help pilots interpret their reports during these conditions. The AOPA Air Safety Foundation offers an *ASOS Safety Advisor* that provides further information on automated weather observation. To receive a copy, send your request with $1 for postage and handling to:

AOPA Air Safety Foundation
ASOS Safety Advisor
421 Aviation Way
Frederick, Maryland 21701

What's Current

Current weather provides a base for comparing trends. Unlike a forecast, it is not a guesstimate, but a valid report of current weather conditions. When combined with the forecast, pilots can see how conditions are expected to change and at what rate.

The Forecast

Accessing much of the same data forecasters use to prognosticate the weather, and understanding what it means, will help you forecast what the weather will be doing when you are flying in it.

ASOS and IFR

Pilots must be aware of current limitations of ASOS, particularly in the IFR environment. Remember that the system is most vulnerable when weather changes rapidly (a frontal situation during convective activity). For flight-planning purposes, check on the availability of ASOS stations along the route. Find out if these ASOS facilities are augmented by human observers. There are four classes of ASOS service: A, B, C, and D. ASOS Service levels A and B have humans backing up the machines 24 hours a day, ASOS Service Level C has a human observer part-time (when the tower is open), and ASOS Service Level D is provided by stand-alone ASOS units with no human augmentation.

Most ASOS stations can be accessed via phone. Calling on the ground for a current report can be useful as a basis for comparison once aloft. VFR pilots should make use of this resource too, especially if planning a flight into marginal conditions.

The Million Dollar Question:

What will the weather be doing during my flight? The forecast helps answer that question. Of course the forecast conditions don't always occur on schedule or at all. Knowledge of the big weather picture helps pilots understand what's driving the weather and provides an advantage when dealing with the unexpected turns it takes.

Accessing much of the same data forecasters use to prognosticate the weather, and understanding what it means, will help you forecast what the weather will be doing when you are flying in it. Remember that your view at altitude is one of the best observation points. Look out the windshield, read the weather, and change your plans, if warranted.

Temperature/Dew-Point Spread

Earlier we discussed moisture and dew point as signs of potential convective activity. Dew points of 50 degrees Fahrenheit and higher in summer are good indicators of the possibility of the development of cumulus clouds, isolated thunderstorms, and moderately turbulent air. If dew points are above 60 degrees, the possibility for severe weather is greater, and if above 70 degrees with lifting action, severe weather is almost guaranteed.

Wind

Shearing winds (changes in wind speeds or directions) can create significant turbulence. Check the surface winds and winds aloft along the route at several altitudes—not just your flight altitude. If they change direction substantially and if speeds are high, the chance for turbulence increases. Speeds over 25 knots and moist air aloft indicate upper level support conditions that may enhance and prolong thunderstorms.

P.L.A.N.

Most weather accidents occur in reduced-visibility conditions. We all know that fog is likely when temperature and dew point converge, so the prudent pilot will plan for it.

Prepare—when the temperature and dew point are within 5 degrees C, you should anticipate fog.
Look—Check METARs and TAFs around your destination to find more favorable visibility conditions.
Alternate—Plan for at least one good alternate when your destination forecast indicates fog.
Never land in dense fog—especially at night.

Night Fog

Night fog conditions are particularly insidious. Because fog layers are often less than 200 feet thick, airport lights are easily seen from directly overhead. The picture changes drastically, though, when you enter the fog on final approach. Many pilots have found themselves in "instant" IFR conditions as the previously distinct runway lights become indistinct light areas and landing lights illuminate the fog, obscuring the runway further. Visibility deteriorates as you descend into the fog layer. The best way to cope with this condition is to avoid it altogether by going to your alternate destination. If you're caught in the fog, though, the only safe way to proceed is to go around and fly to the alternate.

Fig. 12 DTN 5000 ft. Wind/Temperature Forecast

The Weather Briefing

Once you've gotten a grasp of the big weather picture, it's time to get a weather briefing. There are three kinds of briefings: standard, outlook, and abbreviated.

A *standard briefing* covers the full route and is recommended for any cross-country flight. It follows the same general outline as the flight planning form: adverse conditions, the synopsis, current conditions, and forecast conditions, both enroute and destination. If departure is more than two hours away, briefers are not required to provide current conditions unless requested. Make a point to ask for it so you can begin grading the forecast.

If departure is more than six hours away, ask for an *outlook briefing*. This covers the forecast conditions for the route of flight. An outlook briefing does not contain current conditions, but you can ask for them to start monitoring trends.

An *abbreviated briefing* is appropriate when you've already received a standard briefing and seek updated information. Tell the briefer what information you already have and what you want.

Observations and Forecasts

Weather briefings contain observations as well as forecasts, and it's important to know which is which. A weather map based on observations is referred to as an "analysis." Radar summary, composite moisture stability, weather depiction charts, and the constant pressure analysis chart are all based on observations and display actual weather reports.

Fig. 13 Weather Channel surface map

Radar reports (rareps) provide a picture of where convective activity is occurring now. Pilot reports (pireps) are an invaluable source of actual conditions. Make them on your flight and ask for them during your briefing. And remember—the weather may change significantly by the time of your flight.

Forecast charts and other weather products are based on informed guesswork. The word "forecast" is often in their names, such as area forecast and terminal forecast.

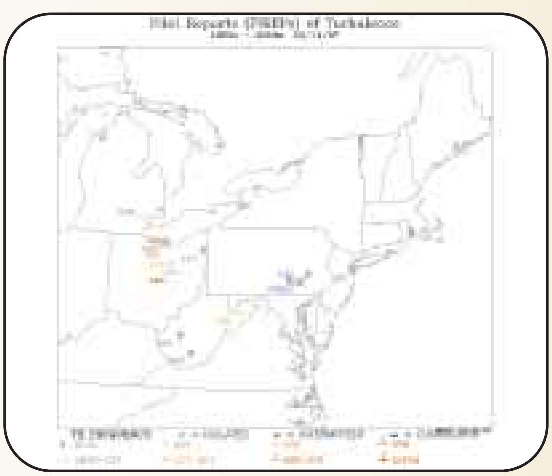


Fig. 14 UCAR Pilot Report

"Prog" charts are based on forecasts or prognostications and are published with a valid time indicating when the conditions are expected to occur.

Fig. 15 DTN 24 hr Surface Forecast

If adverse conditions are in the current or forecast report, get as much information about them as possible. Convective outlooks detail forecasters' predictions of where significant weather is most likely to occur. If you have to rely on an unaugmented ASOS during these conditions, call an FBO or someone on the field where the weather is poor, and compare their observation with the current ASOS report on the telephone. Remember, however, that you are pilot in command. The responsibility rests with you and the weather may change significantly by your arrival time.

Wait a Minute

One important point to consider about telephone briefings: When the weather goes down, the wait time goes up. Budget cutbacks have trimmed the number of flight service stations and weather briefers. Fortunately, much of the same information is available online for pilots.

Online Weather Resources

There are many online weather resources. AOPA's Web site (www.aopa.org), for example, enables users to view and download near-real-time weather reports and graphics.

DUAT (Direct User Access Terminal) is a free online service available to pilots. Private weather companies have contracted with state aviation agencies and FBOs to bring online weather to pilot lounges across the country. DUAT provides free access to more weather information than is available in a standard telephone briefing, including downloadable color weather depiction charts.

What's Adverse

If adverse conditions are in the current or forecast report, get as much information about them as possible. Convective outlooks detail forecasters' predictions of where significant weather is most likely to occur.

You Can Know

Because FAA weather briefings tend to be conservative, pilots need an understanding of the conditions to determine the extent of the hazards contained in a forecast.

As when calling flight service, three briefing formats are available: standard, outlook, and abbreviated.

Reports of hazardous weather are available from DUAT and other computerized weather services in airmets (WAs), sigmets (WSs), convective sigmets (WSTs), center weather advisories (CWAs), urgent pilot reports (UUAs), and severe weather watch bulletins (WWWs).

When briefed by phone, picturing the affected area described in these reports can be difficult, as they are defined by VORs on the in-flight advisory plotting chart. Online, this information is often presented in graphical form, making it much easier to see the affected areas in relation to your route of flight.

Practice

Working with the weather, both on the ground and in the air, is a critical skill of piloting, and like flying, requires practice. Exercise your weather awareness by thoroughly checking conditions before every flight. Develop your knowledge of flight planning and decisions for hazardous weather by getting a briefing for a route that would take you near areas of thunderstorms, icing, reduced visibility, or areas of high winds. Get these practice briefings once a week, even if you don't actually fly. You'll become much more weather savvy and will start to learn how to "read" the weather. Become comfortable with the language of pireps and rareps and other weather service products. Follow the weather to see if conditions develop as forecast.

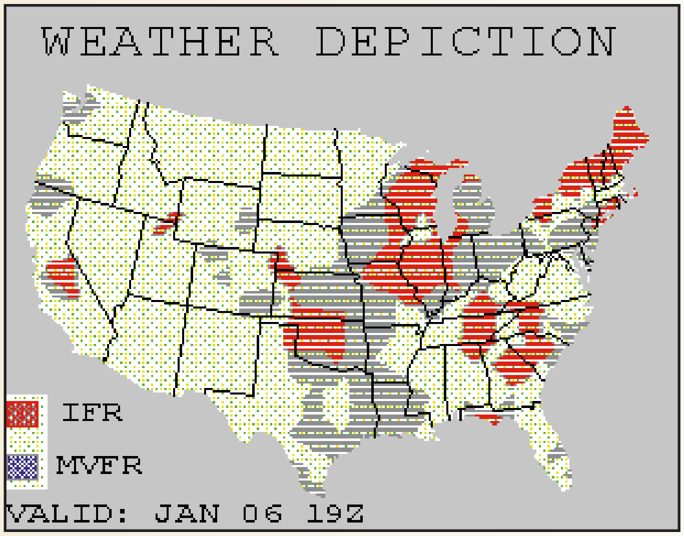


Fig. 16 DUAT Weather Depiction Chart

Weather Resources

There are many places to find weather information. Below is a list of a few of the resources used in compiling this booklet:

Online

1. AOPA Online: http://www.aopa.org, or call 1-800-USA-AOPA

2. Aviation Weather Center: www.awc-kc.noaa.gov

3. DTC DUAT: http://www.duat.com, or call Data: 1-800-245-3828 or Help: 1-800-243-3828

4. GTE DUAT: http://www.gtefsd.com/aviation/GTEaviation.html, or call Data: 1-800-767-9989 or Help: 1-800-345-3828

5. National Weather Service: http://www.nws.noaa.gov

6. University Corporation for Atmospheric Research (UCAR): http://www.ucar.edu

Videos

1. Sporty's Weather Videos: Fall, Winter, Spring, and Summer. Call Sporty's at 1-800-LIFTOFF.

2. AOPA Air Safety Foundation: *Aviation Weather Theory.* M456A Call Sporty's at 1-800-LIFTOFF.

Publications

1. AOPA Air Safety Foundation, *General Aviation Weather Accidents*. Frederick, MD 1996. M904A Call Sporty's at 1-800-LIFTOFF.

2. AOPA Air Safety Foundation, *Aircraft Icing Safety Advisor.* Frederick, MD 1997. Call ASF at 1-800-638-3101.

3. Buck, Robert N., *Weather Flying*. New York, N.Y., McGraw-Hill Publishing Co., Inc., 1997.

4. Collins, Richard L., *Flying the Weather Map.* New York, N.Y., Delacorte Press, 1979.

5. Department of Commerce, Federal Aviation Administration, *Aviation Weather*-AC 00-6A. Washington, D.C., U.S. Government Printing Office, 1985.

6. Department of Commerce, National Oceanic and Atmospheric Administration, Department of Transportation, Federal Aviation Administration, *Aviation Weather Services*-AC 00-45C. Washington, D.C., U.S. Government Printing Office, 1985.

Afterword

Learning weather is not as simple as our pilot certification curricula would suggest. Private pilot ground schools cover myriad subjects in a few short hours. Once the weather lessons are over, it's not unusual for students to neglect the subject until the brush-up period just before the check ride. Flight training isn't much better. With all the things we have to teach, there's no time to concentrate on weather.

Proficient pilots know that weather is not a separate subject to be learned for the check ride and forgotten until the flight review. Most aspects of flying are routine and predictable. Weather is the one thing we can rely upon to change, and we need to be confident of our ability to forecast and deal with its variability. We do this by developing weather sense.

10 Minutes a Day

The best way to learn weather sense is to pay attention to weather every day. Whether you're flying or not, start your day with a synopsis of the national weather patterns. TV or newspaper weather pages are fine for this. Compare today's weather with yesterday's data and see how close you came to forecasting the changes. Jot down your prediction for tomorrow. Then, once or twice a week, although you may not intend to fly, get an aviation briefing from Flight Service or DUAT for a cross-country flight. At first, you'll want to deal with trips in your local area that you're likely to take. Later, as you become more proficient, test your interpretation skills with unfamiliar routes.

As you refine your weather sense, you'll realize, like the pros before you, that weather wisdom is not a destination—it's a journey—and the longer you've traveled, the more you'll know. Enjoy the trip!

A Weather Planning Exercise

AOPA Air Safety Foundation surveys show that 85% of general aviation pilots get their preflight weather information from flight service station telephone briefings. Take a few minutes to analyze the following transcript of a weather briefing for a flight from Dulles International Airport (KIAD) in Virginia to Bradford Airport (KBFD) in Pennsylvania. We've included maps of the route and an ASF Flight Planner Form for your use.

At first glance, the flight may seem impossible, but if you dig deeper, you may find a way to make the flight without running into hazardous weather. Ask yourself these questions:

- Is there any hazardous weather along the route now?
- What is expected at my estimated time of arrival (ETA)?
- Should I leave sooner?
- Can I go partway, land, and wait until the weather improves?
- Where's the best weather going to be?
- What direction would I go to find good VFR conditions?
- What additional infromation do I need?

Weather Sense

Weather is the one thing we can rely upon to change, and we need to be confident of our ability to forecast and deal with its variability. We do this by developing weather sense.

Flight Service Transcript

FSS Specialist: Leesburg flight service, good afternoon.

Pilot: "Hello Leesburg. This is November 1588 Sierra—a Beech Debonaire at Dulles. I'll be flying from here to Bradford Pennsylvania about 1300 local this afternoon. I'd like a standard briefing for the route. I'll be about an hour and thirty minutes enroute between 6000 and 8000 ft.

FSS Specialist: All right sir, your weather picture this afternoon shows a cold front that's currently out in western Ohio extending down through southern Indiana. That cold front will continue to slowly move eastward. It will be dissipating as the day and evening comes on.

As for advisories, no airmets for you, enroute and looking at radar though I do have some convective activity up in northwest Pennsylvania extending up into the western Penn, ah correction New York. And a convective sigmet for a line of severe thunderstorms 15 miles wide moving from the west, southwest, through the east, northeast at 15 knots. Hail to one inch, wind gusts to 50 knots possible and tops above Flight Level Four-five-zero. These storms had started up earlier in the afternoon starting off as level 3 to 5 thunderstorms. And they look like they are going to continue moving close to Bradford. I noticed in the forecast for the Bradford area they did have occasional thunderstorms in their forecast, however, at this time they are not reporting anything.

Current weather at Dulles—they are reporting variable winds at five knots, visibility five in haze, 6,000 scattered, temperature 34, dew point one-niner, altimeter two-niner-niner-six.

Enroute up over Martinsburg they're reporting five miles in haze, scattered clouds at six thousand, Altoona four miles and haze, ceiling 5,000 broken. Up over DuBois, 5 miles, scattered clouds at 3500 and the Bradford automated station is reporting wind two-zero-zero at 6 knots. Visibility four in haze, 3800 scattered, temperature 28, dew point 20, altimeter 30.00.

Now for pilot reports enroute I don't have anything low-level for you at this time.

Your enroute forecast for Northern Virginia calls for scattered to broken clouds, between 5 and 7 thousand, tops to 15 thousand with occasional visibility 3 to 5 miles in haze. Widely scattered thunderstorms are not expected in this area until after 2000 Zulu.

Up through Pennsylvania the forecast calls for broken clouds between 4 and 6 thousand, tops one-two-thousand, with visibility ranging between 3 and 5 miles due to haze, with scattered thunderstorms and heavy rain and those thunderstorm tops are forecasted up to Flight Level Three-eight-zero.

Terminal forecast up at Bradford for your time of arrival, and this is the 2:00 forecast, the latest we have from now through zero two-hundred Zulu tonight: Winds two-two-zero with six knots, visibility five and haze, 2,700 scattered, with occasional visibility three miles, thunderstorms in rain, ceiling 2,500 broken, cumulonimbus and one-zero thousand overcast.

And your winds aloft at six thousand over Westminister two-six-zero at one-one. Over Philipsburg two-five-zero at one-five, would you like them at niner thousand?

Pilot: Yes please.

FSS Specialist: All right over Westminster two-seven-zero at one-zero and over Phillipsburg two-six-zero at one-four. Anything else that I can get for you at this time?

Pilot: No thanks - that'll do it.

FSS Specialist: All right, sir, have a good day.

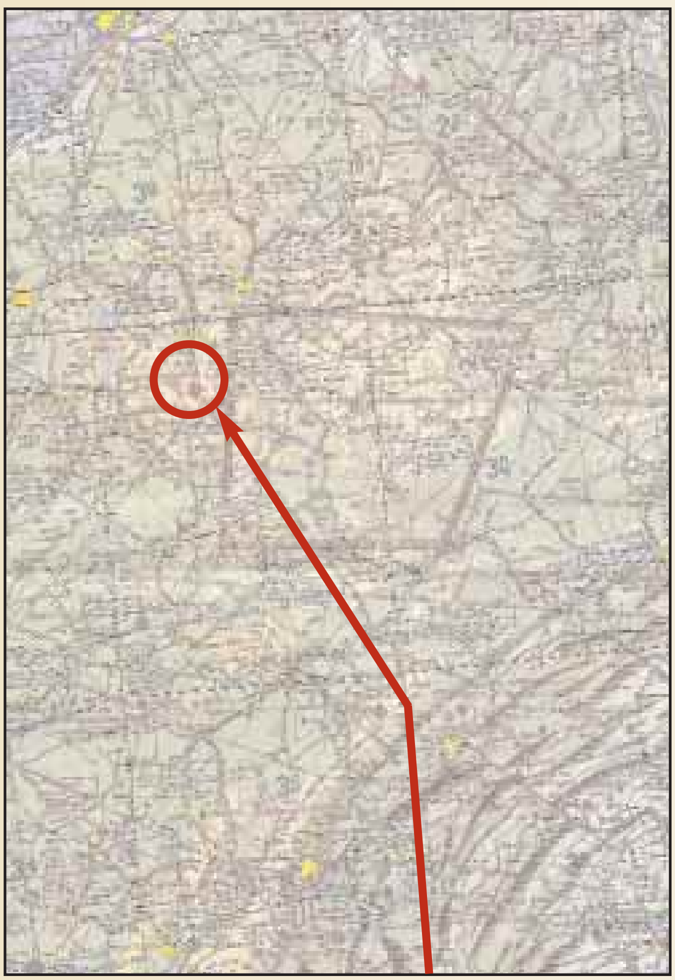


Fig. 17 WAC Chart: Route of Flight

Fig. 18

Fig. 19

CONVECTIVE SIGMET 45E
VALID UNTIL1955Z
NY PA
FROM 50E BUF-30S BUF-40E ERI
LINE SEV TS 15 NM WIDE MOV FROM 25015KT. TOPS ABV FL450
HAIL TO 1 IN…WIND GUSTS TO 50 KT POSS.

OUTLOOK VALID 151955-152355
AREA1…FROM MSL-ILM-1203 EYW-EYW-160S CEW-CEW-MSL
AMS HEATING WILL RESULT IN FURTHER DESTBLZ RMNDR OF DAYTIME
HRS. EXP OCNL LNS/CLUTERS TO REQ WST ISSUANCES THRU SNST.

AREA2…FROM BML-PVD-ILM-MSL-CLE-BML
SFC FNT EXTNDS THRU N CNTRL OH-ERN KY-MID TN-CNTRL AR WWD. AMS
ALG/AHD OF THE BNDRY IS ALREADY UNSTBL AND WILL FURTHER

METAR KIAD 151751Z VRB05KT 5SM HZ SCT060 34/19 A2996
METAR KBFD 151753Z AUTO 20006KT 4SM HZ SCT038 28/20 A3000
METAR KDCA 151751Z 15005KT 5SM HZ SCT050 36/21 A2995
METAR KMRB 151750Z VRB05KT 5SM HZ SCT060 34/20 A2999
METAR KHGR 151745Z 23005KT 3SM HZ SCT120 34/20 A2999
METAR KAOO 151750Z 22006KT 4SM HZ BKN050 33/20 A3003
METAR KUNV 151749Z 25007KT 3SM HZ BKN045 32/21 A2999
PSB SA—DATA MISSING
OYM SA—DATA MISSING

BOSC FA 151745
SYNOPSIS AND VFR CLDS/WX
SYNOPSIS VALID UNTIL 161200
CLDS/WX VALID UNTIL 160600…OTLK VALID 160600-161200
ME NH VT MA RI CT NY LO NJ PA OH LE WV MD DC DE VA AND CSTL WTRS

SEE AIRMET SIERRA FOR IFR CONDS AND MTN OBSCN.
TS IMPLY SEV OR GTR TURB SEV ICE LLWS AND IFR CONDS.
NON MSL HGTS DENOTED BY AGL OR CIG

SYNOPSIS…AT 18Z CDFNT WWD FM ATLC TO NY CSTL WTRS THN NWWD TO PVD WITH WRMFNT PVD-SLK LN AND CDFNT NR CLE-CVG LN. BY 12Z WRMFNT WL XTND NWWD FM ATLC OVR PWM-YQB LN WITH CDFNT SLK-AVP-TRI LN. TROF BDR-GSO LN AT 18Z WL BE NR SBY-RWI LN BY 12Z.
..KERR/AVIATION WEATHER CENTER/MKC..

PA NRN AND WRN PTNS…BKN040-060 TOP 120 WITH VIS 3-5SM HZ AND
SCT +TRSA. TS TOPS TO FL380. 01Z SCT120 VIS 3-5SM HZ.
OTLK…MVFR CIG BR HZ.
SERN PA…SCT050. 03Z SCT CI OCNL VIS 3-5SM BR. OTLK…MVFR HZ

MD DC DE VA
SCT-BKN050-070 TOP 150 WITH OCNL VIS 3-5SM HZ. WDLY SCT TSRA AFT 20Z. TS TOPS TO FL420. 03Z SCT-BKN050-070 TOP 150. OTLK…MVFR HZ.

TAF KIAD 151720Z 151818 VRB050KT 5SM HZ FEW060
FM0100 VRB03KT 4SM HZ SKC TEMPO 0713 1 _SM BR
FM1500 32006KT 5SM HZ SCT050
TAF KBFD 151730Z 151818 22006KT 5SM HZ. SCT027 TEMPO 1923 3SM
TSRA BKN025CB OVC100
FM 0200 27006KT 3SM BR SCT 025
FM1200 29008KT P6SM SKC
TAF KDCA 151720Z 151818 15004KT 5SM HZ FEW 050
FM0200 VRB04KT 4SM HZ SCT050
TAF KMRB 151720Z 151818 VRB05KT 5SM HZ SCT 060 TEMPO 1923
BKN060
FM0100 VRB03KT 4SM HZ SKC TEMPO 0713 2SM BR
FM1500 28006KT 5SM HZ SCT050
TAF KAOO 151730Z 151818 24005KT 4SM HZ BKN040 TEMPO 1822
3SM -TRSA BKN030CB
FM0100 VRB05KT 3SM BR SCT040
FM1400 29007KT P6SM SCT040
TAF KUNV 151730Z 151818 270077KT 4SM HZ BKN040 TEMPO 1822 3SM
-TRSA BKN030CB
FM0100 VRB05KT 3SM BR SCT040
FM1400 29007KT P6SM SCT040

Weather Briefing Flow Chart

Getting the "Big Picture"

- Media
  - TV weather, Weather Channel, local news
  - Newspaper weather pages
- Transcribed Radio Broadcasts
  - NOAA Weather Radio
  - ASOS, AWOS, ATIS broadcast or telephone
- Recorded Telephone Weather
  - Pilots Automatic Telephone Answering Service (PATWAS)
  - Flight Service briefing 1-800-992-7433 (1-800-WX BRIEF)

The Preflight Weather Briefing

- In Person
  - Flight Service
  - NWS Weather Office
- By Telephone
  - Flight Service
    - Direct User Access Terminal (DUAT)
    - NWS Weather Office
  - Items to Cover
    - Weather Depiction Chart, Analyses and Forecasts
    - Area Forecasts
    - Hazardous Weather
      - Severe Weather Outlooks, Watches, and Warnings
      - Sigmets/Airmets
    - TAFs (Terminal Forecasts)
    - METARs (Sequence Reports)
    - Radar Summary Charts
    - Radar Observations
      - Individual Radar Sites and Composites
    - Freezing Level
    - Winds and Temperatures Aloft Forecast
    - Pireps
    - Satellite Pictures

The "No-Go" Decision

- If you don't go, your alternatives are:
  - Leave earlier or later than originally planned
    - Get additional weather information
    - Revisit the "Go/No-Go" decision
  - Cancel

"No-Go"

The "Go" or "No-Go" Decision

- Consider the following:
  - Current and forecast weather
  - The capability of your aircraft
  - Your level of experience and proficiency
  - Your physical and mental state
- Don't allow mission pressures (get-home-itis) to impair your judgment

"Go"

The "Go" Decision

- If you make the "Go" decision, you're still faced with a continuing decision-making process; i.e., continue, land short of your destination, or divert
- In-flight Weather Sources
  - EFAS - (Flight Watch) 122.0 Mhz
  - Flight Service
  - Air Traffic Control
  - Transcribed radio broadcasts
    - TWEBs (Transcribed Weather Broadcasts)
    - HIWAS (Hazardous In-flight Weather Advisory Service)
    - ASOS, AWOS, ATIS

Safe Pilots. Safe Skies.

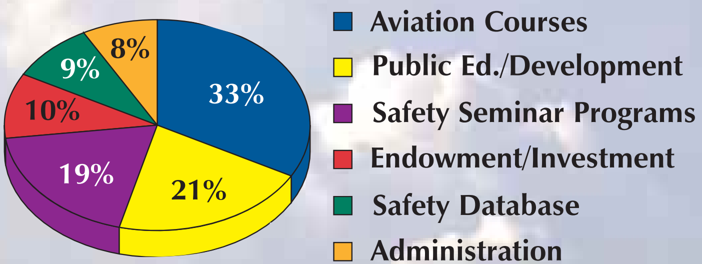
AOPA Air Safety Foundation

Chartered in 1950, the AOPA Air Safety Foundation is the nation's largest nonprofit organization providing aviation safety education and programs to the general aviation community.

The mission of the Foundation is to save lives and promote accident prevention through pilot education. To serve the nation's 622,000 general aviation pilots, the Foundation:

- Maintains a national aviation safety database that contains NTSB reports on general aviation accidents since 1982.
- Performs accident-trend research to focus Foundation resources on the principal causes of accidents.
- Produces and disseminates aviation education and training videos, pamphlets, books, and newsletters to increase safety awareness.
- Conducts specialized aviation training courses for students and instructors.
- Provides free public-service aviation safety seminars.

Where the money goes—



Gifts to the Foundation qualify for the federal charitable deduction and take many forms, including cash, appreciated stock, insurance, pledges, real estate, and personal property.

An annual report is readily available by writing or calling the Foundation at:

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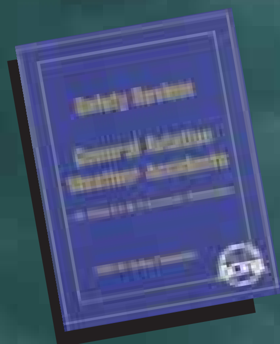

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