Aviation Weather Recommendations and Procedures Knowledge Base

This document outlines standard procedures and recommendations for pilots based on various weather conditions and information typically found in METARs, TAFs, and other aviation weather products. These recommendations are synthesized from common aviation best practices and general knowledge of FAA guidelines, advisory circulars, and regulations. **Always verify with official and current publications.**

Visibility Conditions

Low Visibility (e.g., Below 3 SM but potentially above IFR approach minimums)

Severity: Moderate to High

Recommendations:

- Ensure aircraft is equipped and certified for IFR flight if there's any doubt about maintaining VFR.
- Verify your instrument currency and proficiency if IFR flight is anticipated or becomes necessary.
- File an IFR flight plan if conditions are marginal or if transitioning through areas where IFR is likely.
- Review instrument approach procedures (IAPs) for destination and suitable alternate airports.
- Have at least one designated alternate airport with forecast conditions significantly better than destination.
- Consider delaying departure if VFR-only rated and conditions are marginal or deteriorating, or if not instrument current and IFR conditions are possible.
- Brief passengers on potential delays, diversions, or encountering areas of reduced visibility.
- Thoroughly analyze METARs and TAFs for trends in visibility. Note obscurations like Mist (BR), Haze (HZ), Smoke (FU).
- Be aware of terrain and obstacles, especially if flying at lower altitudes due to visibility.

| Regulatory References (Illustrative - Always Verify) |

- 14 CFR 91.103 - Preflight Action
- 14 CFR 91.155 - Basic VFR weather minimums
- 14 CFR 91.169 - IFR flight plan: Information required
- AIM Chapter 7, Section 1 - Meteorology (General Information & Weather Product Interpretation)
- AIM Chapter 5, Section 1 - Preflight Preparation

Very Low Visibility (e.g., Below 1 SM or below IFR approach/takeoff minimums)

Severity: High

Recommendations:

- IFR flight is mandatory.
- Ensure availability of suitable alternate airports meeting IFR alternate criteria.
- Review approach minimums (DA/DH/MDA, visibility) for planned approaches very carefully.
- Review and adhere to published takeoff minimums for the departure airport.
- Consider delaying or canceling flight until conditions improve significantly.
- Verify aircraft is equipped with appropriate and operational avionics for low visibility approaches (e.g., ILS, WAAS LPV).
- Review missed approach procedures thoroughly for all planned IAPs.
- Expect potential ATC delays, holdings, and routing changes.
- Plan for increased fuel reserves to accommodate potential delays and diversions.
- Be familiar with Runway Visual Range (RVR) reports if available and applicable.
- Pay close attention to Fog (FG), Widespread Dust (DU), or other severe obscurations in METAR/TAF.

| Regulatory References (Illustrative - Always Verify) |

- 14 CFR 91.175 - Takeoff and landing under IFR
- 14 CFR 91.169 - IFR flight plan: Information required (Alternate airport requirements)
- AIM Chapter 5, Section 4 - Instrument Flight Rules (IFR) Procedures
- Instrument Flying Handbook (FAA-H-8083-15)

Ceiling Conditions

Low Ceiling (e.g., Below 1,000 ft AGL but potentially above IFR approach minimums)

Severity: Moderate

Recommendations:

- File and fly IFR if ceilings are at or below personal minimums or approach VFR with extreme caution.
- Review approach plates (IAPs) for all potential airports on route, including destination and alternates.
- Consider alternate airports with significantly higher forecast ceilings.
- Be prepared for missed approaches and have a clear plan for diversion if necessary.
- Brief passengers on potential diversion due to low ceilings.
- Ensure functioning panel and cockpit lighting, especially for potential instrument flight.
- Analyze METAR/TAF for ceiling trends (e.g., BKN008, OVC005).
- Consider terrain elevation along the route in relation to the ceiling height.

| Regulatory References (Illustrative - Always Verify) |

- 14 CFR 91.155 - Basic VFR weather minimums
- AIM Chapter 7, Section 1 - Meteorology (Ceiling and Visibility Interpretation)
- AIM Chapter 5, Section 2 - Flight Plan Procedures

Very Low Ceiling (e.g., Below 500 ft AGL or below IFR approach minimums)

Severity: High

Recommendations:

- IFR flight is mandatory.
- Strongly consider delaying flight if possible until ceilings improve.
- Check approach minimums (DA/DH/MDA) meticulously against current and forecast conditions at destination and alternates.
- Review takeoff minimums and departure procedures, especially if obstacles are a factor.
- Prepare for possible significant delays, holding, or diversions.
- Ensure aircraft is equipped for precision approaches (e.g., ILS, LPV) if available and lower minimums are required.
- Calculate fuel requirements with additional reserves for potential missed approaches and extended flight time.
- Pay close attention to TAFs indicating low ceilings (e.g., OVC003, VV002 - Vertical Visibility).

| Regulatory References (Illustrative - Always Verify) |

- 14 CFR 91.175 - Takeoff and landing under IFR
- 14 CFR 91.177 - Minimum altitudes for IFR operations
- Instrument Flying Handbook (FAA-H-8083-15)

Wind Conditions

Strong Winds (e.g., Sustained winds above 25 kt, or as per aircraft POH limitations)

Severity: Moderate (can be High depending on aircraft type and gusts)

Recommendations:

- Check aircraft Pilot Operating Handbook (POH) for maximum demonstrated crosswind and tailwind limitations. Do not exceed.
- Use the most favorable runway for takeoff and landing, considering wind direction and speed.
- Review and apply proper crosswind landing and takeoff techniques.
- Anticipate turbulence, especially in mountainous areas or near obstructions.
- Maintain appropriate approach speeds, potentially adding a safety margin for gusts as per POH or best practices (but avoid excessive speed).
- Anticipate potential wind shear on final approach, especially with frontal passages or convective activity.
- Consider alternate airports with more favorable wind conditions if current winds exceed limits or your comfort level.
- Check METARs for wind direction, speed, and gusts (e.g., 27025G35KT).

| Regulatory References (Illustrative - Always Verify) |

- Aircraft POH/AFM - Operating Limitations Section
- AIM Chapter 7, Section 5 - Wind (General wind effects, wind shear)
- AC 00-45H - Aviation Weather Services (Understanding wind reports)
- PHAK - Chapters on Flight Maneuvers and Aerodynamics

Wind Gusts (e.g., 10-15+ kt differential between peak and sustained wind)

Severity: Moderate to High

Recommendations:

- Consider adding half the gust factor to your normal approach speed (consult POH/reliable sources for specific aircraft recommendations).
- Use partial flaps for landing if recommended for better control in gusty conditions (consult POH).
- Be prepared for a go-around if handling becomes difficult or the approach becomes unstabilized.
- Anticipate the possibility of mechanical turbulence, especially near the ground or around terrain/buildings.
- Use positive control inputs; avoid over-controlling, especially in the flare.
- Ensure all items in the cockpit and cabin are secured.
- Plan for potentially longer landing distances.
- Note gust reports in METARs (e.g., G25KT).

| Regulatory References (Illustrative - Always Verify) |

- Aircraft POH/AFM - Procedures for gusty conditions
- AIM Chapter 7, Section 5-8 - Wind Shear
- PHAK - Chapters on Flight Maneuvers

Convective Activity

Thunderstorms (Observed or Forecast, including TS in METAR/TAF)

Severity: High to Extreme

Recommendations:

- Avoid thunderstorms by at least 20 nautical miles. More if severe or fast-moving.
- Never attempt to fly under a thunderstorm, even if it looks clear underneath (risk of downdrafts and hail).
- Request routing changes from ATC early to avoid cells. Do not try to navigate visually through a line of thunderstorms.
- Use onboard weather radar if available and you are properly trained in its interpretation and use.
- Monitor NEXRAD (via datalink if available) or listen to ATC for updates on storm movement and intensity.
- Be prepared for turbulence, hail, icing, lightning, wind shear, and rapid changes in ceiling/visibility near thunderstorms.
- Check for potential airport closures or restrictions along the route due to convective activity.
- Have alternate landing sites identified well away from thunderstorm activity.
- Understand METAR/TAF codes: TS (Thunderstorm), VCTS (Thunderstorm in Vicinity), CB (Cumulonimbus cloud).

| Regulatory References (Illustrative - Always Verify) |

- AC 00-24C - Thunderstorms
- AIM Chapter 7, Section 1-26 to 1-28 - Thunderstorms and Associated Phenomena
- PHAK - Chapter on Thunderstorms

Embedded Thunderstorms (Thunderstorms obscured by other cloud layers)

Severity: Extreme

Recommendations:

- Strongly consider delaying or canceling flight. Embedded thunderstorms are particularly hazardous as they are not visible.
- If airborne and encountering unexpected convective activity, request ATC assistance for deviation immediately.
- Consider diverting to the nearest suitable airport if embedded activity is suspected or encountered.
- Avoid flight in clouds near forecast or reported thunderstorm activity, especially if radar is not available or cells are widespread.
- Request frequent weather updates from ATC or Flight Watch (if available).
- If equipped, use onboard weather radar at appropriate tilt angles to try and detect cells within cloud layers.
- Monitor engine parameters closely if encountering precipitation, as heavy rain or hail can affect engine performance.

| Regulatory References (Illustrative - Always Verify) |

- AC 00-24C - Thunderstorms
- AIM Chapter 7, Section 1-26 to 1-28 - Thunderstorms and Associated Phenomena
- Instrument Flying Handbook (Importance of weather radar and avoidance)

Icing Conditions

Potential Icing Conditions (Visible moisture and temperatures near or below freezing)

Severity: Moderate to High (depending on intensity)

Recommendations:

- Verify aircraft is certified for flight in known icing (FIKI) conditions if intentional flight into such conditions is planned. Most GA aircraft are not.
- Check for PIREPs of icing along the planned route and altitude.
- Plan route and altitude to minimize time in potential icing conditions. Avoid prolonged flight in areas where temperatures are 0°C to -20°C in visible moisture.
- Plan altitudes to avoid temperature ranges conducive to icing, or to be in temperatures well below freezing (where moisture is already frozen) or well above.
- Be aware of escape routes (descend to warmer air, climb to colder/drier air, or turn back).
- Ensure all anti-ice/de-ice equipment is operational and understand its limitations.
- Brief passengers on potential for diversion or early termination of flight if icing is encountered.
- Monitor aircraft performance and visual cues for signs of ice accumulation (e.g., on wing leading edges, prop spinner, windshield).
- Understand METAR/TAF codes for freezing precipitation and conditions conducive to icing.

| Regulatory References (Illustrative - Always Verify) |

- 14 CFR 91.527 – Operating in icing conditions (primarily for larger/transport category aircraft but good info)
- AC 91-74B - Pilot Guide: Flight in Icing Conditions
- AIM Chapter 7, Section 1-19 to 1-21 - Icing
- Aircraft POH/AFM - Icing Section, Limitations, and Procedures

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Freezing Precipitation (Freezing Rain - FZRA, Freezing Drizzle - FZDZ)

Severity: Extreme

Recommendations:

- Avoid flight in freezing rain or freezing drizzle unless aircraft is specifically certified and equipped for these severe conditions (very few aircraft are). These conditions cause rapid and severe ice accumulation.
- Consider postponing flight until conditions improve. Do not attempt to fly "through" a small area of reported FZRA/FZDZ.
- If encountered, request immediate altitude or route change to exit conditions. This is an emergency situation.
- Consider immediate diversion to the nearest suitable airport if icing begins to affect performance. Declare an emergency if necessary.
- Report icing conditions to ATC immediately to warn other aircraft.
- Use full anti-ice/de-ice capability according to AFM/POH, but understand it may be overwhelmed.
- Monitor for airspeed decay, loss of lift, increased stall speed, and increased power requirements.

| Regulatory References (Illustrative - Always Verify) |

- AC 91-74B - Pilot Guide: Flight in Icing Conditions
- AIM Chapter 7, Section 1-20 - Freezing Precipitation
- Aircraft POH/AFM - Severe Icing Procedures (if any)

Turbulence

Moderate Turbulence

Severity: Moderate

Recommendations:

- Reduce speed to maneuvering speed (Va) or turbulence penetration speed (Vb/Vno as specified in POH) to prevent overstressing the airframe.
- Ensure seat belts (and shoulder harnesses if equipped) are fastened securely for all occupants. Secure loose items in the cockpit and cabin.
- Consider an altitude change to find smoother air. Often, a few thousand feet can make a difference.
- Report turbulence to ATC (location, altitude, intensity, type - e.g., chop, clear air turbulence CAT).
- Use autopilot with caution; be prepared to disconnect if it struggles to maintain control or makes abrupt inputs.
- Brief passengers before encountering expected turbulence to reduce anxiety.
- Avoid abrupt control inputs. Make smooth, deliberate corrections.

| Regulatory References (Illustrative - Always Verify) |

- AIM Chapter 7, Section 1-23 - Reporting Turbulence
- AC 00-30C - Clear Air Turbulence Avoidance
- Aircraft POH/AFM - Operating in Turbulence

Severe Turbulence

Severity: High

Recommendations:

- Immediately reduce to turbulence penetration speed (Vb/Vno or Va if Vb/Vno not specified).
- Attempt to maintain wings level and accept variations in altitude. Do not "chase" altitude. Use attitude indicator as primary reference.
- Avoid unnecessary maneuvering. Make only small, smooth control inputs to maintain attitude.
- Request ATC assistance for an altitude or route change to exit the area of severe turbulence.
- Discontinue use of autopilot.
- Ensure maximum passenger safety: seats upright, belts securely fastened, advise passengers to remain still.
- Report severity, location, and altitude of turbulence to ATC as soon as practicable.
- If terrain permits, consider descending to lower altitudes where turbulence might be less, but be mindful of terrain clearance.

| Regulatory References (Illustrative - Always Verify) |

- AIM Chapter 7, Section 1-23 - Reporting Turbulence
- AC 00-30C - Clear Air Turbulence Avoidance
- Aircraft POH/AFM - Severe Turbulence Penetration Procedures

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Mountain Weather

Mountain Obscuration (Mountains obscured by clouds, precipitation, or haze)

Severity: Moderate to High

Recommendations:

- File and fly IFR where possible, utilizing published airways and instrument procedures.
- If VFR, maintain VFR cloud clearance minimums appropriate for the airspace and altitude (14 CFR 91.155). This is critical.
- Plan routes through mountain passes at least 2,000 ft below cloud bases and ensure passes are clear. Do not fly "up a blind canyon."
- Be aware of rising terrain and potential for cloud layer convergence, which can rapidly reduce visibility and ceiling.
- Consider delaying flight if mountain tops or passes are not clearly visible or are forecast to be obscured.
- Have escape routes planned to lower, flatter terrain if conditions deteriorate.
- Be alert for rapidly changing conditions, common in mountainous areas.
- Monitor wind direction – strongest turbulence and downdrafts often occur on the lee side of mountains.

| Regulatory References (Illustrative - Always Verify) |

- AIM Chapter 7, Section 5-4 - Mountain Flying
- AIM Chapter 7, Section 5-6 - Mountain Flying Hazards (including obscuration)
- AC 91-15 - Mountain Flying (Older, but principles may still apply - check for newer ACs)

Mountain Wave Activity (Often indicated by lenticular clouds, rotor clouds, cap clouds)

Severity: High to Extreme

Recommendations:

- Check AIRMETs (WA), SIGMETs (WS), and PIREPs for reports of mountain wave activity and associated turbulence.
- Look for visual signs: lenticular (lens-shaped) clouds, rotor clouds (roll clouds, often turbulent, below lenticulars), cap clouds over peaks.
- Expect severe to extreme turbulence, especially on the lee side of mountains and in/below rotor zones.
- Maintain higher airspeed for better aircraft control, but do not exceed turbulence penetration speed.
- Avoid flying in or near rotor zones, which can be invisible and contain extreme turbulence.
- Consider delaying flight or choosing a different route to avoid areas of strong mountain wave.
- Be prepared for rapid and significant altitude excursions (both up and downdrafts). Downdrafts can exceed aircraft climb capability.
- File a flight plan and maintain communication with ATC. Report conditions.

| Regulatory References (Illustrative - Always Verify) |

- AIM Chapter 7, Section 5-6 - Mountain Wave
- AC 00-30C - Clear Air Turbulence (can be associated with mountain waves)
- PHAK - Chapter on Mountain Flying

Fog and Low Visibility Phenomena

Fog Formation (Conditions conducive to fog, e.g., small temp/dew point spread)

Severity: Moderate to High (potential for rapid deterioration)

Recommendations:

- Check temperature/dew point spread at departure, destination, and alternates. A spread of 3°C (5°F) or less, especially with light winds, indicates high potential for fog.
- Be alert for TAFs forecasting fog (FG), mist (BR), or conditions becoming marginal (TEMPO, BECMG lines).
- Review TAF for timing of potential fog formation (e.g., overnight, early morning).
- Plan alternate airports in different weather patterns or at locations less prone to fog.
- Consider delaying departure until after fog is forecast to burn off or dissipate.
- File an IFR flight plan if IFR certified and current, especially if fog is possible.
- Review instrument approach procedures for destination and alternates.
- Plan extra fuel for potential holds or diversions if fog forms unexpectedly.

| Regulatory References (Illustrative - Always Verify) |

- AIM Chapter 7, Section 1-10 - Weather Observing Programs (Understanding how fog is reported)
- PHAK - Chapter on Weather Theory (Fog formation types)
- AC 00-45H - Aviation Weather Services

Dense Fog (Visibility significantly restricted, e.g., 1/4 SM or less)

Severity: High

Recommendations:

- Strongly consider delaying flight until fog dissipates. Operations in dense fog are high risk.
- Verify approach minimums against current visibility (METAR/RVR). Do not attempt an approach if reported visibility is below minimums.
- Ensure aircraft is equipped for the lowest approach category available and that you are proficient.
- Have multiple alternate airports with significantly better conditions; one alternate may not be enough if fog is widespread.
- Check surrounding airports for their conditions to understand the extent of the fog.
- Consider fuel requirements for extended holds or diversions to distant alternates.
- Be prepared for rapid changes in visibility during approach; conditions can fluctuate quickly.
- Use all available airport lighting (e.g., HIRL, TDZL, CL) and approach lighting systems (e.g., ALSF-1/2).

| Regulatory References (Illustrative - Always Verify) |

- 14 CFR 91.175 - Takeoff and landing under IFR
- AIM Chapter 7, Section 5-7 - Instrument approach procedures
- AIM Chapter 2, Section 1 - Airport Lighting Aids

General Flight Planning Recommendations

Pre-Flight Weather Analysis

- Obtain a complete weather briefing from an approved source (e.g., 1-800-WX-BRIEF, aviationweather.gov, approved EFBs).
- Review METARs and TAFs for departure, destination, alternates, and en route conditions.
- Check AIRMETs (Sierra for IFR/mountain obscuration, Tango for turbulence, Zulu for icing), SIGMETs (severe weather), and Convective SIGMETs.
- Review winds and temperatures aloft forecasts for flight level optimization and performance calculations.
- Check PIREPs for actual conditions being reported by other pilots.
- Review area forecasts for a big-picture understanding of weather systems.
- Ensure understanding of all weather products, symbols, and abbreviations.
- Consider seasonal weather patterns and typical local weather phenomena in planning.

Weather Minimums Selection

- Base personal minimums on your experience, currency (recent flight hours in type and conditions), and aircraft capability/equipment. Do not solely rely on legal minimums.
- Add buffers to legal minimums, especially for less experienced pilots or in unfamiliar conditions.
- Consider time of day (day/night) and lighting conditions. Night operations and low-light conditions generally warrant higher personal minimums.
- Adjust minimums for unfamiliar airports or terrain. Add a greater margin of safety.
- Reconsider or delay flight if conditions are at or below your established personal minimums.
- Write down your personal minimums and refer to them during planning to avoid emotional decision-making.
- Consider passenger comfort and experience when setting minimums for a particular flight.

Alternate Airport Selection

- Choose alternates based on forecast conditions at your estimated time of arrival (ETA) at the alternate.
- Consider fuel requirements to reach the alternate *after* a missed approach at the destination, plus required reserves (e.g., 45 minutes for IFR).
- Verify instrument approach procedures are available and suitable for your aircraft and equipment at alternates.
- Check NOTAMs for potential runway closures, navaid outages, or other facility limitations at alternates.
- Consider availability of services (fuel, maintenance, transportation) at alternate airports.
- When possible, select alternates in different weather patterns or geographically diverse locations to reduce the chance of all being below minimums.
- Verify navigation equipment required for approaches at alternates is operational in your aircraft.

Go/No-Go Decision Making

- Create a personal decision tree or use a structured checklist (e.g., PAVE - Pilot, Aircraft, enVironment, External pressures) for consistent go/no-go decisions.
- Assess pilot factors: rest, currency, health, stress, IMSAFE checklist.
- Assess aircraft factors: equipment status (required vs. optional), maintenance history, fuel reserves.
- Assess environmental factors: current and forecast weather, terrain, time of day/night, airport conditions.
- Consider the importance of the trip versus the weather risk. Avoid "get-there-itis."
- Establish clear decision points for potential diversions or a return to departure/nearby airport if conditions en route deteriorate.
- Brief passengers on the possibility of delay, cancellation, or diversion.
- Maintain a "Plan B" for cancellation or significant delay. Never feel pressured to complete a flight if conditions are unsafe.