Turbulence Intensity	Aircraft Reaction to Turbulence	Reaction Inside Aircraft
LIGHT TURBULENCE	Momentarily causes slight, erratic changes in altitude and/or attitude (pitch, roll, yaw).	Occupants may feel a slight strain against seat belts or shoulder straps. Unsecured objects may be displaced slightly
LIGHT CHOP	Slight, rapid and somewhat rhythmic bumpiness, without appreciable changes in altitude or attitude.	
MODERATE (*see below*)		
MODERATE TURBULENCE	Similar to light turbulence, but of greater intensity. Altitude and/or attitude changes occur, but aircraft remains in positive control at all times. It usually causes variations in indicated airspeed.	Occupants feel definite strains against seat belts or shoulder straps. Unsecured objects are dislodged.
MODERATE CHOP	Similar to light chop but of greater intensity; causes rapid bumps or jolts without appreciable changes in aircraft altitude or attitude.	
SEVERE	Large, abrupt changes in altitude and/or attitude; large variations in indicated airspeed; aircraft may be momentarily out of control.	Occupants are forced violently against seat belts or shoulder straps. Unsecured objects are tossed about.
EXTREME	Aircraft is violently tossed about and is practically impossible to control; may cause structural damage.	

Thunderstorms imply severe or greater turbulence

ATC Weather Radar Echo Terms & Definitions

ATC Weather Radar Terms	dBZ Reflectivity
LIGHT	18 – 29 dBZ
MODERATE	30 – 40 dBZ
HEAVY	>40 – 50 dBZ
EXTREME	> 50 dBZ

ATC describes; the PIC decides!

- It is not ATC's job to keep you out of severe weather.
  - Do you need to deviate from your route?
  - Do you need to deviate from your altitude?

- Ask for information….*never* make assumptions.
- Make sure you understand what services ATC is providing.
- Pipe up with PIREPS—report your flight conditions to ATC.
- Thunderstorms always imply severe or greater turbulence.

Safety Tips for IFR Flight Near Known or Forecast Convective Activity

Flight in IMC Near Known/Forecast Convective Activity:

- Tighten seat belts and shoulder harnesses (all occupants).
- Secure all loose items.
- Turn up cockpit lighting to fullest intensity.
- In moderate or greater turbulence, reduce power to establish and maintain V_A.
- Listen up for PIREPs.
- Ask ATC if they see any areas of moderate or greater precipitation along your route of flight.

Avoiding Convective / Thunderstorm Encounters

<u>Preflight</u>

- Ask what kind of weather system you might encounter.
- Are conditions ripe for squall lines, area thunderstorms, embedded thunderstorms?

<u>Inflight</u>

- Seek updates from AFSS Flight Watch.
- Listen to chatter on the ATC frequency. Are there PIREPs? Requests to deviate or divert?
- Ask ATC if there are any areas of moderate or greater precipitation along your route of flight.
- Decide early whether to change course, land early, or fly to an alternate. Don't wait until the last minute!

Inadvertent Thunderstorm Encounter—What to do?

- Concentrate on keeping the aircraft in a level attitude.
    - Allow the airspeed to fluctuate.
    - Allow the altitude to fluctuate—DO NOT attempt to maintain altitude!
- If equipped with an autopilot, disengage the altitude hold and constant speed modes.
- Fly straight ahead—avoid turning until you have exited the thunderstorm.
- Turn on pitot heat, carb heat, and any anti-icing or deicing equipment on board.

Radar Limitations

- En Route facilities (centers) cannot display LIGHT precipitation.
- Some approach control facilities cannot provide precipitation intensities. In these cases, ATC will state: "intensity unknown."
- ATC radar cannot detect clouds.
- ATC can tell you where some areas of precipitation are, but cannot tell you whether they consist of rain or hail.

Controller Phraseology Examples

Examples:

- "Extreme precipitation between eleven o'clock and one o'clock, one zero miles, moving east at two zero knots, tops flight level three niner zero."
- "Heavy precipitation between ten o'clock and two o'clock, one five miles. Precipitation area is two five miles in diameter."
- "Moderate precipitation between ten o'clock and two o'clock, one five miles. Precipitation area is two five miles in diameter."
- "Light to moderate precipitation between ten o'clock and two o'clock, one five miles. Precipitation area is two five miles in diameter."
- "Precipitation area between one o'clock and three o'clock, one five miles, intensity unknown."

Suggested Phraseology for Pilots

Examples for requesting weather deviation:

- "Nashville Approach, N123A, request 20 degree deviation right of course."
- "Detroit Approach, N123A, request left deviation to avoid buildups."
- "Los Angeles Center, N123A, request approval to deviate around weather for next 10 miles."