Section 7
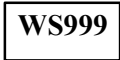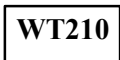## RADAR SUMMARY CHART

A radar summary chart (Figure 7-1) is a computer-generated graphical display of a collection of automated radar weather reports (SDs). This chart displays areas of precipitation as well as information about type, intensity, configuration, coverage, echo top, and cell movement of precipitation. Severe weather watches are plotted if they are in effect when the chart is valid. The chart is available hourly with a valid time of H+35; i.e., 35 minutes past each hour. Figure 7-2 depicts the WSR-88D radar network from which the radar summary chart is developed.

ECHO (PRECIPITATION) TYPE

The types of precipitation are indicated on the chart by symbols located adjacent to precipitation areas on the chart. Table 7-1 lists the symbols used to denote types of precipitation. Note that these symbols do not reflect the change to METAR. Since the input data for the radar summary chart are the automated SDs, the type of precipitation is determined by computer models and is limited to the ones listed in Table 7-1.

Table 7-1 Key to Radar Chart

<u>**Symbols Used on Chart**</u>

Symbol	Meaning	Symbol	Meaning
R	Rain	↗ 35	Cell movement to the northeast at 35 knots
RW	Rain shower		
S	Snow	LM	Little movement
SW	Snow shower	WS999	Severe thunderstorm watch number 999
T	Thunderstorm	WT210	Tornado watch number 210
NA	Not available		
NE	No echoes	SLD	8/10 or greater coverage in a line
OM	Out for maintenance		Line of echoes

INTENSITY

The intensity is obtained from the amount of energy returned to the radar from the target and is indicated on the chart by contours. Six precipitation intensity levels are reduced into three contour intervals as indicated in Table 7-2. In Figure 7-1, over central Montana is an area of precipitation depicted by one contour. The intensity of the precipitation area would be light to possibly moderate. Whether there is moderate precipitation in the area cannot be determined. However, what can be said is that the maximum intensity is definitely below heavy. When determining intensity levels from this chart, it is recommended that the maximum possible intensity be used. To determine the actual maximum intensity level, the SD for that time period should be examined. It should also be noted that intensity is coded for frozen precipitation (i.e., snow or snow showers). This is due to the fact that the WSR-88D is much more powerful and sensitive than previous radars. Finally, it is very important to remember that the intensity trend is no longer coded on the radar summary chart.

Table 7-2 Precipitation Intensities

Digit	Precipitation Intensity	Rainfall Rate in./hr. Stratiform	Rainfall Rate in./hr. Convective
1	Light	Less than 0.1	Less than 0.2
2	Moderate	0.1-0.5	0.2-1.1
3	Heavy	0.5-1.0	1.1-2.2
4	Very heavy	1.0-2.0	2.2-4.5
5	Intense	2.0-5.0	4.5-7.1
6	Extreme	More than 5.0	More than 7.1

450 Highest precipitation top in area in hundreds of feet MSL (45,000 feet MSL).
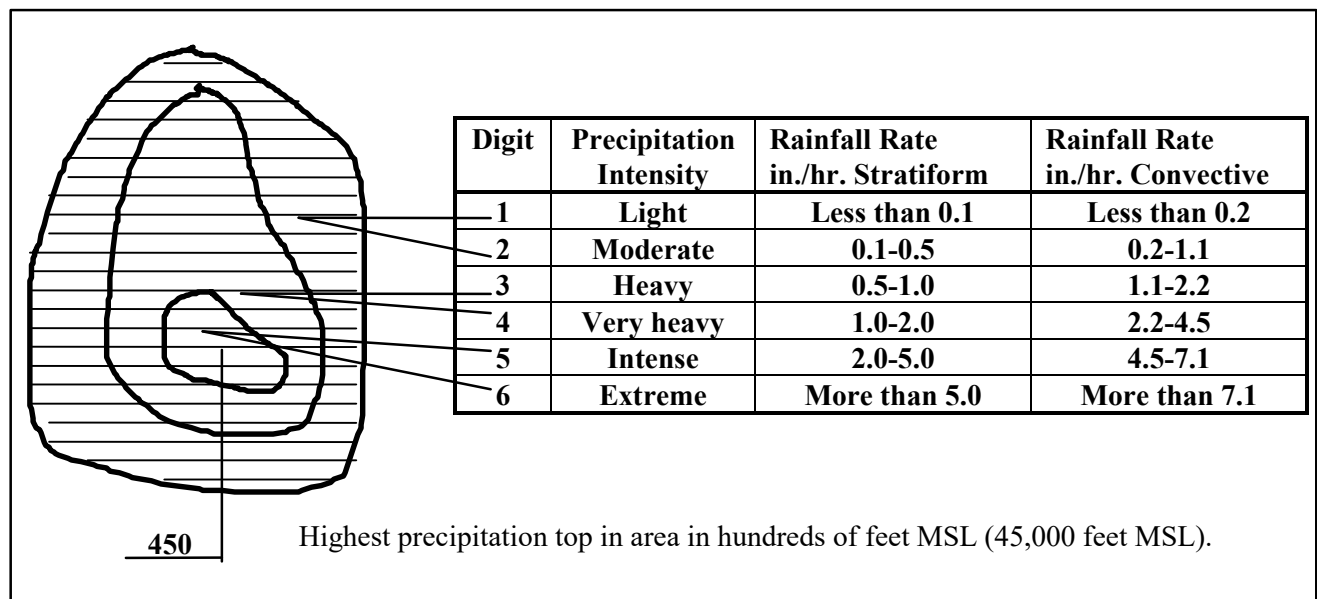
ECHO CONFIGURATION AND COVERAGE

The configuration is the arrangement of echoes. There are three designated arrangements: a LINE of echoes, an AREA of echoes, and an isolated CELL. (See Radar Weather Reports in Section 3 for definitions of the three configurations.)

Coverage is simply the area covered by echoes. All the hatched area inside the contours on the chart is considered to be covered by echoes. When the echoes are reported as a LINE, a line will be drawn through them on the chart. Where there is 8/10 coverage or more, the line is labeled as solid (SLD) at both ends. In the absence of this label, it can be assumed that there is less than 8/10 coverage. For example, in Figure 7-1, there is a solid line of thunderstorms with intense to extreme rain showers over central Georgia.

ECHO TOPS

Echo tops are obtained from both radar and, on occasion, satellite data and displayed for <u>precipitation</u> tops. Echo tops are the maximum heights of the precipitation in hundreds of feet MSL. They should be considered only as approximations because of radar wave propagation limitations. Tops are entered above a short line, with the top height displayed being the highest in the indicated area.

Examples:
<u>220</u>: maximum top 22,000 feet
<u>500</u>: Maximum top 50,000 feet

It is assumed that all precipitation displayed on the chart is reaching the surface. Some examples of top measurements in Figure 7-1 include a top of 15,000 feet MSL over northeast Washington; 23,000 feet over north-central Texas; and 32,000 feet MSL in central Georgia.

ECHO MOVEMENT

Individual cell movement is indicated by an arrow with the speed in knots entered as a number at the top of the arrow head. Little movement is identified by **LM**. For example, in Figure 7-1, the precipitation over north-central Texas is moving southwest at 8 knots. The precipitation in New England area is moving east-northeast at 25 knots. Line or area movement is no longer indicated on the chart.

SEVERE WEATHER WATCH AREAS

Severe weather watch areas are outlined by heavy dashed lines, usually in the form of a large rectangular box. There are two types - tornado watches and severe thunderstorm watches. Referring to Figure 7-1 and Table 7-1, the type of watch and the watch number are enclosed in a small rectangle and positioned as closely as possible to the northeast corner of the watch box. For example, in Figure 7-1, the boxed "WS0005" in northeast Georgia and western South Carolina is a severe thunderstorm watch and is the 5th severe thunderstorm watch issued so far in the year. The watch number is also printed at the bottom of the chart (in Mexico) together with the issuance time and expiration time.

USING THE CHART

The radar summary chart aids in preflight planning by identifying general areas and movement of precipitation and/or thunderstorms. This chart displays drops or ice particles of precipitation size only; it does <u>not</u> display clouds and fog. Therefore, the absence of echoes does not guarantee clear weather, and cloud tops will most likely be higher than the tops of the precipitation echoes detected by radar. The chart must be used in conjunction with other charts, reports, and forecasts.

Examine chart notations carefully. Always determine location and movement of echoes. If echoes are anticipated near the planned route, take special note of echo intensity. Be sure to examine the chart for missing radar reports before assuming "no echoes present." For example, the Rapid City (RAP) radar report in western South Dakota is shown as "not available (NA)."

Suppose the planned flight route goes through an area of widely scattered thunderstorms in which no increase in area is anticipated. If these storms are separated by good VFR weather, they can be visually sighted and circumnavigated. However, widespread cloudiness may conceal the thunderstorms. To avoid these embedded thunderstorms, either use airborne radar or detour the area.
Remember that the radar summary chart is for <u>preflight</u> planning only and should be updated by current WSR-88D images and hourly reports. Once airborne, the pilot must evade individual storms by inflight

observations. This can be done by using visual sighting or airborne radar as well as by requesting radar echo information from Automated Flight Service Station (AFSS) Flight Watch. The AFSS Flight Watch has access to current WSR-88D imagery.

There can be an interpretation problem concerning an area of precipitation that is reported by more than one radar site. For example, station A may report RW with cell movement toward the northeast at 10 knots. For the same area, station B may be reporting TRW with cell movement toward the northeast at 30 knots. This difference in reports may be due to a different perspective and distance of the radar site from the area of echoes. The area may be moving away from station A and approaching station B. The rule of thumb is to use that plotted data associated with the area that presents the greatest hazard to aviation. In this case, the station B report would be used.