

WEATHER ADDENDUM

1. During the initial portions of the approach, continuing through approximately 2348, Flight 1420 encountered only intermittent light to moderate precipitation.

a. At 2339:12, while at an altitude of 5,300 feet msl, First Officer Origel reported to the LIT tower controller that "we can see the airport from here. we can barely make it out but we should be able to make two two. that storm is moving this way like your radar says it is but a little bit farther off than you thought." While there is no WSR-88D data from KLZK that show the conditions at the aircraft's precise location at this time, the 1.45 degree tilt (Figure 1) and .48 degree tilt (Figure 2) from the KLZK 2340:02 volume scan indicate that the flight crew could see the field and surrounding area, at least intermittently. They also show that Flight 1420 was in an area of light or no precipitation at that time.

b. As the aircraft continued northward, an area of locally higher reflectivity began moving into the area southwest of the runways. At an altitude of approximately 3,300 feet msl, First Officer Origel reported to the LIT tower controller at 2344:30 that "there's a cloud between us and the airport" and "we just lost the field." A CAPPI image from the KLZK 2340:02 volume scan (Figure 3) shows that the cloud that obscured the flight crew's view of the field was an elongated area of higher reflectivity extending from southeast through southwest through west of the airport. As this image shows, however, when the flight crew briefly lost sight of the field, the aircraft was in an essentially precipitation-free area.

c. By 2345, Flight 1420 had begun to descend in the downwind leg and was at an altitude of about 3,200 feet msl. At that time, the 1.45 degree tilt from the KLZK 2345:51 volume scan (Figure 4) was closest in time and space to the aircraft position. Figure 4 shows that the reflectivity in the aircraft's immediate vicinity was relatively light. Reflectivity appears in a line of sight between the aircraft and LIT that exceeded 50 dBZ in a few areas, but Figure 4 suggests that the flight crew continued at 2345 to have intermittent visual contact with LIT and the lights of Little Rock.

d. By 2348, Flight 1420 had made its turn onto the final approach leg. At an altitude of about 2,000 feet msl, the aircraft was located about 7 statute miles from the Runway 4R threshold. At that time, the 1.45 degree tilt from the KLZK 2345:51 volume scan (Figure 5) was closest in time and space to the aircraft's position (although the precipitation shown precedes the aircraft's position by about 1 minute). Figure 5 shows that Flight 1420 was in a region of light to moderate reflectivity at that time. This is confirmed by the 2.42 degree tilt from the KLZK 2345:51 volume scan (Figure 6), which shows the reflectivity at the aircraft's location at almost exactly 2348, but approximately 2,300 feet above the aircraft. Figure 6 shows that the reflectivity at the aircraft location at 2348 was light to moderate. It also indicates that the elongated region of higher reflectivity over LIT (which had broadened in coverage but decreased in intensity) had continued to move to the east-northeast away from the Runway 4R area.

e. Perhaps the most notable indication that the precipitation encountered during the initial portions of the approach was relatively light is the fact that the flight crew did not find it necessary to turn on the windshield wipers until 2349:38, less than 1 minute before touchdown. Indeed, the flight crew was able to maintain visual contact with the field and surrounding area throughout the initial portions of the approach without the aid of windshield wipers, except for the period when their view of the field was briefly blocked by a cloud between the aircraft and LIT.

2. Flight 1420 encountered heavy (and occasionally very heavy) precipitation during the final 1 or 2 miles of the approach. The Proseus study's claim that such precipitation was encountered for more than 4 miles before landing is not supported by the data.

a. The conclusion that more intense precipitation was not encountered until the final 1 or 2 miles of the approach is supported by the fact that both Captain Buschmann and First Officer Origel confirmed verbally around 2349:30 that they could see the runway. At that time, Flight 1420 was over a mile from the Runway 4R threshold, and the flight crew could see the runway without the aid of windshield wipers.

b. Flight 1420 did not encounter precipitation requiring the windshield wipers to be turned on until 2349:38, when the aircraft was around a mile from the Runway 4R threshold. Notwithstanding the precipitation they encountered at that time, First Officer Origel was still able to maintain visual contact with the field, and Captain Buschmann only momentarily lost visual contact with the field.

c. The precipitation did not obscure the view of the LIT tower ATC controller, who told NTSB investigators that he could see Flight 1420 from the tower when it was on final approach a mile away. He also saw the aircraft when it touched down.

d. The WSR-88D data from KLZK do not allow a reconstruction of the actual intensity of the precipitation encountered by Flight 1420 during the final portion of the approach. At 2349, Flight 1420 was at about 1,200 feet msl, an altitude nearly in the center of the .48 degree tilt. However, the .48 degree tilt from the 2345:51 volume scan shows conditions about 3 minutes *before* the aircraft's position at 2349, while the .48 degree tilt from the 2351:41 volume scan shows conditions about 3 minutes *after* the aircraft's 2349 position. As a result, the data captured in these two scans allow only an estimate of the reflectivity actually encountered by the aircraft from 2349 through touchdown. (Mathematical interpolation of reflectivities between the times of the images is improper because it can be misleading.)

i. Figure 7 is a close-up of a portion of the .48 degree tilt from the 2345:51 volume scan. It shows reflectivity at the Runway 4R threshold and touchdown zone of about 47 dBZ, although reflectivities in a few range gates along the flight track exceed 50 dBZ. (Note, however, that this image *precedes*

the aircraft's 2349 position by about 3 minutes, so it does not depict the actual reflectivity encountered on the final portion of the approach.)

ii. Figure 8 is a similar close-up of a portion of the .48 degree tilt from the 2351:41 volume scan. It depicts reflectivity at the Runway 4R threshold of 46.5 dBZ, with similar reflectivities along the flight track. (Note that this image also does not depict the actual reflectivity encountered on the final portion of the approach, because it was recorded about 2 to 3 minutes *after* touchdown.)

iii. Despite the noted limitations of the data from the two .48 degree tilts, Figures 7 and 8 suggest that reflectivities at or slightly above 50 dBZ possibly were encountered in a few areas along the flight track. Contrary to the Proseus study's claim, however, the WSR-88D data indicate that such reflectivities were encountered only during the final 1 or 2 miles of the approach, as the elongated area of locally higher reflectivity decreased in intensity and moved away from LIT to the east-northeast and east.

iv. The movement of the elongated area of locally higher reflectivity away from LIT during the final portion of the approach is illustrated by the .48 degree tilts from the 2345:51 and 2351:41 volume scans. (Attachments 17, 17A, 18 and 18A to the NTSB Meteorology Group Chairman's Factual Report.) Its movement also is confirmed by the data from the LIT ASOS sensor, which recorded a locally heavy precipitation event that began around 2346, peaked about 2 minutes later, and then decreased rapidly in intensity by 2349.

3. Flight 1420 did not fly into an area of concentrated lightning. The lightning that the flight crew saw was sufficiently distant that it indicated that the developing weather would not affect their approach and landing.

a. As illustrated in Figure 9, no lightning ground strike was recorded within 2.5 nautical miles of the aircraft's ground position between 2345 and 2351 until approximately 2 seconds prior to touchdown.

b. Figure 10, which depicts the location of the lightning ground strikes within 10 nautical miles of the aircraft's location on the inbound leg from 2347:22 to 2350:20, shows that most of the ground strikes were several miles to the west of Flight 1420. The closest ground strike was located aft of the aircraft, so the flight crew probably did not see it.

4. Turbulence encountered by Flight 1420 was below the "light" category until the last moments of the approach.

a. As illustrated in Figure 11, the turbulence encountered by Flight 1420 was below the "light" category throughout the approach until the last moments before

touchdown. This is consistent with accounts given by passengers and flight attendants. It is also consistent with the reflectivity data showing that relatively heavy precipitation was not encountered until the final 1 or 2 miles of the approach.

FIGURES

- 1 1.45 degree tilt, 2340:02 volume scan
- 2 .48 degree tilt, 2340:02 volume scan
- 3 CAPPI from 2340:02 volume scan at altitude of 3,040 feet AGL
- 4 1.45 degree tilt, 2345:51 volume scan
- 5 1.45 degree tilt, 2345:51 volume scan
- 6 2.42 degree tilt, 2345:51 volume scan
- 7 Close-up, .48 degree tilt, 2345:51 volume scan (with different color map to accentuate reflectivities above 40 dBZ)
- 8 Close-up, .48 degree tilt, 2351:51 volume scan (with different color map to accentuate reflectivities above 40 dBZ)
- 9 Scatter diagram, distance from lightning ground strike location to AA 1420 aircraft ground track location (between 2345 and 2351)
- 10 Lightning ground strikes within 10 nautical miles relative to aircraft orientation on inbound leg (2347:22 to 2350:20)
- 11 DFDR vertical acceleration data

Note: colors in WSR-88D reflectivity images use the official WSR-88D color table from Federal Meteorological Handbook No. 11, Part C, p. A-8 (OFCM 1991), except where noted.

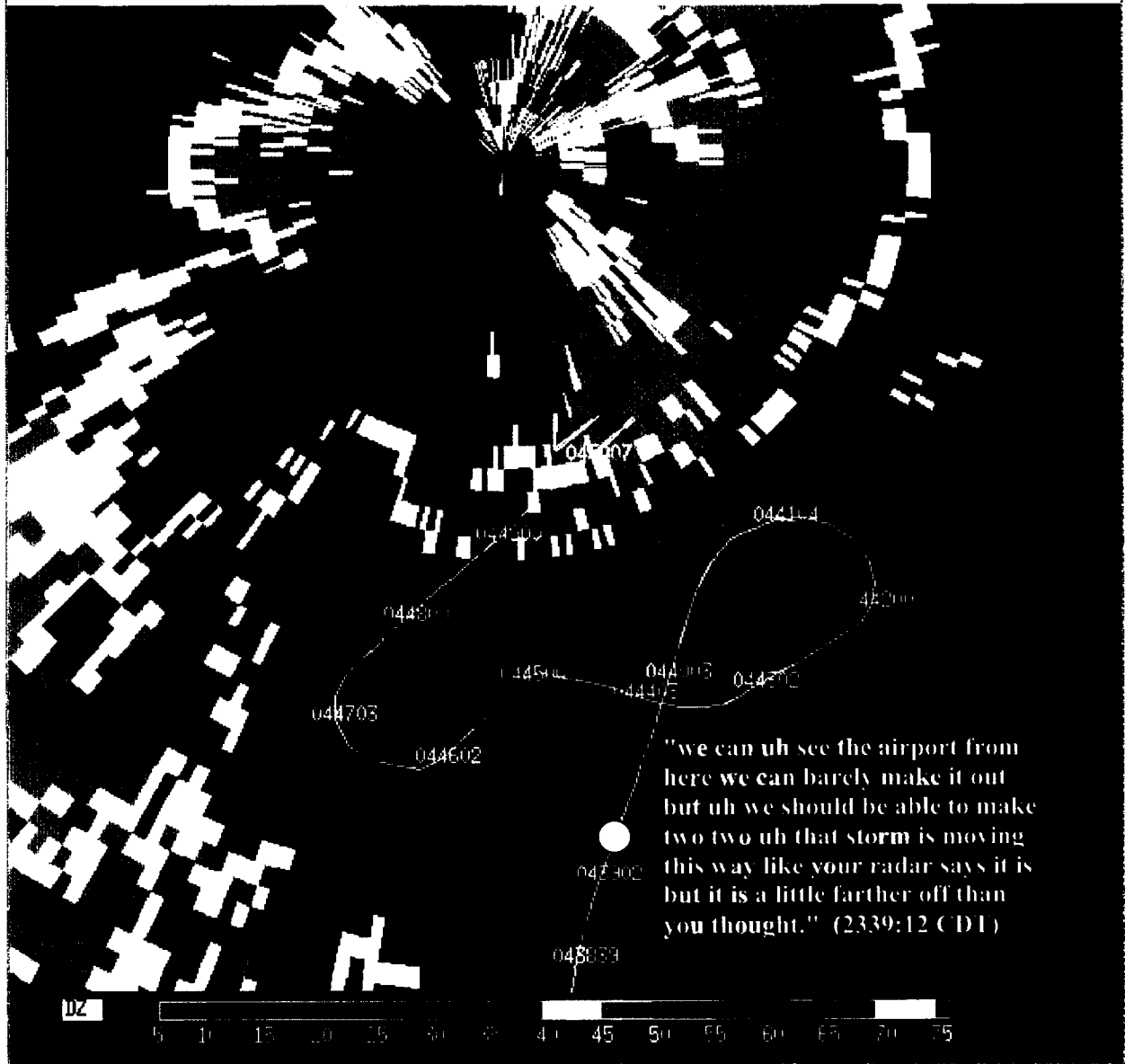


Figure 1

Reflectivity from the 2340:02 KLZK volume scan at an elevation angle of 1.45 degrees. The white dot is the approximate aircraft location at 2339:12.

Radar: KLZK Site: LIT Date: 060299 Time: 044002-044543 UT Display: PPI Elevation: 0.4

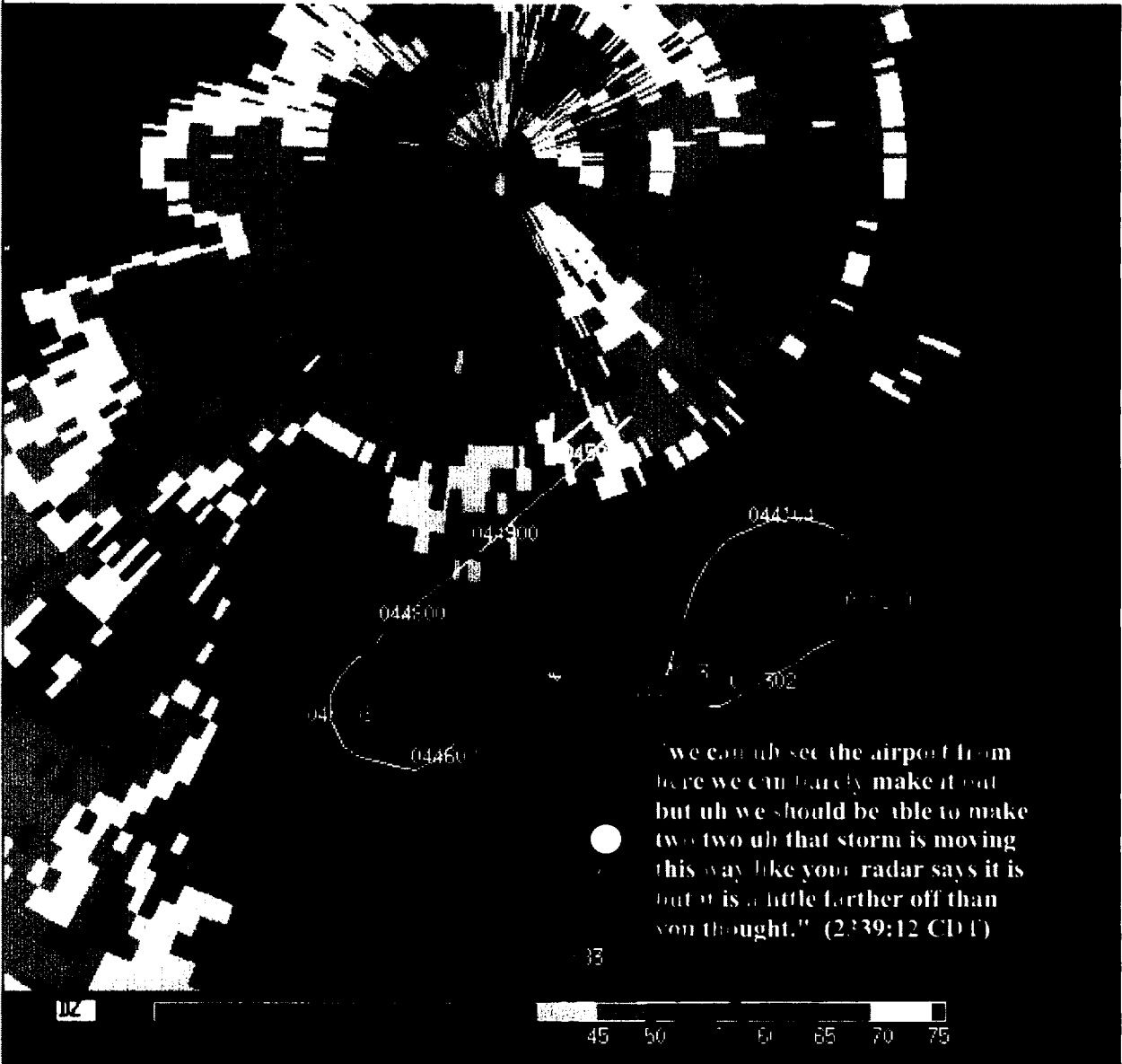


Figure 2

Reflectivity from the 2340:02 KLZK volume scan at an elevation angle of .48 degrees. The white dot is the approximate aircraft location at 2339:12.

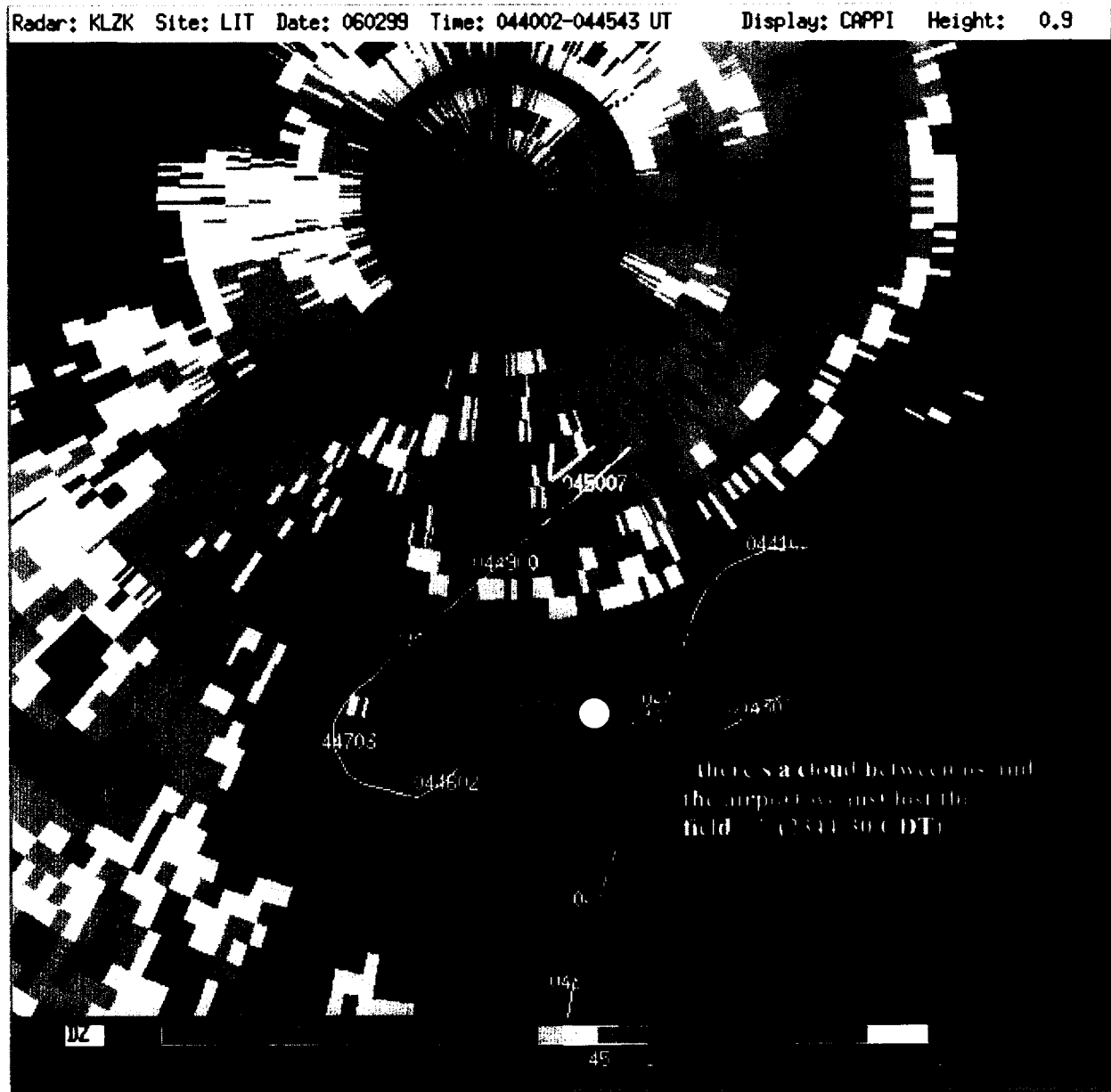


Figure 3

CAPPI reflectivity from the 2340:02 KLZK volume scan at an altitude of 3,040 feet AGL (relative to the runway 4R threshold). The white dot is the approximate aircraft location at 2344:30.

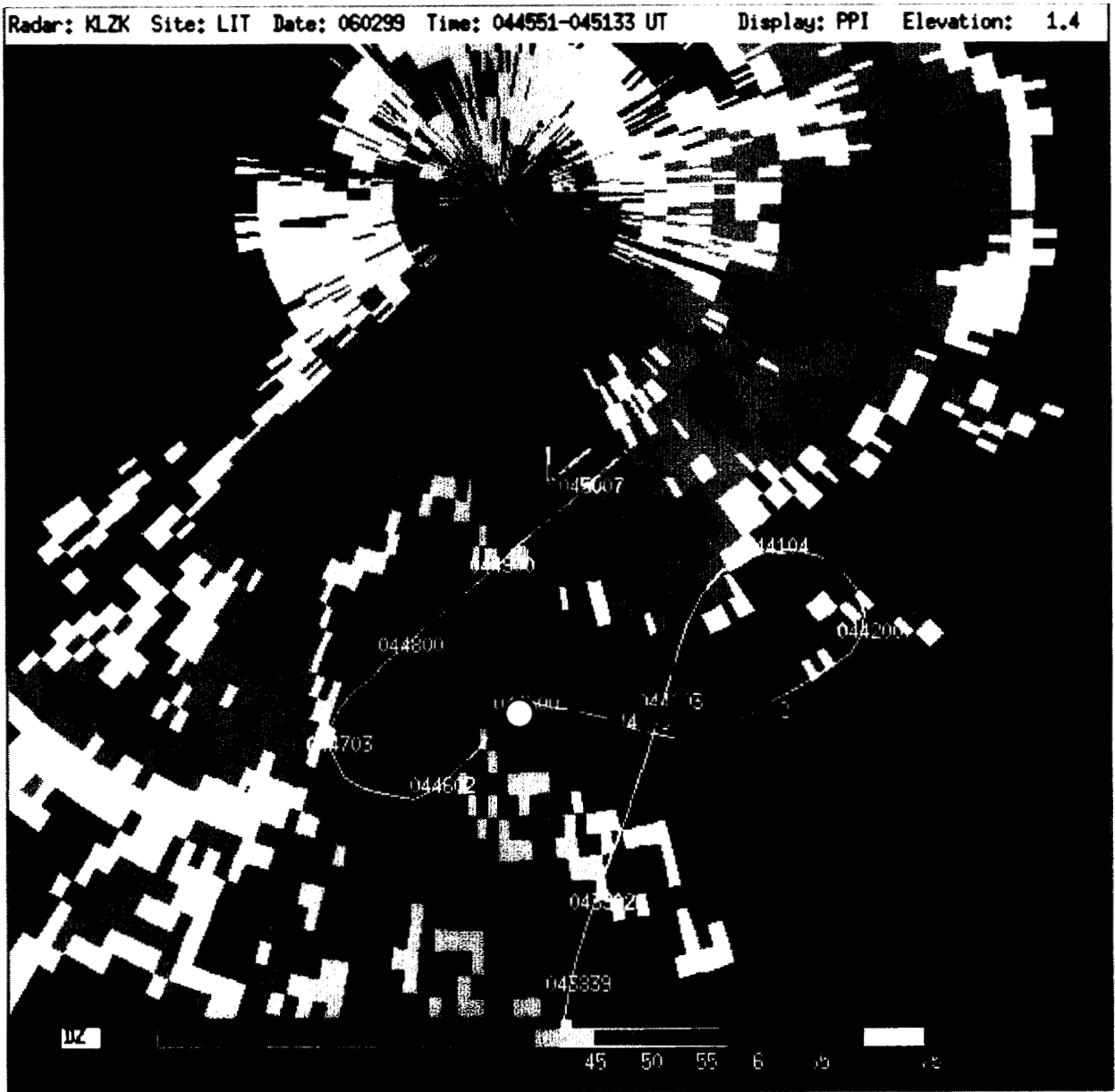


Figure 4

Reflectivity from the 2345:51 KLZK volume scan at an elevation angle of 1.45 degrees. The white dot is the approximate aircraft location at 2345.

Radar: KLZK Site: LIT Date: 060299 Time: 044551-045133 UT Display: PPI Elevation: 1.4

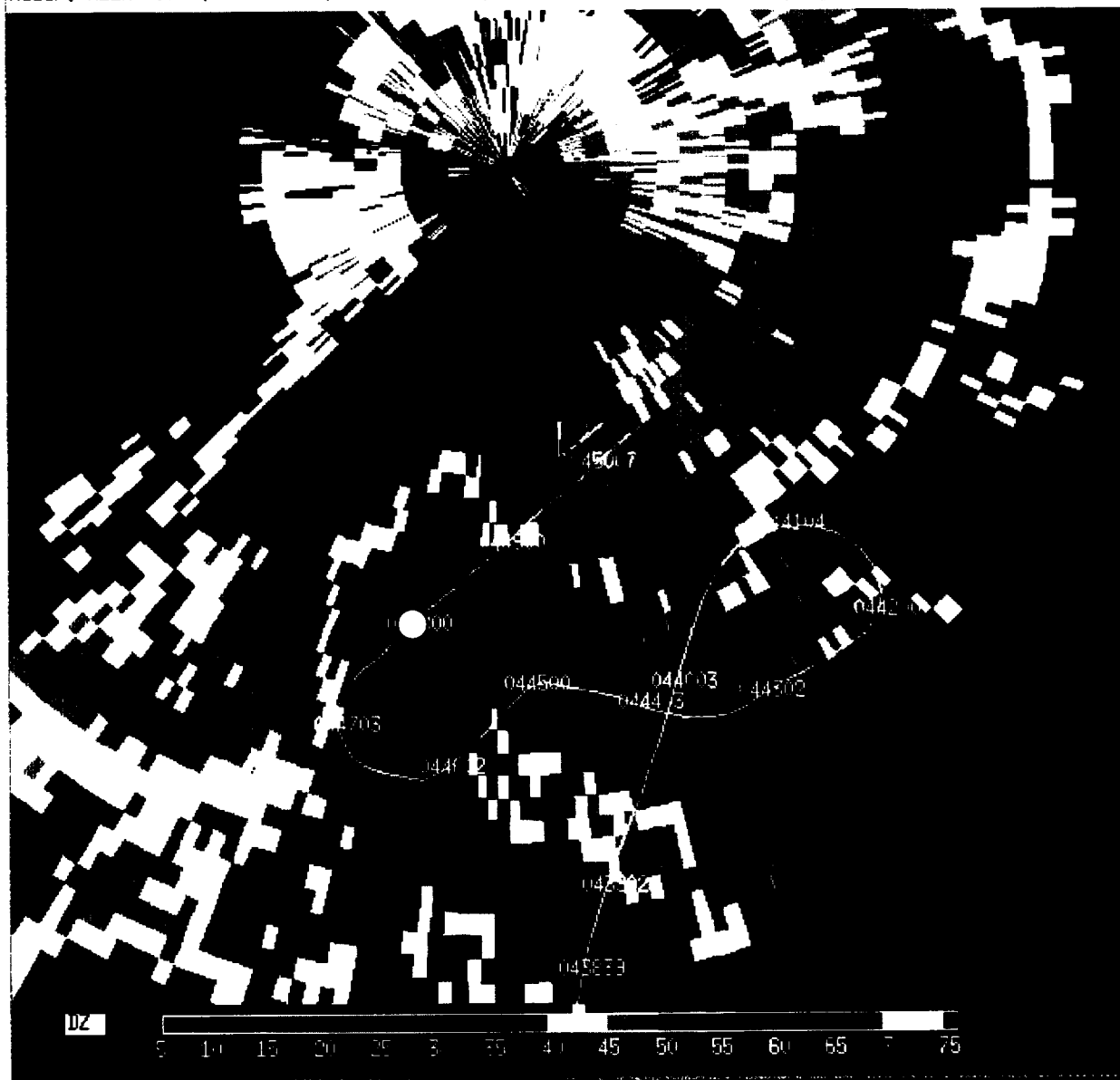


Figure 5

Reflectivity from the 2345:51 KLZK volume scan at an elevation angle of 1.45 degrees. The white dot is the approximate aircraft location at 2348.

Radar: KLZK Site: LIT Date: 060299 Time: 044551-045133 UT Display: PPI Elevation: 2.4

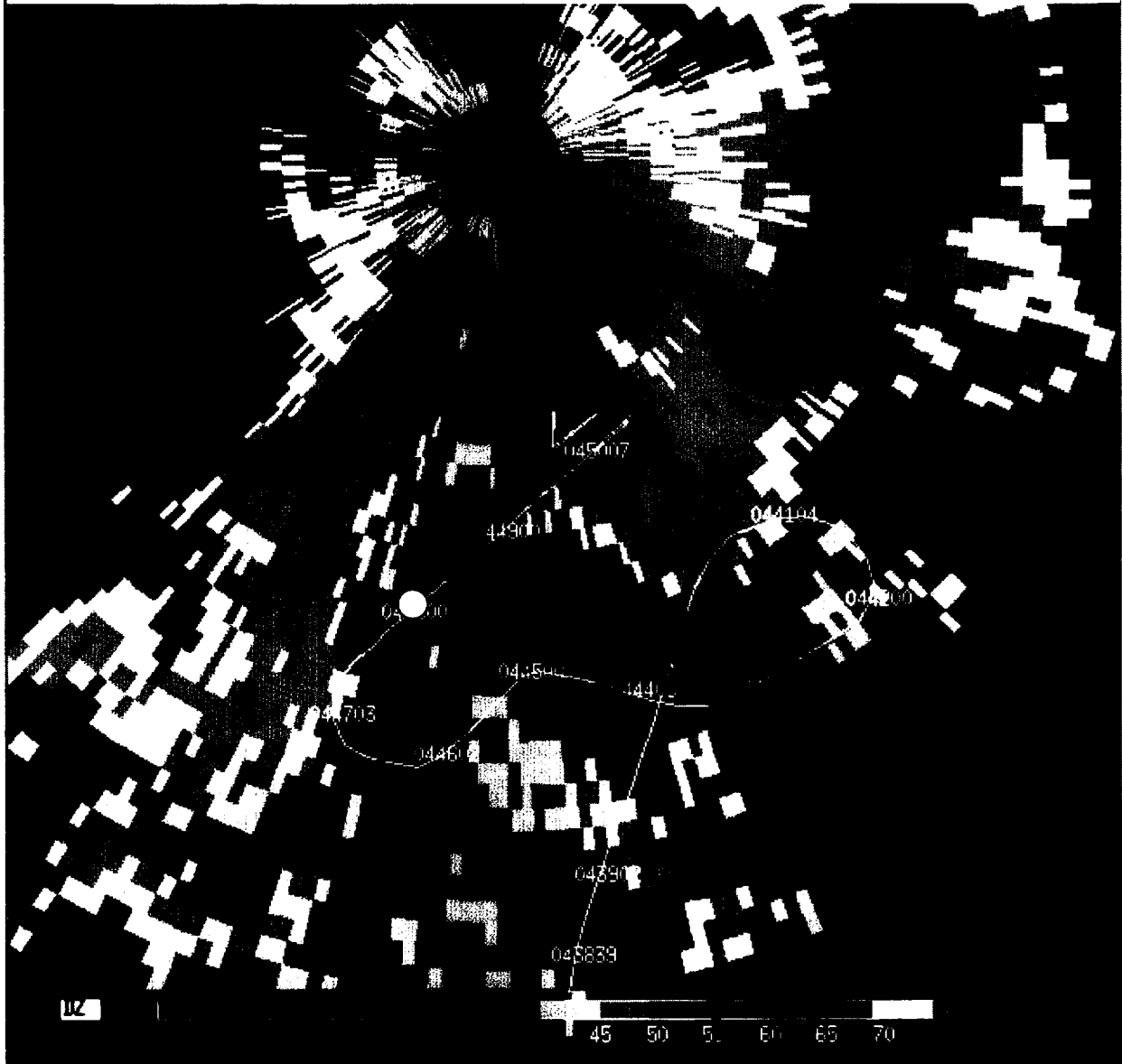


Figure 6

Reflectivity from the 2345:51 KLZK volume scan at an elevation angle of 2.42 degrees. The white dot is the approximate aircraft location at 2348.

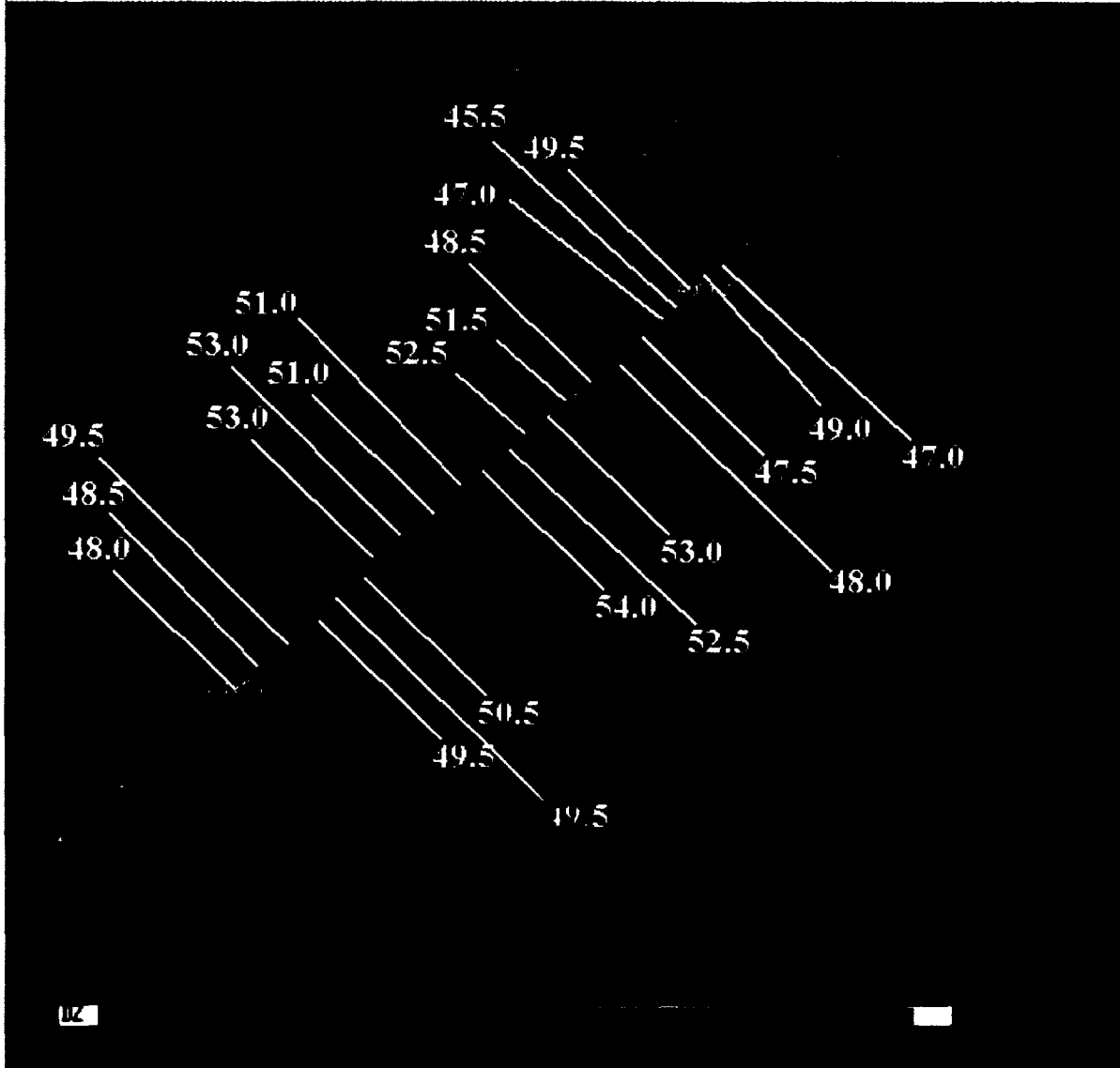


Figure 7

Close-up of reflectivity from 2345:51 KLZK volume scan at an elevation angle of .48 degrees. (Note that a different color map is used to accentuate reflectivities above 40 dBZ. Reflectivity below 40 dBZ is colored black.)

Radar: KLZK Site: LIT Date: 060299 Time: 045141-045722 UT Display: PPI Elevation: 0.4

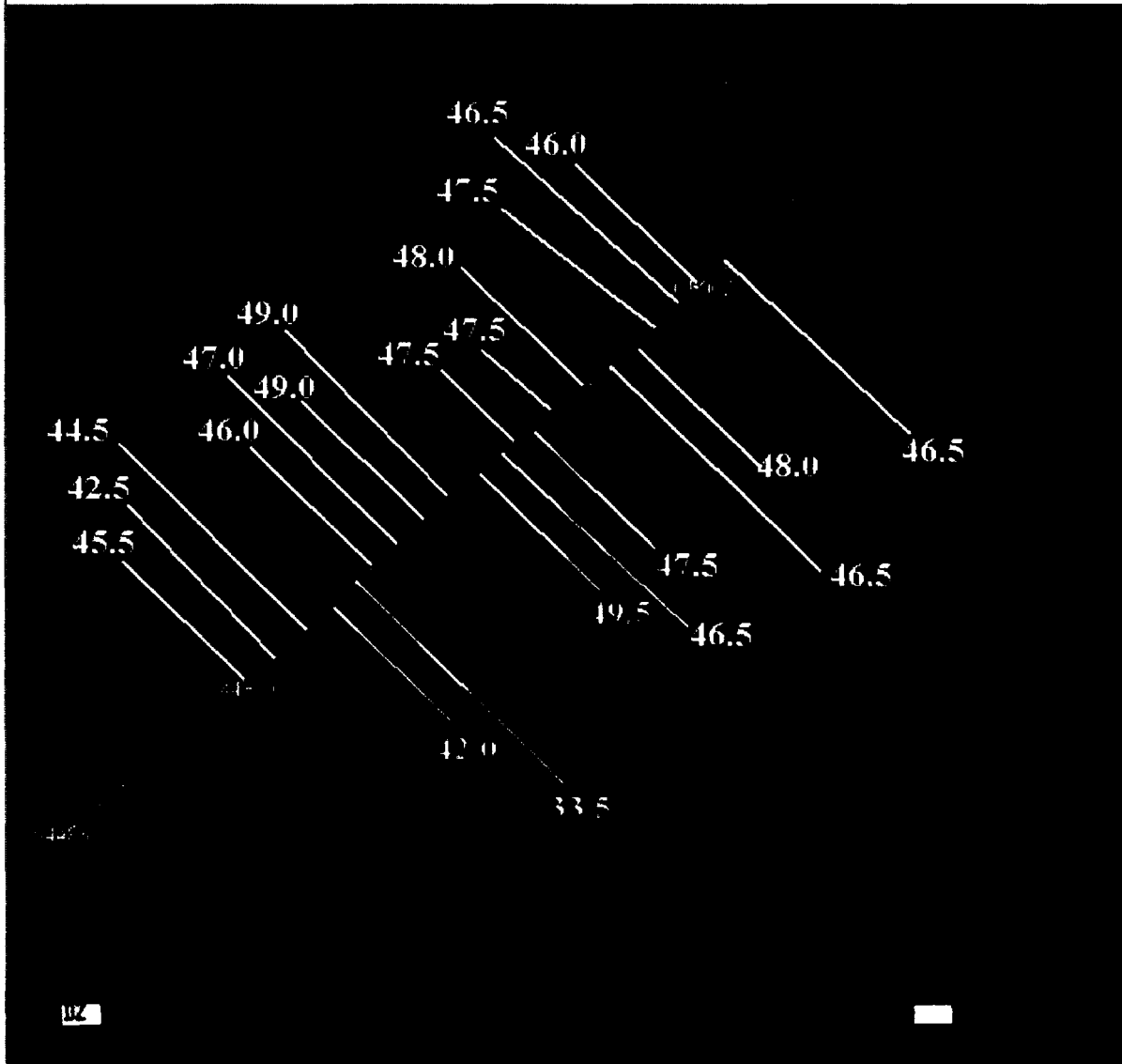


Figure 8

Close-up of reflectivity from 2351:41 KLZK volume scan at an elevation angle of .48 degrees. (Note that a different color map is used to accentuate reflectivities above 40 dBZ. Reflectivity below 40 dBZ is colored black.)

Distance from Lightning Ground Strike Location to AA 1420 Aircraft Ground Track Location

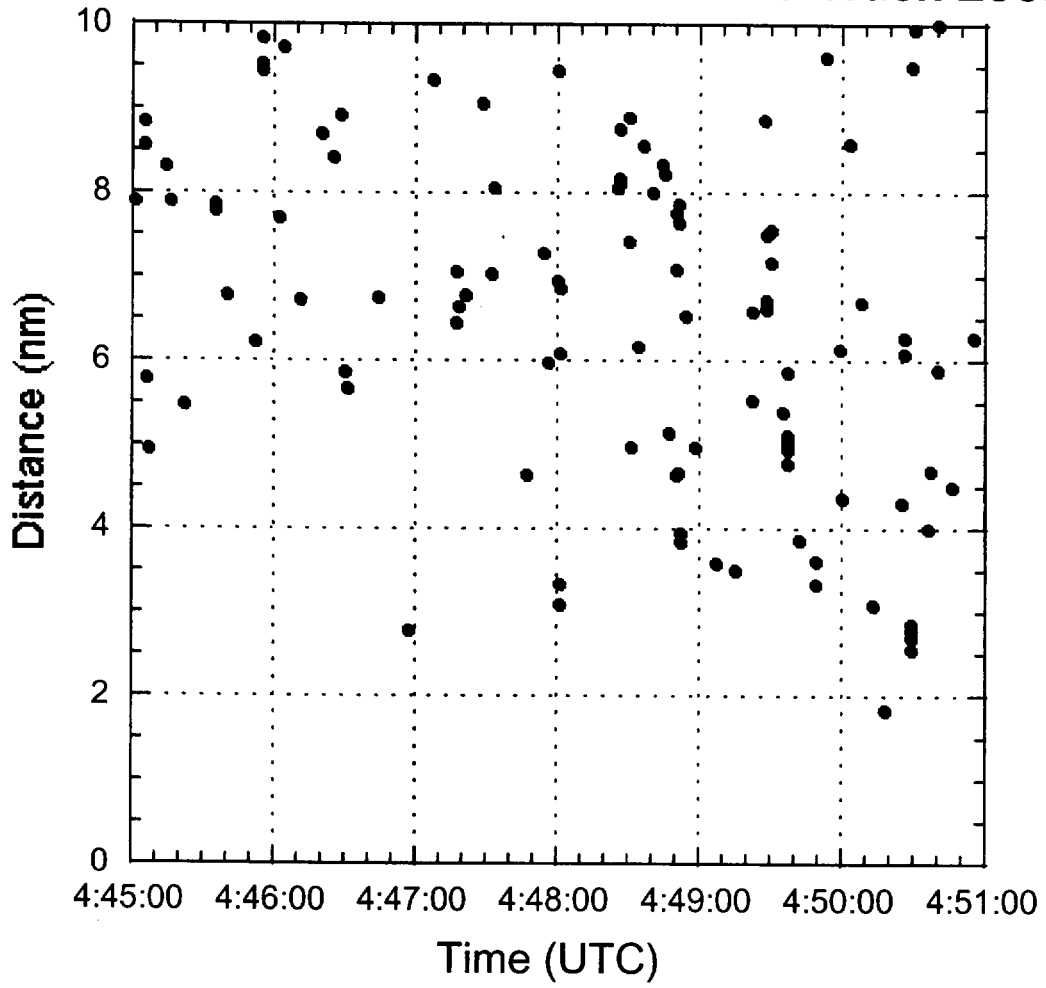


Figure 9

**Lightning Ground Strikes Within 10 Nautical Miles
Relative to Aircraft Orientation on Inbound Leg**

(2347:22 to 2350:20 CDT)

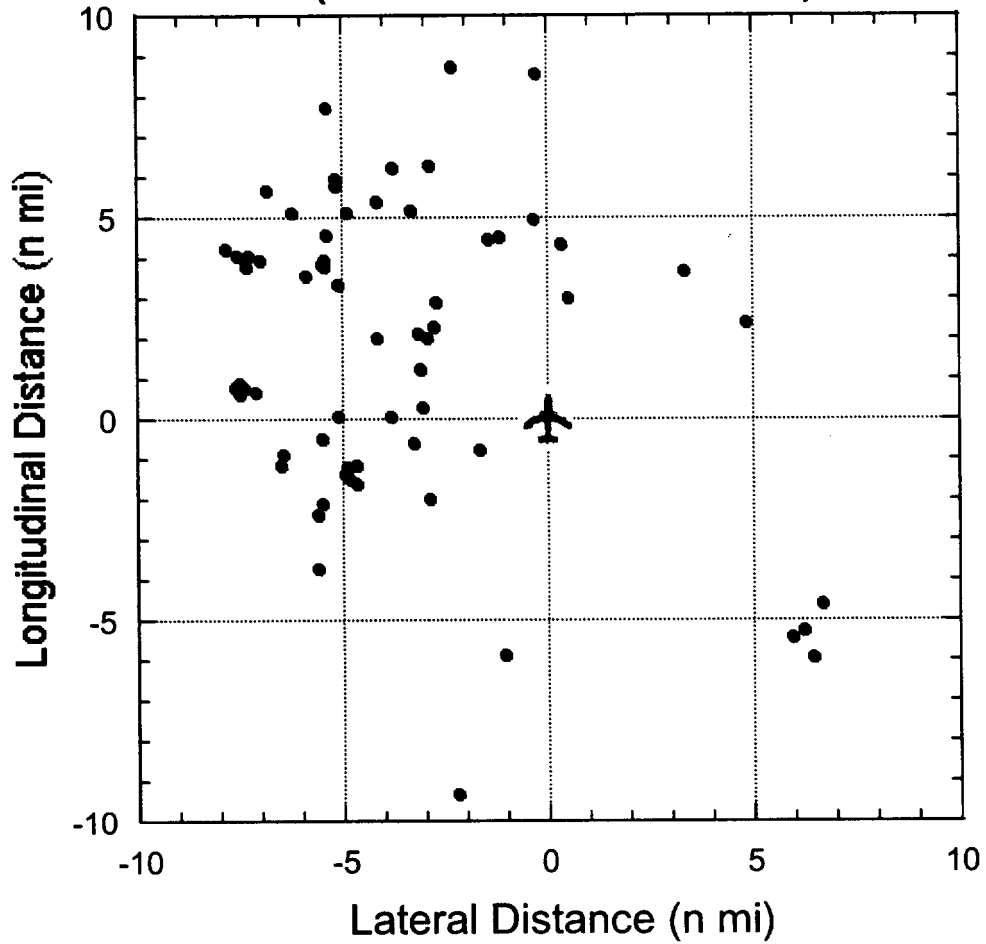


Figure 10

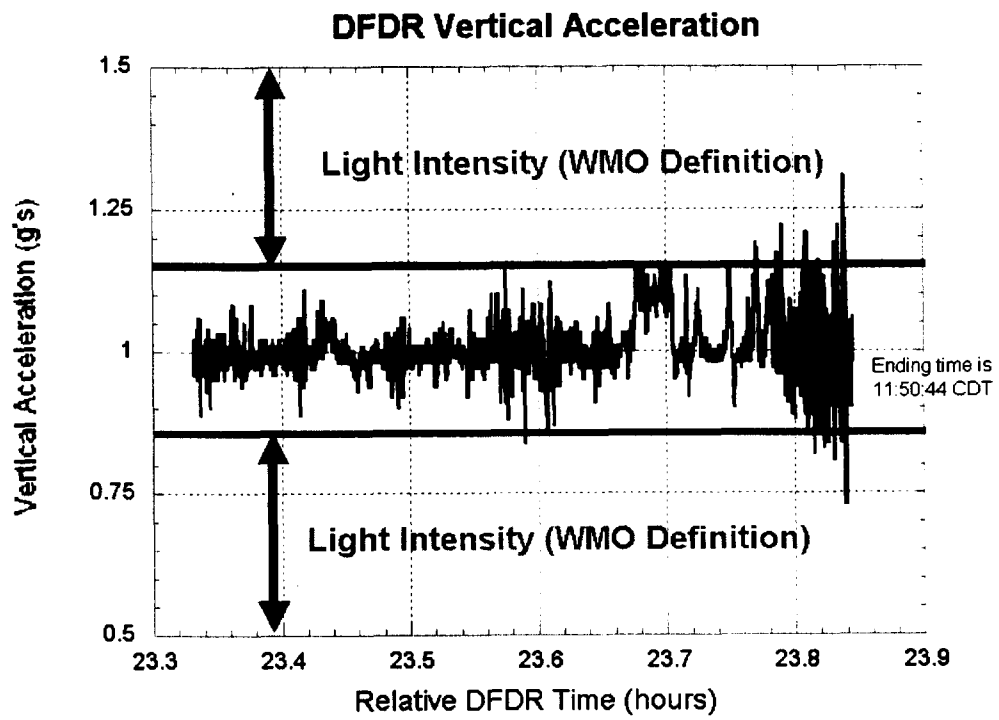


Figure 11