

Marathon F1-F2 Tornado

Friday Morning, August 25th 2005

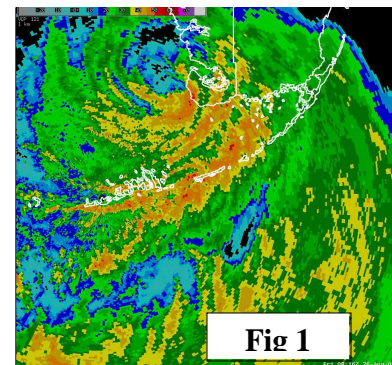
Survey Report

Summary

At 4:52am on Friday, August 25th 2005, the State Warning Point contacted WFO Key West to pass on information about a potential tornado touchdown, and to report damage at the Marathon airport. At 4:54 am, Jon Rizzo, Warning Coordination Meteorologist NWS Key West, spoke with Hans Wagner, Marathon Fire Chief, to find out if the Marathon Fire Department had any information about the tornado; they did not. Hans Wagner stated that conditions were unsafe to check on damage, and he would return the call. After several calls between various agencies, it was determined at WFO Key West that there was enough validity in the reports to warrant a tornado survey to ascertain the extent of the damage, and the intensity and track of the tornado. Andy Devanas, Science and Operations Officer NWS Key West, was dispatched on Saturday morning, August 26th, to conduct the tornado survey. The tornado survey team also included Mike Puto, Marathon City Manager. Mike Puto and Andy Devanas spent approximately seven hours interviewing witnesses and investigating damage. Andy Devanas concluded that the damage was most likely caused by a tornado, which had evidence of having reached F1 and F2 intensity. Mike Puto estimated the dollar amount of the damage to be in the three to five million dollar range.

Meteorology

During the time of the tornado, the center of Hurricane Katrina was located approximately 40 miles north northwest of Marathon. A rain band, oriented east northeast to west south west, stretched from Florida Bay, across Marathon, and just south of the lower keys (Fig 1). A thorough post storm analysis of Key West Doppler radar could not find a tornadic signature. The individual cells within the rain band were moving towards the north northeast at near 50 knots, and the general movement of the rain band was towards the northeast at near 35 knots.



Survey and Analysis

It is believed the tornado began as a waterspout, coming ashore at the eastern corner of 73rd Street Ocean and the waterfront, which is currently an empty lot(s) (Fig 2). The tornado then began to track to the north northwest. Flattening a line of bushes and stripping a tree of foliage at the north end of the lot. A one story rectangular residence, approximately 500 square feet, located at the north end of the lot (seen approximately left center in Figure 2) had four of six windows blown out. A trailer on 74th Street Ocean, just east of the above structure, suffered substantial damage to the siding and skirt. The two houses north of the trailer received damage to the rear of their properties, including several trees downed, fences knocked down, and a substantial gazebo destroyed. One of the residents reported a cast iron table breaking a window and crashing into their house. They do not know from where the table originated.



At this point in the survey, the damage was similar to what would be expected with a convective downburst or strong F0 tornado. The width of the damage path was very narrow, maybe only 20 yards wide.

From 74th Street Ocean through W 75th Street Ocean, the tornado appeared to intensify somewhat. More missile damage was evident, and there was substantial damage to at least two houses, as well as one trailer severely damaged. Power lines were downed, and at least one utility pole snapped. A house on 74th Street Ocean, belonging to Mike Card (see witness testimony) was twisted on its foundation, causing the masonry to crack at all four corners of the house (Fig 3). Additionally, the shutters were ripped off one of Mr. Card's windows, and the window shattered (Fig 3). Across the canal, at 944 W 75th Street (see witness testimony), the porch was destroyed, and several fence boards, of an unknown origin, embedded between the window frame and the siding of the house (shattering the window). The shutter was closed when this occurred (Figures 4 and 5).



The porch of this residence was also destroyed, with the aluminum roof and all siding and screens removed. Several of the planks which comprised the porch floor were also missing. After interviewing the resident, it was discovered that the house had been shifted on its pilings; either pushed or lifted and dropped (Figure 6). Later, independent of this survey, it was discovered that the roof had been separated from the walls. Given the missile damage and the structural damage evident, it appeared that the tornado had reached F1 intensity during this portion of the path. The path width at this point also appears to have expanded, as best could be determined, reaching approximately 50 yards.



Fig 6



Fig 7

From W 75th Street Ocean, the tornado continued towards the north northeast, moving over a children's park causing some tree damage, then moving just east of 76th Street Ocean and the Overseas Highway impacting two businesses. General Rental, on the southeast corner of 76th Street Ocean and the Overseas highway, received damage to a fence, roof, and several sheds which had been tied down and anchored (Figure 7). The sheds were picked up and dropped an estimated 30 to 50

feet from their point of origin. The business just east of General Rental, Marooned in Marathon, owned by Mayor John Bartus, received damaged to the their main street sign, located near the Overseas Highway. The sign posts, which are steel filled with concrete, were bent towards the east. Also, the top third of a large Norfolk Pine snapped off and landed on the property east of Marooned in Marathon.

The tornado crossed the Overseas Highway and damaged several hangers at the Marathon Airport. The recently built hangers, which according to one witness on scene where built to withstand category five winds, suffered minor to substantial damage, with the western most hanger receiving heavy damage. This hanger had all but one of its doors damaged and toppled, roof damage, and three large steel I-beams bent (figures 8 and 9). Estimated wind to cause this type of damage, and to bend the I-bean infrastructure, are near 120 mph. This would be consistent with a weak F2 tornado.



Fig 8



Fig 9

The survey team inspected the wooded area to the north of the runway, where it was suspected the tornado would have entered given the determined track. Some broken branches were discovered on the northern portion of the airport, so the survey team decided to inspect for damage along Aviation Blvd., which runs east to west just north of the airport. Some broken branches were found, but not enough significant damage to warrant further inspection, and the survey was called off with the preliminary conclusion that the tornado had either weakened, or lifted, after crossing the runway at the Marathon Airport.

The next morning, Sunday the 28th, team member Mike Puto received information about damage along Sandy Ave. and Mango Lane in Marathon. Mike Puto found two homes damaged, one located at 160 Sandy Ave. and the other located at the northern end of Mango Lane. The house on Mango Lane had severe roof damage. The location of the damaged property was determined to be consistent with the path of the tornado. Apparently, the tornado crossed over Aviation Blvd. and through a wooded area before damaging the homes on Mango Lane and Sandy Ave.

Therefore, the track of the tornado can be clearly ascertained, having traveled the girth of Marathon, from entering at 73rd Street Ocean and exiting at Sandy Lane. The length of the track was approximately 2 miles, and was estimated at times to be near 50 yards wide.

Conclusion

A very discrete, narrow track was uncovered during the survey (Figure 10) . Damage, if any, outside of the tornado track was minimal, and could be explained as a result of the ambient tropical storm force winds. At times along the path, strong F1 to weak F2 damage was apparent. The debris field was very convergent, with some debris deposited along the track traceable to points of origin as far as 1,200 feet away. Given the convergent debris field, missile damage, long track, and the apparent strengthening of the tornado from 74th Street Ocean to the Marathon Airport, a convectively induced downburst was ruled out as a cause of the damage. However, some type of shear zone, such as a gust front along a convective downburst, could certainly have been the larger scale mechanism that spawned the tornado. Some of the witness testimony might also support this, with reports along the Ocean side reporting a loud boom and pressure change which would be consistent with a downburst, with witness further along the track describing an increasing noise, or roaring sound. After consultation with Jon Rizzo, the Warning Coordination Meteorologist at NWS Key West, survey team member Andy Devanas concluded that the event was a F1 tornado, with a limited area of F2 damage.



Witness Testimony

All witnesses were interviewed separately and independently. The witnesses will be listed in the order interviewed. Since the survey began at the beginning of the storm track, the interviews are very close to mirroring the start of the tornado track to the end.

1673 74th St. Ocean

Resident Carmen (first name only) reported hearing loud boom (described as “wompf”) around 4:30am Friday morning. There was extensive damage to back yard gazebo and trees. Missing hot tub cover which was eventually found about 1,200 ft further down the tornado track.

1199 73rd St. Ocean

Resident Jamie (first name only) reported that he felt a rapid change in pressure, and heard a loud concussion similar to a “sonic boom”. He was looking out his plate glass window, with his face within an inch or so of the window during the event, and the window flexed inwards and hit him in the face (but did not break). Jamie estimated the time to be 4:15am.

1431 74th St. Ocean

Resident George Blaze felt his house shake, which “lasted about 2 seconds then gone”. A neighbor visiting George mentioned that the small house at the beginning of the tornado track (on 73rd St. Ocean) had four of its six windows blown out simultaneously, at around 4:12am.

1001 W. 75th St. Ocean

Resident Gary Wilson reported a “big bang” around 4:30am, and “everything started shaking”

999 W. 75th St. Ocean

Resident Tricia Baker reported a “big boom” and a “howling sound”. She said her house began shaking, which lasted only a few seconds. She said she remembered it was over by 4:30am because she went to get on her computer and was surprised that the electricity was still on.

960 W. 75th St. Ocean

Resident Mike Card, a Captain in the Marathon Fire Department, toured his damaged home with the survey team. Capt. Card was on duty and not at home when the event occurred. He showed the shutters ripped off his house, and his house had “shifted”, showing cracks on all four corners. He had extensive damage to his property, especially his back yard along the canal.

1003 W. 75th St.

Resident John Bartus, the Mayor of the City of Marathon, reported hearing an “increasing noise” after 4am, and “it became very violent, and for a brief time the whole house was shaking” and his deck furniture had become “airborne”.

1342 74th St. Ocean

Resident David Irwin (whose back yard faces the Mayors back yard) reported his roof lifting up around 4:30am, and slamming back down. He said this happened “very fast”, in a “matter of seconds”.

944 E. 75th St. Ocean

Resident Peggy Essenburger reported that her house began to shake around 4:10am, and the house was shaking so bad that it had “popped the grout” out her tiles throughout her house. Further inspection found that the house had shifted on its pilings.

76th St. and Overseas Highway

Keith Gustafson, owner of General Rental, showed the survey team where three large sheds, which had been tied down and anchored, had picked up and dumped 30 to 50 feet from their point of origin.

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Further damage photographs available on request