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THE NORTH ATLANTIC HURRICANE OF OCTOBER 13-21, 1944

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THE hurricane of October 13-21, 1944, was of great intensity, and the most destructive storm to visit Cuba and Florida in recent years. Over 300 lives were lost as a result of the storm, and estimates of property damage run well over \$100,000,000.

HISTORY OF THE HURRICANE

First indications that this tropical storm was developing in the Caribbean Sea came when the motorship *Silver Arrow*, en route from Jamaica to Belize, stopped at Swan Island about 6:30 p. m., on October 12, and reported rough seas encountered about 100 miles to the eastward. At this time the seas at Swan Island were already fairly high and conditions became gradually more severe until on the 16th the keeper of the island reported the roughest sea in his 17 years of residence. During the period of squally weather from the 12th to 18th, inclusive, no extremely high winds were recorded on the island, the highest gust failing to reach 60 miles per hour.

Farther to the northeastward at Grand Cayman Island, the first signs of the storm were noted during the forenoon of October 13, when a deck of low nimbostratus moved in obscuring the altostratus overcast that had made its appearance the previous day. Rain was continuous on Grand Cayman throughout the remainder of the day except for a 20-minute interval about 9:30 a. m., during which time it was possible to make a 2,000-foot pilot balloon run, showing upper air winds of 63 miles per hour, from a northeasterly direction. Surface winds averaged under 25 miles per hour, with gusts reaching 45 miles per hour, throughout the afternoon and evening on the 13th.

On the 14th surface winds had increased and the highest gust recorded was 58 miles per hour. On this day, as on all other days during the time that the storm influenced Grand Cayman, there was a definite rise in pressure after the normal diurnal minimum at about 4 a. m. and 4 p. m. At about 5 p. m. on the 14th rapidly changing conditions evidenced the existence of a heavy individual squall within the main storm area. At that time the wind changed suddenly without pause from moderate NNE. to strong SE., and the heaviest rainfall of the entire storm period occurred. After about 20 minutes the wind returned to NNE. and lost much of its force. A record 24-hour rainfall for the island, 16.04 inches, fell on the 14th.

On the next day, October 15, shortly after 6:30 p. m., the pressure at Grand Cayman Island reached its lowest point 29.06 inches. The extreme gust for that station, 118 miles per hour from the east, was registered at about the same time. The hurricane center passed westward, south of the island and turned rather abruptly to the north along the 83d meridian. As the storm moved northward, hurricane winds on the right of the center sent a destructive storm tide lashing at docks, piers, and

other shore installations on the south coast, reducing many of the wooden structures to kindling. During the late afternoon of the 17th the storm center crossed the Isle of Pines. Communications between Cuba and the smaller island were completely severed, but delayed reports that have filtered in indicate heavy damage on the Isle of Pines. Approaching Cuba from the south, the storm center crossed the island a short distance west of the Mariel-Majana line, the narrowest part of Cuba, and about 10 or 15 miles west of Havana.

On the 18th, at a point about midway between the north coast of Cuba and Dry Tortugas, a vessel heavily involved in the storm reported passing through the eye of the hurricane where calm airs were observed for an hour between 1:40 and 2:40 p. m. Except during passage through the center, hurricane winds (Beaufort force 12) were encountered from noon to about 4 p. m.

The calm center of the hurricane was observed over Dry Tortugas from 3 to 5 p. m. on the 18th. From that group of islands, the storm moved northward with the center passing inland south of Sarasota, near Nokomis, about 3 a. m. eastern standard time on October 19. A pressure of 28.42 inches (962.4 millibars) was recorded at Sarasota. Taking a course north-northeastward across Florida, the storm center skirted the east side of Tampa Bay, moved over Dade City and Ocala, and passed seaward a short distance below Jacksonville. Although the storm was traveling about 20 miles per hour, the "eye" was reported to have lasted from 11:30 a. m. to 5 p. m. This exceptionally long period of time required for conditions characteristic of the "eye" of the hurricane to pass Jacksonville indicates an unusually large central core. This central portion of the storm was apparently an elongated oval with its principal axis along the line of advance. The central core extended at one time almost from Jacksonville to Ocala, a distance of about 70 air line miles.

After traveling over a short expanse of ocean the center moved inland just north of Savannah. Passing some distance inland through South Carolina, North Carolina, and Virginia it again reached the Atlantic off the Eastern Shore of Maryland and moving northeastward with increasing speed, passed between Cape Cod and Nantucket, and reached Nova Scotia late on the 21st. Gale winds of force 8 were observed over Newfoundland on the following day during passage of the depression, which later merged with the Icelandic Low east of Greenland.

PRESSURE

The lowest pressure so far reported for the October hurricane is 28.02 inches (948.9 millibars) recorded by an aneroid barometer (uncorrected) at Dry Tortugas on the 18th of October. Within the continental limits of

the United States the lowest known pressure was 28.42 inches (962.4 millibars) registered at Sarasota, Fla., during the late afternoon of the 19th. A reading of 28.55 inches (966.8 millibars) taken at Tampa is the lowest recorded at that station in the period of more than 50 years of record. The lowest sea-level pressure on record in the western hemisphere is 26.35 inches, recorded in the Florida Keys storm of September 2, 1935.

A tabular listing of the lowest pressures observed at selected stations during the October hurricane is contained in table 1.

WINDS

Damaging winds accompanied the hurricane from the time the storm took up a position west of Grand Cayman Island, British West Indies, on the 16th, until the center had passed north of Savannah, Ga., and into southern South Carolina, late on the 19th. During passage of the storm over Florida, gale winds were experienced over the entire peninsula and westward over the Gulf Coast nearly to Tallahassee, as well as over the coastal sections of Georgia and South Carolina.

The highest winds recorded during the passage of the hurricane were recorded at Havana (National Observatory), across the bay from the city, where the fastest mile registered 120 miles per hour and the strongest gust

163 miles from the south-southeast at about 10 a. m. on October 18. Gusts of at least 60 miles per hour were recorded for a period of 18 hours, and for 1¼ hours all gusts were above 140 miles per hour.

At Dry Tortugas the wind record on a special airways type of anemometer registered 120 miles per hour for 2 consecutive hours before the instrument was finally blown away.

Tampa, although registering the lowest pressure in the history of the station, did not suffer the damage that might be expected, as the storm center passed a short distance to the right of the city and at the height of the storm the winds were blowing offshore.

Heaviest wind damage occurred over a 30-mile-wide belt, beginning on the right-hand edge of the central core which, over Florida, extended some 20 miles on each side of the storm track. Damaging winds thus cut a wide swath through the great citrus and truck producing areas of the State. Orlando reported a 1-minute maximum velocity of 82 miles per hour and gusts of 108 miles per hour, from the south-southeast, during the morning of the 19th.

Stations in the following tabular summary of meteorological conditions accompanying the 1944 hurricane are arranged in a time sequence corresponding, as nearly as possible, to the order in which they were affected by the storm.

TABLE 1.—Meteorological data for hurricane of Oct. 13–21, 1944

[All times eastern standard]

Station	Date of observation	Lowest pressure	Time of lowest pressure	Velocity and direction at time of lowest pressure	Maximum wind velocity and direction for a 5-minute period	Time of maximum velocity	Extreme wind velocity and direction (fastest mile from register)	Time of extreme velocity	Velocity of extreme gust	Duration in hours of winds over 38 miles per hour
Swan Island, West Indies					38 NW		40		58	
Grand Cayman, British West Indies	15	29.06	5:30 p. m.	55 E	95				118 E	
Havana, Cuba:										
National Observatory	18	28.50					140	10:00 a. m.	163 SSE	
Batista Field	18	28.56	7:00 a. m.	80 SSE			85 SE ¹	5:45 a. m.	125	17
Dry Tortugas	18	28.02	5:00 p. m.		120 E ¹	1-2:00 p. m.	120 E ¹	1-2:00 p. m.		72
Key West, Fla.	18	29.11	2:50 p. m.	38 SE	56 SE	2:37 p. m.	66 SE	2:11 p. m.		13
Sunbrene Light	18	29.25	4:00 p. m.	110 SE	115 SE	6-7:00 p. m.				30
Miami, Fla.	19	29.49	1:57 a. m.		65		69	12:04 a. m.		
Sauibel Light	19	28.98	12:30 a. m.	100 S	100 S	12:30 a. m.				13
Fort Myers, Fla.	19	29.05	12:30 a. m.	65 ESE	65	12:30 a. m.				17
Tampa, Fla.	19	28.55	5:00 a. m.	43 NE	51 NE	4:19 a. m.	68 NE	4:23 a. m.	100 ²	5
Lakeland, Fla. (WBO)	19	28.68	5:30 a. m.	45 E	49 E	4:35 a. m.	57 E ¹	4:38 a. m.		3
Lakeland, Fla. (WBAS)	19	28.67	5:30 a. m.				57 E ¹	4:30 a. m.	78	
Lakeland, Fla. (Army)	19	28.62					81 E ¹		86	
Orlando, Fla.	19	28.94	7:30 a. m.	62 ESE			82 SSE ¹	9:05 a. m.	198 SSE	
Jacksonville, Fla.	19	28.94	2:44 p. m.	6 SE	41 NE	8:02 a. m.	46 NE	7:45 a. m.	60	1¼
Savannah, Ga.	19	29.13	11:55 p. m.	15 NW	42		50 NE ²	5:05 p. m.	85 ²	
Charleston, S. C.	20	29.25	2:30 a. m.	40 S ²	60 NE ²	7:15 p. m.			79 ²	4¼
Florence, S. C.	20	29.36	6:28 a. m.	25 SE					75	2
Columbia, S. C.	20	29.28	7:00 a. m.	19 NNE	30 NE	7:34 p. m.	34 NE	7:34 p. m.	60 NNE	0
Wilmington, N. C.	20				37 S	10:47 a. m.	40 S	10:52 a. m.	52 ²	0
Greensboro, N. C.	20	29.53	1:30 p. m.	20 N	35 NE	5:28 a. m.	38 NE	6:30 a. m.	61	0
Raleigh, N. C.	20	29.60	3:00 p. m.	18 SW	29 S	1:42 p. m.	31 S	1:44 p. m.	60	0
Richmond, Va.	20	29.49	7:15 p. m.	10 W	24 NE	9:25 a. m.	25 NE	9:25 a. m.	25 NE	0
Extreme pressure and highest velocities		28.02			120 E ¹		140		163 SSE	72

¹ Maximum for 1 minute.
² Estimated.
³ Aneroid barometer (uncorrected).
⁴ Anemometer blown down by wind registering 120 miles per hour.
⁵ Exceeds all previous records.

STORM TIDES

On the continent, damage from high tides was most severe along the Florida west coast, between Sarasota and Everglades, with heaviest losses reported along the beaches near Fort Myers. Along the coast north of Sarasota, including Tampa Bay, offshore winds prevented serious tide damage.

The highest tide reported was 12.28 feet above mean low tide at Jacksonville Beach, in an area which was subjected to a tide built up by gale winds off the ocean.

In Cuba, along the southern coast of Havana Province, a tidal wave caused the death of 20 persons in 1 small village and resulted in a considerable property damage. Its strength can be gaged by a report, received through the State Department, that a Standard Oil barge was carried 10 miles inland.

TABLE 2.—Storm tides during the hurricane of October 1944

Station	Highest tide ¹	Date	Time of highest tide (est.)	Normal high tide ²	Time of normal highest tide (est.) ²
	<i>Feet</i>				
Key West, Fla.	3.0	18	4:30 p. m.	3 0.5	4:02 p. m.
Everglades, Fla.	8.2	19	4:00 a. m.	2.6	1:18 a. m.
Fort Myers, Fla.	4.5	19	3:00 a. m.		
Tampa, Fla.	3.1	19	2:15 p. m.	1.9	4:08 p. m.
Daytona Beach, Fla.	6.9	19	9:00 a. m.	4.8	9:03 a. m.
Jacksonville Beach, Fla.	12.28	19	9-10:00 a. m.		
Jacksonville, Fla.	4.5	19	9-10:00 a. m.		
Fernandina, Fla.	10.6	19	11:18 a. m.	6.6	9:45 a. m.
Mayport, Fla.	7.83	19	5.3	9:33 a. m.
Savannah, Ga.	9.4	19	11:00 a. m.	8.3	9:40 a. m.
Charleston, S. C.	8.5	19	8:24 p. m.	5.1	9:02 p. m.

¹ Height above mean low tide.
² Compiled by Coast and Geodetic Survey.
³ Low tide; high tide 1.6 at 10:44 a. m.

WARNINGS AND ADVISORIES

During the 9 days that the hurricane menaced the islands and the Atlantic Seaboard of the United States, a total of 58 warnings and advisories were issued by the Hurricane Warning Centers at Miami, Washington, and Boston. At Miami on the 18th and 19th, prior to the failure of all wire service, 6 commercial radio stations maintained microphones in the Weather Bureau Office over which broadcasts of all warnings and advices were made at 2- to 3-hour intervals by members of the station force. Thorough and prompt dissemination of warnings by all news distributing agencies resulted in the evacuation of thousands of persons from threatened areas, and safeguarding, insofar as was possible, of all protectable property.

The Red Cross reports sheltering 35,000 persons during the height of the storm, a figure which represents only a small proportion of those evacuated from danger areas in the storm's path.

All Army and Navy planes that were in flying condition were moved from Florida to safe fields, and personnel that was not considered essential was evacuated from threatened sections. At Key West 150 small naval vessels were so effectively secured that no vessels were lost and only 6 grounded or had to be beached. Salvage of these was effected without great expense.

LOSS OF LIFE

The number of deaths resulting from the October hurricane has been placed at 318. This number will probably be increased as additional reports are received from the rural areas of Cuba, and the islands to the south, where most of the fatalities occurred.

Marine casualties include nine persons killed and five injured. The deaths occurred in the capsizing of a boat which was attempting to ride out the storm while at anchor in the mouth of Tampa Bay. The injured were involved in the sinking of a crash boat from Batista air base.

PROPERTY DAMAGE

Property damage incurred in connection with the storm has been placed at over \$100,000,000, of which \$63,000,000 has been estimated for the State of Florida.

As a result of the hurricane taking a path through the great citrus- and truck-producing area of the State, damage to crops was excessive. A total of about 25,000,000 boxes of fruit was blown from the trees or otherwise damaged. Only a small percentage of this fruit could be salvaged. Damage to fall truck is estimated at 70 to 75 percent of the crop.

Damage summary for Florida

Crops.....	\$50,000,000
Buildings (including livestock).....	8,000,000
Power and communications.....	800,000
Highways and bridges.....	200,000
Trees, ornamentals and shrubbery.....	3,000,000
Miscellaneous.....	1,000,000
Total damage.....	63,000,000

Damage in North Carolina and South Carolina was largely confined to power and communication lines, and from flooding of low coastal areas by high tides. Similar damage occurred in Georgia, and in addition many small fishing boats were wrecked in Savannah harbor.

In Cuba damage was reported from the Provinces of Havana, Pinar del Rio, and Matanzas, but was most severe in the eastern and northern portions of Pinar del Rio, in the region of Guanajay, Artemisa, and Candelaria. After passage of the hurricane, Havana harbor was so clogged with wrecked and sunken vessels that it was closed to traffic until it could be cleared. Reports of property damage in the island areas are too sporadic, at this time, to warrant statistical summarization.

TABLE 3.—Data on hurricane of Oct. 13-21, 1944

Place where first reported ...	Latitude 17° to 18° N., longitude 81° W., or about 200 miles east of Swan Island.
Coast lines crossed.....	Cuba, Florida, Georgia, Virginia, Maryland, and Delaware.
Lowest barometer reported at land station.	948.9 millibars (28.02 inches) at Dry Tortugas.
Lowest barometer reported at sea.	963.8 millibars (28.46 inches) at 4:30 p. m. on the 18th, near latitude 23°52' N., longitude 83°01' N
Maximum wind velocity and direction for a 5-minute period.	120 miles per hour from the East at Dry Tortugas. ¹
Maximum wind velocity and direction for a 1-minute period.	140 miles per hour at Havana, Cuba.
Velocity of extreme gust	163 miles per hour from the South-southwest at Havana, Cuba.
Greatest duration of gale winds.	72 hours of winds over 38 miles per hour at Dry Tortugas.
Heaviest precipitation.....	31.29 inches of rain fell during the passage of the hurricane at Grand Cayman Island, British West Indies, with a 24-hour maximum of 16.04 inches.
Number of persons killed....	18 persons killed in Florida. An estimated 300 lives lost in the Cuba area, about 200 of which were reported on the Isle of Pines and 24 at Havana.
Property damage.....	Estimated over \$100,000,000 in the Florida and Cuba areas, of which about \$63,000,000 occurred in Florida.

¹ Anemometer blown down by wind, registering 120 miles per hour.

Chart I. Hurricane of October 13-21, 1944

