National Transportation Safety Board
Office of Research and Engineering
Washington, D.C. 20594

Performance Study

Specialist Report
Marie Moler

A. ACCIDENT

Location:	New York, New York
Date:	March 11, 2018
Time:	1908 EDT
Aircraft:	Airbus Helicopters AS350B2, N350LH
NTSB Number:	ERA18MA099

B. GROUP

No vehicle performance group was formed.

C. SUMMARY

On March 11, 2018, about 1908 eastern daylight time (EDT), an Airbus Helicopters AS350B2, N350LH, was substantially damaged when it impacted the East River and subsequently rolled inverted after the pilot reported a loss of engine power near New York, New York. The pilot egressed from the helicopter and sustained minor injuries. The five passengers did not egress and were fatally injured. The scheduled 30-minute, doors-off aerial photography flight was operated by Liberty Helicopters, Inc., on behalf of FlyNYON under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which originated from Helo Kearny Heliport (65NJ), Kearny, New Jersey about 1850.

D. PERFORMANCE STUDY

Radar data used in this study are from the ASR-9 (airport surveillance radar) at John F. Kennedy International Airport (JFK) which sampled at a rate of once every 4.5 seconds. These radar data have approximately a 60 nautical mile (NM) range and an inherent uncertainty of ±2 Azimuth Change Pulses (ACP) = ± (2 ACP) x (360º/4096 ACP) = ±0.176° in azimuth, ±50 ft in altitude, and ±1/16 NM in range. The radar was approximately 12 NM from the end of the accident aircraft flight path.

Additionally, videos of the accident from outside and inside the helicopter are discussed in this report. Two cell phone videos taken by witnesses were used to determine the speed and location

of the helicopter's impact [1], the results of which are used in this report. A GoPro camera was mounted inside the helicopter and recorded events associated with the accident [2].

Communication between the LaGuardia air traffic control (ATC) tower, the accident aircraft, and another FlyNYON helicopter is included in this report [3].

Weather Observations

The closest weather observation to the accident was at LaGuardia Airport (LGA), 3 NM east of the accident location. The airport had a federally installed and maintained Automated Surface Observation System (ASOS), which was augmented by certified weather observers. At 1851 EDT (17 minutes before the accident), KLGA reported the weather as winds from 300° at 5 knots, visibility 10 miles or more, scattered clouds at 25,000 ft AGL, temperature 44°F (7°C), dew point 21°F (-6°C), altimeter 30.05 inHg.

Aircraft Ground Track, Altitudes, and Speeds from Radar

The helicopter was flying north along the East River (Figure 1 and Figure 2) and had climbed to an altitude of 1,900 ft (Figure 3) while at an airspeed of about 80 kts. The helicopter maintained 1,900 ft for about a minute and was turning along a track of about 330° as it traveled over the island of Manhattan. At 19:06:11 the helicopter began losing altitude. The helicopter continued on the 330° track until 19:06:30 when, at an altitude of 1200 ft, it began a 180° right turn toward the East River. By 19:06:53, the helicopter was over the river and at an altitude of 300 ft. The last recorded radar return was at 19:07:02, when the helicopter was at an altitude of 100 ft and passing Mill Rock, a small island in the East River. Figure 2 shows the location of the wreckage as recorded by local law enforcement and the estimated point of water impact determined from two witness cell phone videos. The difference between the two points was due to the helicopter drifting downstream in the current.

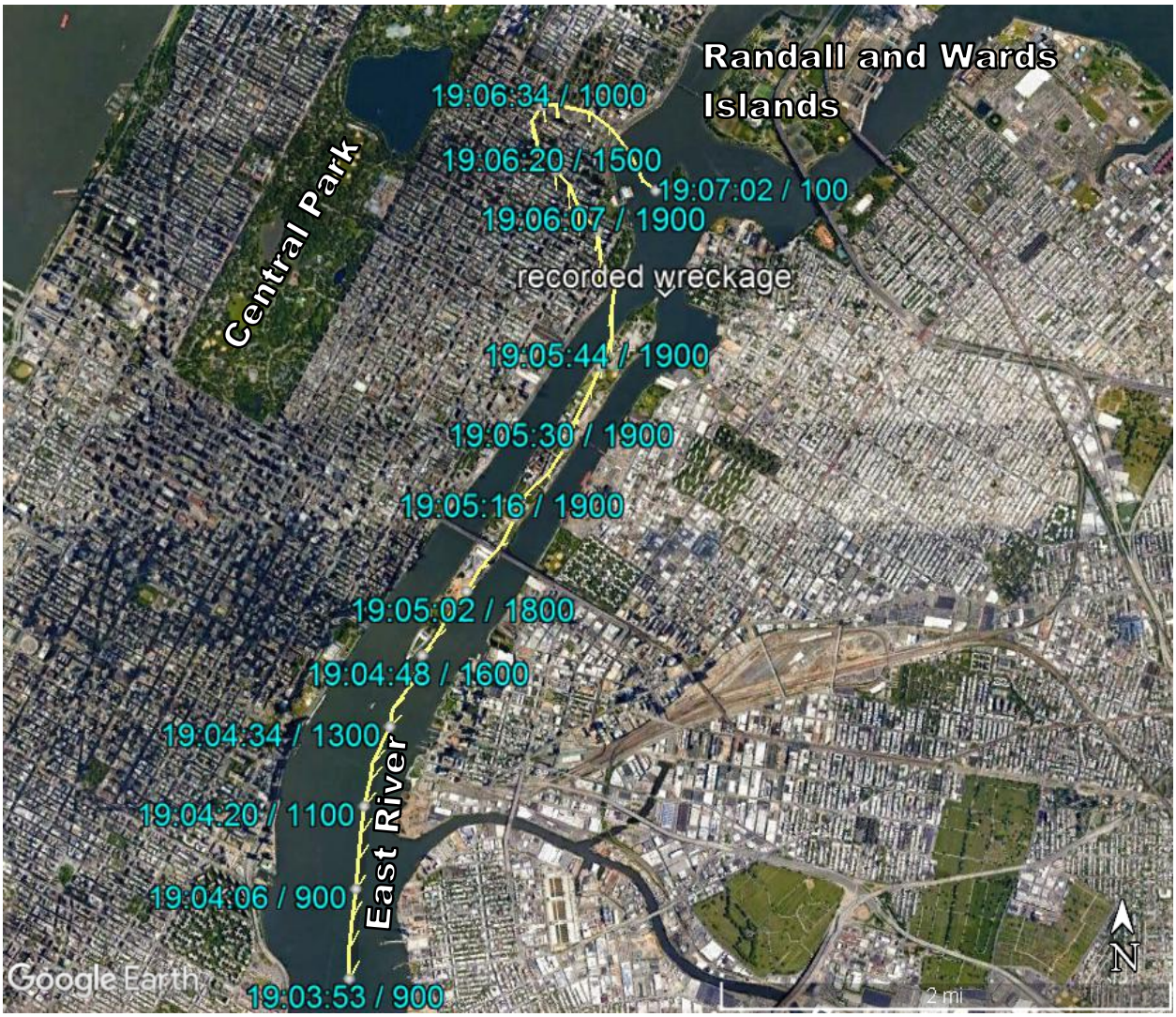

Figure 1. Aircraft flight path north along the East River.

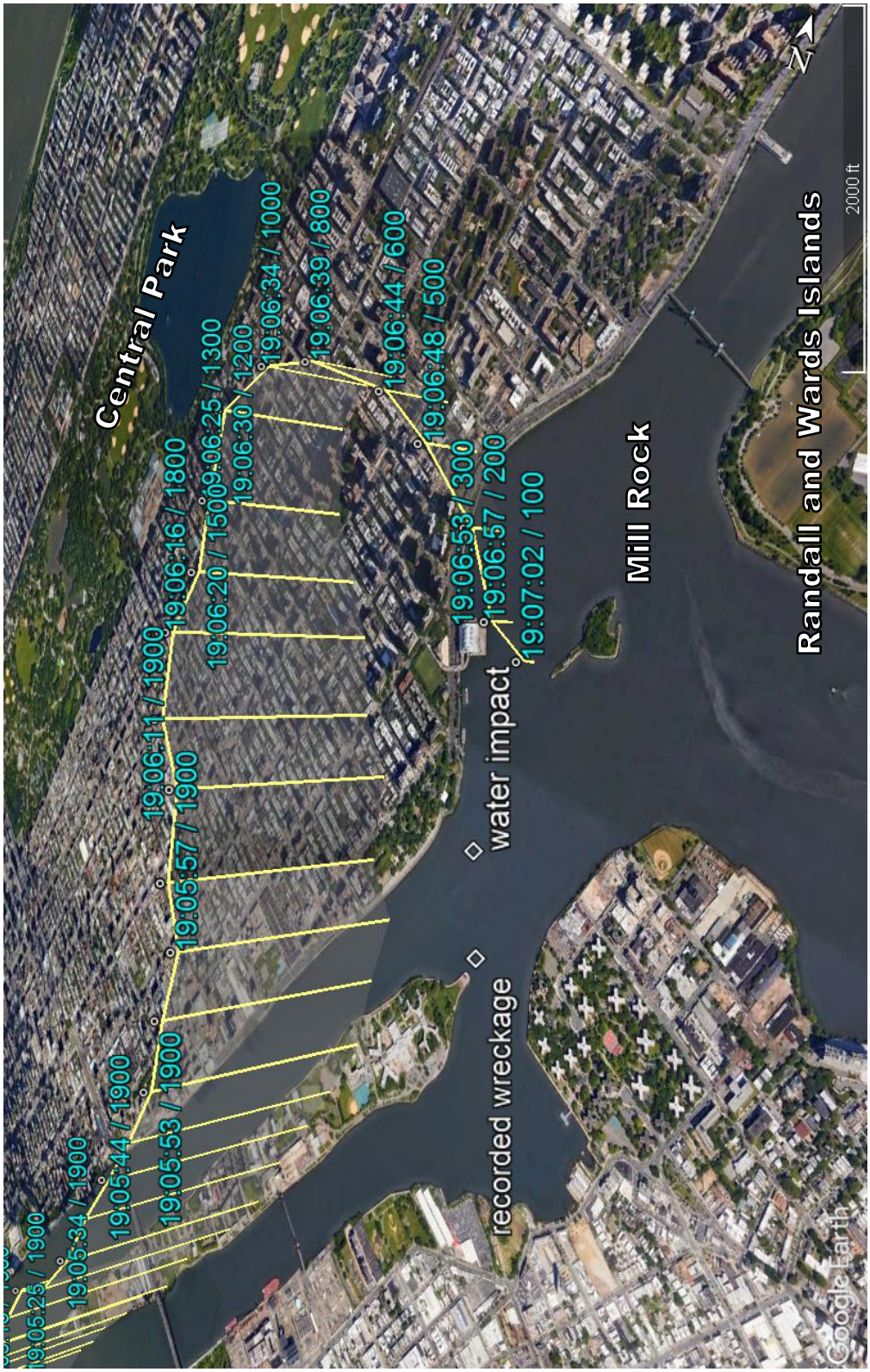

Figure 2. Aircraft flight path over Manhattan and down into East River.

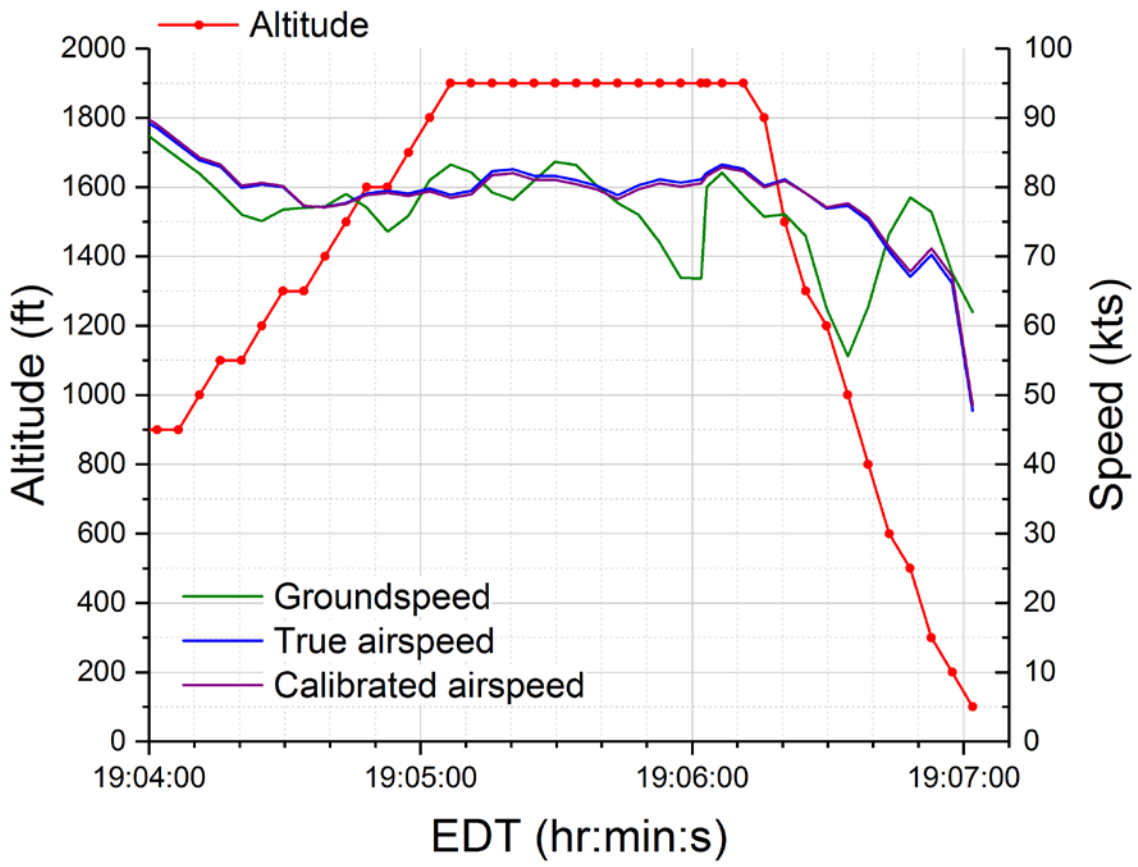

Figure 3. Aircraft altitude and calculated speeds.

Onboard Video and Air Traffic Control Communications

Details on how the timing of the internal GoPro video was correlated with a cellular provider's time are available in the Onboard Recording Device Factual Report. An additional time correlation compared when the helicopter passed over landmarks in the GoPro video with the radar track. All time correlation methods were consistent.

The onboard video recorded the timing of the loss of engine power, float deployment, a comment from the pilot to the passengers about landing, a sound similar to a helicopter flare maneuver, and impact with the water. Figure 4 shows an overlay of these events with the radar altitude, calculated speeds, and ATC communications from the accident helicopter. The loss of engine power occurred at 19:06:10 when the helicopter was at an altitude of 1,900 ft. The helicopter autorotated for the remainder of the flight, flared at 19:07:11, and impacted the water at 19:07:15. The cell phone video study estimated the helicopter impacted the water at about 22 kts of groundspeed, which is included in the figure. Emergency procedures recommend a maximum groundspeed for water contact to be 10 kts or less [4]. The sound of the floats deploying corresponded with the last radar point as the helicopter was passing Mill Rock and about 100 ft above the water, 13 seconds before

impact. The groundspeed at the time of float deployment was about 60 kts, approximately equivalent to airspeed. Procedures specify that floats should not be deployed until the airspeed is less than 75 kts. The total time between loss of engine power and water impact was 65 seconds.

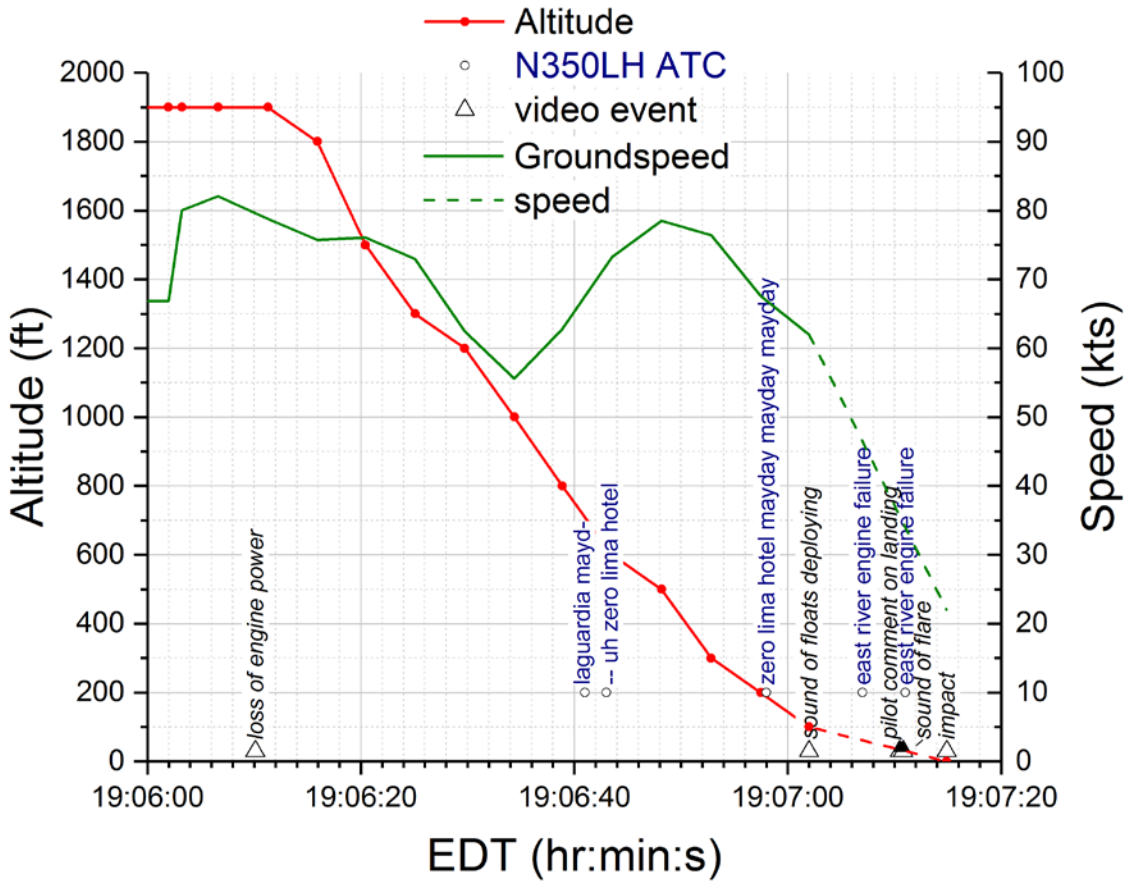

Figure 4. Aircraft altitude, speed (from radar and cell phone video), events from GoPro video, and accident helicopter ATC communications.

The accident helicopter had been in communication with the air traffic control tower at LaGuardia during the flight. At 19:06:41, the accident pilot communicated "laguardia may—" and then "—uh zero lima hotel" but the transmission was then interrupted by another aircraft and the tower's response. At 19:06:58, 18 seconds after the earlier possible mayday, the accident aircraft called "zero lima hotel mayday mayday mayday". The pilot made two more calls of "east river engine failure" before the helicopter impacted the river. The ATC communications of the accident aircraft after the loss of engine power are included in Figure 4, but the communications between the tower and other aircraft have been omitted for clarity.

The time between the loss of engine power and the first attempt at a mayday call is 30 seconds. During this time the aircraft had descended 1,100 ft and was turning towards the East River (Figure 5). The full mayday call occurred over the river just before the floats were deployed. The pilot replied twice to ATC "east river engine failure" just before and as the aircraft flared for landing.

Figure 5 does not show events between the floats deploying and the water impact because they have only been located in time and cannot be accurately placed on a map as the aircraft's flightpath is uncertain.

Figure 5. Radar track with selected ATC and GoPro events.

Autorotation Performance

The flight manual for the AS 350 B2 [5] states that the glide distance in autorotation is 0.54 NM per 1000 ft at an indicated airspeed of 65 kts and a rotor speed of 410 rpm. These values are equivalent to a descent angle of about 17°. Figure 6 shows that the helicopter on average achieved the glide distance specified in the manual. Including the distance between the final radar point and the water impact location, the helicopter travelled over 1 NM while descending 1900 ft. This is consistent with the manual stated performance.

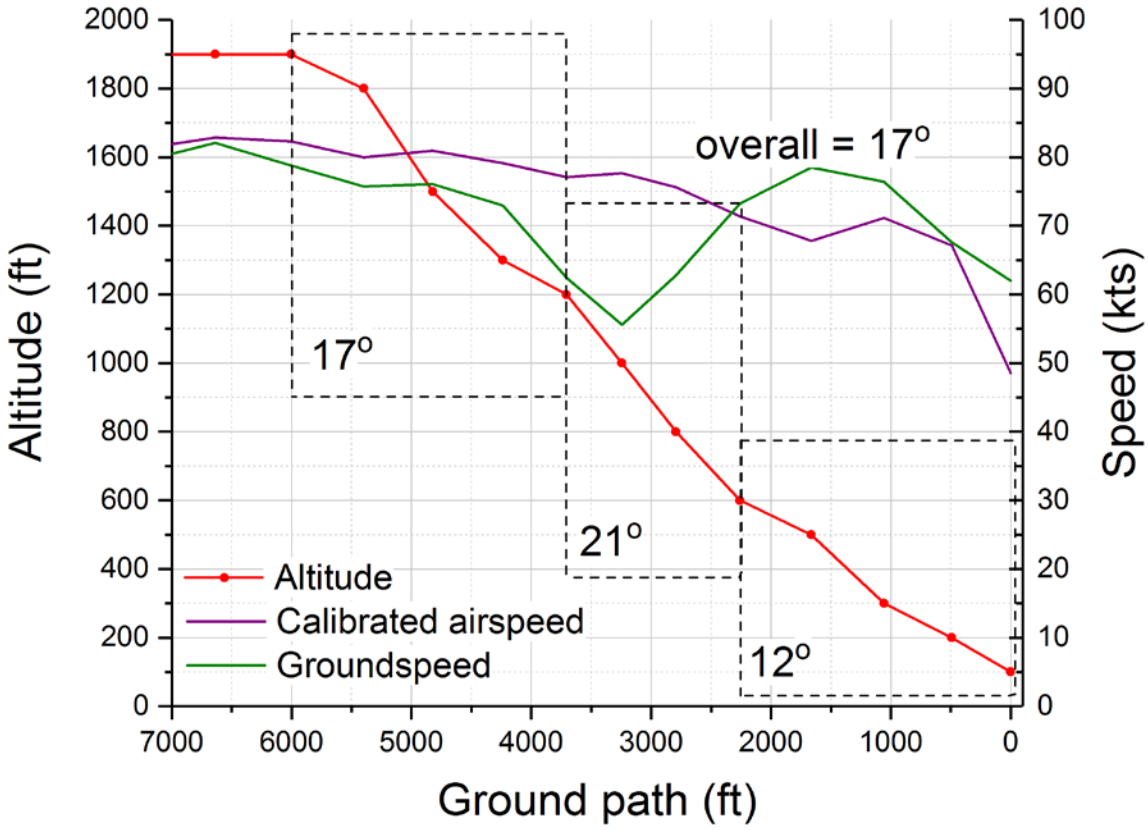

Figure 6. Aircraft altitude and calculated ground path distance, with descent angles.

The glide distance specified by the manual and achieved by the accident helicopter dictates that at 1800 ft of altitude, the aircraft had about one NM of range. Figure 7 shows an arc of one NM from 19:06:16, assuming a straight line of travel. At this point, the reservoir[1] in Central Park and the East River are both within the glide distance of the helicopter. The reservoir is 40 ft deep and does not permit boating[2].

[1] Officially named the Jaqueline Kennedy Onassis Reservoir and originally the Central Park Reservoir.
[2] http://www.centralparknyc.org/things-to-see-and-do/attractions/reservoir.html

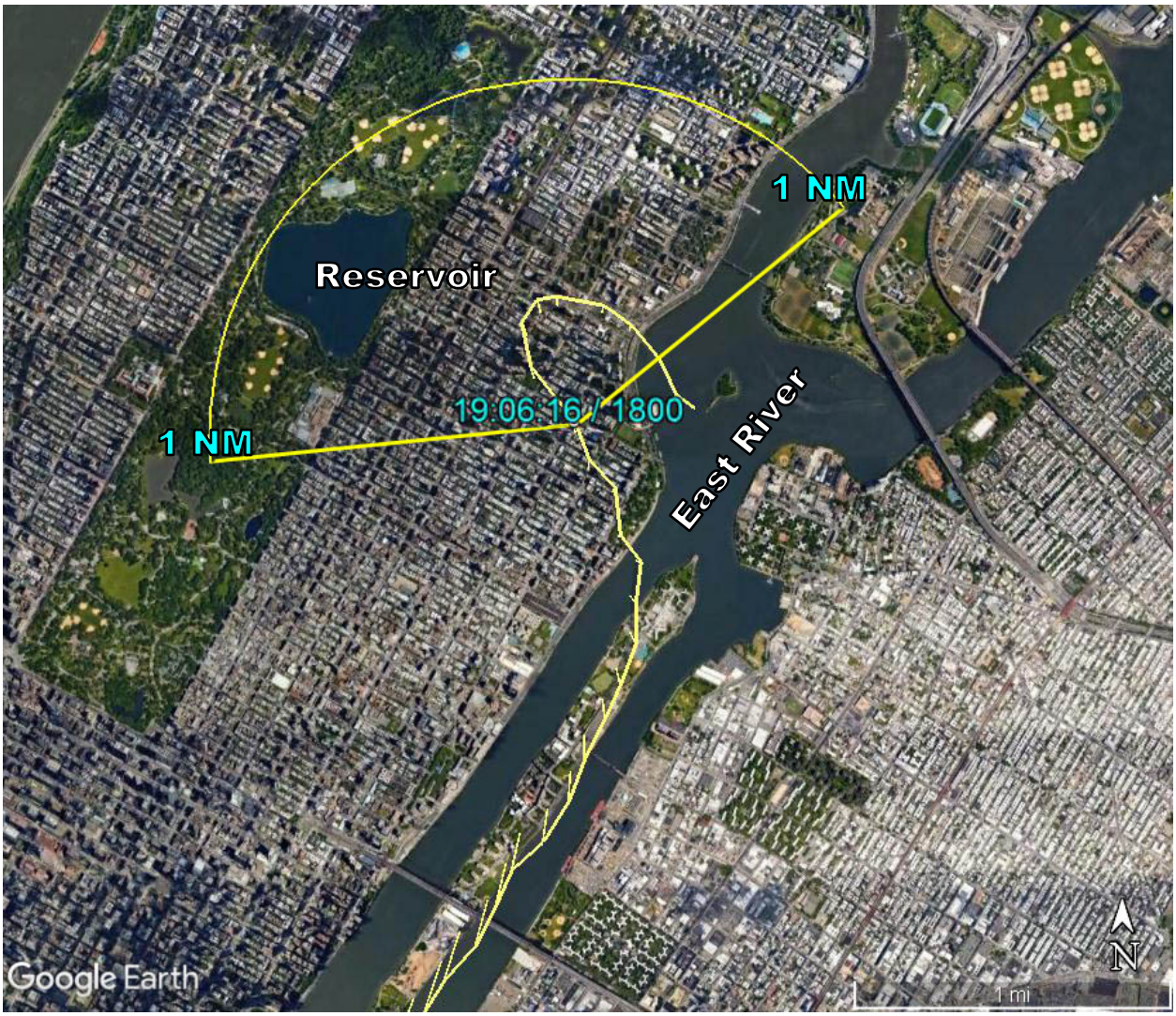

Figure 7. 1 NM of glide distance from 19:06:16, just after the helicopter began losing altitude.

At 19:06:34 the helicopter was at 1,000 ft and halfway through its turn towards the East River. Figure 8 shows an arc of the 0.54 NM range in autorotation. The playing fields on Randall and Wards Islands were no longer in range of the flight manual's stated glide distance.

Figure 8. 0.54 NM of glide distance from 19:06:34, as the helicopter turned towards the river.

E. CONCLUSIONS

After the engines lost power at 19:06:10 the helicopter descended from an altitude of 1,900 ft to the surface of the East River in 65 seconds. The helicopter achieved a glide distance in autorotation comparable to that described in the AS 350 B2 Flight Manual. Floats were deployed at 19:07:02 as the helicopter passed Mill Rock and the helicopter impacted the water at 19:07:15, 13 seconds later.

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F. REFERENCES

1. Video Study – Witness Video, ERA18MA099, National Transportation Safety Board, 2018.
2. Onboard Recording Device Factual Report, ERA18MA099, National Transportation Safety Board, 2018.
3. Air Traffic Control Transcript, ERA18MA099, National Transportation Safety Board, 2019.
4. RFM Supplement to EUROCOPTER AS350C, D, D1, B, B1, B2, BA, and B3 Rotorcraft Flight Manual. STC No. SR00470LA.
5. AS 350 B2 VEMD Flight Manual, Eurocopter, Revision 4.