

**NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Vehicle Recorder Division
Washington, D.C. 20594**



GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

ERA18MA099

**By
Sean Payne**

WARNING

The reader of this report is cautioned that the transcript of an onboard image recorder audio recording is not a precise science but is the best product possible from a Safety Board group investigative effort. The transcript or parts thereof, if taken out of context, could be misleading. The transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division

August 15, 2019

Onboard Image Recorder

Group Chairman's Factual Report
By Sean Payne

1. EVENT SUMMARY

Location: Flushing, New York
Date: March 11, 2018
Aircraft: Airbus Helicopter AS350 B3, Registration N350LH
Operator: Meridian Consulting Corp.
NTSB Number: ERA18MA099

On March 11, 2018, about 1908 eastern daylight time (EDT), an American Eurocopter Corp (Airbus Helicopters) AS350 B2, 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 1900.

2. GROUP

A group was convened on May 22, 2018. The group consisted of the following members:

Chairman:	Sean Payne Mechanical Engineer National Transportation Safety Board
Member:	Emily Gibson Survival Factors Investigator National Transportation Safety Board
Member:	Robert Hendrickson Senior Air Safety Investigator Federal Aviation Administration
Member:	Amanda Taylor Research Engineer Federal Aviation Administration

Member: Audrey Fournier
Technical Investigator
Bureau d'Enquêtes et d'Analyses (BEA)

Member: Manny Figlia
Director of Aviation Safety
Airbus Helicopters

Member: Paul Tramontana
Chief Pilot
Liberty Helicopters

Member: Brian Rosenberg
Director of Operations
FlyNYON

3. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division received the following imaging devices:

Recorder Manufacturer/Model: **Go Pro Hero 5**
Recorder Serial Number: **C3161354671380**
Owner: **FlyNYON**

Recorder Manufacturer/Model: **iPhone X**
Recorder Serial Number: **N/A**
Owner: **Passenger S6¹**

3.1 Recorder Description

GoPro Hero 5

The GoPro HERO is a compact, lightweight, POV² digital camera enclosed in a ruggedized housing that allows the camera to be mounted in a variety of positions using an array of supported accessories. Depending on the model, the camera supports 4K³ HD⁴ at 60 frames per second (fps) as well as other lower quality recording resolutions at higher frame rates. The camera can be set to record still images simultaneously or independently of a video stream at a resolution of up to 12 megapixels.⁵ The camera includes a wide angle aspherical f/2.8 glass lens that provides a maximum of 170 degrees

¹ References figure 1, section 3.4 of this report.

² POV – Point of View Shot – A photography technique that records the character's viewpoint from a singular camera location mounted in a manner that represents the character's field of view.

³ 4K – A resolution format of 3840 x 2160 pixels.

⁴ HD – High Definition – A resolution generally consisting of greater than 480 lines of horizontal resolution.

⁵ Megapixel – (MP) – A count of a million pixels in an image or used to express the number of individual image sensor elements on a digital camera image sensor.

viewing angle. The camera supports recording to micro SD⁶ cards up to 64 GB in size. A built in Wi-Fi⁷ module allows users to connect to the camera either via an accessory remote control or via a smart phone app that permits camera control and image transfer.

iPhone X

The iPhone X is a Portable Electronic Device (PED). These devices are typically consumer electronic devices capable of communications, data processing and/or utility. Examples range from handheld, lightweight electronic devices such as tablets, e-readers, and smartphones to small devices such as MP3 players and electronic toys.

3.2 Recorder Damage

GoPro Hero 5

Upon arrival at the laboratory, it was evident that the GoPro had not sustained any heat or structural damage. The device was found submerged in water and shipped to the laboratory in water, however, the device is designed to be waterproof. Video and audio were extracted from the recorder normally, without difficulty, from the device's microSD card.

iPhone X

Upon arrival at the laboratory, it was evident that the iPhone X had not sustained any heat or structural damage. The device was found submerged in water and shipped to the laboratory in water, however, the device is designed to have water resistant properties. Video and audio were extracted from the device normally, without difficulty, from the device's internal memory.

3.3 Recording Description

GoPro Hero 5

The GoPro's SD card contained .MP4⁸, .WAV⁹ and .LRV¹⁰ files. One .WAV and one .LRV file was created for each .MP4 video recording. Each .MP4 video recording contained its own embedded audio track, however, the associated .WAV file for each .MP4 video recording contained a higher quality audio recording. The transcript below was developed from video obtained from the .MP4 files and audio synced from the .WAV files to produce the highest quality product possible. Digital filters were used as necessary to adjust the audio for maximum information extraction.

Each .WAV file contained 4 tracks of audio. Channels 1 and 2 contained an ambient recording of sounds captured near the camera's microphone when the camera was

⁶ SD – Secure Digital – a standard for nonvolatile memory card used in portable devices.

⁷ Wi-Fi – A local area wireless technology that allows electronic devices to exchange data over a network.

⁸ .MP4 – A video container format for compressed high resolution video.

⁹ .WAV – Waveform Audio file. A format for digital audio.

¹⁰ .LRV – Low Resolution Video file. A smaller scale video for use in conjunction with a preview feature available with GoPro's smartphone control application for mobile devices.

operating. Channel numbers 3 and 4 did not contain any audio information. Each channel's audio quality is indicated in Table 1.¹¹

Table 1: GoPro Audio Quality¹¹.

Channel Number	Content/Source	Quality¹²	Duration¹³
1	Ambient	Excellent	1:33:41.9
2	Ambient	Excellent	1:33:41.9
3	Null	N/A	1:33:41.9
4	Null	N/A	1:33:41.9

11. Audio quality from the iPhone X was not rated.

12. Ratings were determined when the helicopter's engine was not operating.

13. Format given in HH:MM:SS.0

iPhone X

Data extracted from the iPhone included 57 photos and 17 videos associated with the accident flight.

Timing and Correlation

Timing on the transcript was established by correlating recorded time on imagery obtained from the passenger in S6's¹² iPhone X to a corresponding image event on the GoPro camera. The video events were offset to reflect the local eastern daylight time of the accident.

For time correlation between the GoPro, the iPhone X and the accident time, the following formula was used:

$$\text{GoPro Elapsed Time} + 67,436.9 \text{ seconds} = \text{EDT}$$

$$\text{iPhone X Recorded Metadata Time} + 0 = \text{EDT}$$

The timing information is given in the format HH:MM:SS.00, where HH stands for the number of hours, MM, the number of minutes and SS.00, the number of seconds. For audio events, resolution is given to the nearest tenth of a second. For video events, resolution is given to the nearest hundredth of second.

3.4 Description of Audio/Video Events

Field of View – GoPro HERO

The GoPro camera was mounted inside the helicopter on the helicopter's roof. The GoPro was mounted just aft of the front row of seats (a pilot and a passenger) and was on the centerline of the helicopter. The camera provided a view to the left side of the helicopter. Within view of the camera was passenger in seat 2 in the front left seat¹³, passenger in

¹¹ See attached Audio Quality Rating Scale.

¹² See section 3.4 for seating chart.

¹³ The front left seat is labeled in figure 1 as both Seat 1 and Seat 2. These two seats were combined as a bench seat. Only one passenger was seated on this bench seat, in the position of seat 2. That passenger is thereby referred to as Passenger S2 (Passenger in seat 2).

seat 3 in the rear left, outer seat and passenger in seat 4 in the left, inner seat/open door position. The camera's view also included a view out the left front windscreen and a view of out of the removed left front and left rear doors. Figure 1 is a seating chart for the accident flight. Figure 1 denotes the camera's approximate field of view in red.

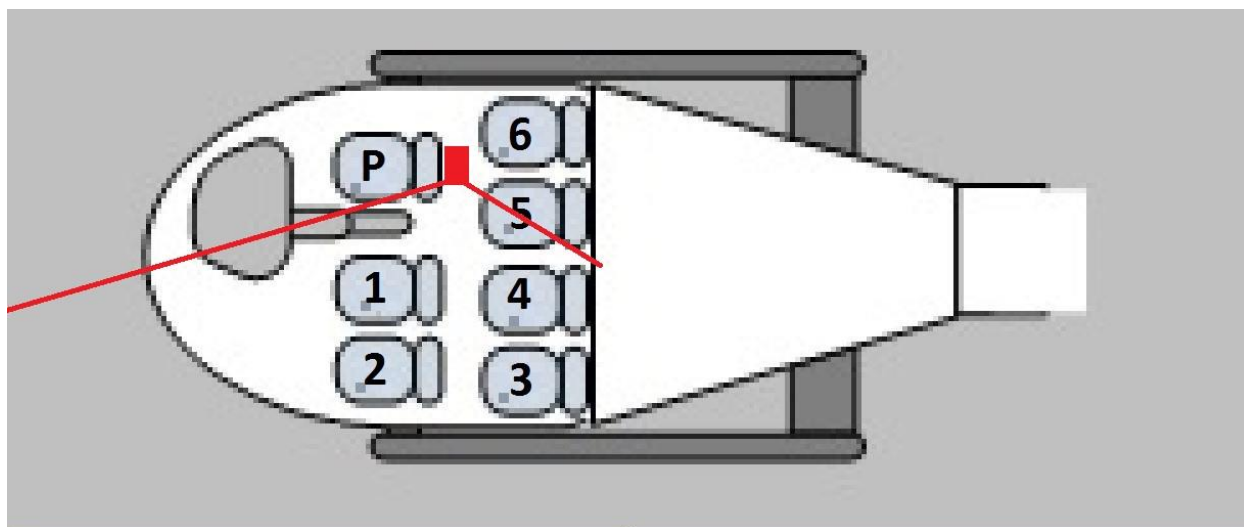


Figure 1. The seating chart for the accident flight and the camera's approximate field of view shown in red. Seat 1 and Seat 2 were combined as a bench seat. Passengers are referred to as their respective seat number.

The helicopter's center pedestal was also in view. The rotor brake, fuel flow control lever and fuel shutoff valve were also visible at times when the pilot's left arm did not obstruct the camera's view.

Passengers are referred to as their respective seat number. For example, the passenger in seat 6 is referred to as "Passenger S6" or "PS6."

Field of View – iPhone X

The iPhone X was hand held by the rear, right, outer seat/doorway passenger, identified as passenger S6 in Figure 1. The iPhone X captured various fields of view, although the majority of photos were taken looking outward from the rear, right, outer seat.

Recording Contents

In the transcript below, no distinction is made as to which device, the GoPro or the iPhone, captured which audio/video event. In general, the majority of the transcribed events, both visual and aural in nature, came from the GoPro recording.

All conversation detected by the group was transcribed, including when the helicopter's engine was operating, if possible.

Once the helicopter was airborne, passengers began using PEDs to capture video and photos during the tour. Passengers' PEDs were either running a camera application or various social media photo sharing applications, namely Snapchat and Instagram. Throughout the flight, passengers interacted with their respective PEDs. In many cases,

it appeared the passengers were sharing photos over a cellular network to social media photography/video applications. In some instances, passengers were interacting with each other. Throughout the flight portion, the passengers photographed their shoes and took "shoe selfies." The number of "shoe selfies" were not specifically quantified but were numerous and frequently taken near visible landmarks. Shoe selfies were only noted in the transcript when determined to be of importance to a passenger's positioning in their seat. Outside of the activity mentioned above, actions by the passengers were only transcribed if they met the following criteria:

- The action appeared to influence the safety of flight
- The action appeared to influence the passenger's survivability outcome
- The action fell outside what might have been typical behavior for a photographic observation flight

Each passenger observed had an Apple brand PED as their electronic device onboard for photography/videography. No other type of electronic device, including dedicated cameras, were observed in use by any of the passengers.

Throughout the recording, noise from the rotorcraft was determined to be nominal for the regime of flight. For the most part, all rotorcraft noises were not specifically transcribed. In some instances, specific noises were noted in the transcript to either give additional clarity to certain flight regimes or to document the autorotative portion of flight.

Transcript of a GoPro Hero 5 image recorder, serial number C3161354671380, installed on a Meridian Consulting Corp. Airbus Helicopter AS350 B2 (N350LH), which crashed after an autorotation into the East River, Flushing, New York.

LEGEND

CAM	Cockpit area microphone ambient voice or sound source
Pilot	Voice identified as the pilot
CX	Voice identified as the “Customer Experience Representative”
MPAX	Voices of multiple passengers
PS-2	Voice identified as the front seat passenger (outer portion of bench seat)
PS-3	Voice identified as the rear, left, outer seat passenger
PS-4	Voice identified as the rear, left, inner seat/doorway passenger
PS-5	Voice identified as the rear, right, inner seat/doorway passenger
PS-6	Voice identified as the rear, right, outer seat/doorway passenger
PS-X?/Y?	Voice of either passenger X or passenger Y
RDO	Voice determined to be speaking into a radio.
-?	Voice unidentified
*	Unintelligible word
#	Expletive
@	Non-pertinent word
()	Questionable insertion
[]	Editorial Insertion

Note 1: Times are expressed in eastern daylight time (EDT).

Note 2: Generally, only radio transmissions to and from the accident aircraft were transcribed.

Note 3: Words shown with excess vowels, letters, or drawn out syllables are a phonetic representation of the words as spoken.

Note 4: A non-pertinent word, where noted, refers to a word not directly related to the operation, control or condition of the aircraft.

Audio Transcript

18:43:56.9

[Start of recording.]

18:43:57.0 smile at the camera guys its lookin at you.
CX

Video Comments

18:43:57.45 PS-2 was wearing the supplemental harness and was tethered to a hardpoint on the helicopter's floor near the right rear base of the front passenger seat (bench). The tether from the hardpoint was routed under Seat 1's right arm rest and was connected to the rear of the passenger's supplemental harness via a twist lock carabiner. Three excess tether loops were hanging from PS-2's carabiner forming a tail of tether loops. PS-2 was wearing a NorthFace style jacket, jeans and sneakers. PS-2 was facing outboard from the helicopter and was having a mostly unintelligible conversation with the pilot who was standing outside the left of the helicopter. At this time, PS-2 was not wearing a headset or the factory installed rotorcraft restraint.

PS-3 was seated in seat number 3. PS-3 was wearing a headset, the supplemental harness, the factory installed rotorcraft restraint and was equipped with both a fanny pack style personal floatation device (PFD) as well as a hook knife on the left upper side of the supplemental harness. PS-3 also had a PED tethered to the supplemental harness using a blue lanyard. Later, it was visible that PS-3's factory installed rotorcraft restraint's shoulder strap was routed under her right arm. PS-3 was wearing winter clothing, including a hat and finger optional gloves.

PS- 4 was seated in seat number 4. PS-4 was wearing a headset around his neck in which the headset cable

Audio Transcript

18:43:57.6 [Mostly unintelligible conversation between the
CAM pilot and PS-2 near the left front side of the
helicopter, away from the microphone. The
conversation related to the geographic differences
between rural areas and cities.]

18:43:59.6 yeaaa.

**PS-5?/PS-
6?**

18:44:01.0 sorry - I gotta go right here.

CX

18:44:08.2 this is to get the front angle from both sides.

CX

18:44:10.8 alright. cool.

PS-4

18:44:12.7 [Three quick beeps. The sound of a GoPro
CAM powering on.]

Video Comments

was tethered to the supplemental harness using a carabiner and zip tie, the supplemental harness, the factory installed rotorcraft restraint and was equipped with both a fanny pack style PFD as well as a hook knife on the right upper side of the supplemental harness. PS-4 also had a PED tethered to the supplemental harness using a blue lanyard. PS-4 was wearing a winter jacket, jeans and sneakers. PS-4 was not wearing gloves.

The CX was stepping inside the rotorcraft to activate GoPro cameras.

18:44:02.43 The CX continued to install and activate GoPro cameras in the helicopter's cabin.

Audio Transcript

18:44:20.7 [Sound of beep, consistent with GoPro starting a
CAM recording.]

18:44:22.9 awesome.

PS-4

18:44:24.7 zero lima is gunna leave in a little bit.

CX-RDO

18:44:29.5 hey @PS-2

PS-4

18:44:31.2 ahh - I'm just putting on your seat belt.

CX

18:44:32.3 yeah yeah.

PS-2

18:44:33.4 (I) mean your headset.

CX

18:44:33.48 The CX attached PS-2's headset cable to the back of PS-2's supplemental harness using a zip tie and a carabiner.

18:44:34.9 yeah.

PS-2

18:44:35.8 I'm ready.

PS-4

18:44:36.0 this is yours.

CX

18:44:36.9 hey @PS-2

PS-4

18:44:37.6 captain captain.

PS-2

18:44:38.3 what's up?

Pilot

Audio Transcript

18:44:39.1 [to PS-2] just know where the cameras are. [to
PS-4 CX] There's not one up there - right?
18:44:43.1 no. that - this one is (good) with recording you
CX guys right here.
18:44:47.3 this one right here [Sounds as if speaking in unison
PS-4 with PS-2.]

18:44:48.2 and that one too.
CX
18:44:49.0 this one too.
PS-2
18:44:49.6 and this one too.
CX
18:44:50.0 that's not one.
PS-4
18:44:50.5 sup - super wide fish eye lens.
Pilot?

18:44:51.8 this one right here? that was - yeah.
CX
18:44:53.7 good - we're good.
**PS-
5?/6?/Pilot?**

18:44:54.6 that one's us - and then that one.
PS-4

Video Comments

18:44:47.60 PS-2 leaned back to reveal that he was equipped also with a fanny pack style PFD and a hook knife located on the upper left portion of his supplemental harness.

18:44:50.93 The CX pointed to cameras throughout the helicopter's cabin.

Audio Transcript

18:44:56.7 and that one.

CX

18:44:57.2 let's all be safe - again.

PS-2

18:44:59.0 [Sound of laughter, mostly attributed to PS-4.]

MPAX

18:44:59.3 * * *.

CX

18:45:01.4 I'm so (excited/psyched).

PS-2

18:45:02.1 [Sound of laughter.]

PS-3?

18:45:02.3 what's that?

PS-4

18:45:02.7 he had like five bloody marys before we even...

PS-4 [Voice trailed off.]

18:45:04.6 yeah yeah - I am - I am - I'm a little twisted.

PS-2

18:45:07.2 had - had some liquid courage.

PS-6

18:45:09.5 [Sound of laughter.]

PS-?

18:45:09.5 [Sound of laughter.] he's pumped you guys.

CX

18:45:11.0 I'm (Rick/redic) twisted. anyone see Rick and

PS-2 Morty?

18:45:14.3 [Sound of laughter.]

MPAX

Video Comments

Audio Transcript

18:45:15.2 get schwiffyyy.¹

PS-2

18:45:16.9 [Sound of laughter.]

PS-4

18:45:18.0 god.

PS-4

18:45:18.7 * * * this under your arm.

Pilot

18:45:19.6 now that's gunna be stuck in my head. thanks.

PS-6

18:45:21.3 * * *.

CX

18:45:21.4 yeah.

PS-4

18:45:22.0 [Sound of laughter.]

PS-4

18:45:22.1 ahhh - get schwifty.

PS-2

18:45:23.2 (hey/thanks.)

PS-6

18:45:25.6 here we go.

Pilot

18:45:27.3 nice.

PS-5?

18:45:27.4 * get that.

Pilot

Video Comments

¹ "Get Schwifty" – A reference to Season 2, Episode 5 of the television show *Rick and Morty*. The reference is to a song, "Get Schwifty." The popculture website UrbanDictionary.com defines "schwifty" as "The ultimate abandonment of inhibition while having a good time."

Audio Transcript

18:45:27.8 I was like * * *. I was like - do I pop into a liquor
PS-6 store and get something? - then I was like "NO" -
business meeting - shouldn't do. no shots before a
business meeting. [Sound of laughter.]

18:45:28.9 [to PS-2] (I'm gunna check) into my flight -
PS-4 tonight.

18:45:32.8 * * *. okay?
CX

18:45:33.3 a (flask)?
PS-5?

18:45:36.3 feel good? you guys good? have fun guyyys.
CX

18:45:39.9 [Sound of laughter.]
MPAX

18:45:40.4 they tell us we're not supposed to drink before we
Pilot fly too - but I mean come on. [Spoken in a joking
tone.]

18:45:43.2 [Sound of laughter.]
PS-?

18:45:43.6 whatever. [Spoken in a joking tone.]
PS-6?

18:45:44.2 eh hh - you know. like come on?
PS-2

Video Comments

18:45:27.90 The CX, then later, the pilot, assisted PS-2 in
securing PS-2's factory installed rotorcraft restraint.
PS-2 was now seated properly in his seat and was
facing forward, no longer facing outboard from the
helicopter. The left shoulder strap was routed over
PS-2's left shoulder and down PS-2's chest to the
central buckle. The right shoulder strap was routed
under PS-2's right arm and to the central buckle.

Audio Transcript

18:45:45.0 you want this? [Shouting in another direction,
Pilot toward CX who was unseen.]
18:45:46.7 its twenty eighteen. you know.
PS-2
18:45:47.7 [to PS-2] yeah. right.
Pilot
18:45:49.9 any parking spots? [CX speaking in another
CX-RDO? direction, or radio, out of view of camera.]
18:45:50.7 let's get schwifty guys. [Shouted.]
PS-2
18:45:52.7 [Sound of laughter.]
MPAX

18:45:54.6 * * *
PS-5?/ 6?
18:45:55.7 [Sound of laughter.]
PS-4
18:45:55.9 get back four more days. [A response to a
Pilot conversation with CX in which only one side was
heard.]
18:45:57.3 ohhh man.
PS-5?
18:45:59.0 ahhh.
**PS-5?/PS-
6?**
18:45:59.8 [Sound consistent with door closing and
CAM automotive motor starting.]

Video Comments

18:45:53.33 Pilot had exited the helicopter and walked toward the CX who was now standing outside the left front of the helicopter and handed her a piece of paper.

Audio Transcript

18:46:01.1 (weee/weirddd)

PS-6?

18:46:02.5 ohhh everybody saw that. (that was bad).

Pilot

18:46:03.6 [Sound of laughter.]

MPAX

18:46:05.1 oh that's a good one.

Pilot

18:46:06.6 get (schwifty). that's the way you do it. @Pilot is gettin' (schwifty/jiffy/drift).

PS-2

18:46:09.7 alright guys. I take it everyone's doin good?

Pilot

18:46:11.92 The pilot entered the helicopter in the pilot's seat and faced backward to address the passengers.

18:46:12.2 yeah.

MPAX

18:46:13.3 alright. so just a couple things first. just give me a couple minutes for ya. ummm. they probably just told ya. they told you back at the other place probably. just remember so. front seat - two corners from me - leave your seatbelts on the whole flight. you're tethered in - you're not goin' anywhere - just so you we don't beat the crrrap out of the helicopter or each other with the buckles - it will hurt. - ummm - for you guys [points at PAX4 and PS-5] - as soon as we get outta here - I'll let you know when you can get down.

18:46:36.5 okay.

PS-4

18:46:36.9 and when I say that - that means corners can spin out - you can spin your legs out. ummm - if it's too

Audio Transcript

Video Comments

cold - too windy while we're enroute and you wanna like - hang out - in the helicopter - that's cool - you don't have to wait for me to tell you AGAIN you can move. Once I say you're free to do your thing - go for it - you know you guys pay to dangle - dangle. umm be advised though - if you do decide to stick your body out - right when I tell you - like I don't waste time - like as soon as we get goin' go ahead get down. If you ever stuck your hand out the car window drivin' - muuultiply that by about three. we're gunna be cookin' so you are gunna feel it.

18:47:13.8 ohhh (cookin').

PS-4

18:47:14.6 ummm - don't let it scare ya - ya know you'll feel it
Pilot in your waist - legs might go back a little - BUT you'll be okay. alright. I just wanna give you guys a head's up - that will happen.

18:47:23.1 okay.

PS-5?/6?

18:47:23.6 ummm - tryin to think. uh then when we land -
Pilot when we come back - do me a favor - umm - ya know - dont worry about takin' any gear off yet ya know or tryin' to get untethered. let me shut down we'll get out we'll help you guys. uhh so for the thirty minute - kinda ya know - the little sheet they gave me - just kinda said everything. did you guys have anything specific you wanted - or you want me just kinda give you what I think is kinda the best for ya?

18:47:53.2 I know that you know what's best. have you seen
PS-2 Billions [Showtime television program] - the

Audio Transcript

Video Comments

openings to Billions where it's like - the - it's like
right - right - right at Battery [Battery Park] - na no
- it sounds stupid - ya know Battery Park city
where its like -

18:48:01.4 umm hmm.

Pilot

18:48:02.0 where its like - boom - World Trade Center -

PS-2

18:48:03.7 alright. so --

Pilot

18:48:04.4 yeah that. that too.

Pilot

18:48:06.1 yeah. straight on - the southern part.

PS-2

18:48:08.7 I'll throw this out there - uhhh - we'll get outta
here-

Pilot

18:48:11.7 umm hmm.

PS-5?/6?

18:48:12.1 are you guys interested in the statue at all?

Pilot

18:48:14.5 yeah. for sure. for sure.

MPAX

18:48:15.2 alright. so what I can do is I uhhh - for the statue -
we usually park just south of her.

Pilot

18:48:19.9 yea.

PS-?

18:48:20.1 ya get the city in the background.

Pilot

18:48:21.6 umm hmm. I love it.

MPAX

Audio Transcript

18:48:22.2 umm - move over to the face and like I'm down
Pilot eye level with her.

18:48:26.5 yeah.
PS-2

18:48:27.2 so it's - it's cool.
Pilot

18:48:28.5 that's nice.
PS-2

18:48:29.1 from there - Brooklyn Bridge - up the East River -
Pilot Central Park.

18:48:32.8 yup.
PS-5?/6?

18:48:33.2 down to the Empire State Building.
Pilot

18:48:35.0 (yeah/yup)
PS-2

18:48:35.5 One World Trade and then that shot from
Pilot Governors Island northbound.

18:48:36.2 [Sound of turbine engine starting in vicinity of
CAM ramp area, not the accident helicopter.]

18:48:38.2 sure.
PS-2

18:48:39.6 sounds good. sounds perfect. yea. sure.
MPAX

18:48:39.7 sounds good?
Pilot

18:48:41.0 [sound of clapping. general agreement was
MPAX verbalized.]

18:48:41.9 alrighhht.
Pilot

Video Comments

Audio Transcript

18:48:42.8 alright. LET'S DO IT. [Shouted.]
PS-2

18:48:43.3 party.
PS-4

18:48:44.2 HOOO. [Spoken loudly.]
PS-2

18:48:45.1 (go again)
PS-2?

18:48:45.7 we're gettin' schwifty.
PS-2

18:48:47.1 alright. well again - my name is @PilotFN² I'll be
Pilot your pilot for the next thirty minutes.

18:48:50.8 alright @PilotLN sounds good.
PS-5?/6?

18:48:51.6 hang tight we'll be outta here.
Pilot

18:48:52.9 alright
PS-2?

18:48:54.2 alright - just so you know - like these up here -
Pilot (and up here for you/there not here for you) - that's not the heat - the heat is under the seats. so there's vents under there - so if your hands get cold - stick em under the seats.

18:49:05.2 okay.
PS-?

18:49:05.7 I love watching people try to put their hand in
Pilot front of that.

Video Comments

18:49:00.12 The pilot pointed out air vents in the helicopter's cabin.

² @PilotFN = Pilot's First name - @PilotLN = Pilot's Last Name

Audio Transcript

18:49:07.8 [Sound of laughter.]

MPAX

18:49:08.3 naw dude that's not-- turn on the A-C for ya if ya
Pilot want.

18:49:11.4 [Sound of laughter.]

MPAX

18:49:12.1 I thought your name was @PilotLN - I was
PS-2 looking at your jacket.

18:49:13.5 ahh that's my last name.

Pilot

18:49:14.5 ahh okay. (thanks).

Pilot

18:49:16.2 like (@PilotLN).

PS-2

18:49:19.1 let's do it @PilotFN.

PS-2

18:49:20.2 like Rick and Morty.

PS-2

18:49:21.4 I get that all the time - yeah.

Pilot

18:49:22.8 I'm (little) @PilotFN man - I'm helicopter - I'm
PS-2 helicopter @PilotFN - bruh [Sounds as if the
speaker is impersonating a voice.]

18:49:32.25 All PAX visible were wearing their headsets over
their ears. PS-3 put on clear protective eyewear.

18:49:32.7 * * *. [Unintelligible comments and the sound of
MPAX laughter.]

Video Comments

Audio Transcript

18:49:35.0 get schwifffttyyy.
PS-2

18:49:43.5 [Sound of laughter.]
MPAX

18:49:47.1 *.
PS-2

18:49:49.0 they love me. [Gestures in direction of the other
PS-2 helicopter on the ramp area.]

18:49:50.9 doubt it. doubt it. I don't even love you.
PS-4

18:49:53.6 they love me - they all love me.
PS-2

18:49:55.2 [Sound of laughter.]
PS-4

18:49:56.6 *.
PS-?

18:49:56.8 * * * schwifty.
PS-2

18:50:08.0 clear. [Shouted.]
Pilot

Video Comments

18:49:40.39 The pilot was now seated in the pilot's seat facing forward. The pilot put on the factory installed rotorcraft restraint.

18:50:04.02 The pilot reached with his left hand toward the floor controls to check the position of the floor controls (Fuel Shutoff Lever, Fuel Flow Control Lever and Rotorbrake).

18:50:19.05 Although most of the pilot's body was not visible, it was apparent that the pilot was beginning a start sequence of the helicopter.

Audio Transcript

18:50:22.8 (how long you) been a pilot?

PS-2

18:50:24.7 (do it).

PS-?

18:50:26.1 turn it on (@PilotFN).

PS-2

18:50:28.0 dude you're in a turbine engine (fire on).

Pilot

18:50:31.2 yeaah.

PS-2

18:50:33.5 I don't know if you heard it when (he/it) started but there's ignitors that go click click click click.

Pilot

18:50:36.7 pow.

PS-2

18:50:38.4 alright. * * .

Pilot

18:50:40.3 a lot better than a piston engine - right?

Pilot

18:50:42.0 yeah.

PS-2

18:50:42.4 exactly.

Pilot

18:50:44.5 [to PS-2] can already see our breath.

PS-4

18:50:45.9 [to PS-4] what?

PS-2

18:50:45.9 [to PS-2] you can already see my breath.

PS-4

18:50:50.5 [to PS-4] image it up there in a minute or two.

PS-2

Video Comments

Audio Transcript

Video Comments

18:51:03.5 woohoo.
PS-4

18:52:12.2 like this
PS-?

18:52:15.0 [Sound of adjacent helicopters operating and
CAM increasing rotor RPM.]

18:52:41.5 [Sound of increase of rotor RPM and N1 of
CAM adjacent helicopter.]

18:52:59.7 [Due to the sound of adjacent helicopters
CAM operating, it was unclear exactly when the accident
helicopter started.]

18:53:16.8 [Sounds of laughter.]
MPAX

18:50:55.60 The pilot continued to perform a start-up of the rotorcraft and avionics. The pilot performed his preflight and started the helicopter without incident.

18:51:03.65 The pilot put on his headset. All visible passengers were still seated in their assigned seats and appeared ready for flight.

18:51:14.63 The pilot put on a pair of full finger gloves.

18:51:26.39 PS-2 pointed outward from the helicopter and waved.

18:51:44.35 PED screens of the passengers showed that another departing helicopter was situated just to the left of the accident helicopter.

18:52:42.50 The pilot reached down with his left hand and put the Fuel Flow Control Lever into the "Flight" gate.

18:53:18.02 The pilot began actively manipulating the flight controls and the helicopter began to depart.

18:53:21.22 The helicopter lifted off from the ground.

Audio Transcript

18:53:24.5 ooouuu. [Sound of laughter.]
PS-?

18:53:25.7 ohhh what the hell.
PS-?

18:53:27.3 [General comments about passenger's excitement
MPAX of departing accident helicopter.]

18:54:04.8 HEY. [Shouted.]
PS-2

18:54:27.8 it's strong bruh.
PS-?

18:55:09.5 it's strong it's strong we're flyin' we're flyin. [Some
MPAX words between PS-2 and pilot.]

Video Comments

18:53:28.35 The helicopter began transitioning through effective translational lift (ETL) and began forward flight.

18:53:34.33 The helicopter departed the helipad property.

18:53:49.43 PS-2 turned to face outboard from the helicopter. PS-2 was still wearing the factory installed rotorcraft restraint.

18:54:01.18 At a hand motion from the pilot, PS-4 began unbuckling the factory installed rotorcraft restraint.

18:54:12.03 PS-4 pivoted off the assigned seat and rebuckled the factory installed rotorcraft restraint. A view was exposed of PS-4's tether to the rear of his supplemental harness.

18:54:42.87 PS-2 faced more forward in his seat, similar to how he was seated during takeoff. PS-4 continued to rebuckle the factory installed rotorcraft restraint.

Audio Transcript

18:56:09.7 * [Unintelligible shout.]

PS-2

18:56:14.6 oh # yea.

18:56:19.6 * * *

PS-5?/PS-6?

18:56:27.4 Whooooaa.

PS-2

18:56:37.5 [Sound of rotor flap consistent with normal operations.]

CAM

18:57:32.7 [Sound of rotor flap consistent with normal operations.]

CAM

Video Comments

18:55:10.20 PS-4 moved to the left side floor of the helicopter and took a seat at the door area. Part of PS-5's supplemental harness was visible, a hook knife was on the left upper side of the supplemental harness. PS-3 was facing more outboard from the helicopter.

18:55:56.00 PS-2 turned to face outboard from the helicopter. PS-2 was still wearing the factory installed rotorcraft restraint.

18:56:32.55 Helicopter crossed over Bayonne Piers, New Jersey.

18:56:33.73 PS-4's excess tether loops were now visible. Three excess tether loops formed a tail hanging below the carabiner.

18:57:56.25 Helicopter transitioned into a hover south of the Statue of Liberty. PS-5 began unbuckling his factory installed rotorcraft restraint. PS-5 had a fanny pack style PFD. It appeared that PS-5 rebuckled the factory installed rotorcraft restraint behind his body.

Audio Transcript

18:58:06.7 let's go around (we're) * * *.
PS-2

18:59:00.4 [Sound of rotor flap consistent with normal
CAM operations].

18:59:49.9 * * *.
PS-4

18:59:59.5 * * *.
PS-2

19:00:04.0 * * *.
PS-2

19:00:09.0 * * *.
PS-?

19:00:50.3 * * *.
PS-?

19:01:01.9 [Sound of rotor flap consistent with normal
CAM operations.]

Video Comments

18:58:25.30 PS-5 moved to the floor of the helicopter. Three tether loops were visible hanging from PS-5's rear carabiner forming a tail. PS-5 was no longer in view of the camera.

18:58:30.43 PS-3, PS-4 and PS-5's tether routing was visible. All tethers connected to a hardpoint on the aft bench of the helicopter.

18:59:07.88 The helicopter transitioned to the east of the Statue of Liberty and hovered in front of the statue's face.

19:00:15.10 PS-2 leaned back inside the helicopter and the lapbelt portion of the factory installed rotorcraft restraint appeared very loose.

19:00:37.97 The helicopter passed south of the Staten Island Ferry Terminal and began transiting up (north) the East River.

Audio Transcript

19:01:14.2 [Sound of rotor flap consistent with normal
CAM operations.]

Video Comments

- 19:01:10.42 The helicopter passed east of South Street Sea Port, traveling north up the East River.
- 19:01:15.60 PS-2 rotated his upper body and drew his right arm across the front of his body to give a thumbs up. As this motion occurred, the factory installed rotorcraft restraint lapbelt became unbuckled. Moments later, it was apparent that the factory installed rotorcraft restraint shoulder strap had also come unbuckled. The "tang" [male end of seatbelt] of the factory installed rotorcraft restraint was visible out of seatbelt buckle receiver.
- 19:01:30.37 The helicopter transitioned into a hover over the east side of the Brooklyn Bridge. The helicopter was over Brooklyn, on the east shore of the East River.
- 19:02:20.23 The helicopter passed the Manhattan Bridge traveling north on the eastern shore of the East River.
- 19:02:35.00 PS-2 leaned into (leaned backward) the helicopter, his head was over the helicopter's center pedestal. Around the same moment, the pilot reached with his left hand and tapped PS-2's right shoulder, almost in a blocking motion. It appeared the pilot had given instruction to PS-2 to refasten PS-2's factory installed rotorcraft restraint.
- 19:02:37.50 The pilot's left hand moved onto Seat 1, the pilot was either blocking PS-2 from leaning back or reaching for PS-2's factory installed rotorcraft restraint. The pilot's arm stayed on Seat 1 as PS-2 leaned back into the pilot's arm.
- 19:02:46.78 PS-2 nodded after turning only his face toward the pilot. PS-2 slid backward into the Seat 1 position, the

Audio Transcript

19:03:30.8 * * *.
PS-4
19:03:43.1 * * *.
PS-2?/4?

Video Comments

pilot's arm was no longer there.

For the next 20 seconds, PS-2 appeared to be manipulating the lapbelt portion of the factory installed rotorcraft restraint. The pilot gestured once to PS-2 as PS-2 seemed to continue manipulating only the lap-belt portion, however, it was unclear if PS-2 had successfully re-buckled his lap-belt.

19:03:06.25 The pilot gestured to PS-2 and PS-2 gave a thumbs up and returned to shooting pictures/videos with his PED.

19:03:06.57 The helicopter passed the Williamsburg Bridge traveling northbound on the East River.

19:03:11.03 PS-2 was shooting photos/videos with his PED. PS-2 was leaning back again and was in the position of Seat 1.

19:03:15.08 PS-2's tether tail was visible hanging loose in the area of the floor mounted controls. The tether tail continued to hang loose in the area of the floor mounted controls, unless otherwise noted. As PS-2 leaned back to take shoe selfies, he was in the position of Seat 1, his carabiner was touching Seat 1's right armrest. The floor mounted controls were in a nominal position for flight.

19:03:59.58 PS-2 transitioned back and forth, sliding along Seat 1 and Seat 2 positions as PS-2 took

Audio Transcript

Video Comments

- photographs/videos.
- 19:04:00.50 PS-2's lap belt of the factory installed rotorcraft restraint was routed over PS-2's hips but was slack. The lap belt appeared to be fastened loosely.
- 19:04:07.90 PS-2's shoulder belt portion of the factory installed rotorcraft restraint system was flapping in the slipstream outside the helicopter.
- 19:04:10.15 PS-4 grabbed the loose shoulder belt portion of the factory installed rotorcraft restraint system for PS-2 and flipped it over Seat 1 and Seat 2.
- 19:04:36.25 The helicopter passed the United Nations building traveling northbound on the East River.
- 19:05:24.87 The helicopter was still traveling northbound on the East River, abeam the south end of Central Park which was in the distance.
- 19:05:20.30 PS-2 began leaning back substantially and freely as he sat between Seat 1 and Seat 2. PS-2 continued to take shoe selfies. PS-2's torso was angled about 45 degrees backward, pointing his feet diagonally aft of the helicopter. PS-2's right shoulder contacted the helicopter's glareshield, his left shoulder was just above Seat 1's armrest. PS-2 was leaning back in a plank-like position. As noted before, PS-2's tether tail was still visible hanging in the vicinity of the floor mounted controls.
- 19:05:38.28 PS-2 sat back up and the tether tail was visible hanging in the area of the floor mounted controls but at this time, was not contacting the floor mounted controls.
- 19:05:40.83 PS-2 leaned back again in the manner described at 19:05:20.30. PS-2 continued to take shoe selfies.

Audio Transcript

19:06:10.1 [Reduction in sound of ambient engine audio.]
CAM

Video Comments

- 19:05:51.40 PS-2 leaned back up and the tether tail now was taut. The end of the tether tail was not visible but was leading toward the area of the floor mounted controls.
- 19:05:52.70 PS-2 adjusted himself in the area between Seat 1 and Seat 2, the tether tail still appeared taut and continued to take photos.
- 19:06:06.77 PS-2 grabbed the helicopter's assist handle which was next to Seat 2 (hand grab, not a flight control) and steadied himself.
- 19:06:08.05 PS-2 pulled on the helicopter assist handle to adjust his seating position, PS-2 rotated his body slightly right. The tether tail still appeared taut but had moved upward as a unit. The tether tail unit appeared to pop upward yet remained taut. Contact with the floor mounted controls was not visible, but the tautness of the tether tail led directly to that area. **Figure 2 is a redacted screenshot captured at this time.**
- 19:06:11.17 The helicopter yawed right. The helicopter was abeam and east of the Jacqueline Kennedy Onassis Reservoir, above York Avenue, somewhere over the Upper East Side of New York.
- 19:06:12.25 The pilot's left hand and arm motion were consistent with lowering the collective.
- 19:06:12.47 The occupants of the helicopter experienced a brief negative G force. The passengers fumbled around a bit. PS-3 removed her hat and her headset slid forward and later near her eyes. PS-4 who was still seated in the doorway grabbed a hold of the seatback

Audio Transcript

19:06:14.0 [Sound to similar to wind hitting camera
CAM microphone at an angle.]

19:06:19.6 I don't want (it) it hit me in the face. [to PS-2.]
PS-4

19:06:27.2 [Sound similar to increase in rotor RPM.]
CAM

19:06:31.1 [Sound similar to rotor RPM management]
CAM

Video Comments

for Seat 1 and Seat 2. PS-3 steadied herself on PS-4's shoulder.

19:06:14.62 The pilot moved his hand from the area of the collective to the area of the floor mounted controls.

19:06:18.85 The angle of the GoPro camera changed slightly upward. A view of the pilot's actions diminished because of the new field of view.

19:06:20.05 PS-4 handed PS-2's the shoulder harness portion of the factory installed rotorcraft restraint system which PS-4 had previously held at 19:04:10.15.

19:06:26.38 PS-2's face displayed an expression of confusion as he handled the shoulder harness portion of the factory installed rotorcraft restraint system.

19:06:25.98 PS-3 slid back toward Seat 4. PS-4 was still in the doorway but slid backward toward the center of the helicopter.

19:06:27.62 The rotorcraft began rolling into a right turn. The helicopter was descending. The helicopter was over 2nd Avenue and 92nd Street, Upper East Side.

19:06:41.38 Passengers remained seated as described at 19:06:25.98.

Audio Transcript

19:06:42.2 [Sound similar to rotor RPM management.]

CAM

19:06:50.6 [Spoken at PS-4] * * .

PS-2

19:06:56.8 * * * .

PS-

5?/6?/ Pilot?

19:07:01.8 [Sound of click.]

CAM

19:07:02.0 [Sound similar to faint whooshing noise associated with float deployment.]

CAM

Video Comments

19:06:44.75 Landmarks outside the helicopter and the helicopter's MFD showed the helicopter crossing back over the shore line over the east river. The helicopter was above E. 92nd Street.

19:06:52.15 PS-2 looked back toward PS-4, said something unintelligible and smiled.

19:06:56.25 The helicopter continued in a descent over the East River. The helicopter was just south of Mill Rock Island. PS-3 and PS-4 still had their PEDs out. PS-4 was typing a caption in the social media app Snapchat.

19:07:00.10 PS-4 moved off the floor and pulled himself into Seat 4. PS-3 moved back outward toward Seat 3 and rotated forward into a normally seated position. The helicopter continued in the descent and banked right.

19:07:01.60 The pilot moved his left hand off the collective and toward the cyclic.

19:07:02.02 PS-2 grabbed the assist handle on the left doorframe of the helicopter with his right hand. PS-2 was facing

Audio Transcript

19:07:04.9 [1100 hz beep. The following two beeps came in
CAM rapid succession with approximately 75
millisecond spacing.]

19:07:05.1 [1100 hz beep.]
CAM

19:07:05.3 [1100 hz beep.]
CAM

19:07:07.0 [Sound similar to increase of compressed air
CAM release, air filling floats.]

Video Comments

about 45 degrees off to the left and seated somewhere between Seats 1 and 2. PS-2's headset was on his head.

19:07:02.28 The pilot moved his left hand from the area of the cyclic back to the collective.

19:07:03.25 One of the helicopter's left floats came into view. It was inflating.

19:07:03.37 Chalk dust from one of the left floats was visible in the aircraft's slipstream outside the left open doorway.

19:07:03.50 The rotorcraft leveled in the roll axis while still in a descent.

19:07:04.98 Chalk dust continued to stream from the inflating left float.

19:07:05.22 One of the left floats began to take a cylindrical shape. The float was pointed upward vertically and still inflating.

19:07:07.20 The main body of one of the left floats began taking cylindrical shape.

19:07:09.45 The left float continued to inflate, it was oriented 45 degrees from vertical, facing forward moving toward the inflated position.

Audio Transcript

Video Comments

19:07:10.5 prepare yourself for exiting the helicopter.
Pilot

19:07:10.8 [Sound similar to increase in rotor pitch, similar to
CAM helicopter in autorotative flare.]

19:07:14.9 [Sound of impact began and lasted until
CAM 19:07:15.3.]

19:07:15.37 During impact, the float was cylindrical in shape and beginning to face forward toward it's inflated position. A number of wrinkles were visible in the float's cylindrical surface. At the same time, the water's surface appeared smooth with some light ripples. **Figure 3 is a redacted screenshot captured at this time. The figure shows the condition of the float.**

19:07:15.5 whoa. #.
PS-4

19:07:15.43 The left float appeared to make contact with water.

19:07:15.53 The camera's rolling shutter exhibited signs of impact and G force in the Z-axis. PS-4's headset was knocked off in the impact. The camera's position changed slightly after impact. Only PS-2,-3 and -4 were visible. They appeared conscious and free from any obvious signs of blunt force trauma.

19:07:15.77 Water was splashing around the area around the helicopter.

19:07:15.9 [Sound of intermittent mid frequency horn.]
CAM

19:07:16.02 Water splashed into the cabin of the helicopter.

19:07:16.70 The visual signatures of impact lessened, water came

Audio Transcript

19:07:18.8 how do I cut this #?

PS-4

19:07:19.7 EVERYBODY-- [Spoken in an excited tone.]

Pilot

19:07:20.1 [Sound similar to rotor blade striking water.]

CAM

19:07:20.4 [Sound of water sloshing.]

CAM

19:07:20.4 [Sound similar to rotor blade striking water.]

CAM

19:07:20.7 [Sound similar to rotor blade striking water.]

CAM

19:07:20.9 [Sound similar to person panting.]

PS-5?/6?

19:07:21.2 [Sound similar to rotor blade striking water.]

CAM

19:07:21.8 [Sound similar to rotor blade striking water.]

CAM

Video Comments

into the cabin at the left door near the floorboard level of the helicopter. The floor was flooded near the occupants' feet.

19:07:17.57] PS-2 grabbed the assist handle on the left side of the helicopter's cabin, steadying himself.

19:07:18.92 PS-2 slid back to Seat 1 position. PS-2 was leaning backward toward the pilot's seat and looked toward PS-4.

19:07:19.38 PS-4 looked down toward the region of where his factory installed helicopter restraint would have been located.

Audio Transcript

19:07:22.5 #.
PS-5?/6?

19:07:25.5 [Sound similar to camera microphone being
CAM submerged in water.]

Video Comments

19:07:22.28 The helicopter was not sitting level in the water. The helicopter was pitched forward and rolled slightly right. Water was coming up into the cabin at the floorboard level on the left side of the helicopter. The water surface condition appeared calm with small ripples, in other areas around the helicopter, the water's condition looked slightly wind blown. **Figure 4 is a redacted screenshot at this time. The figure shows the condition of the float and the surface condition of the water.**

19:07:22.67 PS-2 looked downward toward his chest and used both hands and manipulated the shoulder strap portions of his supplemental restraint. PS-2 performed this action until water later covered the GoPro's lens.

19:07:23.67 PS-4 brought his left arm across his body toward the area of his right chest where the hook knife was previously visible. PS-4 looked down toward his right chest. The hook knife was never visible in his hand. PS-3 looked downward toward her chest.

19:07:24.63 PS-4 pivoted his body and looked toward the hardpoint where PS-4's tether was installed. The helicopter was rolled significantly right.

19:07:25.33 **Figure 5 is a redacted screenshot at this time. The figure shows the condition of the float and the surface condition of the water.**

19:07:25.82 PS-4 grabbed the outboard edge of Seat-2 on the left side of the helicopter. The helicopter had rolled right

Audio Transcript

19:07:26.9 [Sound of three loud thumps in rapid succession.]

CAM

**[End of
Detailed
Transcript]**

19:07:31.08

19:07:31.08 [Until 19:08:30, sounds attributed to occupant movement.]

CAM

19:08:30 [Between 19:08:30 and 19:10:42.9, almost no noise was detected.]

CAM

19:10:42.9 [Last sound potentially attributed to a passenger. Sound lasted for approximately 14 seconds.]

CAM

19:10:56 [Between 19:10:56 and 19:23:29.9, almost no significant noise was detected.]

CAM

Video Comments

significantly and PS-4 was making an upward motion toward the left open door of the helicopter. PS-4's headset was tethered to the rear of his supplemental harness, the headset cable became taut.

19:07:26.13 PS-3 was still seated and her factory installed helicopter restraint was still fastened as was visible earlier. PS-3's headset was still on and moved forward over her head, rotated forward over part of her eyes.

19:07:26.27 Water began obscuring the GoPro's lens. PS-4 was still at the left door of the helicopter, his headset cable still taut.

19:07:26.43 The GoPro's lens became completely covered in water.

19:07:31.08 The GoPro video became mostly black due to the water and remained this way for most of the rest of the recording.

Audio Transcript

19:23:29.9 [Start of mechanical noise similar to a boat
CAM maneuvering. Variations of this noise were heard
for the majority of the remainder of the recording.]

19:38:10.9 [Sound similar to Self-Contained Underwater
CAM Breathing Apparatus (SCUBA). Sounds continued
intermittently until nearly the end of the
recording.]

[End of [The recording ended, likely due to camera battery
Recording] exhaustion.]
20:17:38.8

Video Comments



Figure 2. A screenshot captured at 19:06:08.05. The occupants have been redacted.



Figure 3. A screenshot captured at 19:07:15.37. The figure shows the condition of the float and the surface condition of the water. The occupants have been redacted.



Figure 4. A screenshot captured at 19:07:22.8. The figure shows the condition of the float and the surface condition of the water. The occupants have been redacted.

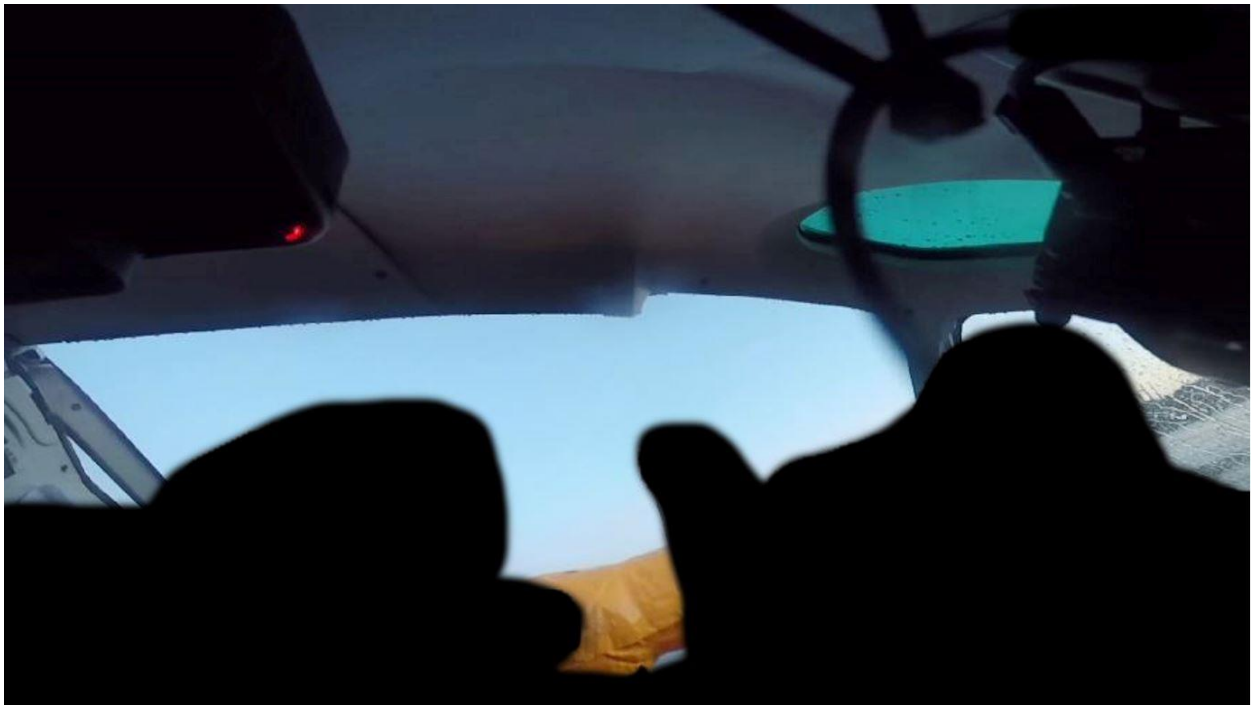


Figure 5. A screenshot captured at 19:07:25.33. The figure shows the condition of the float. The occupants have been redacted.

Surviving Crew Commentary

As part of the Safety Board's accident investigation process, the surviving flight crew was invited to review the audio/video transcript and suggest corrections, clarifications or additional commentary. The surviving crew in this accident, the pilot, did not attend the review session.

Attachment I

Audio Quality Rating Scale

The levels of recording quality are characterized by the following traits of the cockpit voice recorder information:

- | | |
|--------------------------|---|
| Excellent Quality | Virtually all of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate only one or two words that were not intelligible. Any loss in the transcript is usually attributed to simultaneous cockpit/radio transmissions that obscure each other. |
| Good Quality | Most of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate several words or phrases that were not intelligible. Any loss in the transcript can be attributed to minor technical deficiencies or momentary dropouts in the recording system or to a large number of simultaneous cockpit/radio transmissions that obscure each other. |
| Fair Quality | The majority of the crew conversations were intelligible. The transcript that was developed may indicate passages where conversations were unintelligible or fragmented. This type of recording is usually caused by cockpit noise that obscures portions of the voice signals or by a minor electrical or mechanical failure of the CVR system that distorts or obscures the audio information. |
| Poor Quality | Extraordinary means had to be used to make some of the crew conversations intelligible. The transcript that was developed may indicate fragmented phrases and conversations and may indicate extensive passages where conversations were missing or unintelligible. This type of recording is usually caused by a combination of a high cockpit noise level with a low voice signal (poor signal-to-noise ratio) or by a mechanical or electrical failure of the CVR system that severely distorts or obscures the audio information. |
| Unusable | Crew conversations may be discerned, but neither ordinary nor extraordinary means made it possible to develop a meaningful transcript of the conversations. This type of recording is usually caused by an almost total mechanical or electrical failure of the CVR system. |