NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

March 7, 2017

Electronic Devices - Pilot

Specialist's Factual Report
By Sean Payne

1. EVENT SUMMARY

Location:	Lockhart, Texas
Date:	July 30, 2016
Aircraft:	Balony Kubicek BB85Z
Registration:	N2469L
Operator:	Heart of Texas Hot Air Balloon Rides
NTSB Number:	DCA16MA204

On July 30, 2016, about 0742 central daylight time, a Balony Kubicek BB85Z hot air balloon, registration N2469L, crashed into a field after striking high voltage powerlines near Lockhart, Texas. The 15 passengers and pilot onboard were fatally injured and the balloon was substantially damaged due to impact forces and post-crash fire. The flight was operating under 14 *Code of Federal Regulations* Part 91 as a sightseeing passenger flight.

2. GROUP

A group was not convened.

3. DETAILS OF INVESTIGATION

Personal Electronic Devices (PEDs) were collected by the Federal Bureau of Investigation (FBI) Evidence Response Team (ERT) prior to the National Transportation Safety Board (NTSB) team's arrival. The PEDs were labeled by the FBI ERT team as E#, where "E" stands for electronic device and "#" stands for the number in which the device was logged. Items E1, E3, E12 and E14 were associated with the pilot of the balloon. One additional evidence item provided by the medical examiner was the pilot's personal mobile phone. Separately the NTSB received a remote pyrometer from the crown of the balloon envelope. Those devices collected associated with the pilot of the balloon are listed below:

Device Manufacturer/Model:	Apple iPad Air 2
Serial Number:	DMPNQ0PAG5YQ
FBI Evidence Number:	E1

Device Manufacturer/Model:	Flytec 3040
Serial Number:	Unknown
FBI Evidence Number:	E3

Device Manufacturer/Model:	Flytec TT34 Remote Pyrometer
Serial Number:	5300
FBI Evidence Number:	N/A

Device Manufacturer/Model:	GoPro Hero 4 Silver
Serial Number:	Unknown
FBI Evidence Number:	E12

Device Manufacturer/Model:	Icomm Handheld VHF Transceiver
Serial Number:	2113424
FBI Evidence Number:	E14

Device Manufacturer/Model:	Unknown Android Device
Serial Number:	Unknown
Medical Examiner Number:	ME5

3.1. Device Descriptions

Apple iPad

An iPad is a touchscreen device produced by Apple that is used for mobile computing. The iPad is offered in a variety of form factors and computing specifications. In general, the iPad series of devices are typically capable of internet access, email, messaging services, and can run user-installed applications (apps) to perform specific tasks. Depending on the model, iPads can perform many of the same tasks as traditional computing systems, plus have voice and text messaging capabilities depending on configuration. iPad user and system data is typically stored on non-volatile memory[1] (NVM) and can be accessed through manufacturer-provided interfaces.

Flytec 3040

The Flytec 3040 is a lightweight electronic device marketed toward balloonists. The device is able to provide pressure altitude information, a variometer function, a chronometric timing function and balloon envelope temperature measurement (when used in conjunction with a Flytec remote pyrometer). The user can set custom alarms to monitor the balloon's envelope temperature.

[1] Non-volatile memory is semiconductor memory that does not require external power for data retention.

Flytec TT34 Remote Pyrometer

The Flytec TT34 Remote Pyrometer is a wireless temperature sensor and transducer. It is used in conjunction with other Flytec products to remotely monitor balloon envelope temperature. The pyrometer is typically mounted near the crown area of the balloon envelope. The TT34 does not have the abiity to store date in NVM.

GoPro HERO 4 Silver Edition

The GoPro Hero 4 Silver Edition is a compact, lightweight, point of view (POV)[2] 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. The camera supports 4K[3] video resolution at 15 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 in lieu of a video stream at a resolution of up to 12 megapixels.[4] The camera supports recording to micro Secure Digital (SD)[5] cards up to 64 GB in size. Built in Wi-Fi[6] connectivity 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.

iCom Air Band VHF Transceiver

The iCom Air Band VHF Transceiver is a handheld VHF radio for use on allocated aviation frequencies. The device has the capability to both transmit and receive voice data over the allocated frequency range. The unit has a backlit LED screen for use at night.

Unknown Android Device (PED)

PEDs are a category of devices comprised primarily of portable computing devices and mobile phones. Portable computing devices are typically capable of internet access, email, messaging services, and can run user-installed applications to perform specific tasks. Depending on the model, mobile phones can perform many of the same tasks as portable computing devices, plus have voice call and text messaging capabilities. PED user and system data is typically stored on NVM and can be accessed through manufacturer-provided interfaces.

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[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] Also known as Ultra High Definition (UHD) – a pixel resolution of 3,840 x 2,160 pixels.
[4] 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.
[5] SD – Secure Digital – a standard for nonvolatile memory card used in portable devices.
[6] Wi-Fi – A local area wireless technology that allows electronic devices to exchange data over a network.

3.2. Data Recovery

Apple iPad

The device was found powered and in operating condition by the FBI. The FBI left the device powered. The screen was damaged but still functional. Upon receipt of the device by the NTSB specialist, the device was charged and monitored closely. Once satisfied the device's battery was stable, the device was hand carried to the NTSB Vehicle Recorder Division laboratory. The device was password locked. The NTSB was able to obtain two possible password combinations from a family member of the pilot. A variation of one of the passwords unlocked the device. Figure 1 shows the Apple iPad as received by the specialist.

Figure 1. The Apple iPad as received in the field by the NTSB Specialist

The device was then connected to a PC via lightning cable and downloaded using laboratory forensic software.

Flytec 3040

The device is pictured in figures 2 and 3. The device sustained heavy impact and fire damage. A discussion with the manufacturer of the device indicated that the unit does not have the ability to record data. No data was recovered from the device.

Figure 2. Side 1 of the Flytec 3040.

Figure 3. Side 2 of the Flytec 3040.

Flytec TT34 Remote Pyrometer

The device was recovered undamaged from the balloon's crown area. A discussion with the manufacturer revealed that the device does not store any data, nor does it contain the hardware to do so. The device is pictured below in figure 4. No data was recovered from the device.

Figure 4. The Flytec TT34 Remote Pyrometer.

GoPro HERO 4 Silver Edition

The unit exhibited heavy thermal damage. The serial number was unable to be determined as the battery was lodged in the battery compartment where the serial number is written. Figure 5 shows the GoPro HERO 4 Silver Edition in the laboratory.

The microSD card was extracted from the device. The microSD card exhibited evidence of fire exposure and impact damage. The card exhibited a crack through the face of the silicon wafer. Additionally, the card failed to mount when inserted into a forensic flash card reader. Figure 6 shows the microSD card as removed. Figure 7 shows the back of the microSD card. No data was recovered from the device.

Figure 5. The GoPro HERO 4 Silver Edition as recovered.

Figure 6. The associated microSD card. The blue arrows point to the crack.

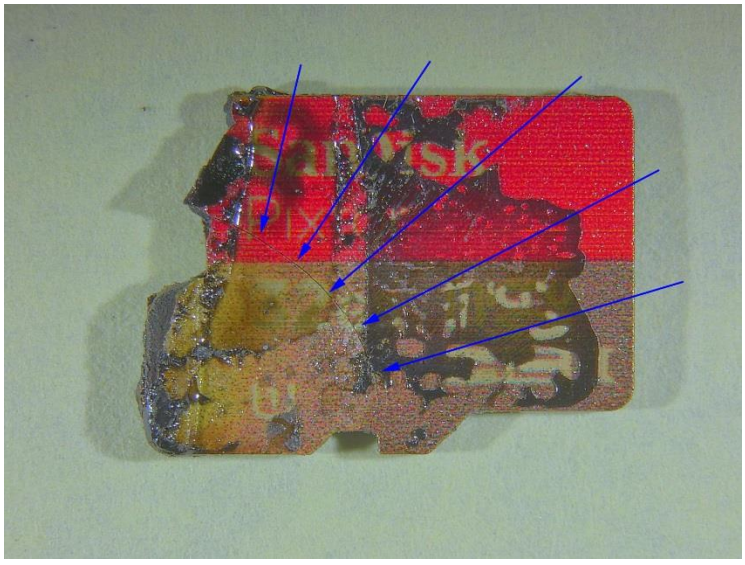
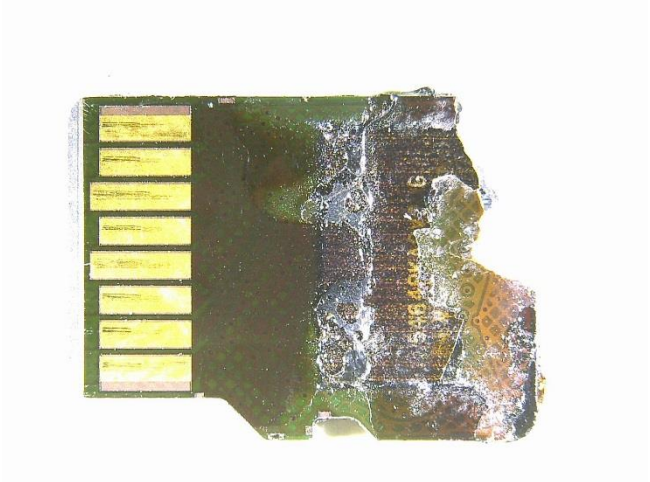


Figure 7. The rear of the microSD card.



iCom Air Band VHF Transceiver

The device was recovered in functional condition; some evidence of minor heat damage was present. The unit was powered. The last frequency was displayed. The last frequency displayed was 126.800 mHz. The unit is shown below in figure 8 powered, displaying the last set frequency. It was not noted by the FBI ERT team whether the device was powered when the item was collected, though when transferred to the NTSB specialist, the device had available power and did not need to be charged to function.

Figure 8. The iCom Air Band VHF Transceiver, powered, showing the last frequency.

Unknown Android Device (PED)

The medical examiner provided the NTSB laboratory a cellular device associated with the pilot on October 4, 2016. The device was heavily fire damaged. Figure 9 shows the front of the device. Figure 10 shows the rear of the device. It was determined that data from the device would not be recoverable.

Figure 9. The front of the unknown Android type PED.

Figure 10. The rear of the unknown Android type PED and the device's battery.

4. DEVICE INVESTIGATION

4.1. Apple iPad

Aviation Navigation Applications

The device contained two applications used for assisting pilots with aeronautical navigation, Foreflight and Hot Air.

Foreflight

The Foreflight application information showed the owner's subscription was either a month long trial or a paid plan based on monthly renewal[7]. The settings page showed this type of subscription began on January 17, 2016 and ended on February 16, 2016. The subscription was not renewed. An exploration of the Foreflight application did not reveal any information relevant to the accident investigation.

Hot Air

Hot Air is a navigational application that is marketed to balloonists. The application has a means to overlay the balloonist's position on a moving map consisting of satellite imagery. It allows the pilot the ability to record their flight and view historical track information from previous flights. The device also calculates winds aloft data during the flight by deriving the information based upon the balloon's groundspeed in relation to the altitudes it flew. The application has the capability to log passenger's weight information. It also contains integration with an application called Glympse, which is a location sharing service to allow others to track the location of a device associated with the application.

Upon unlocking of the pilot's iPad, the Hot Air application was noted as currently active in the device's operating system. When the application was opened, a satellite map overview page of the accident region was available and a tracklog of the accident flight was present. In the absence of an active internet connection,[8] base satellite imagery was

[7] It could not be certain from the logs whether the pilot had a monthly trial or a month long subscription from the subscription information page.
[8] During the digital forensic examination, the device is not allowed to connect to the internet.

not displayed. The developer of the application stated the source of the imagery was Apple Maps when the device had an active wireless connection.

An examination revealed the device was capable of connecting to the internet wirelessly at the time of the accident. Furthermore, the application settings showed that the owner of the device had not purchased an offline map option which would have allowed the user to display satellite imagery information from an alternate database when not connected to the internet. There was no evidence that the user was utilizing the alternative database through the optional offline subscription.

The scale in which the satellite imagery is overlaid on the device when working within the application is dependent on user input. The user can "pinch to zoom" and scroll to different locations by moving their hand across the device's screen. It was not possible to tell the exact scale being used at the time of the accident. Using the application on a surrogate iPad, Apple Maps base satellite imagery showed powerline support towers in the vicinity of the accident site, however, individual powerlines were not obvious.

The forensic download obtained of the device, discussed above in section 3.2, produced a database file associated with the pilot's usage of the Hot Air application. The database file was then transferred to a surrogate iPad running the Hot Air application. Upon transfer, the surrogate iPad contained a mirror of the information within the pilot's Hot Air application. GPS tracks for the accident flight as well as the pilot's previous flights were exported as .KML[9] files. Additionally, screencaptures of information contained in this app were taken in the surrogate device and exported for inclusion in this report. A detailed log of the accident flight, as recorded by the device, is included in this report as attachment 1.

Attachment 2 is a log of the Hot Air tracklog activity recovered from the pilot's iPad including the date and duration of each flight. The log includes the date of the record as well as the duration of the flight that was logged. Records began on Monday, June 8, 2015 up until Sunday, July 24, 2016.[10] One record on August 13, 2015 for a duration of 23.99 hours was discarded as it was likely recorded as a result of a failure to close the record or exit the application. Overall, a total of 127.57 hours of data were recorded in the tracklog. In the previous year from the accident, 118.02 hours were recorded. In the previous 90 days to the accident, 25.89 hours were recorded.

Figure 11 shows the full history of all flight activity recorded in the app's tracklog history. Clusters of flights are represented as pushpin heads and showed past activity as having taken place in the vicinity of Austin, TX, Houston, TX, Albuquerque, NM and Phoenix, AZ.

Figure 12 is a graphic exported directly from the Hot Air app from the iPad. The graphic shows the track history of the accident flight recorded on July 30, 2016. A graphic color

[9] .KML – Keyhole Markup Language – A file standard for use with geo-referenced files.
[10] The tracklog page did not include the accident flight on July 30, 2016. The accident flight may not have been added to the overall tracklog activity as accident flight tracklog was never completed by the user, thus the data was not transferred to the overall log.

scale is shown in feet MSL[11] and is located at the bottom left corner of the image. The graphic color scale represents the balloon's altitude during the accident flight. Recorded altitude shows a minimum of 419 feet MSL and a maximum of 1,080 feet MSL.

The altitude recorded by the device was found to be in error. The altitude error is discussed in detail in the description for figure 15.

Figure 13 is a screenshot captured on the iPad from the Hot Air application. The graphic shows the track history for the balloon flight as well as an estimation of the wind speed during the accident flight. The estimated wind speed at 500 feet MSL is shown as just greater than 16 knots from a directional average of 246 degrees true.

Figure 14 is a Google Earth overlay of the recorded accident tracklog showing the departure of the balloon from XS90. The first record was recorded at 06:56:28. Data shows the balloon remained in the vicinity of the launch area until 06:58:32 when a clearly defined track began. The time of takeoff, when correlated with the imagery from the Onboard Image Recorder Factual report, was determined to be at approximately 06:58:32.

Figure 15 is an approximate north-up oriented view showing the accident flight tracklog overlaid on Google Earth. This figure shows the balloon's ground track shortly after takeoff. For portions of the flight, the altitude was recorded as being below ground level when compared to the WGS84[12] geodesic datum. For the entire tracklog, all data points that were recorded under the given ground level on the WGS84 datum for their respective latitude and longitude were measured, and the WGS84 geodesic datum height was entered. The recorded altitude was compared at all subterranean points to the given WGS84 ground level coordinate. At 07:10:15, the Hot Air app recorded the balloon's altitude as 422.9 feet. In the same position on the WGS84 datum, the ground level was shown as 515 feet. A difference of 92.1 feet was noted. When referencing the Onboard Image Recorder Factual report at this moment, the height of the balloon was estimated as being no greater than 20 feet AGL.[13] The altitude in this location was estimated to be incorrect by approximately 112 feet.

Altitudes recorded of the balloon during the accident flight were examined in all areas in which the balloon's track was shown traveling below the earths surface when in reference to the WGS84 datum. The offset ranged from showing a 6 foot difference to a 92 foot difference. Since the offset of the balloon's altitude was not linear, no offset could be applied throughout the entire dataset. When referencing altitude, the offset could be up to a maximum of 112 feet.

Figure 16 is an approximate north-up oriented view showing the balloon's ground track around 07:17. This area corresponds to the powerlines discussed in figure 39 of the

[11] MSL – Mean Sea Level
[12] WGS84 – World Geodetic System, revision 1984. A standard datum used in cartography, geodesy and navigation that allows references to be made within a geospatial coordinate system.
[13] AGL – Above Ground Level

Onboard Image Recorder factual report. The balloon reached a maximum recorded altitude of 695.9 feet at 07:18:22

Figure 17 shows variation in the balloon's recorded altitude between approximately 07:25 and 07:27. At 07:25:28 the balloon's altitude was recorded as 946 feet. Ten seconds later, at 07:25:38, the balloon's altitude was recorded as 797.4 feet. The derived descent rate of the balloon in this area is -891.6 feet per minute, or 14.9 feet per second. It is possible that the performance calculation between these two data points exceeds the potential performance of the balloon. No video or imagery data was available from the recovered devices discussed in the Onboard Image Recorder factual report to compare the balloon's performance in this region to the recorded data.

Figure 18 is a north-up oriented view of the balloon's tracklog from the accident flight. A region of low altitude recording was noted around 07:30.

Figure 19 is a north-up oriented view of the balloon's tracklog from the accident flight in the region of the wreckage location. The wreckage location is denoted by a red arrow.

Figure 20 is a view of the balloon's tracklog from the accident flight in the region of the wreckage location oriented in the direction of the northeast. A slight positive trend in altitude was recorded at 07:42:12, just prior to the wreckage location. Due to the known inaccuracies of the GPS altitude recording, a conclusion cannot be made as to whether the balloon was in a climb or descent trend just prior to the accident.

Figure 21 is a north-up oriented view of the balloon's tracklog during the accident flight. The departure location is shown near the bottom left of the image, the accident location shown near the top center of the image.

Figure 22 is a top down, north-up oriented view of the balloon's tracklog during the accident flight overlaid on an aeronautical sectional chart of the region. The balloon's track has been thickened for clarity.

Figure 23 is a Google Earth overlay showing all recorded tracklog activity in the region south of Austin, TX. The graphic shows all previous flights recorded to the iPad in the vicinity of Austin, TX.

Data used to create figures 14 through 22 is included in this report as Attachment 1. Appendix A lists parameter names and their associated units.

Emails

Only three emails on the iPad were identified as relevant to the investigation.

An email dated July 1, 2016 from [redacted]@aol.com showed sales information for balloon rides presumably sold in June 2016. The email with the subject "Sales" showed the following:

"June 2016

2 @ 175

10 @ 199

27 @ 200

2 @ 249

Horrible month! I am going to claim the yelp review site, and post regarding weather etc. I know it is hurting us. Are you asking passengers to post on yelp following the flight?"

A response to the above quoted email was sent on July 3, 2016 from [Pilot's Email - Redacted]@gmail.com. The response stated, "$3920 thank you. hopefully getting flights off will take some pressure off the schedule."

On July 21, 216 an email was received with an invoice of $3480.00 paid to Americans Balloon LLC in Land O' Lakes, Florida. The invoice stated, "balloon repairs," there were little other details.

On July 22, 2016, an invoice was received from a shipping company for one 48 inch by 48 inch by 40 inch pallet with a weight of 540 lbs. The invoice also stated, "balloon." The shipment was from Tampa, Florida to St. Louis, Missouri.

Facebook Messages

Messages from the Facebook application installed on the iPad were reviewed. Relevant messages are shown below grouped by conversations with individual users. Those individual conversations are then grouped in chronological order from oldest to most recent. The individual users are identified as: Friend #1, Friend #2, Friend #3, Southwest Region Commercial Balloon Operator (SWRCBO) and East Coast Commercial Balloon Operator (ECCBO).

Times are given in CST throughout, with no correction for daylight savings time if applicable to when the communications took place. Editorial insertions are given within brackets. Messages are presented without any corrections for spelling, punctuation or grammar.

Conversation with Friend #1

4/24/2015 1:55:48 AM
Pilot:
Sober 5 years Jan 15 this year.A change to save my life.Thankful everyday.

4/24/2015 9:52:31 AM
Friend #1
Wow! ! How in the hell did you do it?

4/24/2015 12:06:12 PM
Pilot:
Give me a call when you got some time @[14] [Telephone number redacted.]

Conversation with Friend #2

5/22/2016 3:49:19 PM (UTC-5)
Pilot:
I hung up my shot glasses along time ago. It just didn't make any sense anymore. I am so proud of you going back for a juris prudence degree you rock!

Conversation with Friend #3

5/22/2016 4:07:17 PM
Pilot:
Have you thought of what kind of guarantee you need? The weather has been #[15] *this year in Texas so far hopefully all the bad stuff getting out of the way and will have a beautiful summer.*

Conversations with an East Coast Commercial Balloon Operator (ECCBO)

5/27/2016 9:20:42 AM
ECCBO
Do you trust the RUC winds?

5/27/2016 9:40:29 AM
Pilot:
Usually the farther out you go time wise the winds seem to project much faster then what we actually have.Is there a reason for the wind? pressure gradient front?

5/27/2016 9:43:22 AM
ECCBO
I don't know, I'm stumped for tomorrow morning. 10 pax in the AM everyone coming from far away super early. Can you look it up? I. would really value your opinion. Zip code @ [REDACTED ZIPCODE.]

5/27/2016 9:52:28 AM
Pilot:
to early too call

[14] @ - A non-pertinent word, in this case a person's name.
[15] A "#" indicates a placeholder for the use of an expletive.

5/27/2016 9:53:12 AM
ECCBO
Yeah. Why can't we get better info like we used too? They have really screwed things up

5/27/2016 9:54:11 AM
Pilot:
But you will never fly from your living room sometimes you go and cancel on the field or at 2 in the morning

5/27/2016 9:54:38 AM
ECCBO
I'm frustrated and honestly scared to fly with all this unreliable info

5/27/2016 9:55:11 AM
Pilot:
Changing climante lots of energy and # nation wide.

5/27/2016 9:56:12 AM
ECCBO
Copy. I'm especially weary when it comes to the 210. I did 20 mph over treetops last year with grandma on her stool and it wasn't fun.

5/27/2016 9:57:20 AM
Pilot:
If grandma cant stand maybe ballooning isn't for her.

5/27/2016 9:57:44 AM
ECCBO
Only 1 flight in it so far this year. Every other flight has been cancelled. Lol she stood for landing.

5/27/2016 9:58:08 AM
Pilot:
I would much rather land a big balloon at speed

5/27/2016 9:58:41 AM
ECCBO
Well I'm not confident enough yet since I don't get to fly it

5/27/2016 9:59:24 AM
Pilot:
get as low as you can you everything you got top of trees are soft good air brakes

5/27/2016 9:59:44 AM
ECCBO
I know. I

5/27/2016 10:00:12 AM
ECCBO
My flying area is so limited as far as space

5/27/2016 10:02:51 AM
Pilot:
You can plant it i land at 22 didnt drag 12 feet..I had on my pilot restraint did deep knee bends wih the red line climbing it for all I had

5/27/2016 10:05:26 AM
Pilot:
probably started opening 6 feet off the ground burning to compensate

5/27/2016 10:11:02 AM
ECCBO
I need to come out there and fly with you lol

5/27/2016 10:11:23 AM
ECCBO
Wow

5/27/2016 10:11:43 AM
Pilot:
come down doing some flying with us @[Name redacted] [16] *is a bit of a charter but a long time friend. he flies VA he bought my death machine a galaxy 180 that I bought back after a couple years it was a # I;m a big guy that thing could pull me up into the burners on rebound reseal then spiniker be glad you have rapid deflation it is a game changer*

5/27/2016 10:12:23 AM
ECCBO
I just don't wanna be the guy that hurts anyone.

5/27/2016 10:12:56 AM
ECCBO
Are you gonna be in va beach?

5/27/2016 10:13:14 AM
Pilot:
@ [Name redacted] *puts on little races or has big groups sometimes try flying with him.*

[16] @ - A non-pertinent word, in this case a person's name.

5/27/2016 10:14:14 AM
ECCBO
I'm so backed up with pax. Too many people not enough days right now

5/27/2016 10:14:35 AM
Pilot:
A wealth of weather information and a balloonist spirit no experence with RDS

5/27/2016 10:14:56 AM
ECCBO
RDS?

5/27/2016 10:15:41 AM
Pilot:
rapid deflation system call me @ [Telephone number redacted.]

5/27/2016 11:22:12 AM
ECCBO
Not sure what happened

5/27/2016 11:23:19 AM
Pilot:
bad area call back in a while

5/27/2016 11:23:57 AM
ECCBO
Ok. Thanks man

New conversation with ECCBO

5/27/2016 4:09:30 PM
ECCBO
Not looking promising they are saying 10-15 tonight and tomorrow

5/27/2016 8:54:44 PM
ECCBO
I was right. Cancelled

5/27/2016 9:42:07 PM
Pilot:
Trust your gut not some computer.

Conversation with a Southwest Region Commercial Balloon Operator (SWRCBO)

6/8/2016 3:00:00 PM
SWRCBO
Hi

6/8/2016 3:03:10 PM
Pilot:
Hello good flight this morning pavement to pavement

6/8/2016 3:03:22 PM
SWRCBO
SWEET !

6/8/2016 3:03:43 PM
SWRCBO
I'm conducting fluffy reviews for FAA Officials

6/8/2016 3:03:54 PM
SWRCBO
Good weather then ? !

6/8/2016 3:04:14 PM
SWRCBO
Are you still in St. Louis ?

6/8/2016 3:04:55 PM
Pilot:
good stairage

6/8/2016 3:05:10 PM
SWRCBO
NICE !

6/8/2016 3:05:15 PM
SWRCBO
Are you still in St. Louis ?

6/8/2016 3:05:41 PM
Pilot:
Texas

6/8/2016 3:06:32 PM
Pilot:
fluffy reviews ?

6/8/2016 3:08:42 PM
SWRCBO
NO "Fluff" - very REAL reviews

6/8/2016 3:10:00 PM
Pilot:
That no will read

6/8/2016 3:10:00 PM
SWRCBO
I don't usually ever do "Fluff"

6/8/2016 3:10:22 PM
SWRCBO
??? ---->. That no will read

6/8/2016 3:10:56 PM
Pilot:
one

6/8/2016 3:11:39 PM
SWRCBO
Ohhhh

6/8/2016 3:12:17 PM
SWRCBO
Maybe not - but, I must sign their formal "Log Entries" & they get filed

6/8/2016 3:13:54 PM
Pilot:
Feed the machine any flying

6/8/2016 3:14:51 PM
SWRCBO
This morning - with the FAA Official, doing his review

6/8/2016 3:15:21 PM
SWRCBO
Texas again - you down in Austin or San Antonio ?

[The conversation than shifted to boating, and then back to ballooning. The conversation about boating is not included.]

6/8/2016 3:23:03 PM
Pilot:
get \some 180 time

6/8/2016 3:23:35 PM
SWRCBO
You flying a 180... It's ok, after being stored ? !

6/8/2016 3:25:05 PM
Pilot:
llooking at 500 will finally pull 180 out today finally no standing water in the yard

6/8/2016 3:26:14 PM
SWRCBO
Ohhhh yea - that "Flooding" thing

6/8/2016 3:28:01 PM
SWRCBO
Looking to buy a 500 !

6/8/2016 3:28:09 PM
SWRCBO
That would be AMAZING !

6/8/2016 3:29:00 PM
Pilot:
I would fill better puting you in it if I could get keith fear RB8 instead of my rb6 15 gallons more fuel is a lot.you really need to fly way ahead in the RB6 with 47 gal onboard

6/8/2016 3:34:20 PM
SWRCBO
Alrighty then... I do like to have plenty of fuel

[The conversation then turned to boating again. The rest of the conversation was no longer pertinent to the investigation.]

New conversation with SWRCBO

6/29/2016 12:48:21 AM (UTC-5)
Pilot:
Happy happy joy joy I blew gthe call for the morhih

6/29/2016 12:50:37 AM
SWRCBO
You blew the call ?

6/29/2016 12:50:46 AM
Pilot:
Happy happy joy joy I blew the morning call cancelled when I should of been flying

6/29/2016 12:51:31 AM
SWRCBO
*Or when * I * should be flying !!! 😅*

6/29/2016 12:51:50 AM
SWRCBO
Was that this morning or for tomorrow morning ?

6/29/2016 12:53:16 AM
Pilot:
great flight this morning two crew guys split 270 in tips compaired to $30 on sunmday.

6/29/2016 12:53:34 AM
SWRCBO
SWEET !!!

6/29/2016 12:54:13 AM
SWRCBO
Why did you already call DG tomorrow mornings flight ?

6/29/2016 12:54:37 AM
SWRCBO
Off / NOT DG ?

6/29/2016 12:56:12 AM
Pilot:
forecast lied I let my guest know by 8 pm for AM flights

6/29/2016 12:56:24 AM
SWRCBO
Got it !

6/29/2016 12:57:03 AM
SWRCBO
I didn't look at Houston weather - what's it supposed to REALLY do in the morning ?

6/29/2016 12:58:27 AM
Pilot:
in Austin rain low ceiling

6/29/2016 12:59:11 AM
SWRCBO

Are you in Austin or Houston ?

6/29/2016 1:01:29 AM
Pilot:
houston just have to get use to raining along the coast and down town.While you fly parallel to them.....fun fun

6/29/2016 1:01:59 AM
SWRCBO
Very interesting !

Figure 11. An overview of the track history available on the iPad in reference to the southern United States. The green pins indicate the start of a flight, the red pins indicated the end of a flight.

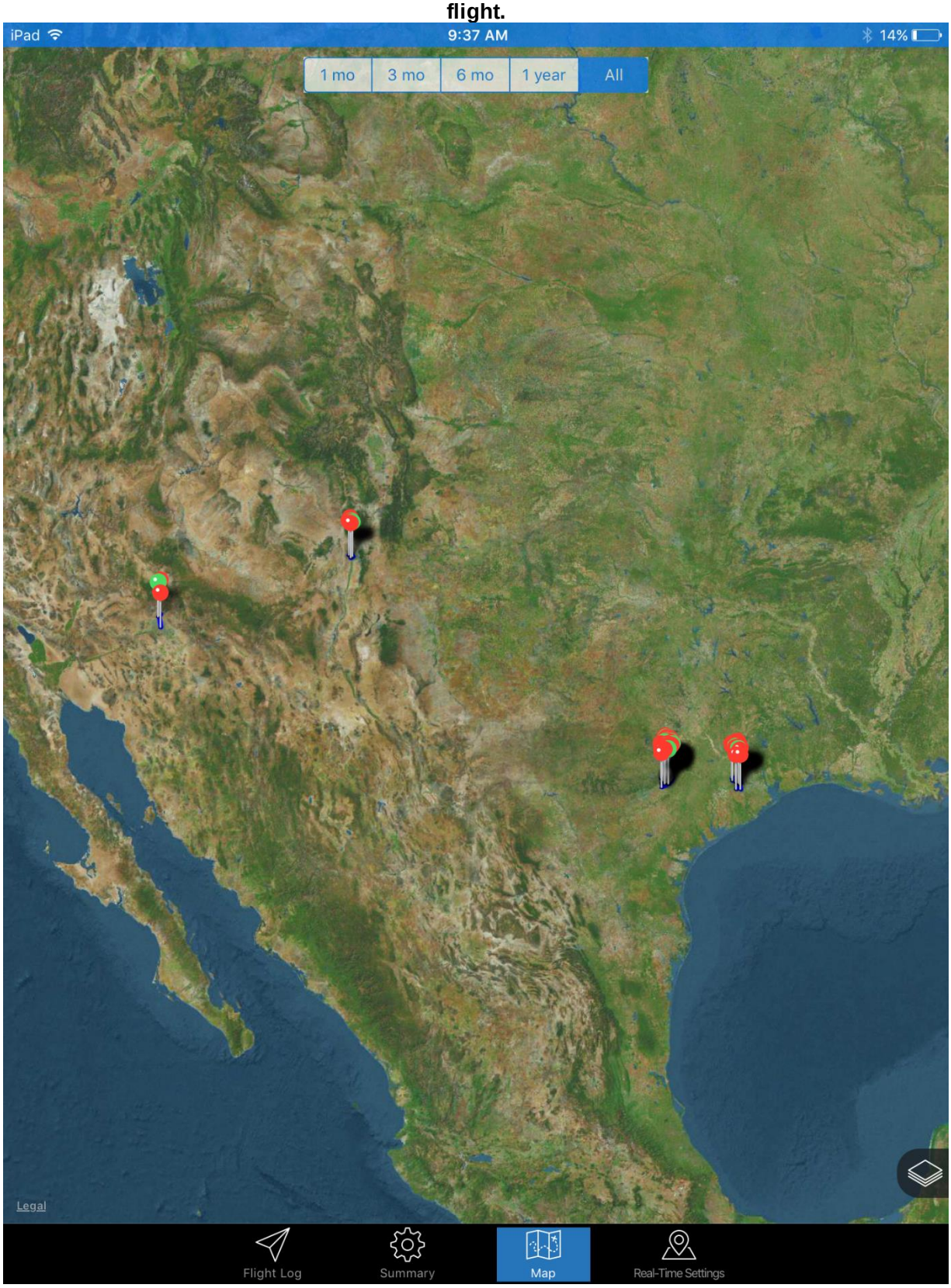


Figure 12. A graphic exported directly from the Hot Air app from the iPad. The graphic shows the track history of the accident flight as well as a history of the balloon's recoded altitude. A scale is shown in feet in the bottom left corner of the image.

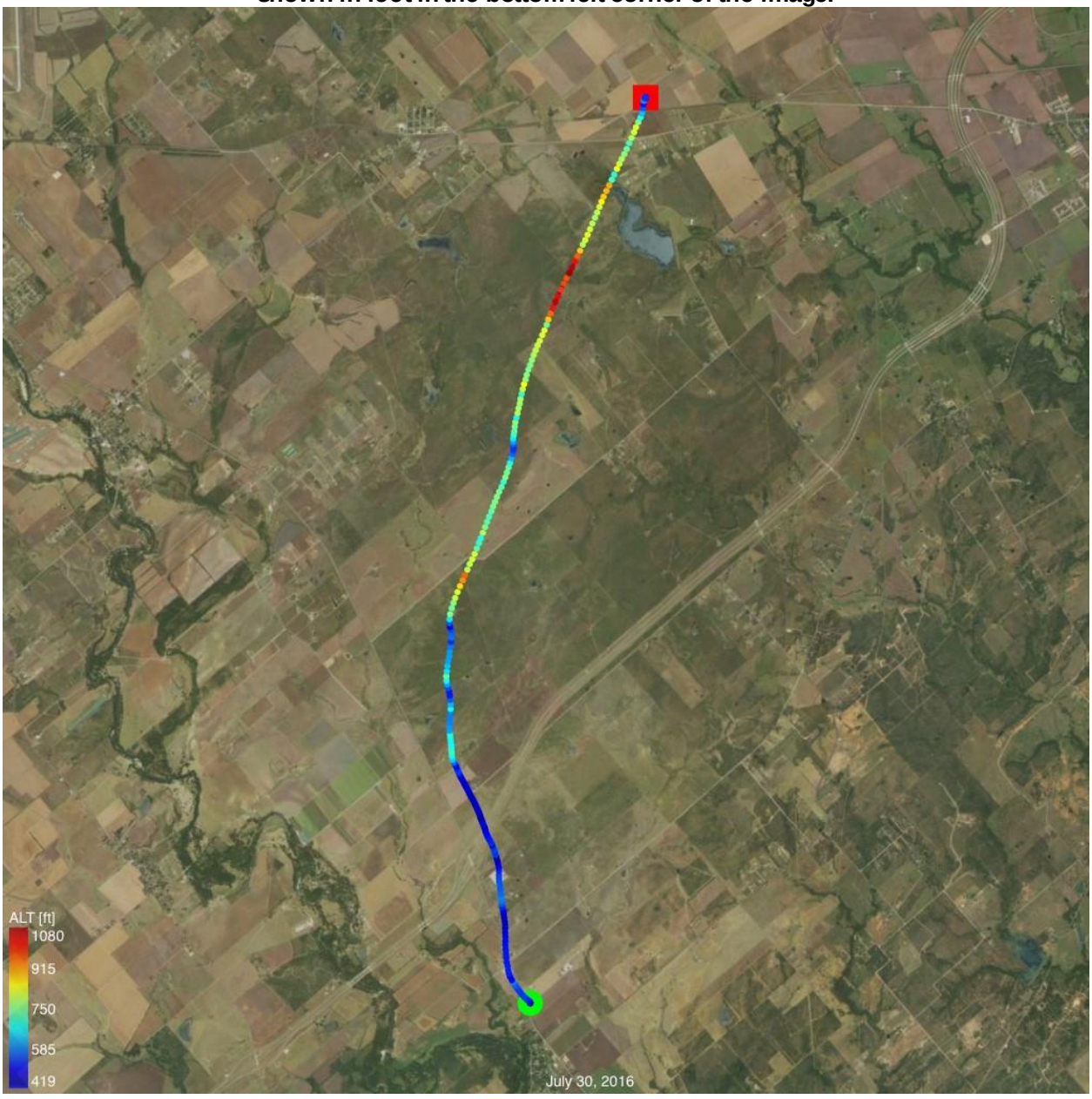


Figure 13. A screenshot captured on the iPad from the Hot Air application. The graphic shows the track history for the balloon flight as well as an estimation of the wind speed during the accident flight. The estimate wind speed at 500 feet MSL is shown as just greater than 16 knots from a directional average of 246 degrees true.

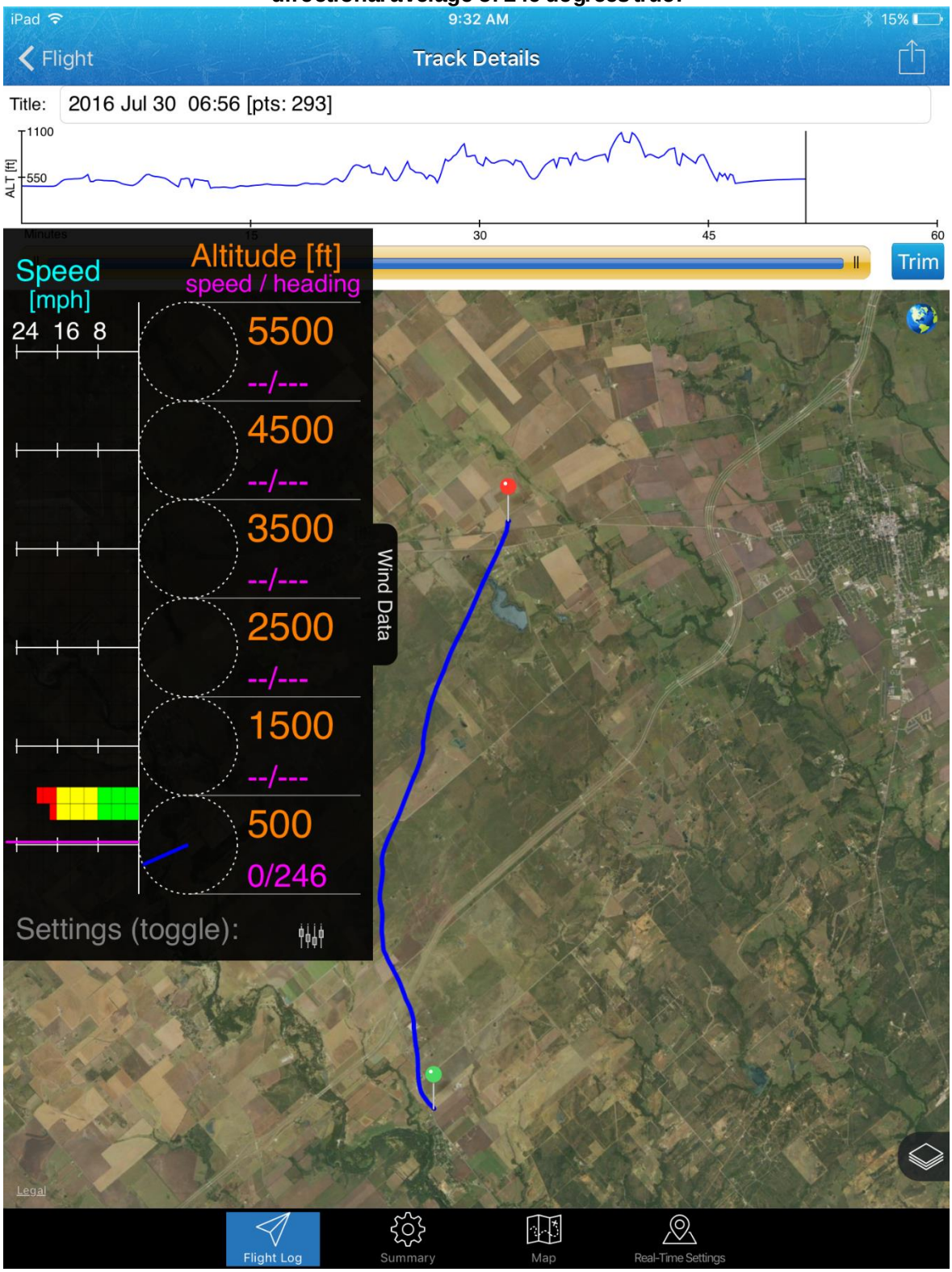


Figure 14. A Google Earth overlay of the recorded accident tracklog showing the departure of the balloon from XS90.

Figure 15. An approximate north-up oriented view showing the accident flight tracklog overlaid on Google Earth. This shows the balloon's ground track shortly after takeoff. For portions of the flight, the altitude was recorded as being below ground level on the WGS84 datum.

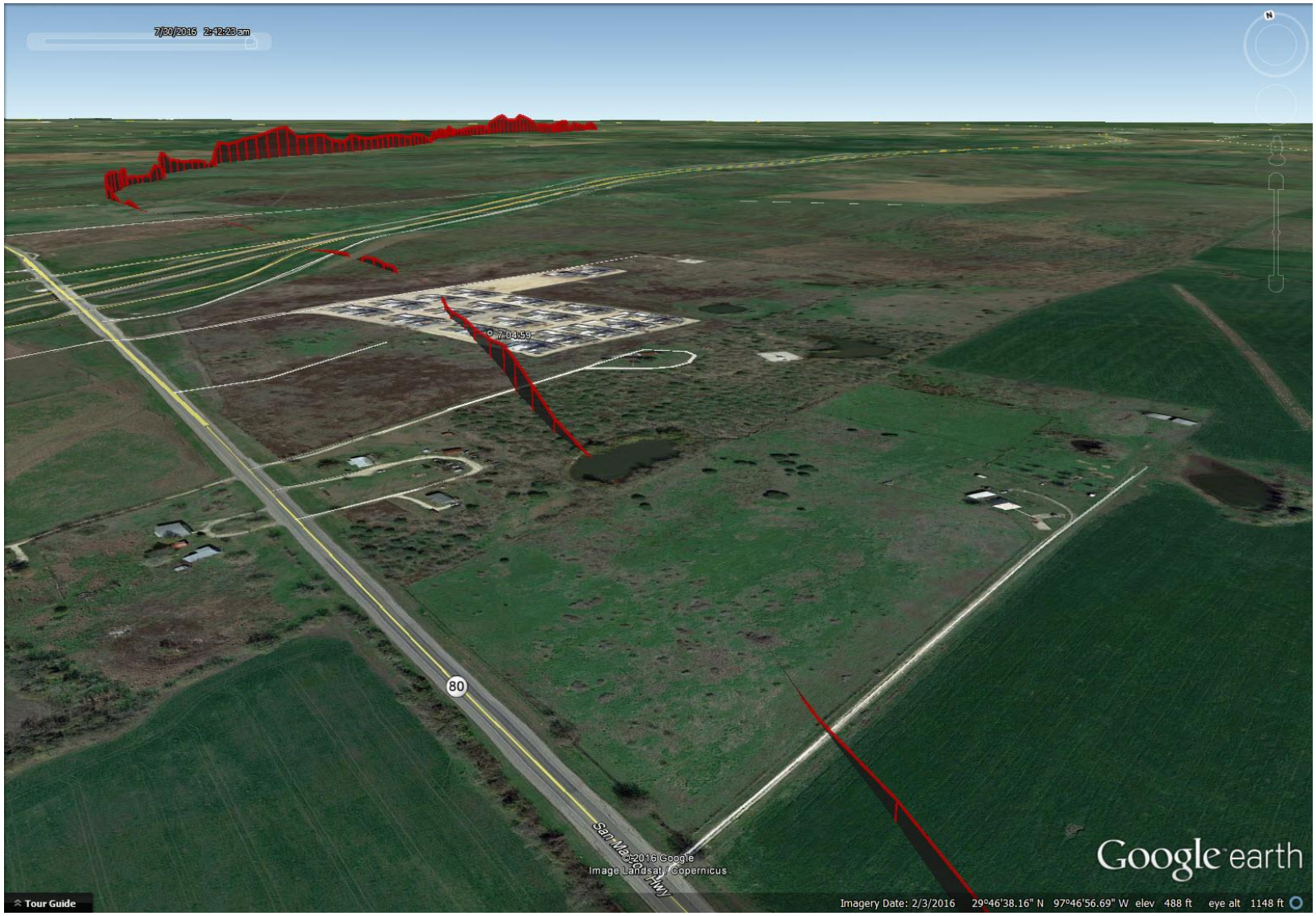


Figure 16. An approximate north-up oriented view showing the balloon's ground track around 07:17. This area corresponds to the powerlines discussed in figure 39 of the Onboard Image Recorder factual report. The balloon reached a maximum recorded altitude of 695.9 feet at 07:18:22.

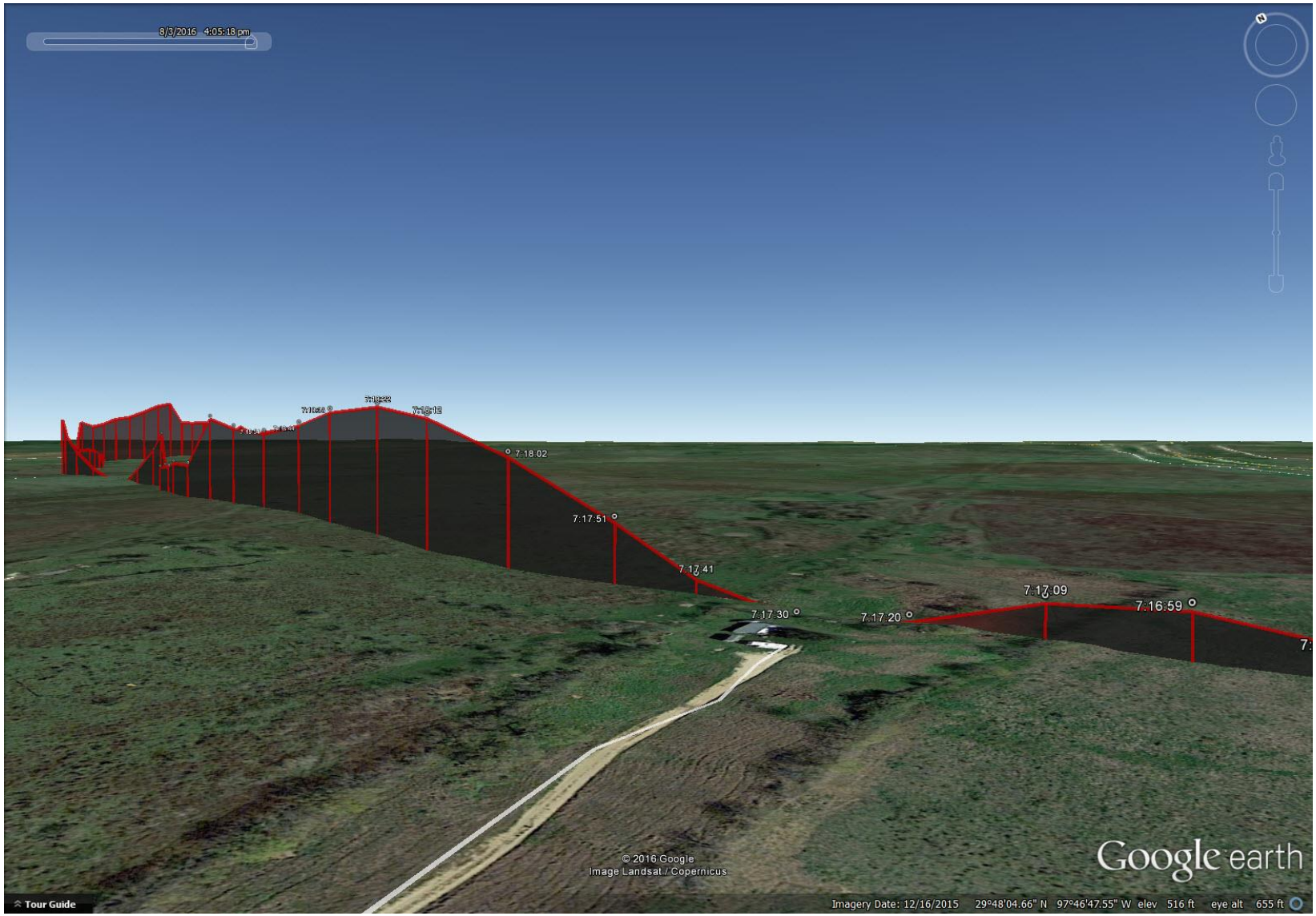


Figure 17. Variation in the balloon's recorded altitude between approximately 07:25 and 07:27.

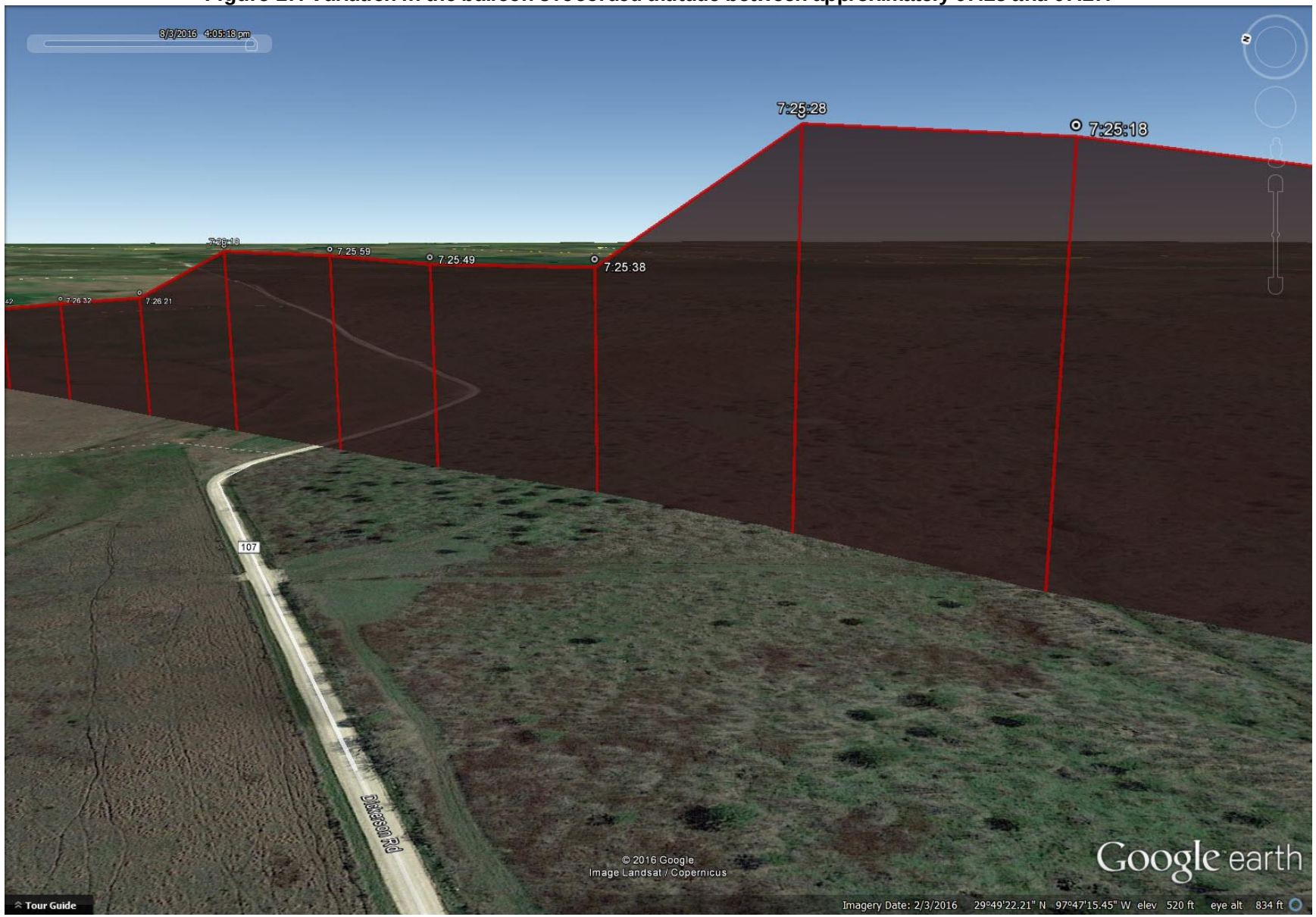


Figure 18. A north-up oriented view of the balloon's tracklog from the accident flight. A region of low altitude recordings was noted around 07:30.

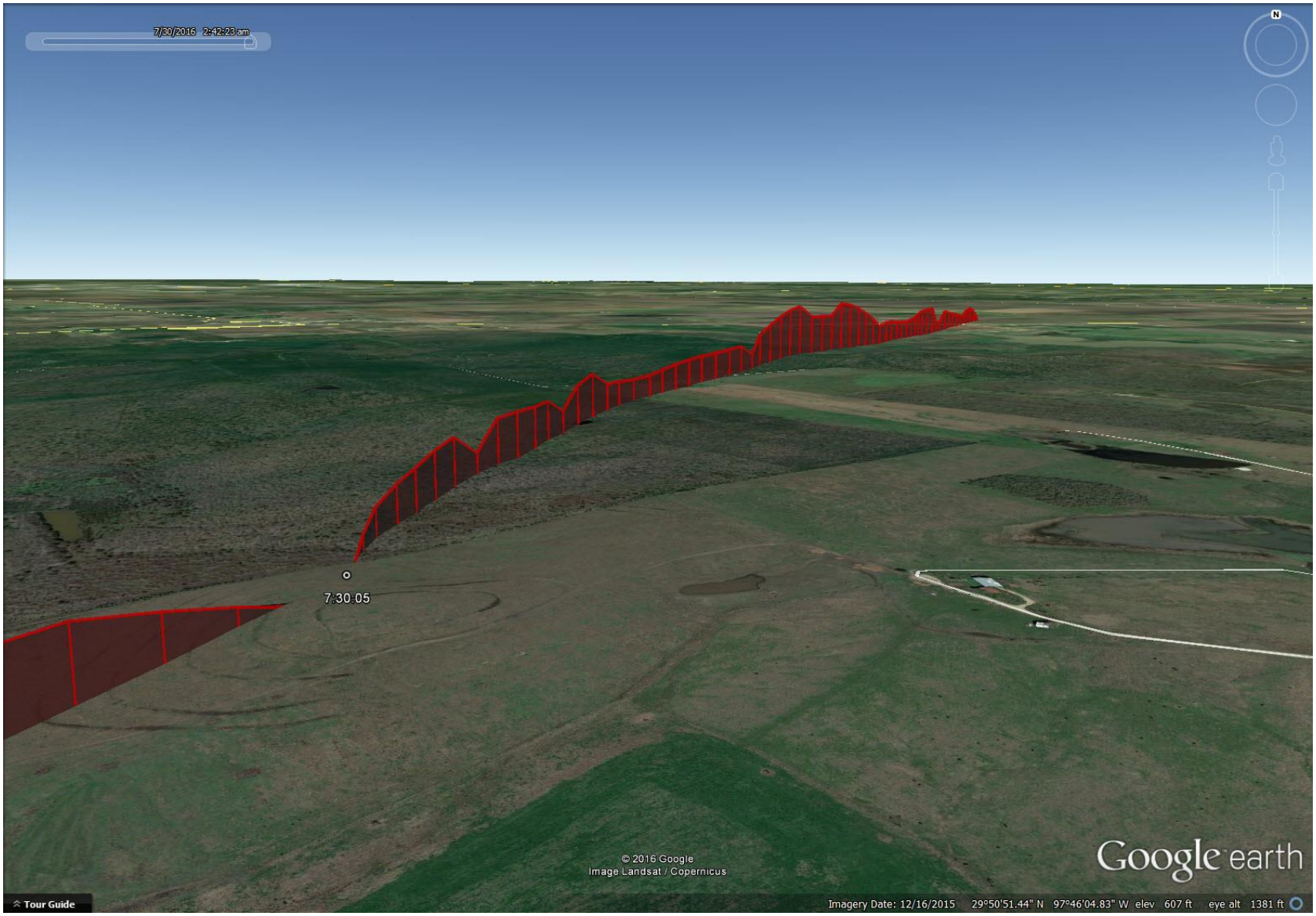


Figure 19. A north-up oriented view of the balloon's tracklog from the accident flight in the region of the wreckage location. The wreckage location is denoted by the red arrow.

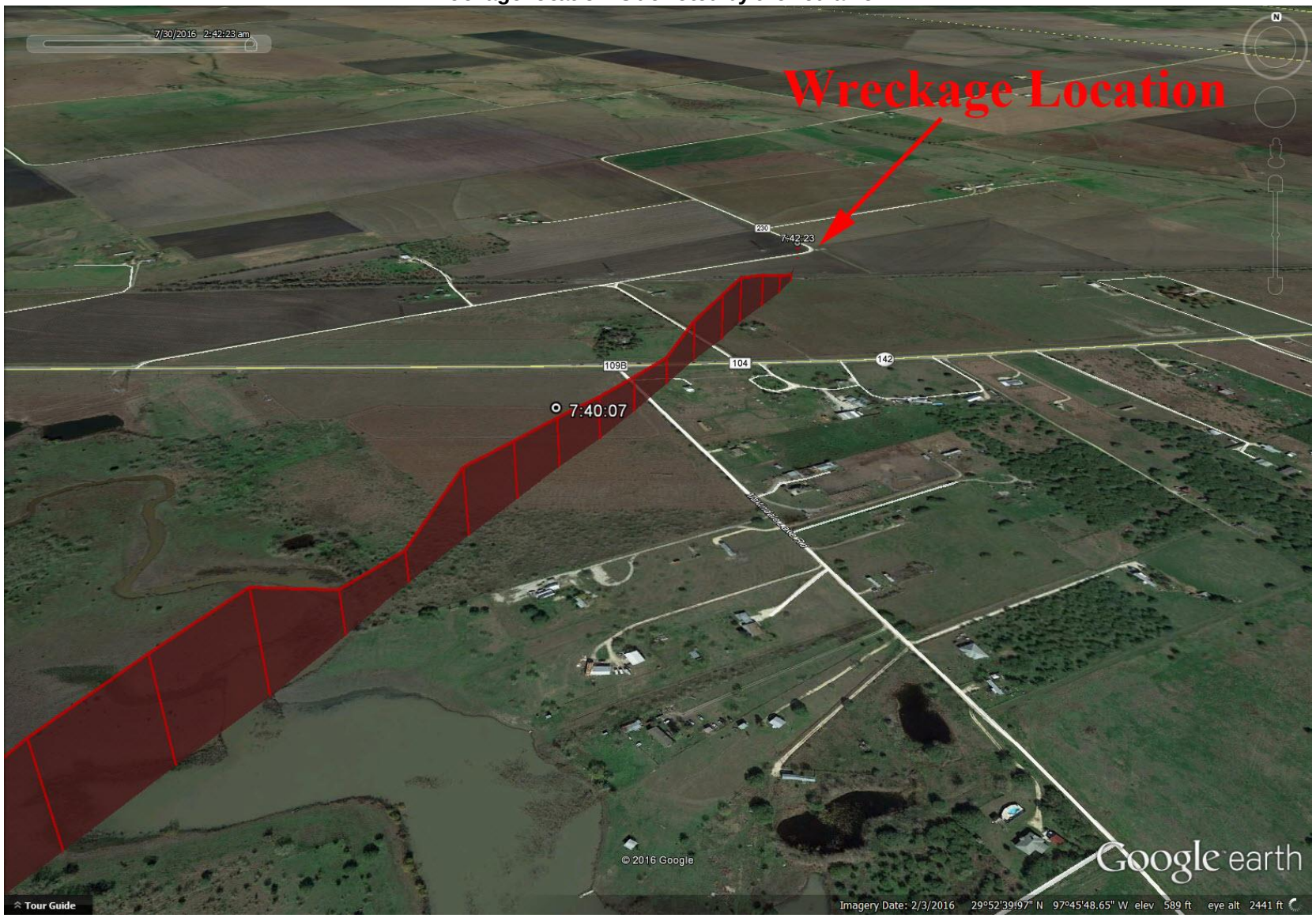


Figure 20. A view of the balloon's tracklog from the accident flight in the region of the wreckage location. The view is oriented in a northeast direction. A slight positive trend in altitude was recorded at 07:42:12, just prior to the wreckage location, however, due to the known inaccuracies of the GPS altitude recording, a conclusion cannot be made as to whether the balloon was in a climb or descent trend just prior to the accident.

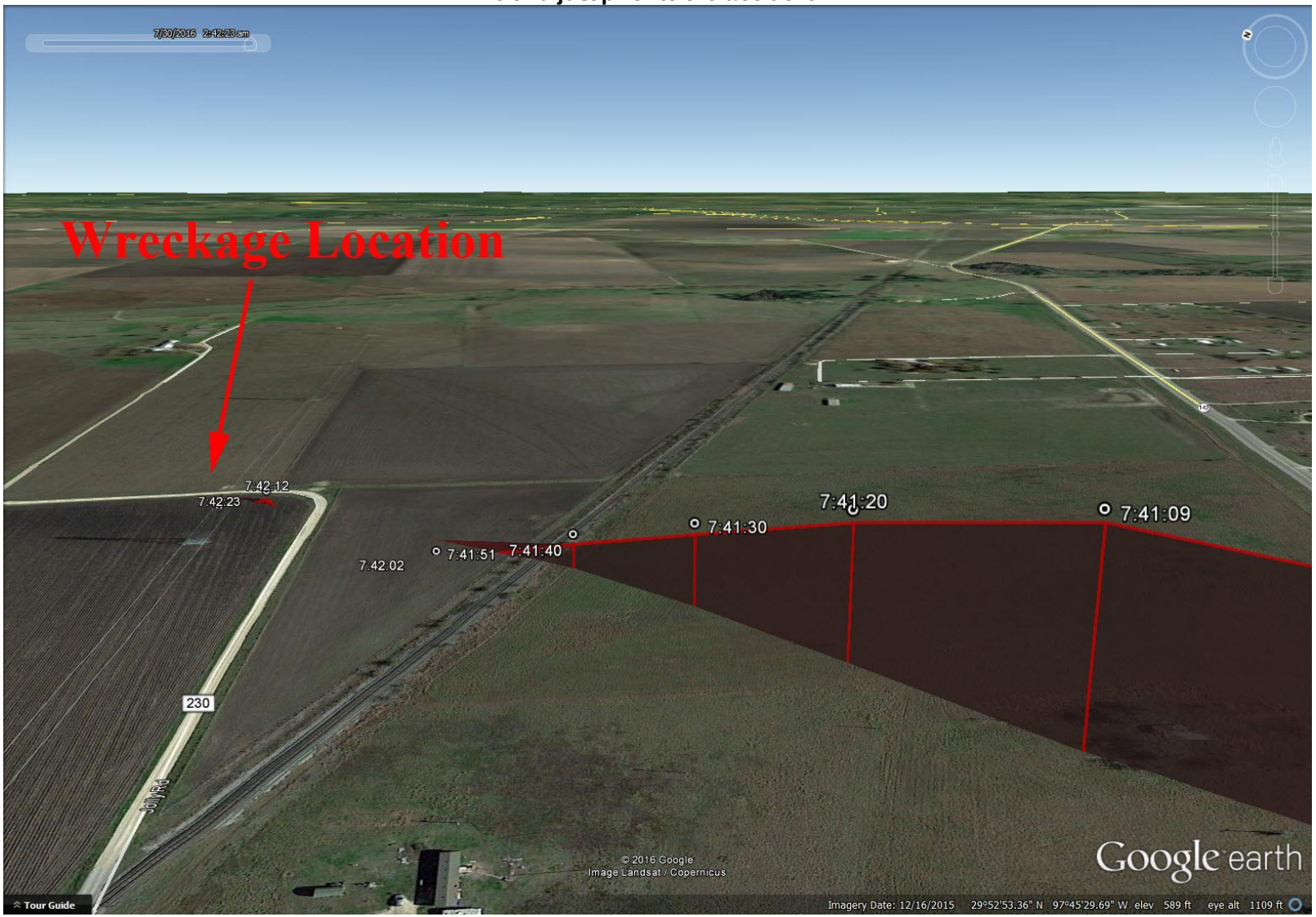


Figure 21. A north-up oriented view of the balloon's tracklog during the accident flight. The departure location is shown near the bottom left of the image, the accident location shown near the top center of the image.

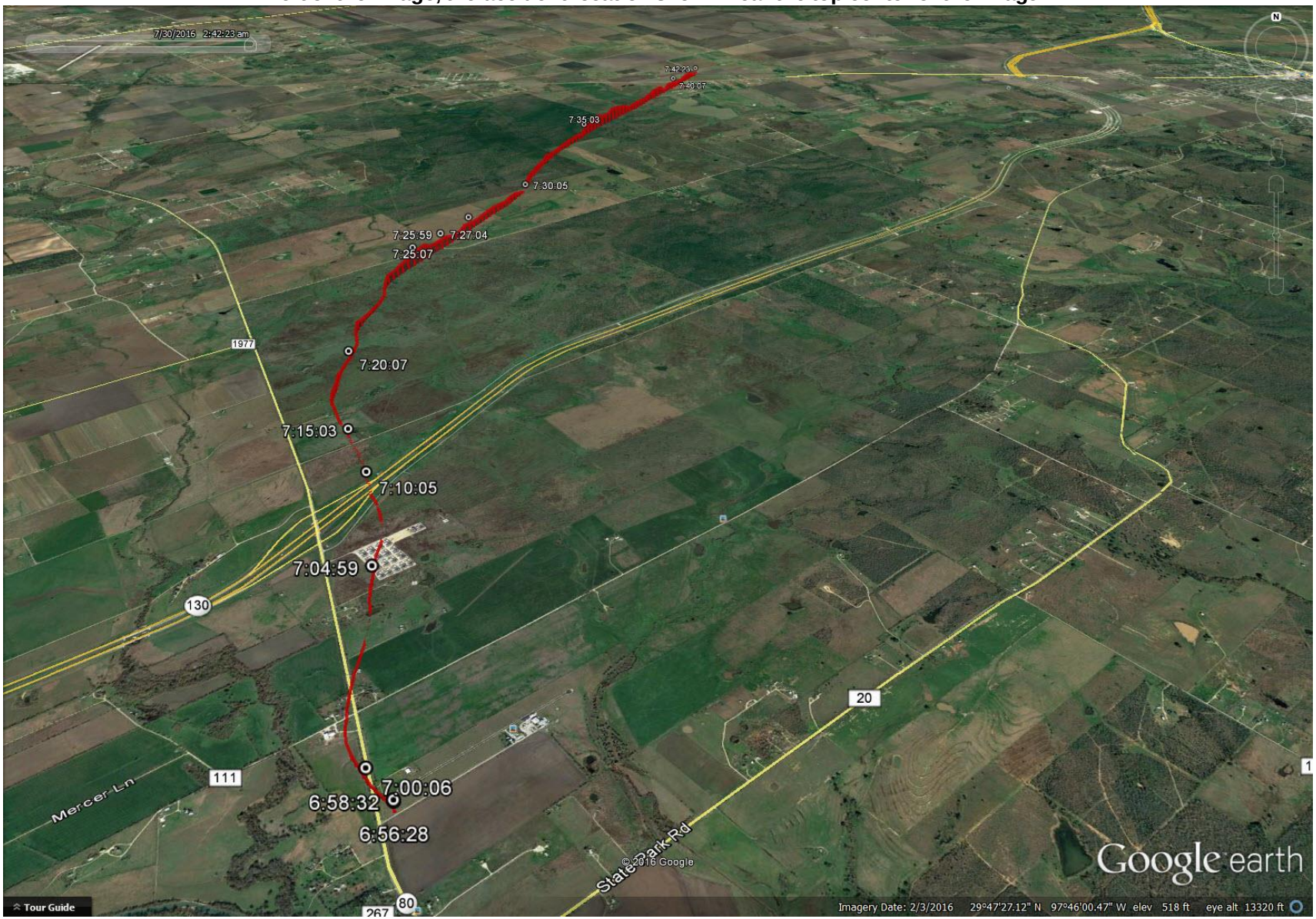


Figure 22. A top down, north-up oriented view of the balloon's tracklog during the accident flight overlaid on an aeronautical sectional chart of the region. The balloon's track has been thickened for clarity.

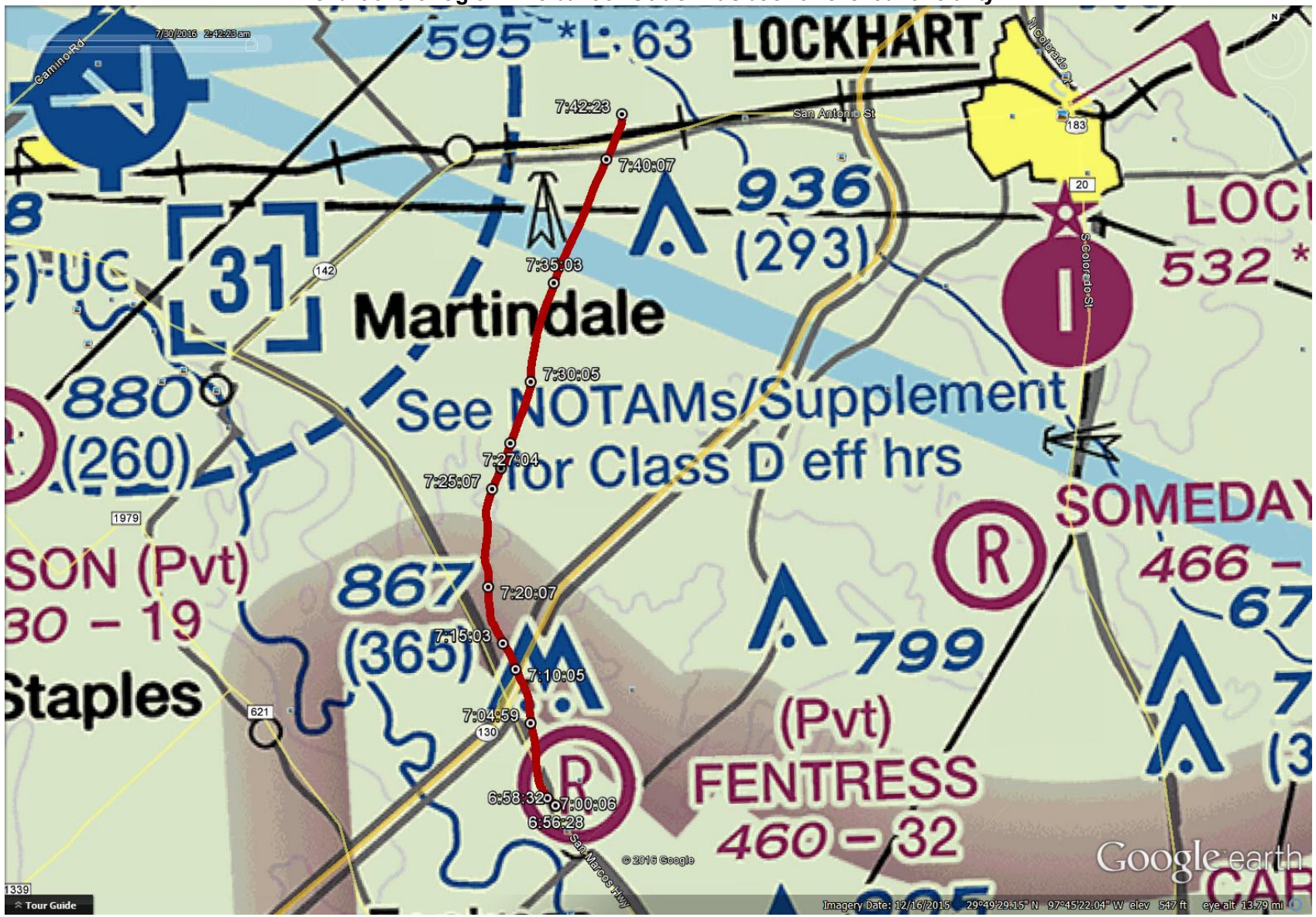
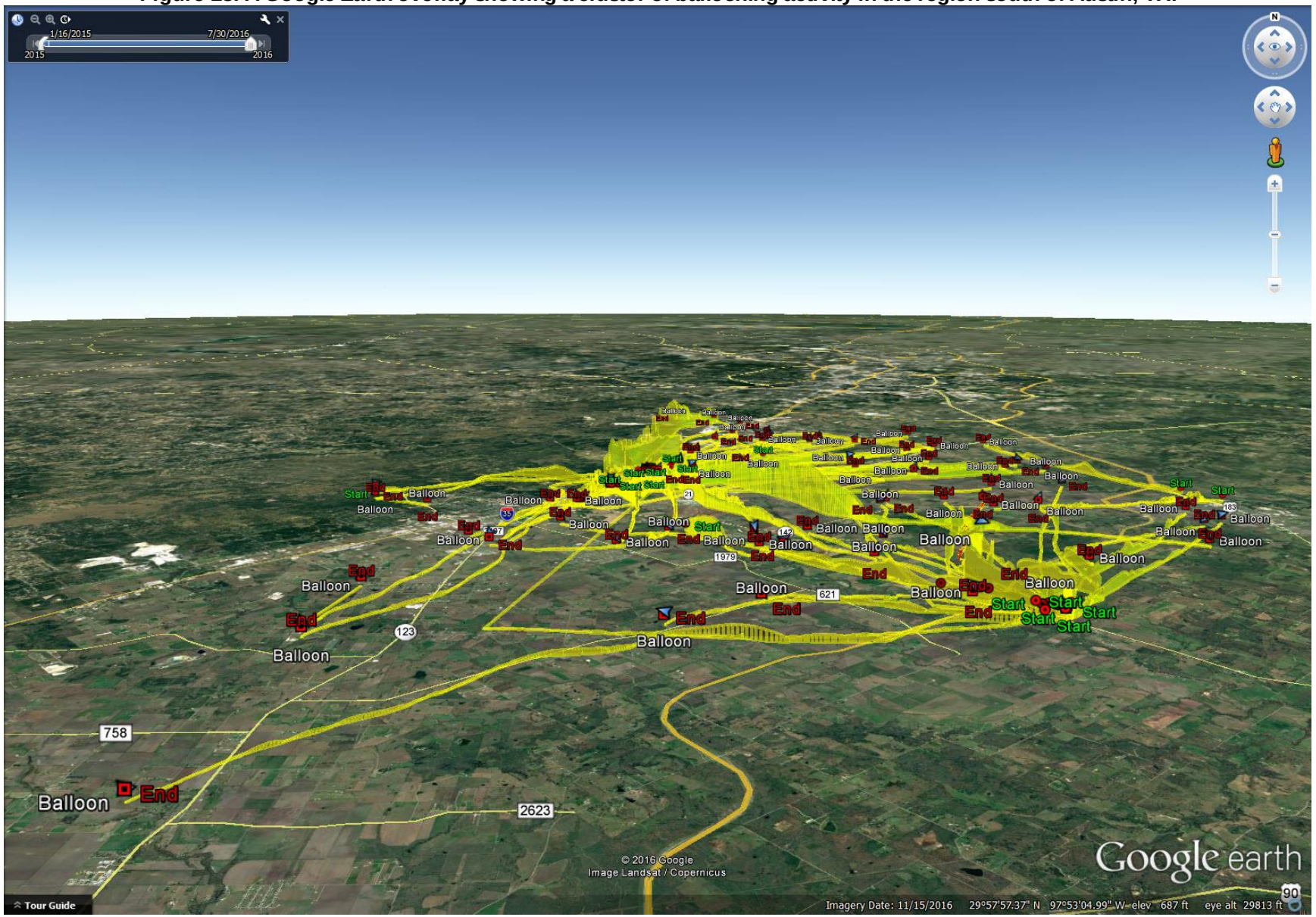


Figure 23. A Google Earth overlay showing a cluster of ballooning activity in the region south of Austin, TX.



APPENDIX A

This appendix describes the parameters provided and verified in this report. Table A-1 lists the Hot Air application parameters and table A-2 describes the unit abbreviations used in this report.

Table A-1 - Verified and provided parameters.

Parameter Name	Parameter Description
Date	Date
Time	Time
Latitude	Latitude
Longitude	Longitude
Leg Length	Leg Length
Leg Time	Leg Time
Groundspeed	Groundspeed
Ground Track	Ground Track
WGS84 Datum	Elevation of ground at given point
WGS84 Offset	Difference between elevation of ground and given point

Table A-2 - Unit abbreviations.

Units Abbreviation	Description
deg.	degrees
deg. true	degrees true
ft	feet
kts	knots