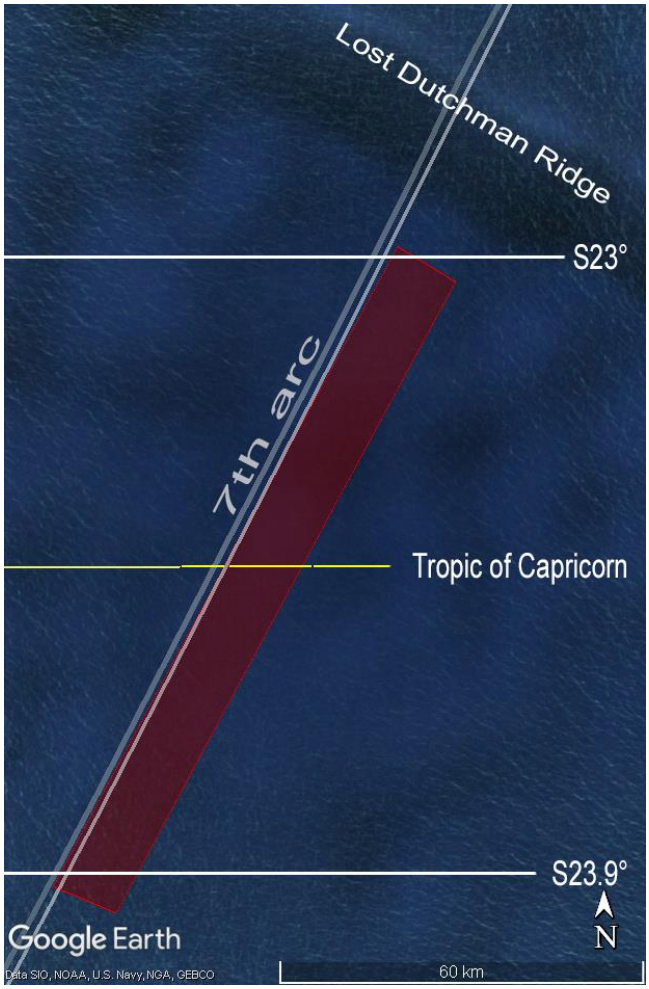


MH370 Report

Draft Version 16

Awaiting Reviewer Responses

Bottom Line Up Front

Cross-matching data from NASA, NOAA, Boeing, CSIRO, and Inmarsat indicates a high likelihood that MH370's wreckage is located east of the 7th arc, between S23° and S24°, south of the Lost Dutchman Ridge. While this area along the 7th arc was bathymetrically surveyed in 2014, it was not covered by acoustic or subsurface searches, and certain regions might have been missed during the 2014 surface search.

Contents

Introduction

On March 8, 2014, Malaysia Airlines Flight 370 (MH370), a Boeing 777 carrying 12 crew members and 227 passengers, disappeared over the South China Sea while en route from Kuala Lumpur to Beijing. Malaysia's military radar, along with analysis by the British satellite telecommunications firm Inmarsat, determined that the plane crossed back over Malaysia, entered the Strait of Malacca, and then turned south near the western tip of Sumatra into the Indian Ocean. The Australian Maritime Safety Authority (AMSA) led the search and rescue effort for MH370 because the suspected crash site in the Indian Ocean fell within Australia's internationally designated search and rescue (SAR) zone.

In March and April 2014, the AMSA coordinated a 42-day search involving aircraft from 9 countries, covering 4.6 million square kilometers of the Indian Ocean. When this search proved unsuccessful, the focus shifted to a deep-sea search. After reaching an agreement with the Malaysian government on May 5, 2014, the Australian Transport Safety Bureau (ATSB) took over responsibility for the underwater search for MH370's wreckage.

Using drift modeling and surface search coverage, the ATSB determined that if MH370 had crashed north of S32.5°, floating debris would likely have been discovered during the 42-day aerial and surface search. In 2017, after the ATSB-led search had ended, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) updated its drift analysis, indicating that the surface search might have missed two small regions between S23° and S24°.

When the underwater search for MH370 began, the Australian Transport Safety Bureau (ATSB) had limited physical evidence about the plane's location. The Inmarsat data showed that MH370's last known position was within a 1,400-nautical-mile arc stretching between the aircraft's northern and southern fuel limits in the Indian Ocean. This arc was determined by the 7th and final satellite communication received from the plane after contact was re-established; it is known as the 7th arc.

The Australian search team based its strategy on a ghost-plane theory. According to this idea, MH370 had a decompression event that eventually caused everyone on board, including crew and passengers, to die. Despite this, the aircraft continued flying on autopilot until it ran out of fuel and crashed into the Southern Indian Ocean.

Three underwater searches for Malaysia Airlines Flight MH370 have covered more than 250,000 square kilometers of the Indian Ocean seabed, extending roughly 25 nautical miles along the east and west sides of the 7th arc between S25° and S40°. Despite extensive efforts over the years in the southern Indian Ocean, the wreckage has not been found. There are only three possibilities for the location of the wreckage:

1. The wreckage was missed during the undersea searches.
2. The wreckage is more than 25 nautical miles from the 7th arc.
3. The wreckage is either north of S25° or south of S40°.

The Smoking Gun

Most atmospheric carbon monoxide (CO) originates from human activities, primarily the incomplete combustion of carbon-based fuels. In theory, if an aircraft were to crash and its fuel tanks ruptured on impact, partially igniting the fuel, it could release a large amount of CO. Within a few hours, the CO, aided by atmospheric convection, could rise to altitudes detectable by NASA's polar-orbiting satellites. Jet fuel (Jet A) is approximately 86% carbon by mass.

Asiana Airlines Flight 991, a cargo flight operated by a Boeing 747-400F, crashed into the East China Sea on July 28, 2011. About an hour after takeoff, the crew reported a fire in the main cargo hold and declared an emergency. They attempted to divert to Jeju International Airport but lost control of the aircraft. The plane crashed about 130 km west of Jeju Island, killing both crew members.

Figure 1: NASA's CO total column, Daytime, East China Sea, July 28, 2011

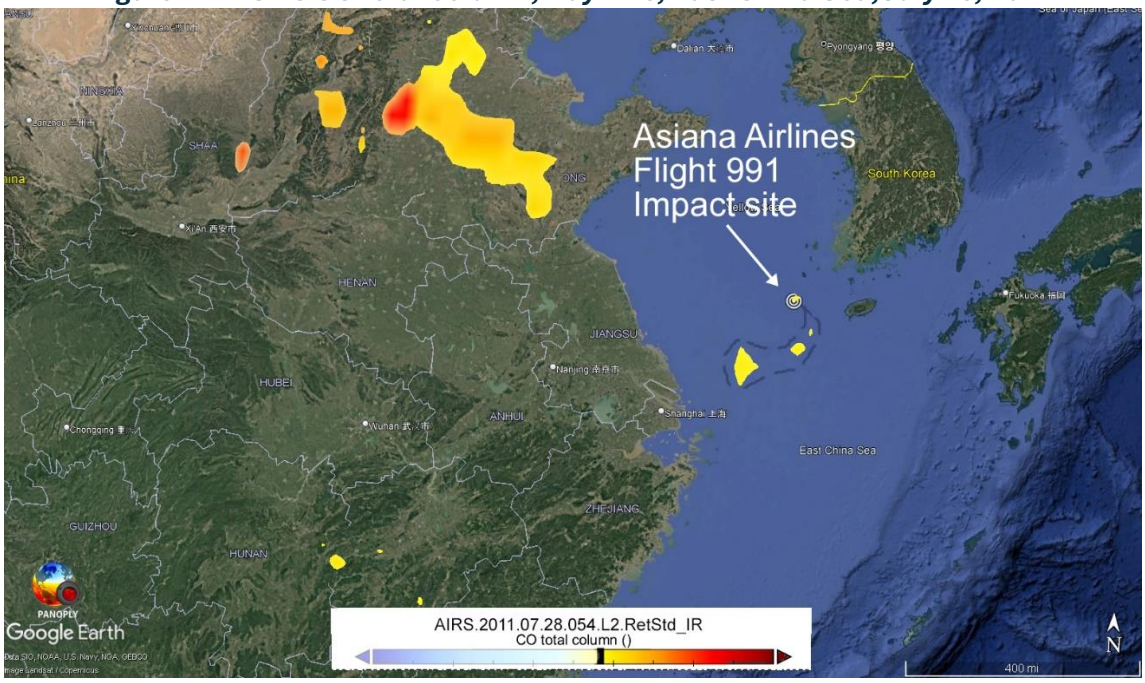


Figure 1 shows that ten hours after Flight 991 crashed into the East China Sea, NASA's Atmospheric Infrared Sounder (AIRS) detected elevated CO levels downwind of the crash site. The CO plume in the East China Sea was likely caused by the incomplete combustion of nearly 80,000 pounds of jet fuel in the 747 at the time of the crash. Some damaged cargo may have contributed to the downwind CO anomaly.

CO is often a major off-gas, appearing alongside CO_2 and H_2 during lithium battery cell failures. Flight 991 carried 258 kg of lithium-ion batteries in its cargo hold. Its crash became a well-known incident that spurred worldwide efforts to enhance lithium-battery safety; later regulations cite this crash (along with UPS 6) as a reason for stricter restrictions.

MH370 carried 221 kg of lithium-ion batteries as cargo.

Figure 2: NASA's AIRS only, v7, CO @ 850 hPa, Indian Ocean, March 8th, 2014

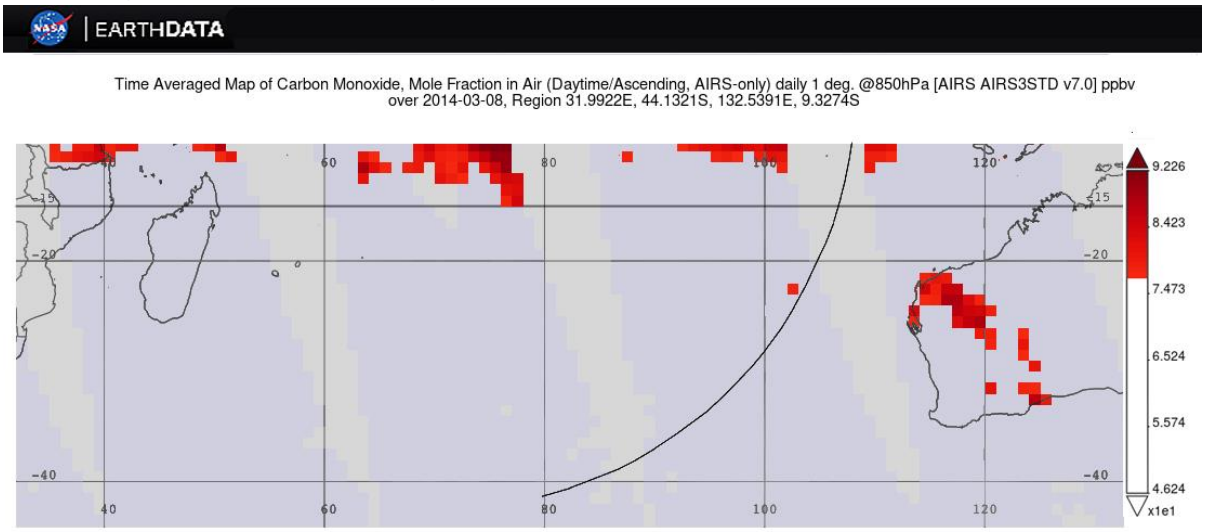


Figure 2 shows that at 07:25 UTC (7 hours after the last satellite communication from MH370), NASA's AIRS detected a significant CO anomaly in the Indian Ocean, 1,100 kilometers west of Coral Bay, Western Australia. The AIRS reading indicated a cloud-top CO level of 76.2 parts per billion by volume (ppbv) at 1,500 meters, centered at -22.5,102.5, northwest and downwind of the 7th arc. **This reading was the highest CO level at 850 hPa recorded by AIRS south of S15° in the Indian Ocean on March 8, 2014.**

Figure 3: NASA's Aqua, Corrected Reflectance & 850hPa CO, Indian Ocean, March 8, 2014

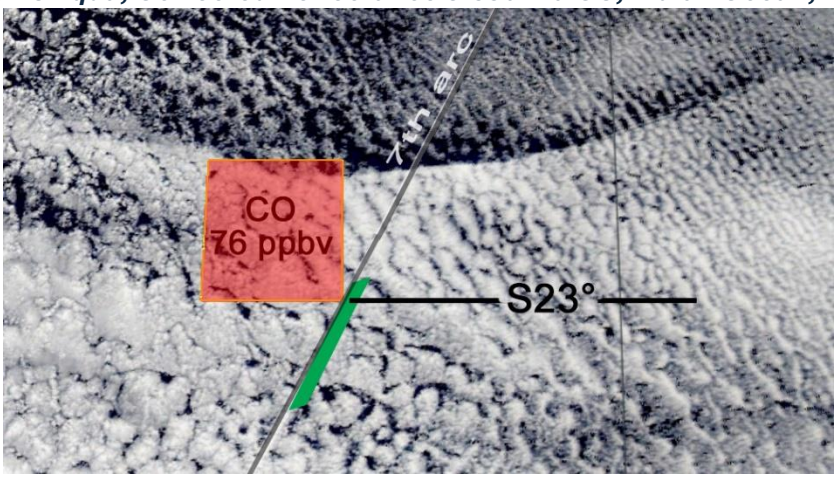


Figure 3 illustrates that 7 hours of prevailing near-surface winds (135°) can trace the cloud-top (850 hPa) CO anomaly back to its source (green) along the 7th arc between S22.8° and S23.6°.

Boeing's analysis on page 6 suggests that if MH370 crossed the 7th arc near latitude S23°, it might have had over 8,000 pounds of fuel remaining in its wing tanks around 00:19 UTC. This calculation assumes a consistent ground speed and altitude during the last six hours. A fuel dump by a rogue pilot just minutes before impact was not possible because the Boeing 777's

jettison system automatically deactivates once fuel drops below 10,000 pounds, safeguarding safety and aircraft integrity.

Investigators might have missed this carbon monoxide anomaly because the data did not match the ATSB end-of-flight scenario, which claims MH370 ran out of fuel and crashed in the southern Indian Ocean with no pilot at the controls. Both government and independent investigators endorsed this story, but they overlooked that more than half of Boeing's simulated flight scenarios did not run out of fuel before crossing the 7th arc.

MH370 Fuel Exhaustion Data

In late 2015, after nearly a year of unsuccessful seabed searches, the ATSB sought Boeing's help in determining MH370's flight path. This data remained unpublished until it was published as **Appendix 1.6E**, titled "Boeing Performance Analysis," in the 2018 Malaysia Safety Report. Boeing conducted 21 flight simulations to investigate potential flight paths, starting with a satellite communication system (SATCOM) log-in request at 18:28 UTC (Arc 1) and continuing until the aircraft exhausted its fuel. The initial 18:28 pings were generated by the Satellite Data Unit (SDU) as it tried to reconnect with the Inmarsat satellite system. The Boeing simulator was specifically configured to mimic the aerodynamic characteristics of the Boeing 777-200ER.

Boeing's analysis indicated that more than half of its simulated flight paths would not have exhausted their fuel reserves before crossing the 7th arc at 00:19 UTC (08:19 MYT). Thirteen simulated flights crossed the 7th arc, with estimated fuel reserves ranging from 400 to 9,900 pounds.

Figure 4: Boeing's 21 simulated flight paths for MH370 (A) and deep-ocean flight path (B)

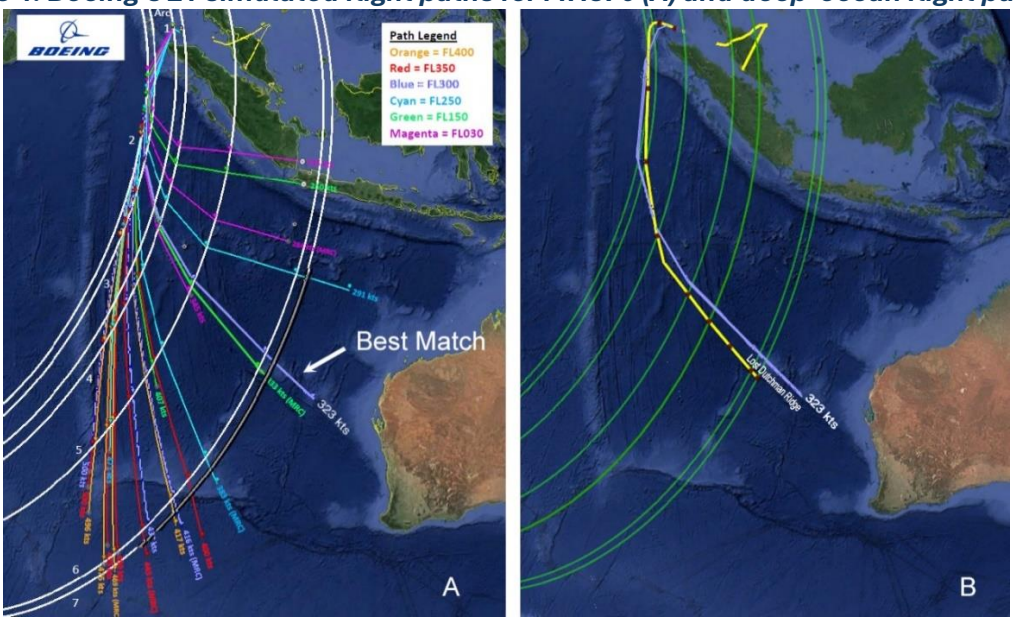


Figure 4 (right) shows 21 simulated flight paths spanning various combinations of altitude and speed. The analysis incorporates constraints from Inmarsat satellite data and wind speed and direction. Boeing assessed each flight path's travel time and range from Arc 1 to the fuel exhaustion point. Between S13° and S36° (gray arc), only 3 of 10 flight paths reached fuel exhaustion before reaching the 7th arc.

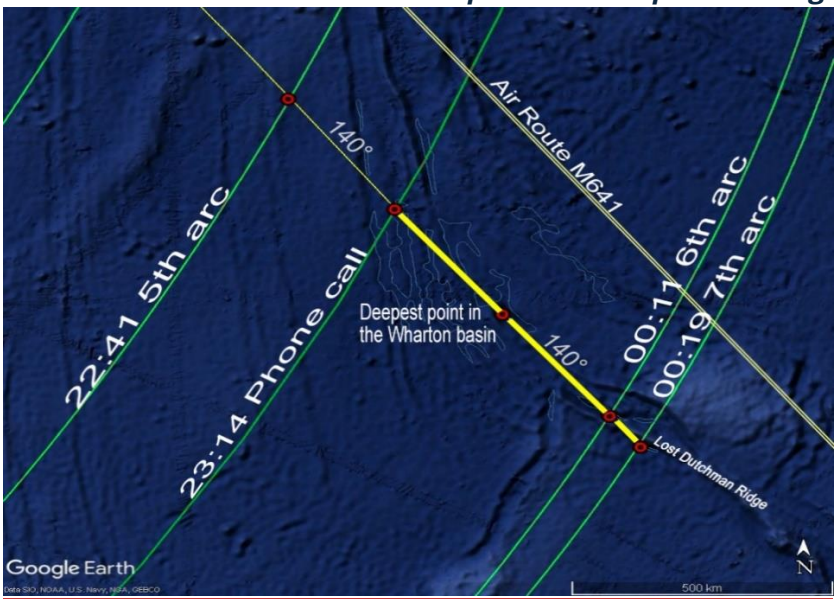
Figure 4 (left) shows a simulated flight path (yellow) that closely matches Inmarsat data, spanning 2,010 nautical miles from Arc 1 to Arc 7. The path maintained an average flight level of FL300 (30,000 feet) and ended near the Lost Dutchman Ridge. A similar Boeing simulation (purple) also flew at FL300 with a ground speed of 323 knots. This simulation had about 45 minutes of fuel remaining, approximately 8,000 pounds, when it crossed the 7th arc north of the Lost Dutchman Ridge at 00:19 UTC.

The 23:14 Satellite Phone Call and Connecting the Dots

At 23:14 UTC, MH370 received a satellite phone call from the ground station. The one-minute call went unanswered, triggering a log-on handshake and 27 pings between the aircraft's SATCOM system and the Inmarsat satellite. These pings provided essential data, including the Doppler-shifted signal frequency, known as the Burst Frequency Offset (BFO). The BFO helped determine whether the aircraft was moving toward or away from the satellite.

Along that 23:14 arc, the ocean's deepest point lies near S18.28°, E 98.77°. If the call were received at that location, the Inmarsat BFO data would be consistent with the plane flying level at a ground speed of 350 knots on a 140° heading.

Figure 5: Southern Wharton Basin with possible deep-ocean flight path



NOTE: The bathymetric data is from Google Earth

Figure 5 shows a notable alignment. By connecting the deepest ocean points along the 5th arc (22:41 UTC), the 6th arc (00:11 UTC), the 7th arc (00:19 UTC), the satellite call arc (23:14 UTC), and the deepest point in the Wharton Basin (-20.35, 100.60), all within +/- 8 NM, a line forms along a 140° track. These points may trace the last 90 minutes of MH370's flight over the Wharton Basin, ending at the 7th arc near the Lost Dutchman Ridge.

The final segment of this flight path, marked in yellow from the satellite call at 23:14 to the final handshake at 00:19 UTC, has an average ground speed of 340 knots and ocean depths exceeding 6,000 meters. Is this just a coincidence, or is this MH370's deep-ocean flight path?

The Deep-Ocean Impact Theory

Evidence indicates that someone with access to MH370's cockpit manually disabled the radar transponder and ACARS, making the aircraft invisible to air traffic control radar. The most plausible theory is that a rogue pilot deliberately disabled all communication systems on the Boeing 777, causing the aircraft to vanish into the night. But why would someone go to such lengths to hijack a Boeing 777 if their real intent was pilot suicide, as in EgyptAir Flight 990 in 1999 or Germanwings Flight 9525 in 2015? A pilot intending suicide would likely have crashed the plane into the South China Sea rather than flying for another seven hours to a remote ocean destination.

One possible strategy could be to scuttle MH370 in the deep ocean to eliminate any chance of discovery. Without the wreckage, there is no concrete evidence of a crime (corpus delicti), which helps the perpetrator avoid association with the loss of 238 innocent lives and protects friends, political allies, and family from public scrutiny. In March 2014, during the investigation, Anwar Ibrahim, Malaysia's current Prime Minister, publicly disclosed that MH370's Captain Zaharie Ahmad Shah was related to one of his in-laws.

After departing Kuala Lumpur, the two most viable locations within MH370's fuel range were the Mariana Trench, at 10,000 meters depth, and the Sunda Trench, at 7,000 meters depth. The Mariana Trench was eliminated because MH370 would have had to fly over the Philippines and come within radar range of the US Air Force base on Guam, roughly 200 nautical miles away. The Sunda Trench was also eliminated because it is only 130 nautical miles from Indonesia's coast, which would have meant flying through an area monitored by the Indonesian military and Australian Border Force surveillance near Christmas Island.

The third viable ditching location within the B777's fuel range was the Wharton Basin in the east-central Indian Ocean. This basin features trench-fracture zones aligned with the Investigator Ridge and the Lost Dutchman Ridge, at depths exceeding 6,500 meters. The fracture zone on the south slope of the Lost Dutchman Ridge was the southernmost hadal zone within MH370's fuel range.

If MH370 had sunk to depths greater than 6,000 meters, locating it would be challenging, as such depths exceed the capabilities of most advanced underwater search equipment. Before 2022, no shipwreck had been discovered deeper than 6,000 meters. Additionally, even if the wreckage were located, recovering the flight data recorders, debris, and possible human remains from nearly twice the depth of the Titanic would be highly challenging and costly, since no part of a shipwreck has ever been recovered from depths over 6,000 meters.

A deep-water target location may explain why MH370 continued flying for 5 hours after entering the Indian Ocean. If the hijacker aimed to sink MH370 in the deepest part of the Wharton Basin, he had to wait until daybreak to reach suitable locations. The rogue pilot followed a predetermined flight plan. When MH370 entered the Indian Ocean, its airspeed decreased to ensure arrival at the first deep-ocean site just after sunrise. Clear visibility and calm seas were crucial for executing a scuttle maneuver that minimized debris. The hijacker may have bypassed

the initial sites due to high waves or nearby marine traffic, ultimately ending up near the Lost Dutchman Ridge.

Another potential reason for MH370's lower airspeed was its attempt to avoid the Australian HF skywave over-the-horizon radar (OTHR) coverage. At sunrise and sunset, the ionosphere undergoes rapid variations, causing skip fading and shifting footprints (range coverage) in OTHRs. A 2016 RAAF FAQ update noted, "*Based on the time of day that MH370 disappeared, and in the context of peacetime tasking, JORN was not operational at the time of the aircraft's disappearance.*"

The deep-ocean flight path included three turns after the near 180° turn in the South China Sea near the waypoint IGARI. The first was around Penang Island (~17:52 UTC), the second a wide banking turn around the tip of Sumatra between 18:28 and 18:50 UTC, and the third skirting the Coco Islands between 21:45 and 22:00 UTC. All three turns involved tangential maneuvers around Malaysian, Indonesian, and Australian military installations.

Figure 6: MH370 flight path. 5000 & 6000 ocean depths.

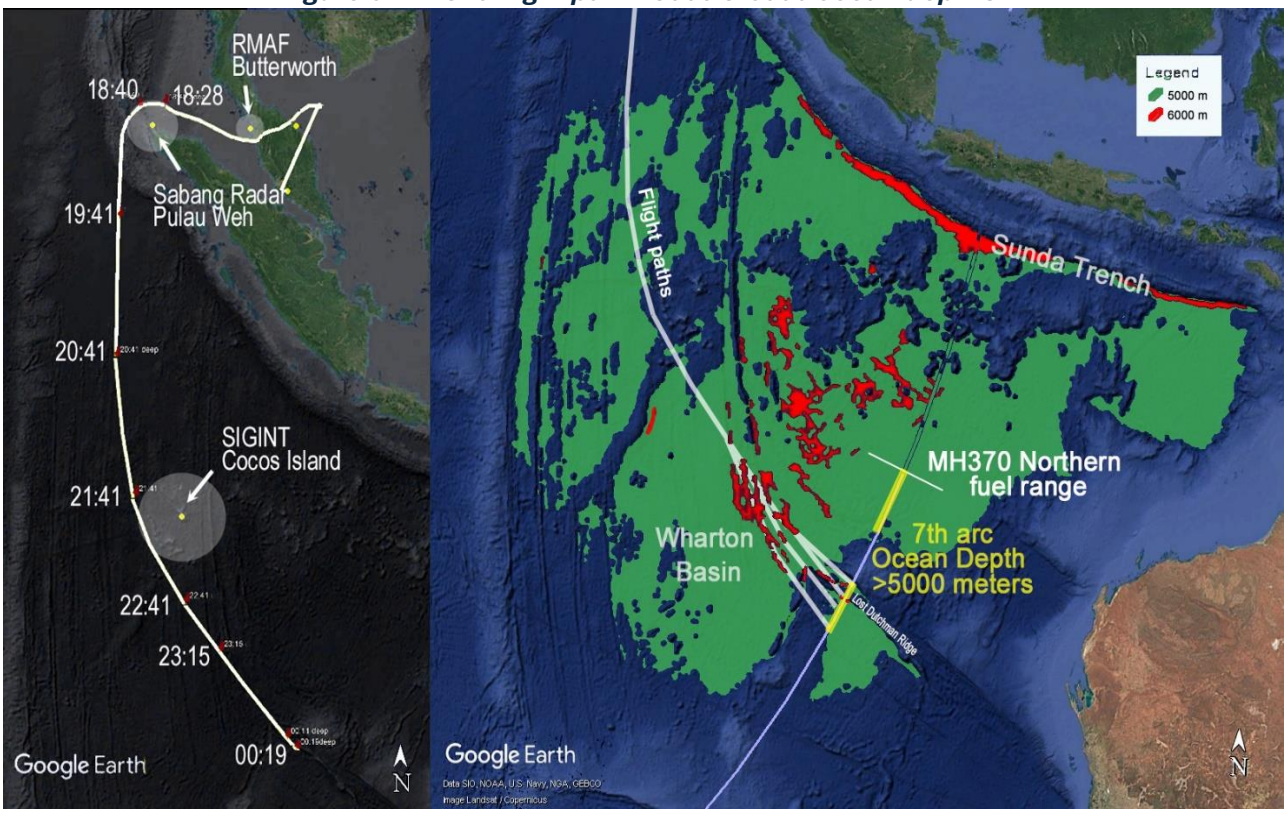


Figure 6 (left) shows the complete Deep-Ocean flight path with nine handshakes. After passing over Malaysia again, the route makes three turns around the RMAF (Royal Malaysian Air Force) base at Butterworth, Penang; around Indonesia's radar station on Pulau Weh (also called Sabang); and the final turn around the Cocos Islands, where Australia's Signals Intelligence (SIGINT) station is located. Figure 6 (right) shows the ocean depths at 5000 meters (green) and 6000 meters (red) in the eastern Indian Ocean.

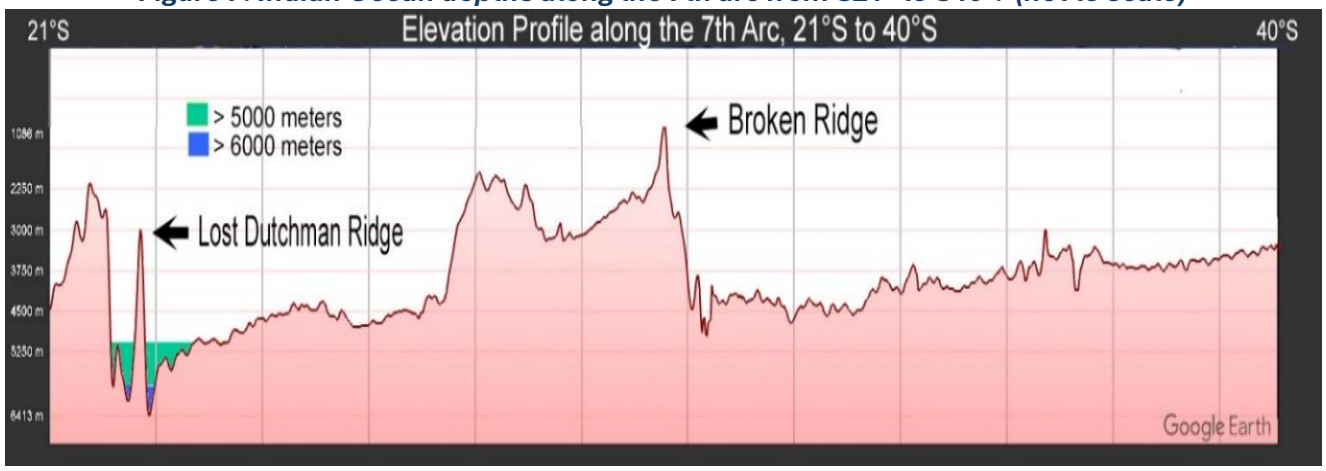
Investigators generally believe MH370 was cruising at a steady altitude northwest along airway N571 when it abruptly turned south between the 18:28 log-on and the 18:40 satellite phone call. However, independent researcher Victor Iannello suggested the plane might have turned south after 18:40 UTC, especially if it descended during the phone call. The rogue pilot may have avoided detection by the Indonesian military and civilian radar on Pulau Weh Island by reducing speed and altitude and flying a perpendicular flight path around Indonesia's western tip.

This flight scenario supports Indonesia's Defense Minister, Purnomo Yusgiantoro, who dismissed Malaysia's investigators' claims that MH370 crossed Indonesian airspace near Banda Aceh. He also stated that military radar at Sabang did not detect MH370.

There are only two possible scenarios: either Minister Yusgiantor was not truthful, and Indonesia did not disclose its radar coverage early on March 8, or MH370 evaded Indonesian radar by flying into the Andaman Sea before turning south.

Figure 6 (right) shows the deep-ocean flight path that follows the Investigator Fracture Zone for more than 600 nautical miles. The fracture zone south of the Lost Dutchman Ridge was the southernmost hadel zone within MH370's fuel range.

Figure 7: Indian Ocean depths along the 7th arc from S21° to S40°. (not to scale)



NOTE: The bathymetric data displayed on this page is from Google Earth.

Figure 7 shows the Google Earth elevation profile along the entire 7th arc within MH370's fuel range (S21°-S40°). The two deepest ocean locations along the 7th arc lie north and south of the Lost Dutchman Ridge. Only 0.35% of the 250,000 sq km underwater search for MH370 was conducted at depths exceeding 5,000 meters.

Overlooked Ocean Eddies

If MH370's impact site was on the 7th arc near S23.45°, E102.75°, floating debris might have remained trapped for months in a slow, churning neutral zone formed by the West Australian Current, the Eastern Gyral Current, and the Leeuwin Current. This dead zone could explain why debris from MH370, especially items with low wind resistance, washed ashore along the western Indian Ocean for more than 19 months, from July 2015 to January 2017.

Figure 8: NOAA drifters caught in a Indian Ocean neutral zone

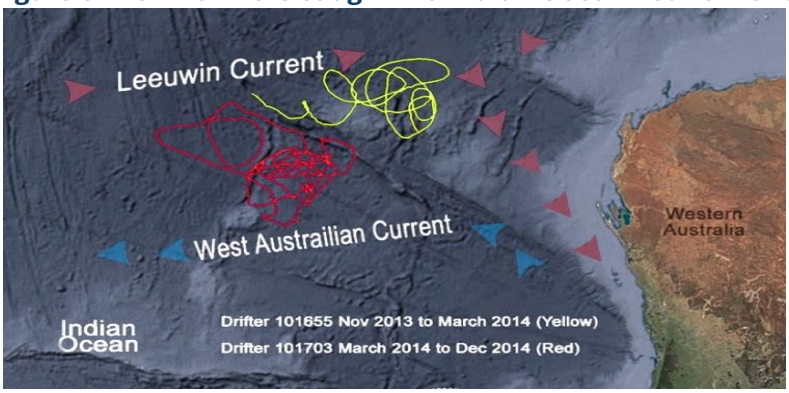


Figure 8 shows two US National Oceanic and Atmospheric Administration (NOAA) Global Drifters, #101655 (Yellow) and #101703 (Red), that were caught in a series of slow-moving ocean eddies and gyres between the West Australian Current and the Leeuwin Current from November 2013 to December 2014.

Figure 9: CSIRO's simulated reverse drift trajectories (unpublished data)

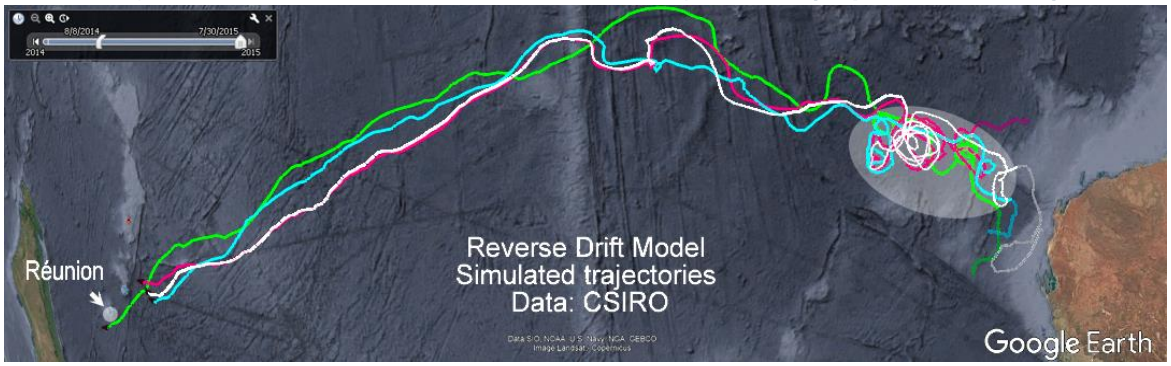


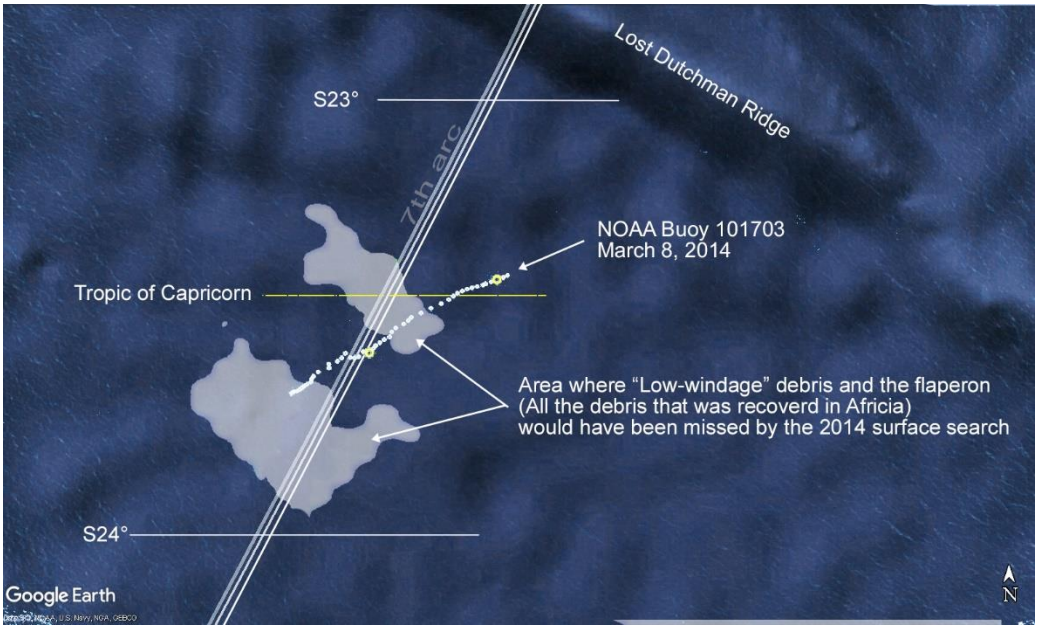
Figure 9 shows four simulated drift paths obtained from CSIRO's unpublished reverse drift model, illustrating the backtrack trajectories of the flaperon found on Réunion Island on July 29, 2015. These trajectories indicate that the dead zone between the West Australian Current and the Leeuwin Current could have captured debris for several months. The four trajectories crossed the 7th arc multiple times, with the final crossings occurring between November 15 and December 17, 2014. Around that time, NOAA global drifter 101703, shown in Figure 8, also made a final crossing of the 7th arc on December 9, 2014. Only one of the 88 CSIRO-sampled reverse trajectories crossed the 7th arc south of S24°, and none came within 200 nautical miles (370 kilometers) of the then-current **ATSB seabed search area** south of Broken Ridge.

In a Q&A, CSIRO stated in a December 2016 report that it didn't publish the reverse drift model ***"because it turned out not to be as informative as the forward tracking model".***

Missed Area During the 2014 Surface Search

In their final ATSB report on page 34, they state, "*the surface search was of high value to the underwater search because it adds to the weight of evidence suggesting that searching the seafloor north of about S32.5° is unlikely to be successful*." This statement contradicts CSIRO data, which indicated that the flaperon and all the low-windage debris found on African shores would have been overlooked if MH370 had crashed along the 7th arc between latitudes S23.4-S23.6 or S23.7-S24.0 (Figure 10). Remarkably, the Global Drifter 101703 passed through that area on March 8, 2014, and was also missed by the surface search.

Figure 10: Missed Area during the 2014 surface search



In response to multiple inquiries about Drifter 101703, CSIRO oceanographer Dr. David Griffin posted a time-drift animation on his webpage. The animation showed that both Drifter 101703 and simulated debris paths, including the flaperon, would have avoided the daily surface search zone boxes if MH370's impact site were on the 7th arc near latitude S23.4°. The file has since been removed from CSIRO's website.

Even with this data, the CSIRO reaffirmed that if the crash site had been north of S32.5°, the surface search would have identified high-windage items, stating, ***'High windage' items have a windage coefficient of 3%, a value commonly used for small buoyant items such as seat cushions***. Their theory was that these items were not found in Africa because *the* ***high-windage items became waterlogged and sank after the surface search***. The seat cushion was a poor example to support their theory because it is designed to be buoyant for only 8 hours. Debris afloat in the treacherous Indian Ocean for 30 to 40 days would eventually have reached Africa.

The surface search was scheduled to cover the area between S23° and S24° within the yellow zone centered on Inmarsat's "best fit" impact location at S23.4°, E102.8°, on April 8-9, 2014. However, after Ocean Shield reported acoustic detections, all aerial assets were redirected to an area aligned with the 30-day debris trajectory from the acoustic detection location.

Overlooked NOAA Global Drifter Data

The NOAA Global Drifter Program (GDP) deploys and manages a global network of approximately 1,200 drifting buoys to monitor the state of the world's oceans. These satellite-monitored surface buoys transmit near-real-time data on sea surface temperature, salinity, and ocean currents. Remarkably, one of the NOAA buoys, Drifter 101703, crossed the 7th arc near latitude S23.4° on March 8, 2014, close to the Inmarsat Doppler BFO analysis best-fit point (refinement of Inmarsat Analysis, March 31, 2014).

Figure 11: Global Drifter 101703 drift trajectory path from March 8, 2014, to July 22, 2015

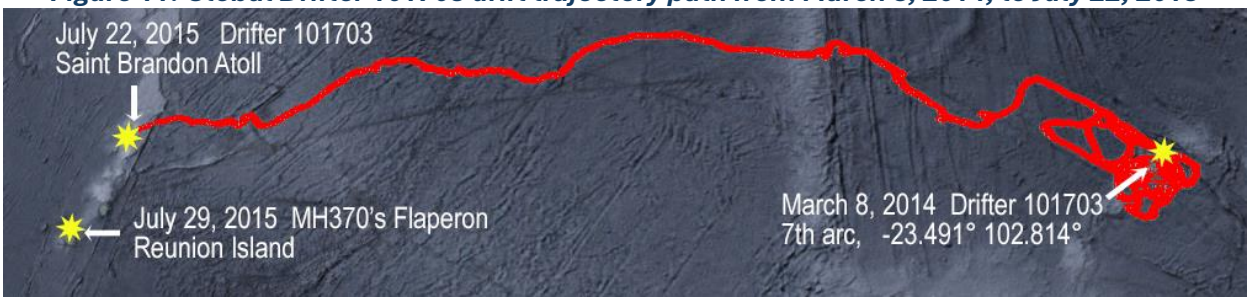
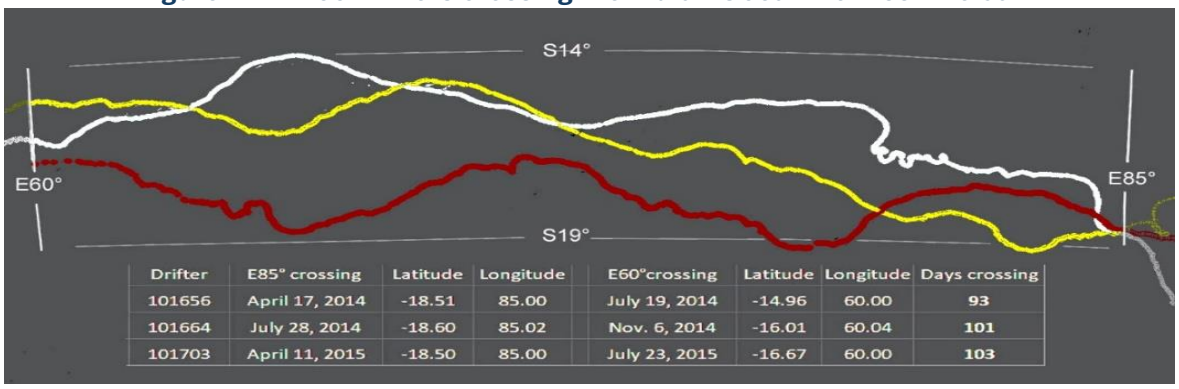


Figure 11 shows that drifter 101703 was trapped in persistent ocean eddies between the West Australian Current and the Leeuwin Current for nine months (page 10). The undrogued buoy broke free on December 8, 2014, and drifted across the Indian Ocean for seven months before reaching Saint Brandon Atoll in Mauritius, where it likely beached. The last satellite transmission from Global Drifter 101703 occurred on July 22, 2015, with **its final recorded position at S16.6761°, E60.0592°, northeast of Réunion Island, where MH370's flaperon was found a week later.**

Two additional NOAA undrogued Global Drifters, 101656 and 101644, drifted within 700 nautical miles of the 7th Arc from March 8 to April 8, 2014. Both eventually crossed the Indian Ocean and washed ashore on African islands between September 2014 and April 2015.

Figure 12: Three Drifters crossing the Indian Ocean from 85°E to 60°E



Drifter	E85° crossing	Latitude	Longitude	E60°crossing	Latitude	Longitude	Days crossing
101656	April 17, 2014	-18.51	85.00	July 19, 2014	-14.96	60.00	**93**
101664	July 28, 2014	-18.60	85.02	Nov. 6, 2014	-16.01	60.04	**101**
101703	April 11, 2015	-18.50	85.00	July 23, 2015	-16.67	60.00	**103**

Although the three Global Drifters crossed the Indian Ocean months apart, their drift speeds and trajectories were nearly identical. Figure 12 shows that, when tracked from a common starting point at S18.5°, E85°, each Drifter traveled over 1,600 nautical miles, crossed paths seven times, and reached 60°E longitude between 93 and 103 days.

Figure 13: NOAA drifting buoys crossing the Indian Ocean

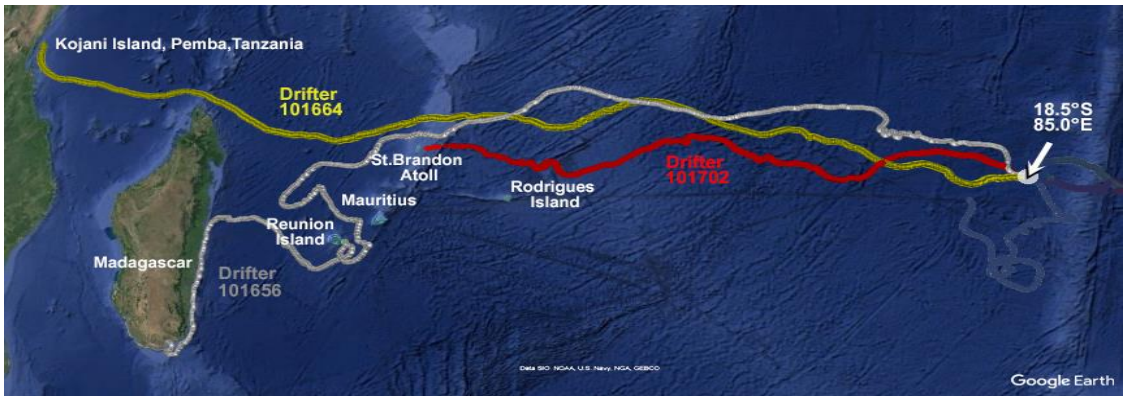


Figure 13 depicts the trajectories of three Global Drifters—101703, 101656, and 101644—originating from the S18.5°, E85° intersection. The diagram traces their westward drift along the South Equatorial Current toward Africa, as well as their beaching locations. Notably, at least one of the three drifters came within 162 nautical miles of 16 confirmed, probable, or suspected MH370 debris sites on Réunion Island, Mauritius, Rodrigues, Madagascar, and Kojani Island.

Figure 14: Confirmed, likely, or suspected pieces of MH370 debris

Reference number	Debris description	Global Drifter ID number	Drifted within (nmi)	the debris location found on:
Item 1	Right Flaperon	101664	8	Saint-Denis, Réunion Island
Item 5	Door R1 Stowage Closet	101703	105	Rodrigues Island, Mauritius
Item 8	Flap Support Fairing Tail Cone	101664	45	Gris Gris Beach, Mauritius
Item 10	Left Outboard Flap	101664	59	L'îlot Bernache, Mauritius
Item 11	Seat Back Trim Panel - IFE Monitor	101664	129	Nosy Boraha Island, Madagascar
Item 12	Wing or Horizontal Stabilizer Panel	101664	125	Nosy Boraha Island, Madagascar
Item 13	Unidentified part	101664	128	Nosy Boraha Island, Madagascar
Item 14	Unidentified part	101664	128	Nosy Boraha Island, Madagascar
Item 15	Right Wing Trailing Edge Panel	101664	119	Nosy Boraha Island, Madagascar
Item 16	Cabin Interior Panel	101664	162	Antsiraka beach, Madagascar
Item 17	Unidentified part	101664	155	Antsiraka beach, Madagascar
Item 18	Forward Nose Landing Gear Door	101664	155	Antsiraka beach, Madagascar
Item 19	Right Outboard Flap	101656	5	Kojani Island, Pemba, Tanzania
Item 23	Unidentified part	101664	128	Nosy Boraha Island, Madagascar
Item 24	Unidentified part	101664	18	Sainte-Luce, Madagascar
Item 25	Unidentified part	101664	128	Nosy Boraha Island, Madagascar

Drifter 101656, which washed ashore on Kojani Island, Pemba, Tanzania, was found less than five nautical miles from the sea cave where local fishermen discovered MH370's right outboard flap. Drifter 101664 traveled within eight nautical miles of Réunion Island, where the right flaperon was found. Although both the outboard flap and flaperon were adjacent on the Boeing 777's right wing, they were recovered 1,300 nautical miles (2,400 kilometers) apart and discovered 11 months apart.

Analysis of 30 years' worth of trajectory data from over 3,000 GDPs in the Indian Ocean, spanning 1985 to 2015, reveals that only two GDPs, 101664 and 101703, passed within 700 nautical miles of the 7th arc between March 8 and April 8, crossed the Indian Ocean, and passed within 350 nautical miles of Réunion Island in fewer than 500 days.

The three drifters' routes across the Indian Ocean formed an indirect path from a S23.4° impact location on March 8, 2014, to the flaperon and 15 other debris locations. Most published CSIRO reports and the Defence Science and Technology Group's book, 'Bayesian Methods in the Search for MH370,' excluded drift **modeling data from origin points north of S27°** because crash sites north of S27° could occur only if MH370 made at least one turn in the Indian Ocean.

The ATSB Cherry-picked CSIRO's Data.

On December 23, 2015, a beachcomber photographed the second piece of MH370 debris found, part of the Rolls-Royce engine cowl at Mossel Bay, South Africa. Four days later, on December 27, Liam Lotter, a teen from South Africa, discovered part of MH370's right-wing flap on a beach near Inhambane, Mozambique—about 1,000 nautical miles north of Mossel Bay and over 2,000 nautical miles along drift currents from Réunion Island.

In 2016, CSIRO created replicas of the two debris items to model how the engine cowling and right-wing flap might have drifted across the Indian Ocean. The replicas were deployed in the ocean, and their drift was tracked with GPS. Using this data, CSIRO developed drift models to estimate the likely starting latitudes along the 7th arc from which these pieces could have reached Mozambique and South Africa by December 2015.

In December 2016, CSIRO published the results of that model, showing starting latitudes between S37° and S41°, but omitting data points north of S27°. The complete dataset of impact latitudes from S8° to S41° was available on CSIRO's website, but the link to that site has since been removed.

Figure 15: Probability of low windage debris arrival in December 2015 on the mainland of Africa

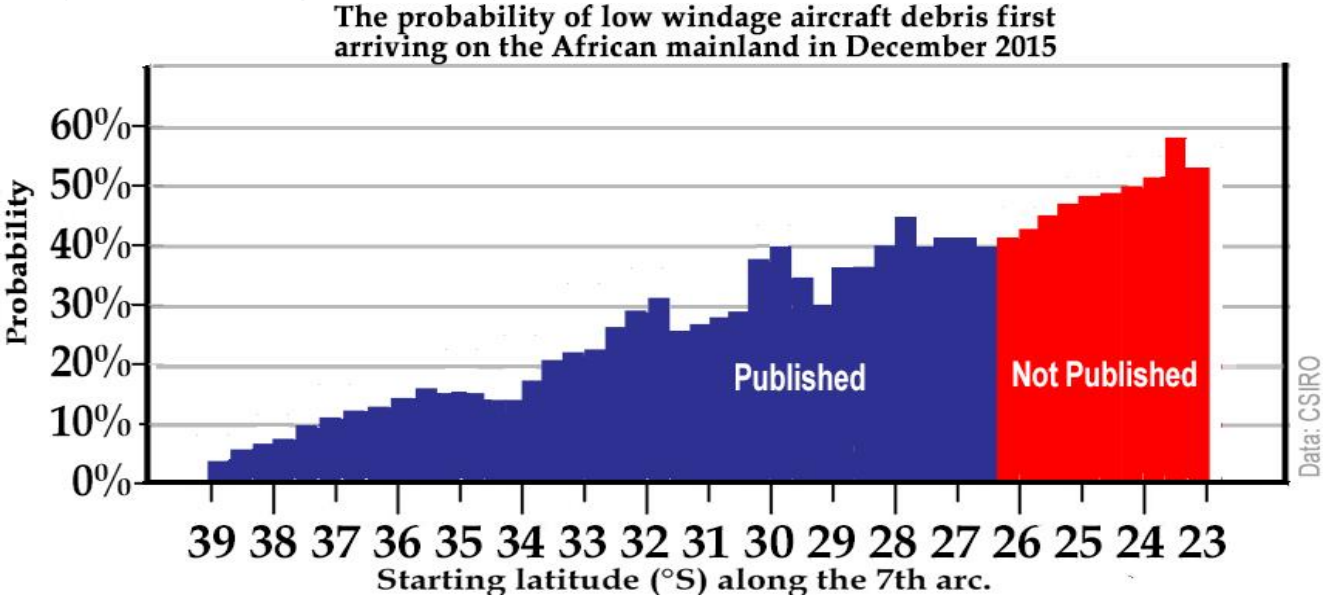


Figure 15 illustrates CSIRO's estimate of the likelihood that low-windage debris could reach the African coast west of E50° (mainland), between S35° (Mossel Bay) and the equator, originating from latitudes along the 7th arc between S23° and S39°, starting March 8, 2014. The unpublished data is indicated in red. The data indicate that the probability increases with decreasing latitude, **peaking at S23.66°.** Three times the likelihood of an impact point near S34° (Ocean Infinity search zone). This peak was corroborated in September 2018, when Dr. David Griffin discussed on his website how MH370's low-windage debris from starting latitudes arrived in Africa in December 2015.

"***A small region near S23.6° is the closest location to being compatible with the observed dates (December 2015) of miscellaneous debris arriving west of 50°E.***" David Griffin, CSIRO

Figure 16: Trajectories starting points from 8°S-37°S

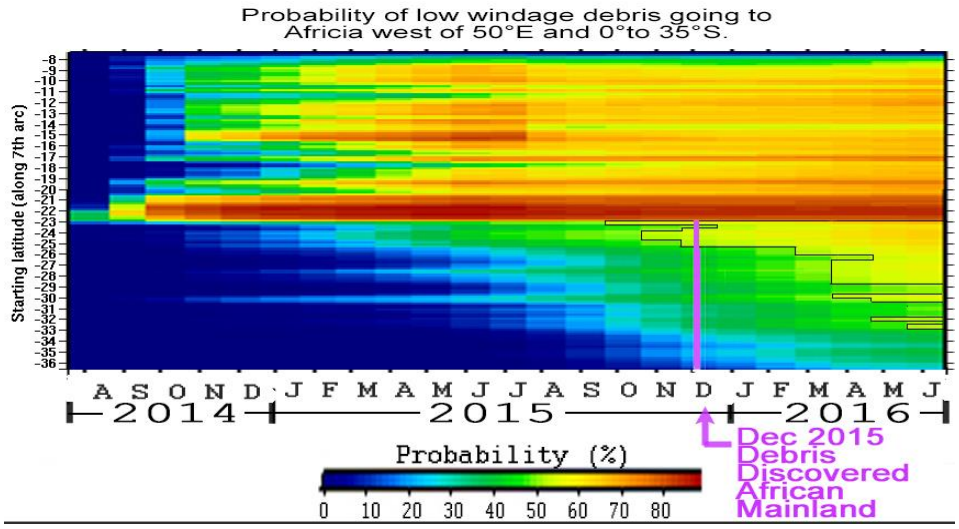
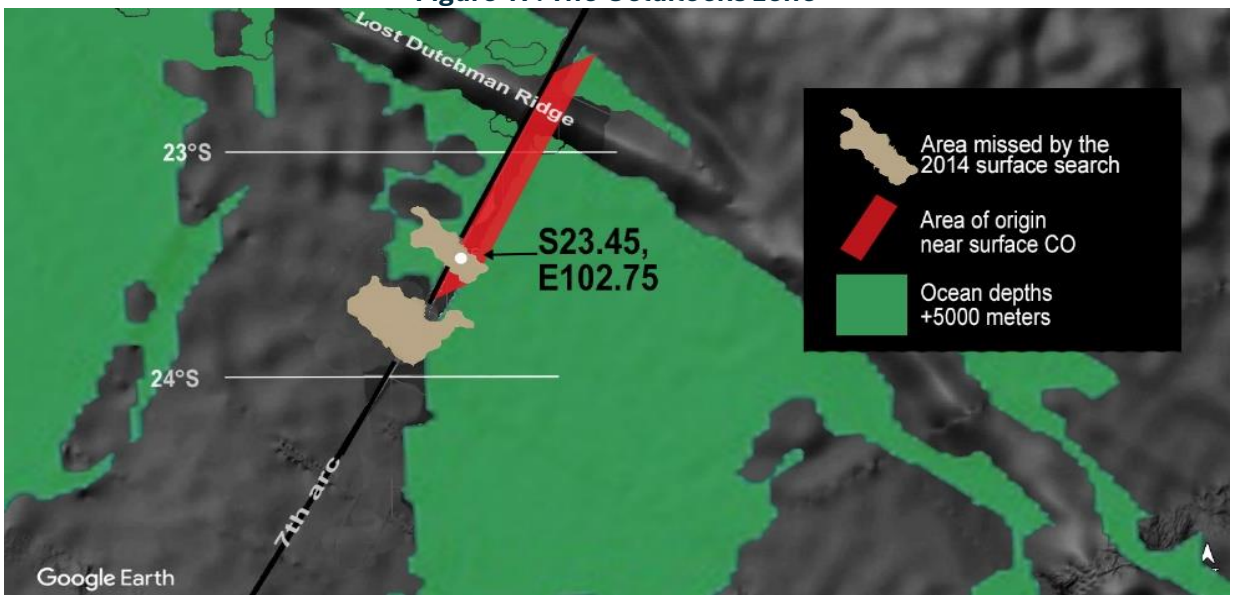


Figure 16 shows the same unpublished CSIRO data, presenting a timeline of debris reaching the African mainland from starting latitudes along the 7th arc between S8° and S36°. The reddish band north of S23° indicates that, if MH370 had impacted the ocean north of 23°S, debris would likely have been carried directly into the South Equatorial Current and arrived in Africa between September and December 2014—almost a year before the debris was discovered.

Figure 17: The Goldilocks zone



The S23°-S24° Goldilocks Zone

Impact sites roughly 25 NM from the 7th arc, between S23° and S24°, had no chance of debris reaching Western Australian beaches but were the most likely latitudes for low-windage debris to reach Africa's mainland in December 2015. If MH370's impact point had been north of S23°, debris would have reached African shores nearly 11 months earlier. Moreover, the likely source of the CO plume (red) and the missed surface search zone (tan) both fall within a 5000-meter depth area (green) between S23.0 and S24°. **An impact site near S23.45°, E102.75°, within this Goldilocks zone, meets all five specified criteria.**

End-of-flight Scenario

MH370's In-Flight Entertainment (IFE) system should have attempted to reconnect after the 00:19 UTC log-on, as it did after the earlier 18:25 UTC log-on. Yet no IFE communication was observed after the 00:19 event. After the 18:25 log-on, the IFE re-established its satellite connection 89 seconds later, showing that power and data channels were functioning. At 00:19 UTC, the aircraft sent both the log-on request (00:19:29) and acknowledgment (00:19:37), but the IFE did not try to reconnect through the SATCOM terminal at 00:21:07 as expected, missing roughly 18 transmissions between 00:21:07 and 00:22:18.

Figure 18: Inmarsat data, 18:25 log-on comparison to 00:19 log-on

Time	ChannelType\SU Type	Time	ChannelType\SU Type
18:25:27.421	R-Channel RX 0x10- Log-on Request	00:19:29.416	R-Channel RX 0x10- Log-on Request
18:25:28.852	P-Channel TX 0x11- Log-on Confirm	00:19:31.572	P-Channel TX 0x11- Log-on Confirm
18:25:29.572	P-Channel TX 0x40- P-/R-Channel Control	00:19:32.212	P-Channel TX 0x40- P-/R-Channel Control
18:25:29.572	P-Channel TX Subsequent Signalling Unit	00:19:32.212	P-Channel TX Subsequent Signalling Unit
18:25:30.213	P-Channel TX 0x41- T-Channel Control	00:19:32.852	P-Channel TX 0x41- T-Channel Control
18:25:30.213	P-Channel TX Subsequent Signalling Unit	00:19:32.852	P-Channel TX Subsequent Signalling Unit
18:25:34.461	R-Channel RX 0x15 - Log-on/Log-off Acknowledge	00:19:37.443	R-Channel RX 0x15 - Log-on/Log-off Acknowledge
18:25:35.408	P-Channel TX 0x15 - Log-on/Log-off Acknowledge	00:19:38.407	P-Channel TX 0x15 - Log-on/Log-off Acknowledge
	88.5 Seconds	Impact	**88.5 Seconds**
18:27:03.905	R-Channel RX Eleven Octet User Data	00:21:07.00	No signal received.
18:27:04.405	R-Channel RX Four Octet User Data		No signal
18:27:04.907	P-Channel TX 0x62 -Acknowledge User Data		No signal
18:27:06.407	P-Channel TX 0x71- User Data - RLS		No signal
18:27:06.407	P-Channel TX Subsequent Signalling Unit		No signal
18:27:08.404	R-Channel RX 0x62- Acknowledge User Data		No signal
18:28:05.904	R-Channel RX 0x22- Access Request		No signal
18:28:06.407	P-Channel TX 0x51- T-Channel Assignment		No signal
18:28:10.260	T-Channel RX 0x71- User Data - RLS		No signal
18:28:10.398	T-Channel RX Subsequent Signalling Unit		No signal
18:28:10.559	T-Channel RX Subsequent Signalling Unit		No signal
18:28:10.718	T-Channel RX Subsequent Signalling Unit		No signal
18:28:10.879	T-Channel RX Subsequent Signalling Unit		No signal
18:28:11.054	T-Channel RX Subsequent Signalling Unit		No signal
18:28:11.907	P-Channel TX 0x62 -Acknowledge User Data		No signal
18:28:12.907	P-Channel TX 0x71- User Data - RLS		No signal
18:28:12.907	P-Channel TX Subsequent Signalling Unit		No signal
18:28:14.904	R-Channel RX 0x62- Acknowledge User Data	00:22:18.00	No signal

The search area in the southern Indian Ocean was guided by the ATSB's theory that the log-on at 00:19 was due to fuel exhaustion, which caused both engines to shut down and triggered the automatic activation of the auxiliary power unit (APU). The APU powered only essential systems, excluding the entertainment system. Investigators believed that the absence of an IFE log-on indicated that the system had not started because power was limited following the flame-out. This assumption supported the ATSB's ghost plane theory and the crash site in the southern Indian Ocean.

If MH370 didn't run out of fuel and was under pilot control at 00:19:38, the rapidly descending B777 couldn't have traveled more than 6 nautical miles in 89 seconds. Therefore, if the missing IFD log-on was caused by MH370 crashing into the ocean between 00:19:38 and 00:21:07, the impact site and wreckage would be within 6 nautical miles east of the 7th arc. By comparison, AF447 descended from 35,000 feet to sea level in 234 seconds, covering only 6.5 nautical miles.

Summary of Overlooked Evidence

Summary of evidence supporting the deep-ocean flight path with MH370 crash point near the 7th arc between the Lost Dutchman Ridge and the Tropic of Capricorn.

1. The near-surface carbon monoxide anomaly detected downwind of the 7th arc matches a similar anomaly recorded downwind of the Asiana Airlines Flight 991 crash site.
2. 70% of Boeing's simulated MH370 flight paths between S13° and 36° crossed the 7th arc while still carrying fuel. Additionally, a Boeing flight path that matched the deep-ocean route had about 8,000 pounds of fuel remaining when crossing the 7th arc.
3. The acoustic and underwater searches missed the area on the east side of the 7th arc, between S23° and S24°.
4. The area south of the Lost Dutchman Ridge has the deepest ocean depths along the 7th arc, making it an optimal spot for ditching MH370, where wreckage would be hard to find or recover.
5. The absence of debris along the Australian coast. The probability that MH370 debris would reach Australia from the crash locations between S23° and S24° was zero.
6. The unpublished CSIRO drift data show that a small region along the 7th arc, near S23.66°, had the highest likelihood of debris arriving on mainland Africa in December 2015.
7. The highly improbable situation in which the deepest ocean points on the 5th, 6th, and together with the 23:14 satellite call arc, align to create a 140° flight path that ends south of the Lost Dutchman Ridge, the deepest location along the entire 7th arc.
8. The deep-ocean flight path ending south of the Lost Dutchman Ridge matches Inmarsat Doppler data with only one turn after entering the Indian Ocean.
9. Global Drifter 101703 crossed the 7th arc near S23.4° on March 8, 2014, and remained trapped in an ocean gyre until it crossed the 7th arc again at S23.25° on December 8, 2014. Its final transmission was from a Mauritius atoll near Réunion Island on July 22, 2015, a week before the discovery of the MH370 flaperon.
10. The CSIRO unpublished reverse-drift model indicates that the flaperon's likely final crossing of the 7th arc occurred north of S24° in November or December 2014. The 2016 GEOMAR report likewise suggested that the flaperon's final crossing of the 7th arc occurred at the end of 2014, north of S24°.
11. The ATSB and Ocean Infinity's underwater searches have extensively searched for and ruled out impact sites along the 7th arc, within approximately 20 nautical miles and beyond, from S25° to S40°.
12. The optimal location is an impact site near S23.45°, E102.75°, which was the "best fit" location for the Doppler frequency in Inmarsat's March 31, 2014, reanalysis.

Conclusion

The ATSB and the Search Strategy Working Group placed undue emphasis on certain assumptions—particularly regarding Inmarsat satellite data and end-of-flight behavior—and considered conflicting evidence less significant. The Australian search team relied on four key assumptions that might have been incorrect:

1. They assumed MH370 was in level flight, heading south, at the time of the first satellite phone call.
2. They believed the last log-in attempt occurred due to fuel exhaustion.
3. Without concrete evidence, it was presumed that the autopilot had been active for the last 5 ½ hours of flight, that the crew was incapacitated due to hypoxia, and that no one was controlling the plane at the end of the flight.
4. They assumed the surface search had ruled out impact sites north of S32.5°.

Recovering the wreckage and black boxes from Air France 447 took almost two years due to initial mistakes by French investigators. They overlooked reverse-drift models of the recovered bodies that pointed to the crash site being near the plane's last known position (LKP). They also excluded the area around AF447's LKP from the Phase 2 and Phase 3 seafloor searches in 2009–2010, based on the Phase 1 acoustic search around the LKP, which found no pinger signals. This absence of signals caused the underwater search to be directed elsewhere.

In 2011, the US company Metron was hired to develop a Phase 4 search plan. The plan accounted for beacon failure, suggesting a high likelihood of impact near the LKP. The Woods Hole Oceanographic Institution began the search there and discovered debris within a week. Their analysis indicated that the wreck was in an area thoroughly covered by the acoustic search and that neither pinger was transmitting. Ultimately, the Airbus A330 wreckage was found just 6.5 nautical miles from AF447's LKP. Both black boxes were recovered, and the pingers were found to be nonfunctional.

Evidence indicates that MH370's wreckage is likely located within six nautical miles east of the 7th arc, between latitudes S23° and S24°. An area less than 500 square kilometers.

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