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“Redefining our safety assumptions”

Address to International Foundation for Aviation and Development



Geoffrey Thomas - Editor/founder
Airlineratings.com

Montreal - October 17th, 2014

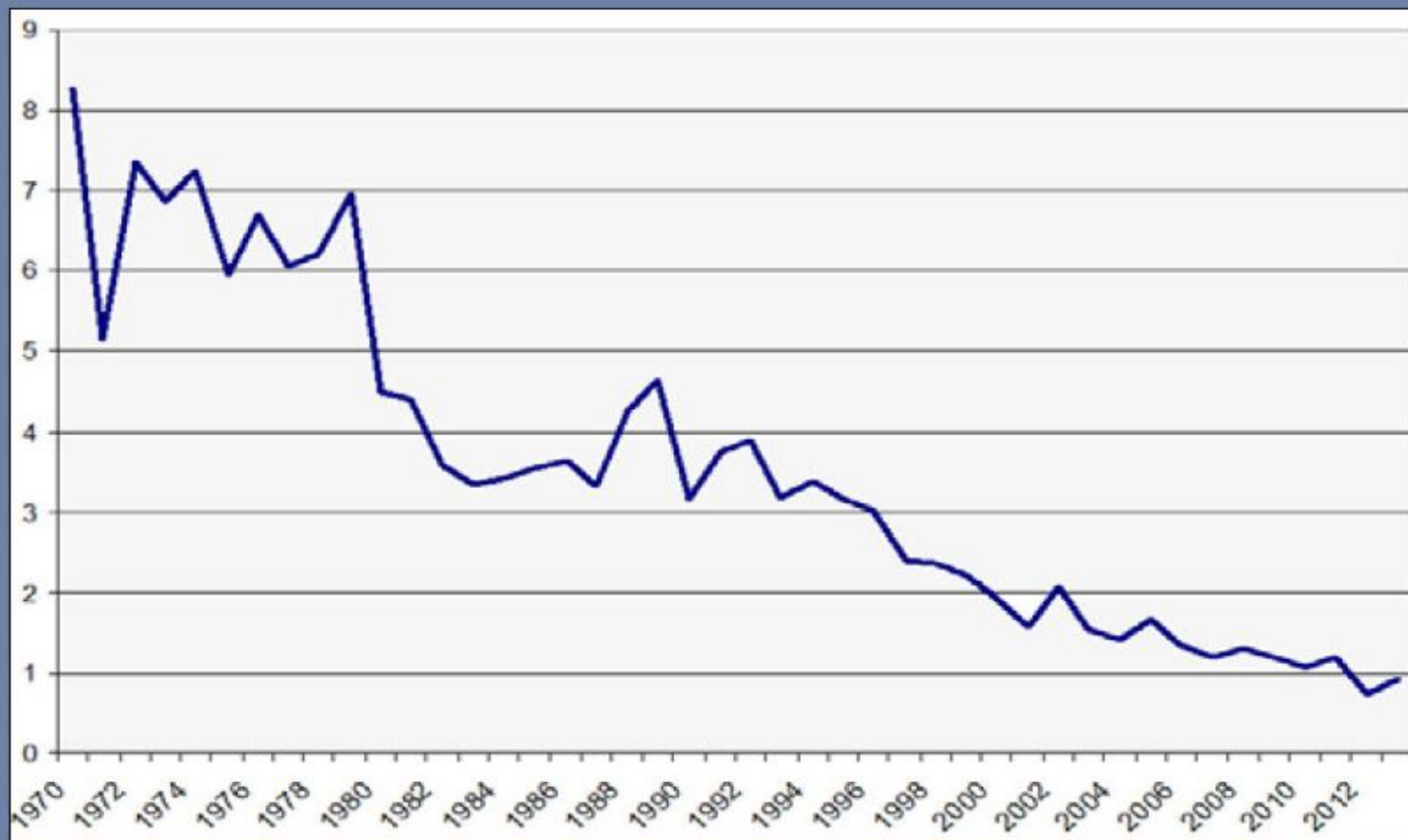


Redefining our safety assumptions

- How safe is flying?
- OZ214
- MH370



Fatal airliner accidents per 1,000,000 departures



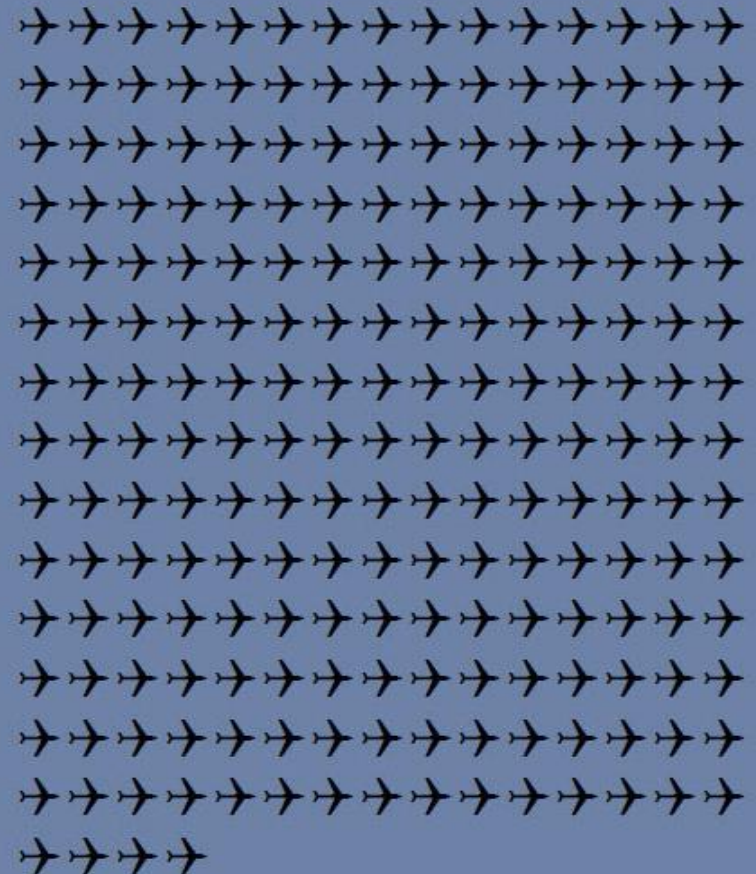
Harro Ranter / 15 October 2014



2013 - at 1973 accident rate

6446 fatalities

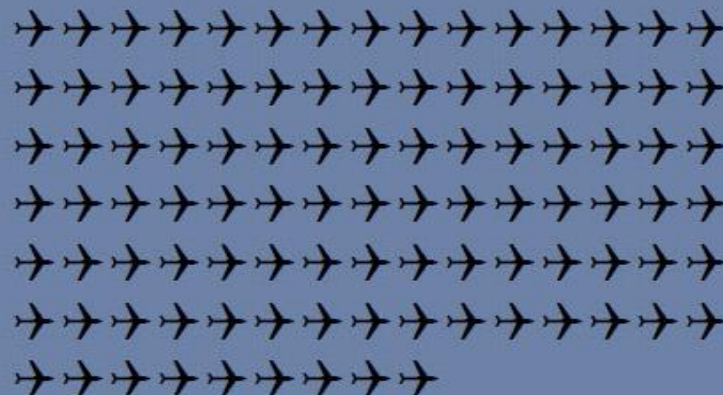
214 accidents



2013 - at 1993 accident rate

2225 fatalities

99 accidents



2013

265 fatalities

29 accidents



16 Passenger

8 Cargo

4 Ferry

1 Training



2014

- 17 accidents
- 522 fatalities
- Does not include MH17
- Below 10 year average



OZ 214 – what does
it tell us?



- OZ 214 a Boeing 777-200ER, registered HL7742
- July 6, 2013, weather was clear with slight wind
- Approximately 10 miles (16km) of visibility.



- ILS was inoperative but the Precision Approach Path Indicator system was functional





Crew

- Captain Lee Kang-Kuk (Flying Pilot - 9,684 hrs)
- Captain Lee Jeong-Min (Pilot Monitoring - 12,307hrs)
- Captain Lee Jong-Joo (Relief Pilot - 11,691hrs)
- First Officer Bong Dong-Won (4,557hrs)



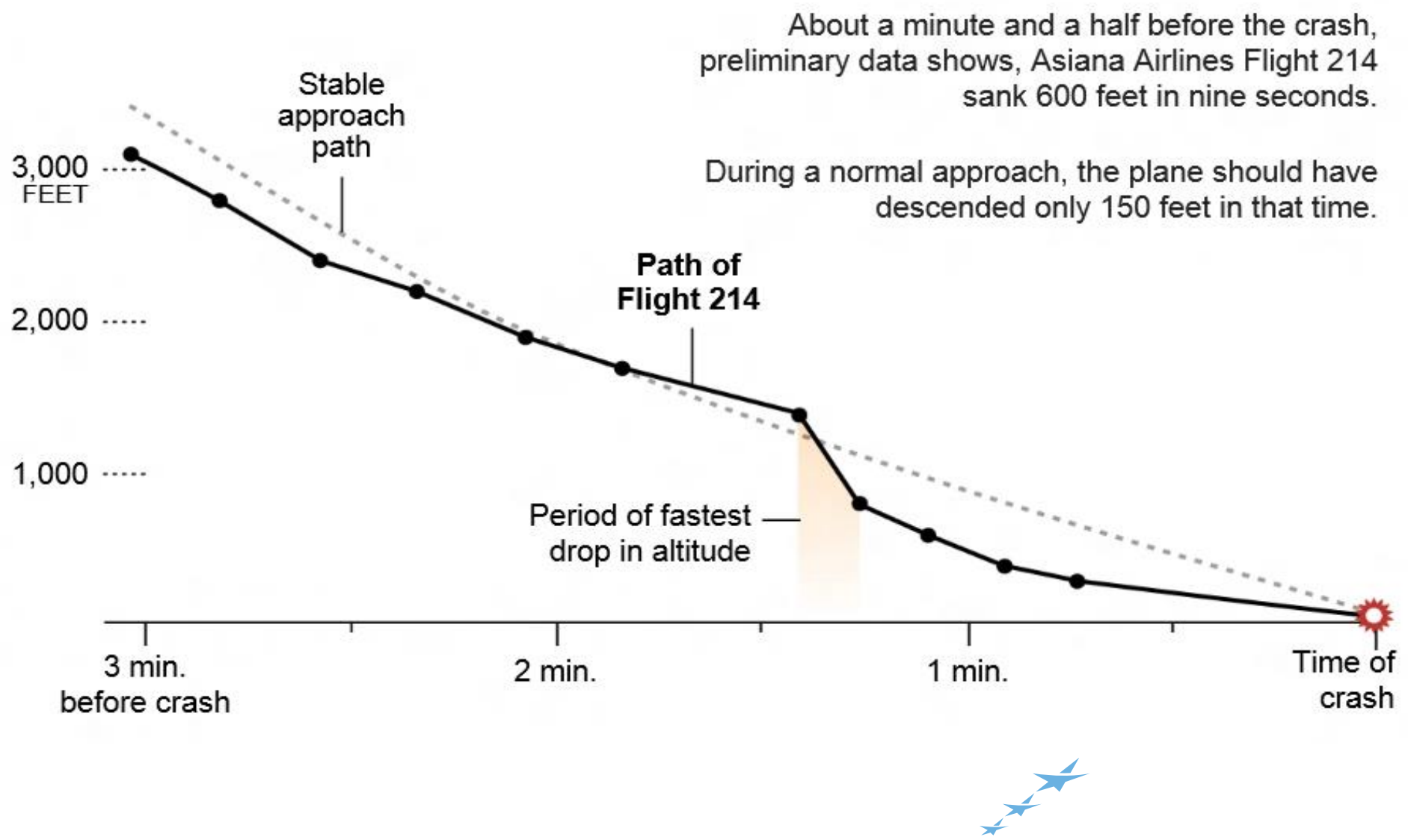
A flight of firsts

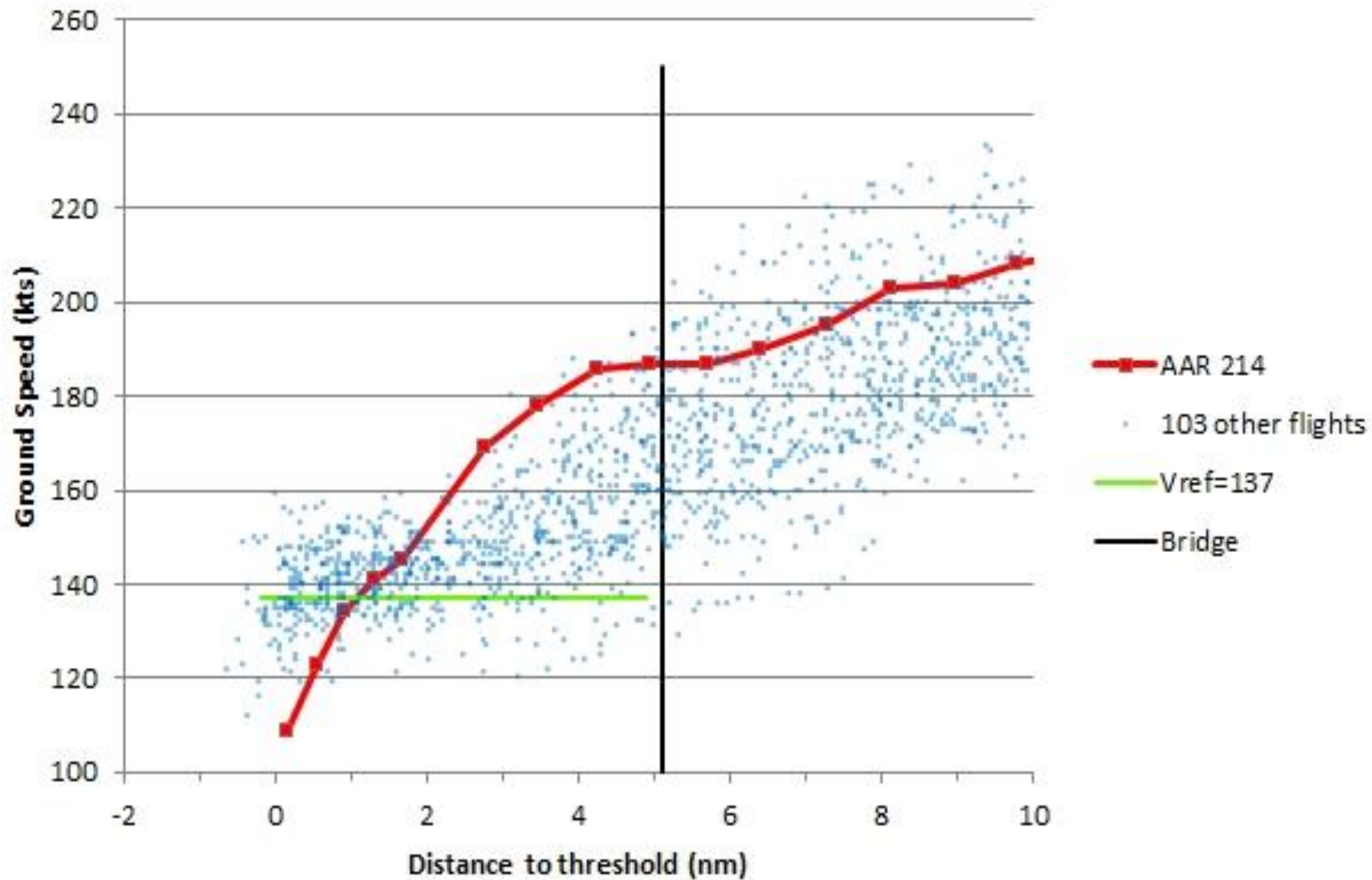
- Captain Lee Kang-Kuk was halfway through training
- First landing at San Francisco, first landing with a Boeing 777, first flight with Captain Lee Jeong-Min. (Training Capt)
- Prior to 777 Captain Lee Kang-Kuk - A320, 737, F/O 737, and 747.
- Captain Lee Kang-Kuk was halfway through 777 transition training, having completed ground school and 14 sim sessions



An Uneven Descent

Source: FlightAware.com







Courtesy of
**Eyewitness
Animations**









Cultural Factors

- Chang Man-Heui, director of flight standards at the South Korean transportation ministry-"outrageous"
- Agreed "authoritarianism existed" in the late 1990s (on South Korean flights) but "we have now a completely different culture," he said,
- Dismissed such a suggestion as "anachronistic".



Evidence a shock

- “Very concerned” about landing the Boeing 777 visually at SFO
- “I could not say I could not do” the landing
- He was blinded on approach by something shiny but “impolite for the training captain” not to see his eyes so no sun glasses.
- “Go around thing. That is very important thing. But the instructor pilot got the authority. Even I am on the left seat, that is very hard to explain, that is our culture.”



David Greenberg, retired Delta Training Captain said...

- On the deficiencies in hand-flying: “I observed it.”
- But added in a portent of a much wider problem that it was not worse than with pilots elsewhere in the world



We can't change culture

- “OZ214 is a watershed in aviation” - Najmedin Meshkati, Professor of Civil/Environmental Engineering and Industrial and Systems Engineering, who also conducts and teaches human factors in aviation safety at the University of Southern California.
- “We cannot change national cultures and their emitting behaviours. We have to better respect them, better understand them and try to delineate their implications on human-machine systems integration.”



“Denial of existence and impact of cultural factors and differences in aviation systems design has been a routine practice in the past. Its time is over, thanks to the rude awakening of the Asiana 214 accident, and has to be changed.”

- Professor Meshkati.



In 1996 FAA conducted a review of human factors in aviation and found issues with automation and cultural factors

Recommendation: The FAA should ensure that research is conducted to characterize cultural effects and provide better methods to adapt design, training, publications, and operational procedures to different cultures. The results of the research should also be used to identify significant vulnerabilities, if any, in existing flight deck designs, training, or operations, and how those vulnerabilities should be addressed.



Professor Meshkati questions:

“What has been the response of the FAA and industry to this recommendation?”
He knows of none.

The FAA report found issues across all designs from all manufacturers



Back to the future

- ICAO journal of October 1996 (Human Factors in Aviation) surveyed 13,000 pilots from 25 airlines from 16 countries
- Found agreement ranged from 15 to 93 per cent to the statement: Crew members should not question the decisions or actions of the captain except when they threaten safety of the flight.



Cultural Twists

- Cultural differences between societies are many and varied
- In a 1989 paper, Professor Meshkati noted Vietnamese consider engineering a low status occupation and therefore it has caused the scarcity of professional engineers.
- Colour perception. Less than 50 per cent in China associated red with stop and green with go. In the US almost 100 per cent.
- Red is a fundamental warning colour in aviation.



In conclusion

- Is Captain Lee Kang-Kuk alone or is he an example of a far, far wider problem?
- Disturbingly, the evidence points to the latter.
- Can Airbus and Boeing culture-proof their cockpits or just try to goof-proof them?
- The PR departments may say yes
- But pilots and cockpit/systems designers are scratching their heads.



Perhaps Albert Einstein sums up the problems best in this quote..

“We cannot solve our problems with the same thinking we used when we created them.”



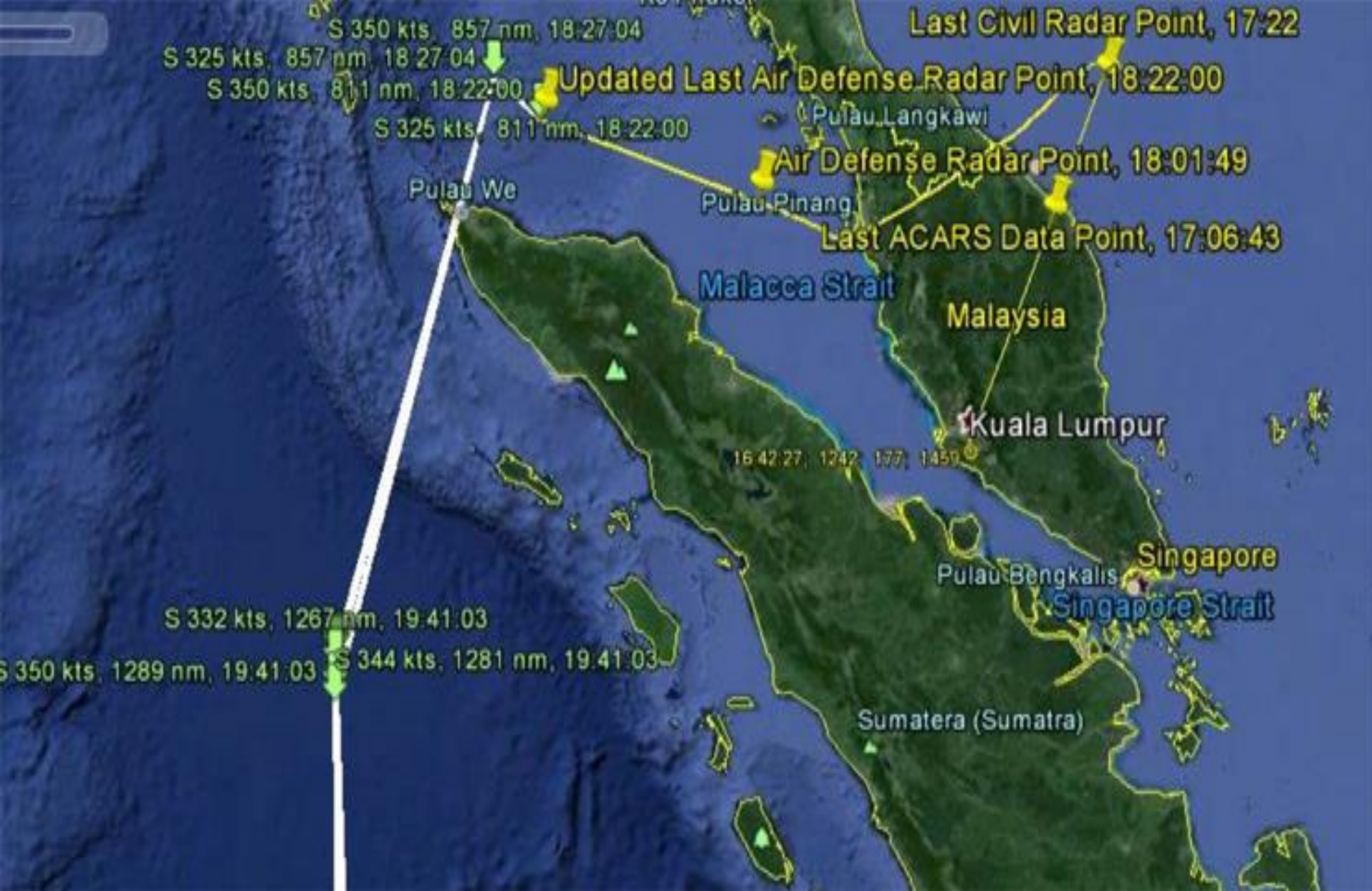
The hunt for MH370



Timeline of disappearance [\[edit\]](#)

Duration (HH:MM)	Time		Event
	MYT	UTC	
00:00	00:41	16:41	Take-off from Kuala Lumpur
00:20	01:01	17:01	MH370 confirms altitude of 35,000 feet (11,000 m) ^[24]
00:26	01:07	17:07	Last ACARS data transmission received; ^[25] MH370 reconfirms altitude of 35,000 feet ^[24]
00:38	01:19	17:19	Last Malaysian ATC voice contact: "All right, good night" ^[23]
00:40	01:21	17:21	Last secondary radar (transponder) contact at 6°55'15"N 103°34'43"E
00:41	01:22	17:22	Transponder and ADS-B now off
00:49	01:30	17:30	Unsuccessful voice contact from another aircraft, mumbling/static audible ^[19]
00:56	01:37	17:37	Missed expected half-hourly ACARS data transmission ^[25]
01:30	02:11	18:11	First of seven automated hourly ACARS contacts with Inmarsat 3F1 satellite
01:34	02:15	18:15	Last primary radar contact by Malaysian military, 200 miles (320 km) NW of Penang
05:49	06:30	22:30	Missed scheduled arrival in Beijing
07:30	08:11	00:11	Last automated hourly ACARS contact with Inmarsat satellite ^{[28][27]}
07:49	08:30	00:30	Reported missing ^[28]





Inmarsat handshakes

- In order to connect to the SATCOM system, the aircraft transmits a 'log-on' request which is acknowledged by the ground station via Satellite.
- Once connected, if the ground station has not heard from an aircraft within an hour, it will check that the connection is still operational by transmitting a 'Log-on Interrogation' message using the aircraft's unique identifier.
- If the aircraft receives its 'unique identifier', it returns a short message that it is still logged onto the network.
- These processes have been described as handshakes.



Inmarsat 3
IOR Satellite



Aircraft



Inmarsat Land Earth Station
Perth (Australia)





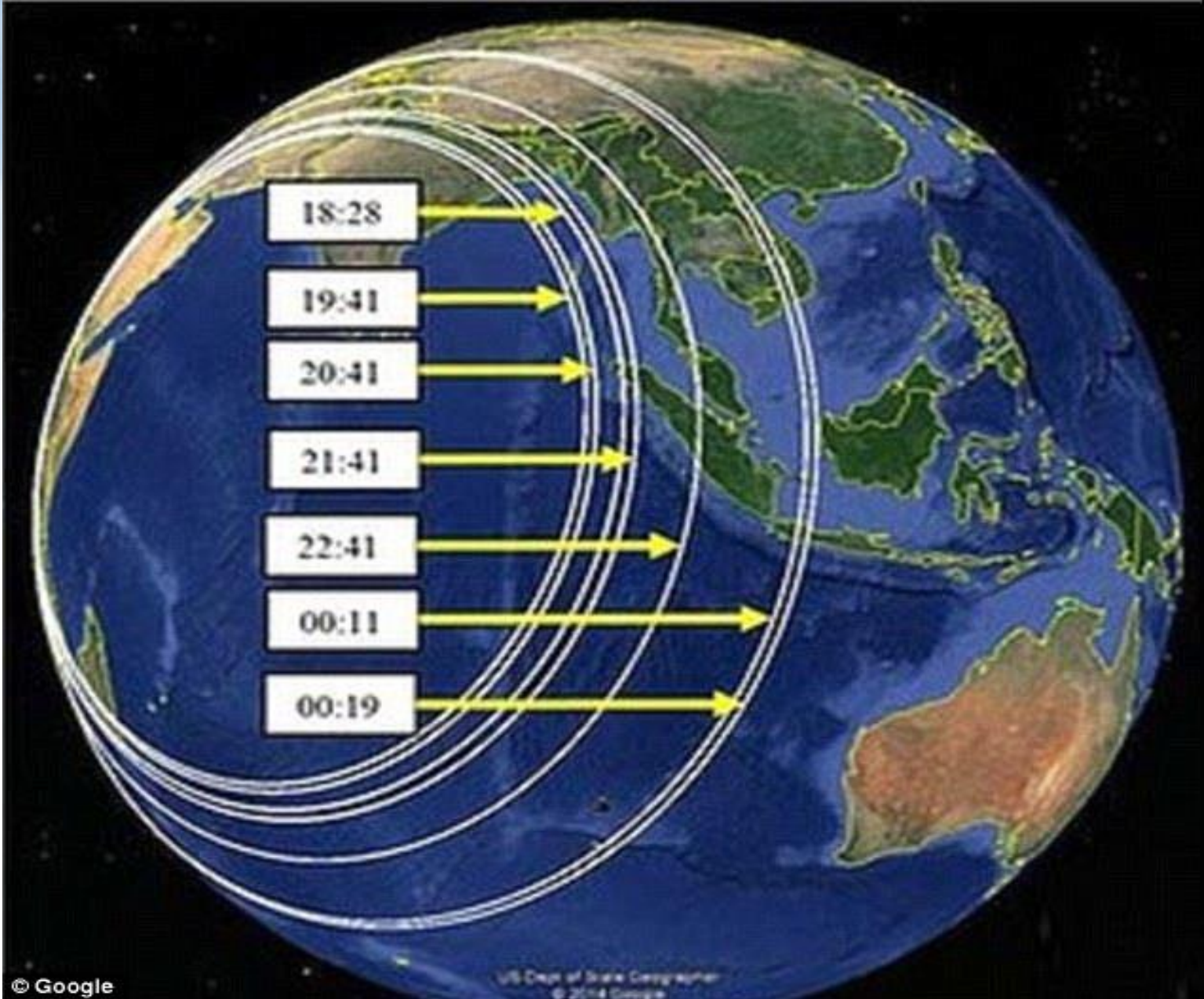
Satellite

35,800 km above sea level

Last radar
contact with
MH370

Last known possible
position of MH370
based on satellite data
(somewhere on red lines)





How can we be so sure?

- Inmarsat checked all Malaysia Airlines 777s satellite signals in the days and weeks after
- It also checked the historical data of this particular Boeing 777 and examined its unique signature
- The data has been checked and rechecked over months
- Five independent teams have arrived at the same most likely crash area



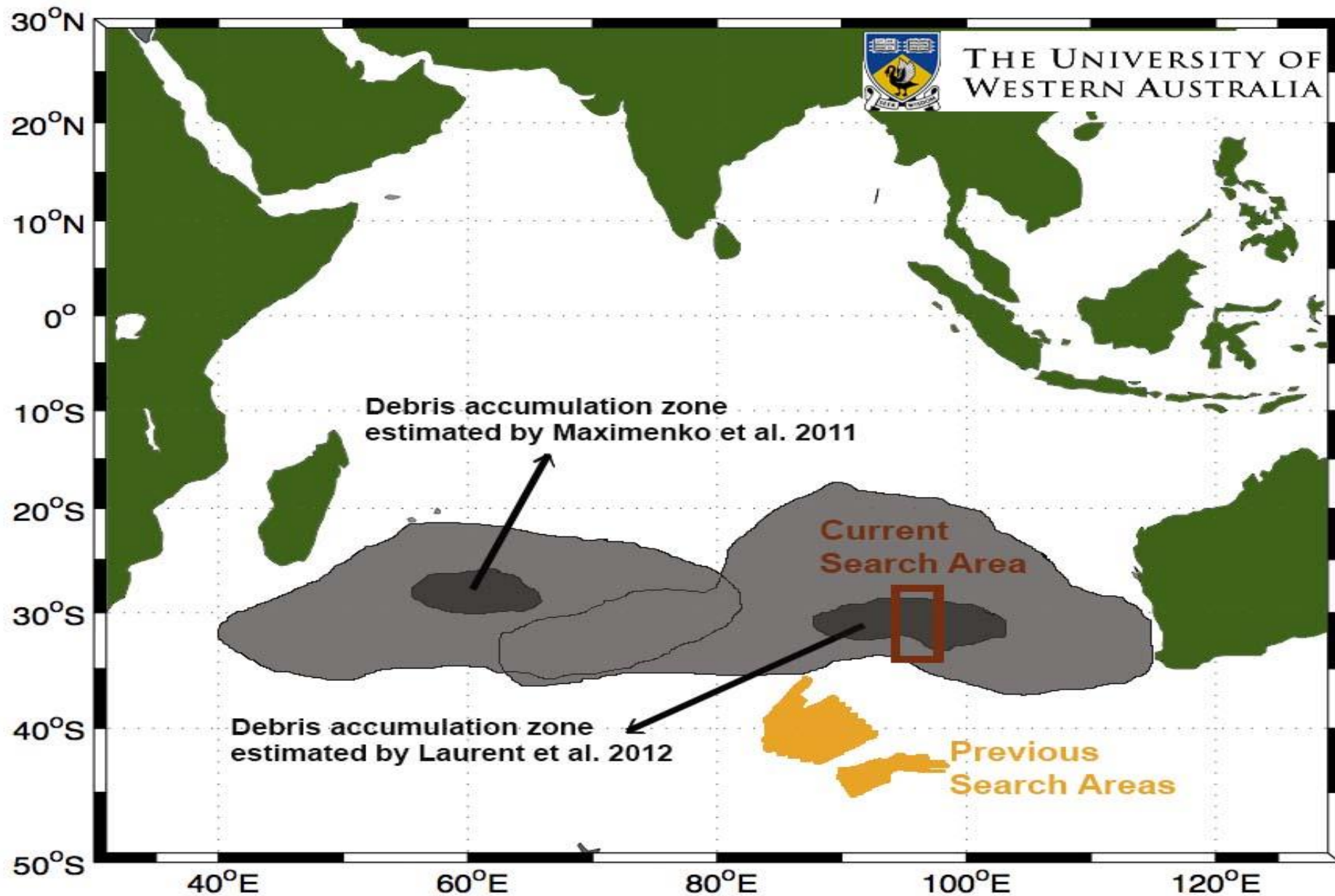
Why no debris?
Why none washed up?







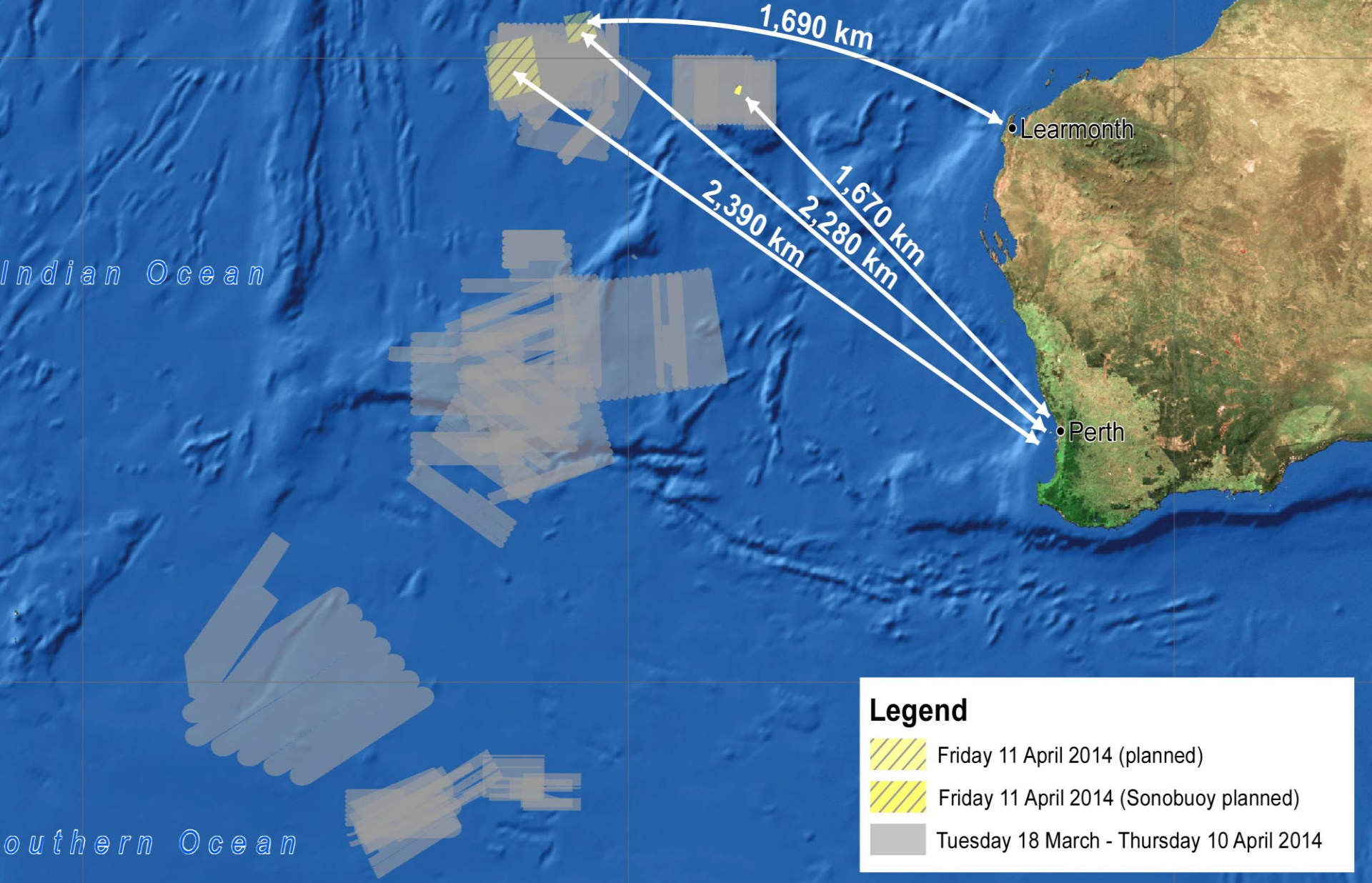




MH370 timeline

- March 8 – B777 missing
- March 17 – Search moves to Southern Indian Ocean
- March 28 – Search moves to 1800km west of Perth
- April 4 – Search moves off Exmouth
- April 7 – “Black box” pings detected
- April 16 – Underwater search starts
- May 29 – Bluefin 21 search abandoned
- June 20 – Search moves south to “March 28” area
- Late June – Sea floor mapping starts
- Oct 3 – Towed side-scan sonar search started

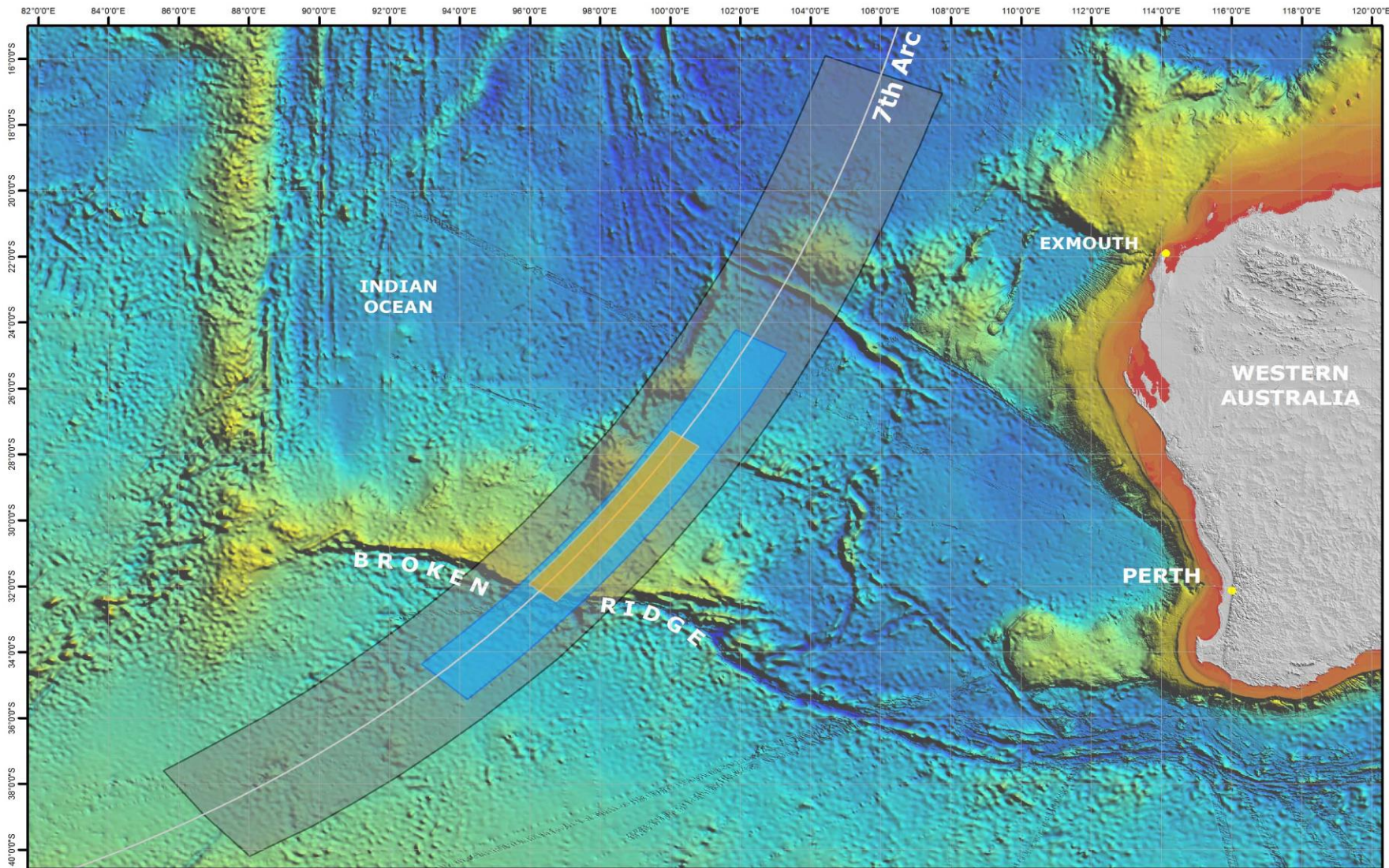




Aerial Search

- In 42 days, more than 50 planes in search and support operations.
- Up to 15 planes a day have been over the various search areas.
- More than 4 1/2 million sq km of ocean has been scoured
- 334 search flights conducted at an average of eight a day.
- Total time in the air was 3000 hours.
- Supporting Australia were New Zealand, China, Japan, South Korea, Malaysia and the US.





MH370 Underwater Search Areas Planning Map

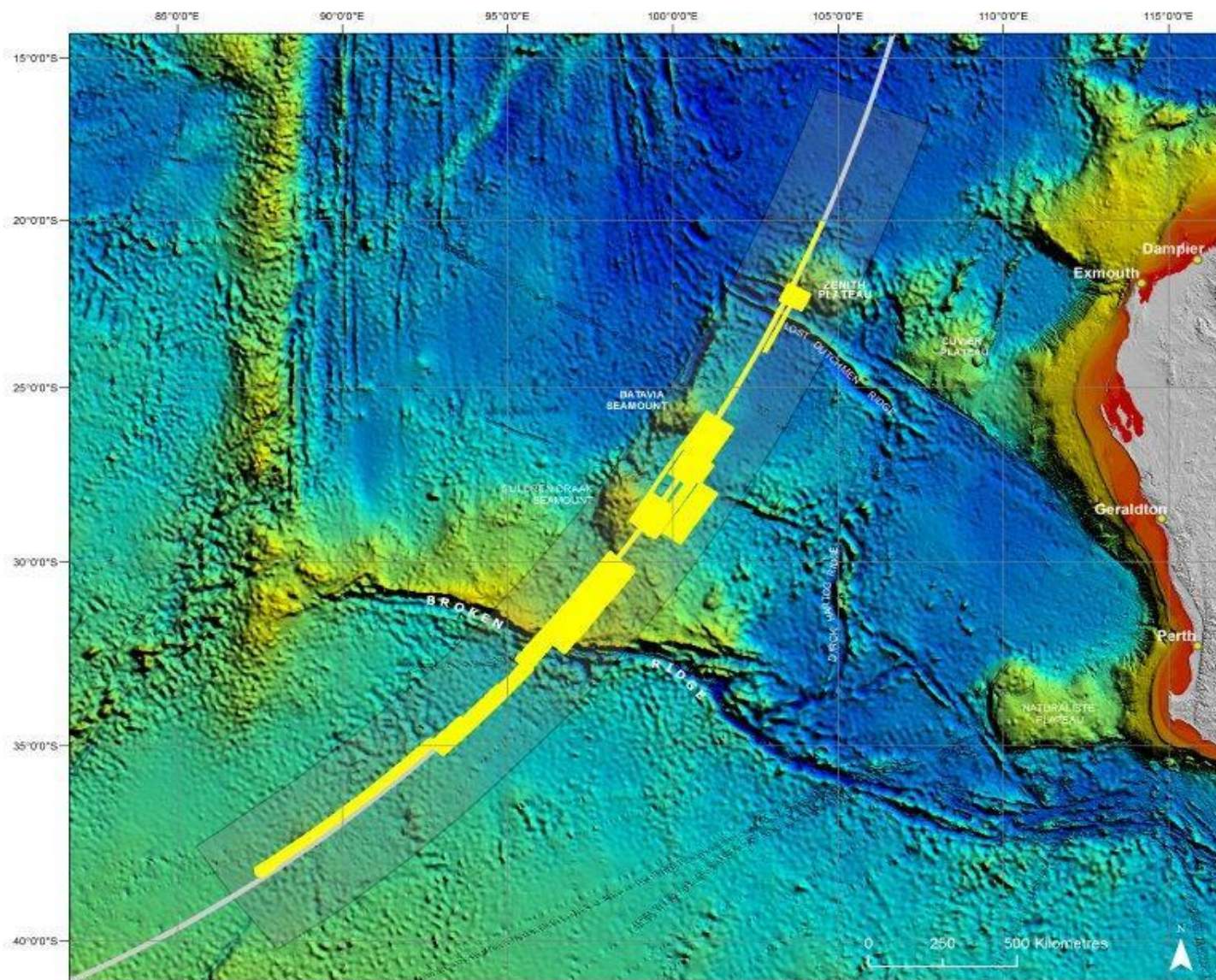
0 250 500 Kilometres

Background image: Australian Bathymetry and Topography Grid (June 2009) <http://www.ga.gov.au/meta/ANZCW0703013118.html>

MH370 Underwater Search Planning Areas

- 1. Priority search area
- 2. Medium search area
- 3. Wide search area





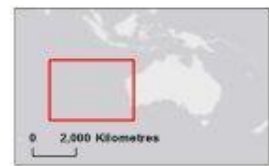
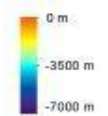
Background Image: Australian Bathymetry and Topography Grid (June 2009)
<http://www.ga.gov.au/metadata/ANZCW0703013116.html>



Australian Government
Australian Transport Safety Bureau
Geoscience Australia
Search for Malaysia Airlines
Flight MH370:
Progress of Bathymetric Survey

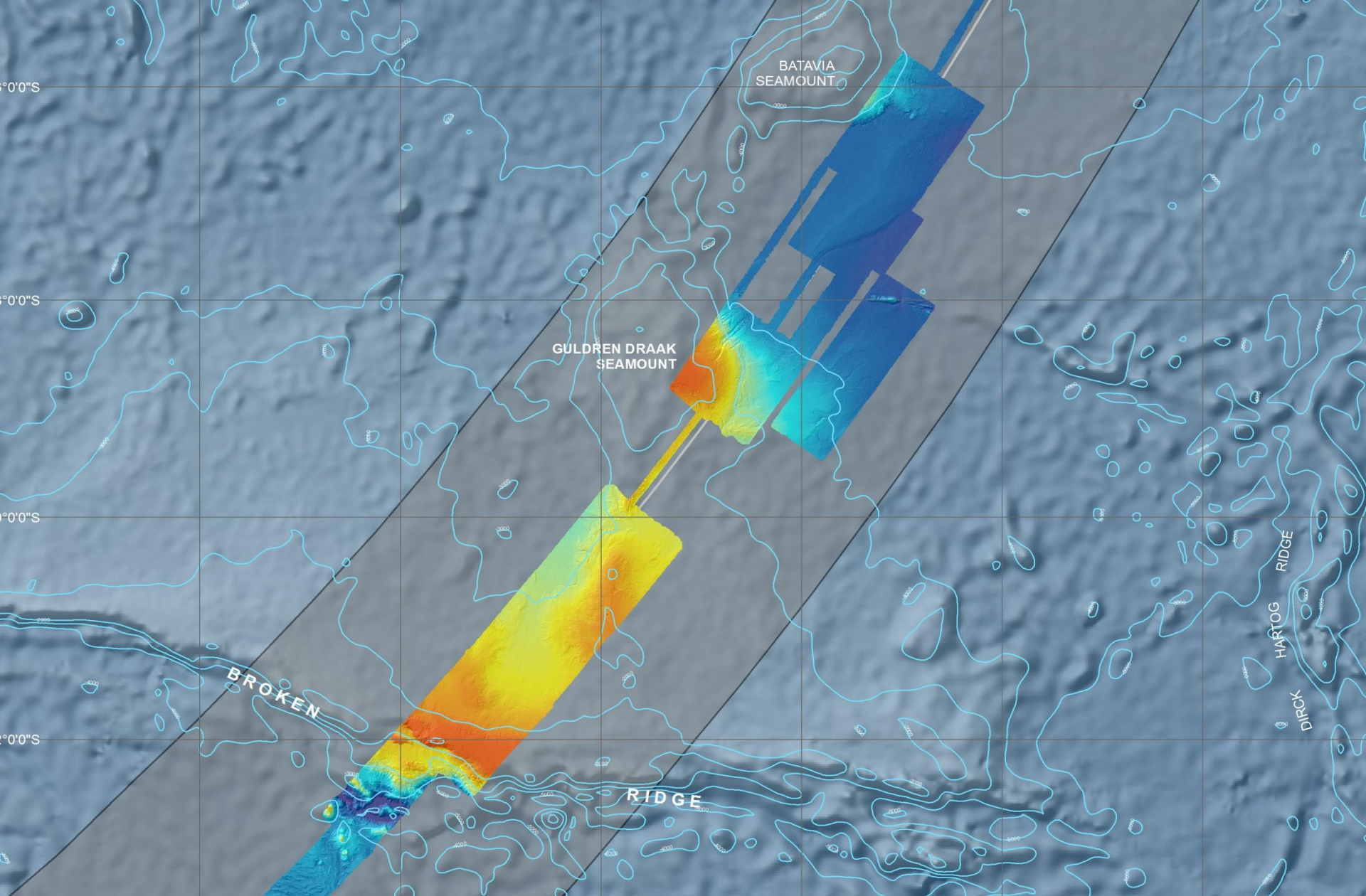
- Area surveyed
- Search area

Background Bathymetry
 Elevation Ramp

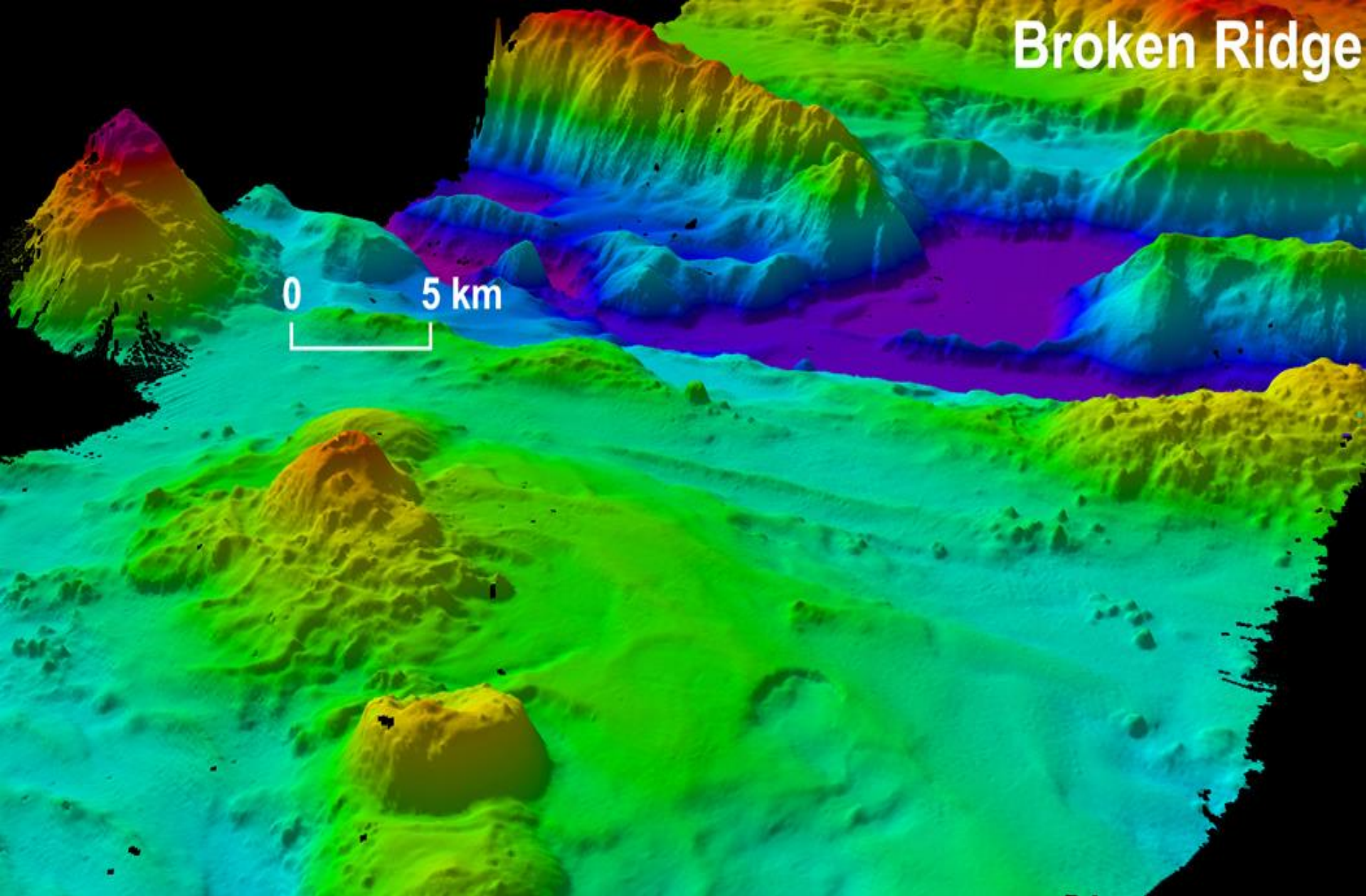


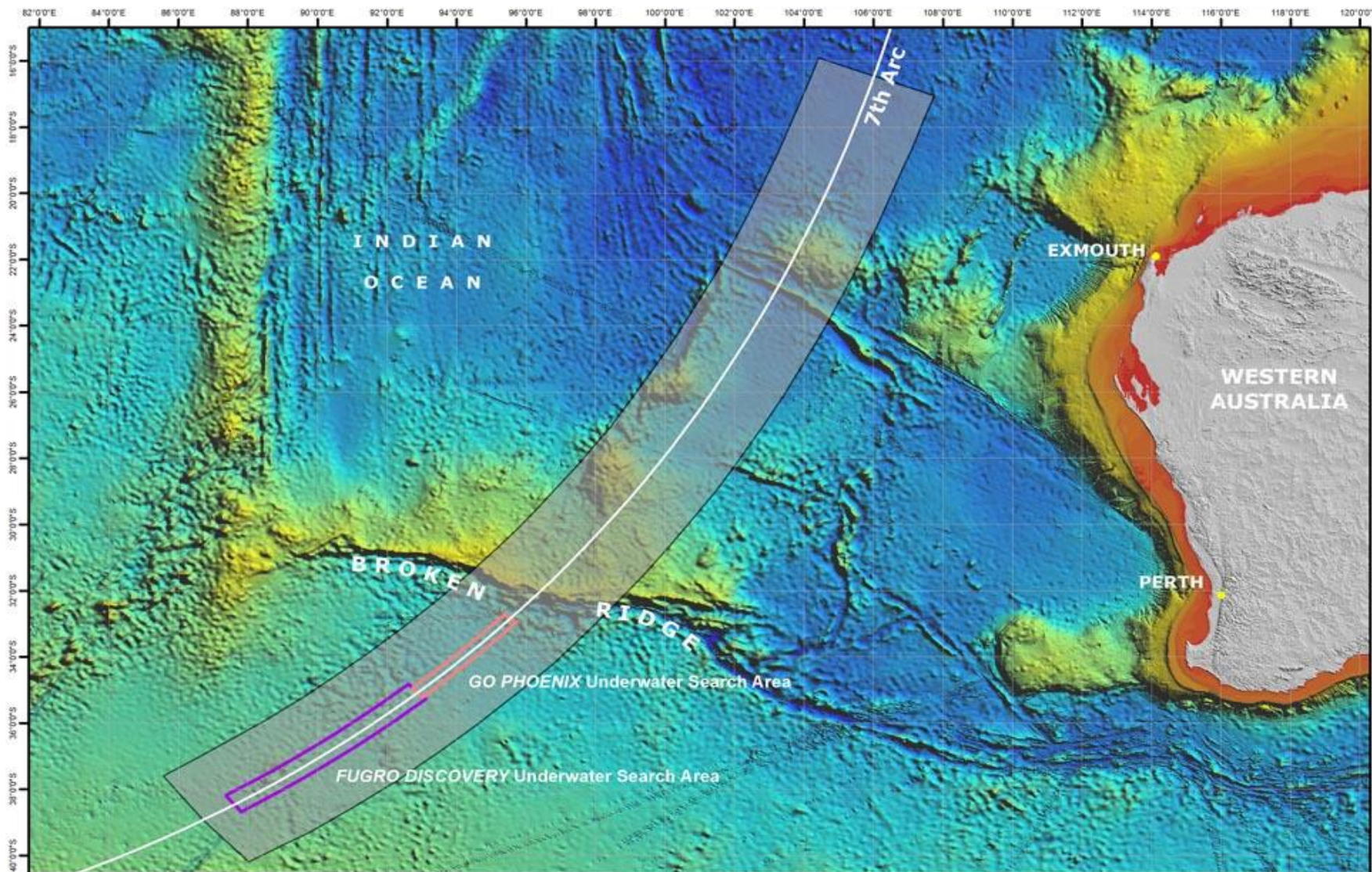
Day of release: 15/10/2014
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Broken Ridge





MH370 Underwater Search Areas Planning Map

0 250 500 Kilometres
 Background image: Australian Bathymetry and Topography Grid
 (June 2009) <http://www.ga.gov.au/meta/ANZCW0703013116.html>

MH370 Underwater Search Planning Areas

	Underwater Search Area 1		Wide search area
	Underwater Search Area 2		

Bathymetry
 Elevation Ramp

 0 m
 -2000 m
 -4000 m
 -7285 m
 approx.




 Date: 2014/10/03
 Map Number: 2014/117

