



# **A Never Give Up Story** **A380 GP7200 fan hub investigation**

AIIG 2 Meeting/Workshop, Jeddah, 13 Sep 2022

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# Fan Module In-Flight Separation

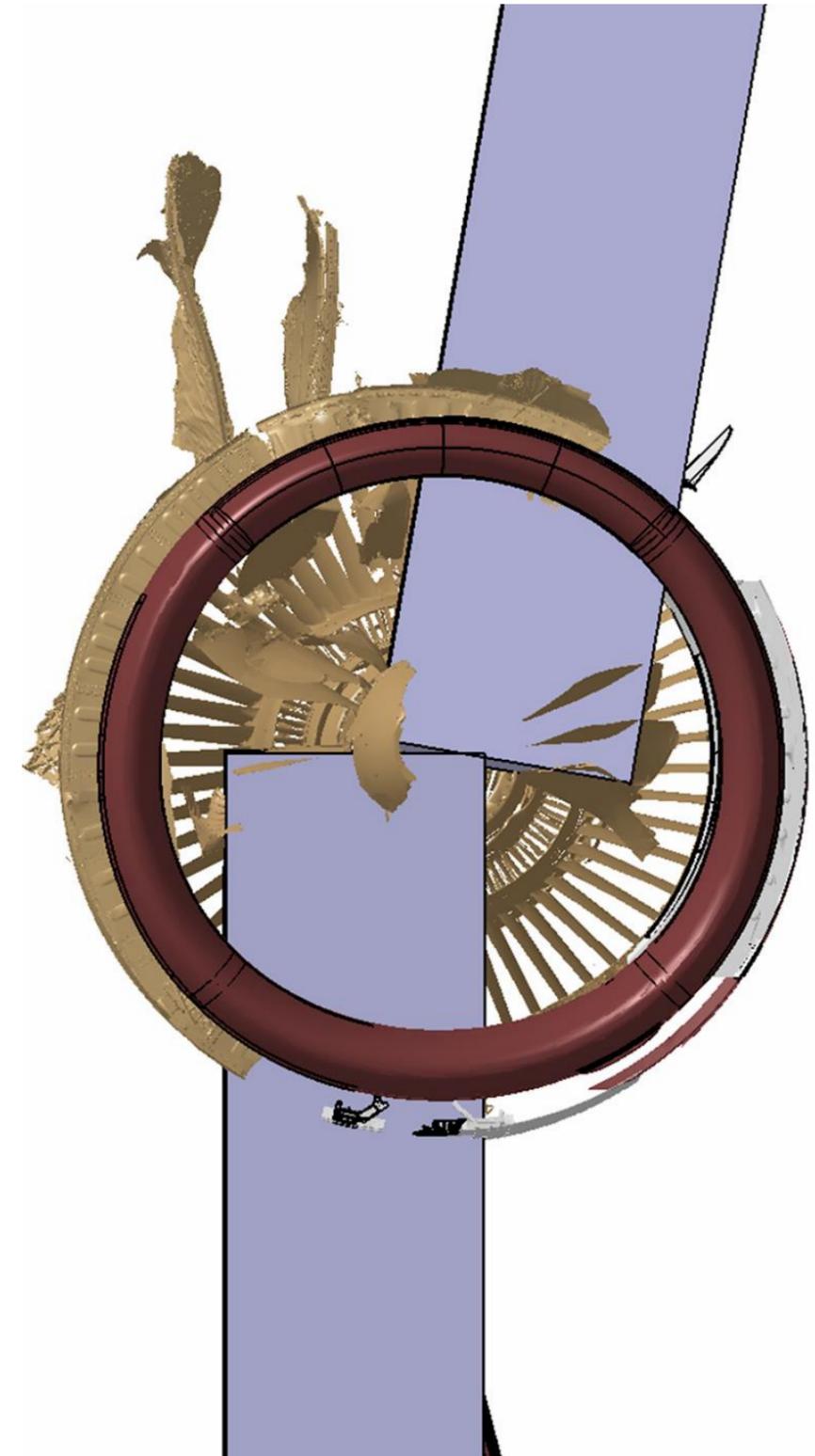
- September, 30th 2017
- A380 powered by Engine Alliance GP7270
- Separation of engine #4 fan rotor during cruise
- No prior indication of any malfunctions
- Diversion to Goose Bay International Airport (Canada)
- No injuries
- BEA final investigation report released in September 2020
  - [BEA investigation webpage](#)



# Fan Hub Rupture

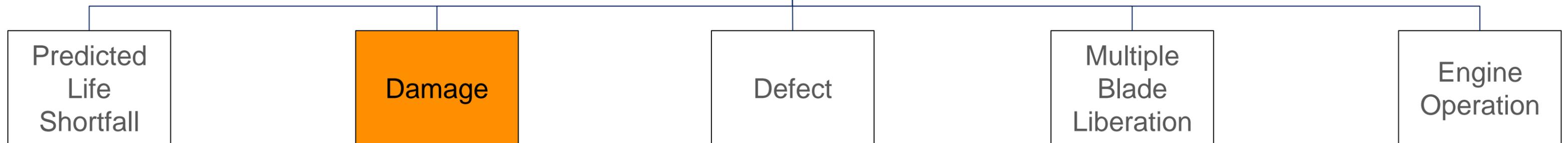


- On-ground inspection of the engine indicated fan hub rupture
  - Two main debris trajectories according to hardware damage



# Critical Component Missing for Accurate Root Cause Analysis

- Engine fan case, air inlet and blade fragments recovered during initial survey
  - No hub fragments
- Initial root cause analysis based on in-service experience



- Critical component recovery needed to base root cause on evidence

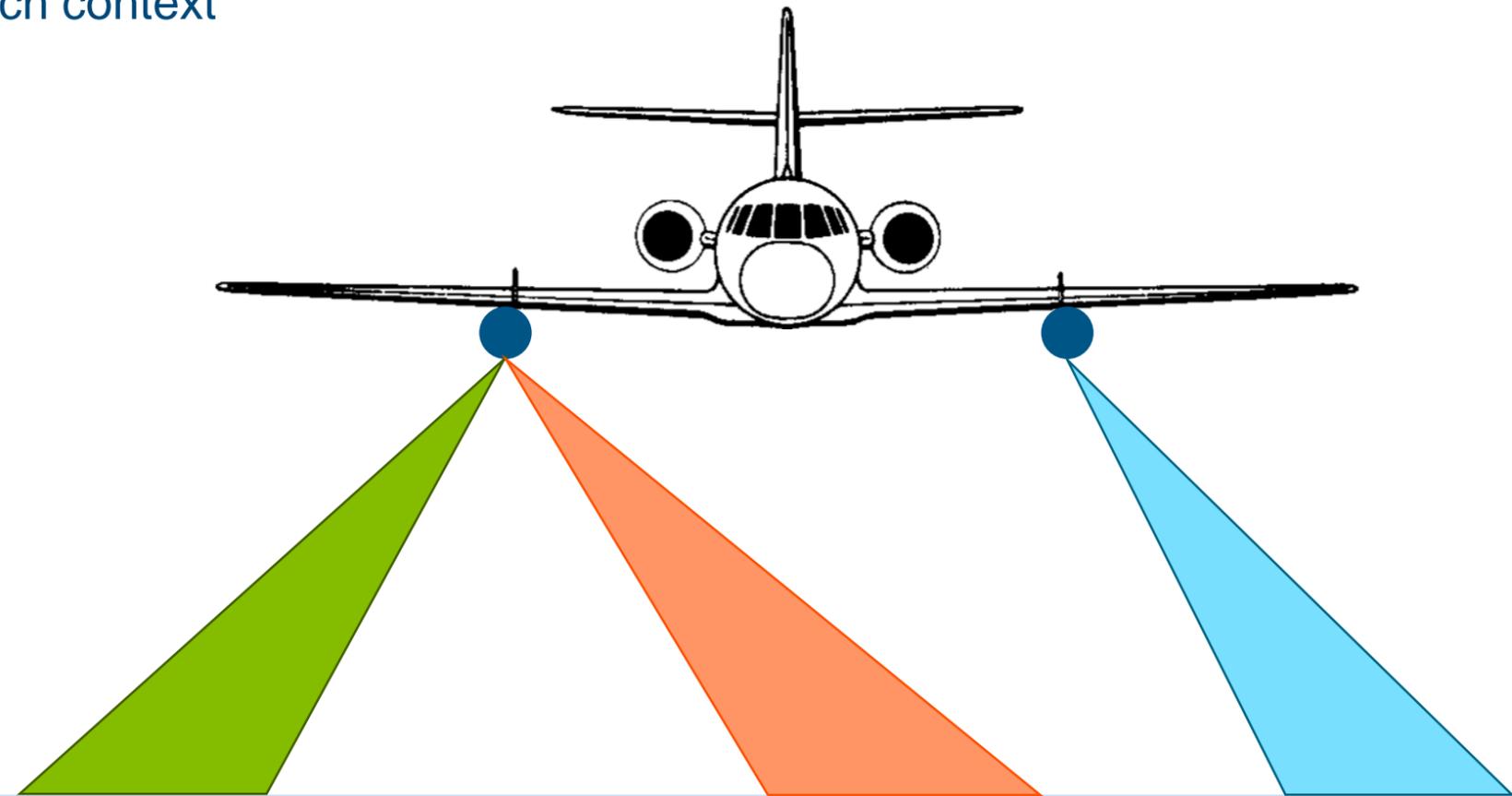
# The Critical Part was Somewhere in Hostile Greenland



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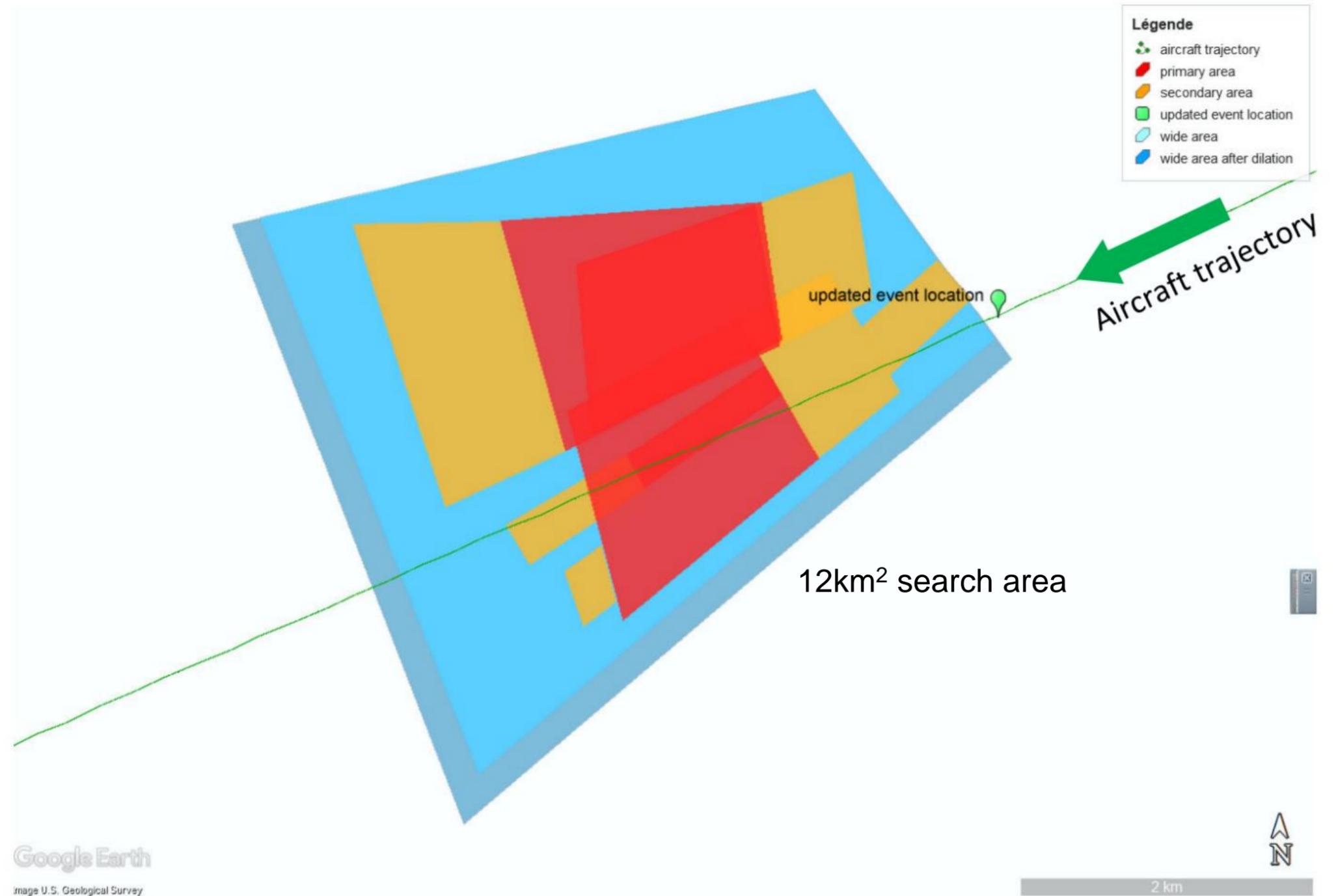
# Making the Search Happen - Aerial Search Campaign

- BEA and Airbus collaboration with French research body ONERA
  - Synthetic Aperture Radar technology never deployed in such context
- Reasonable confidence of detection, although no guarantee
- Go-ahead decision given the criticality of hub recovery for root cause determination
- ONERA contracted



# Making the Search Happen - Search Area

- Independent ballistic computations
  - BEA, Airbus and ArianeGroup
  - NTSB and their technical advisors
- Similar areas of probability



# Making the Search Happen - Ground Expeditions

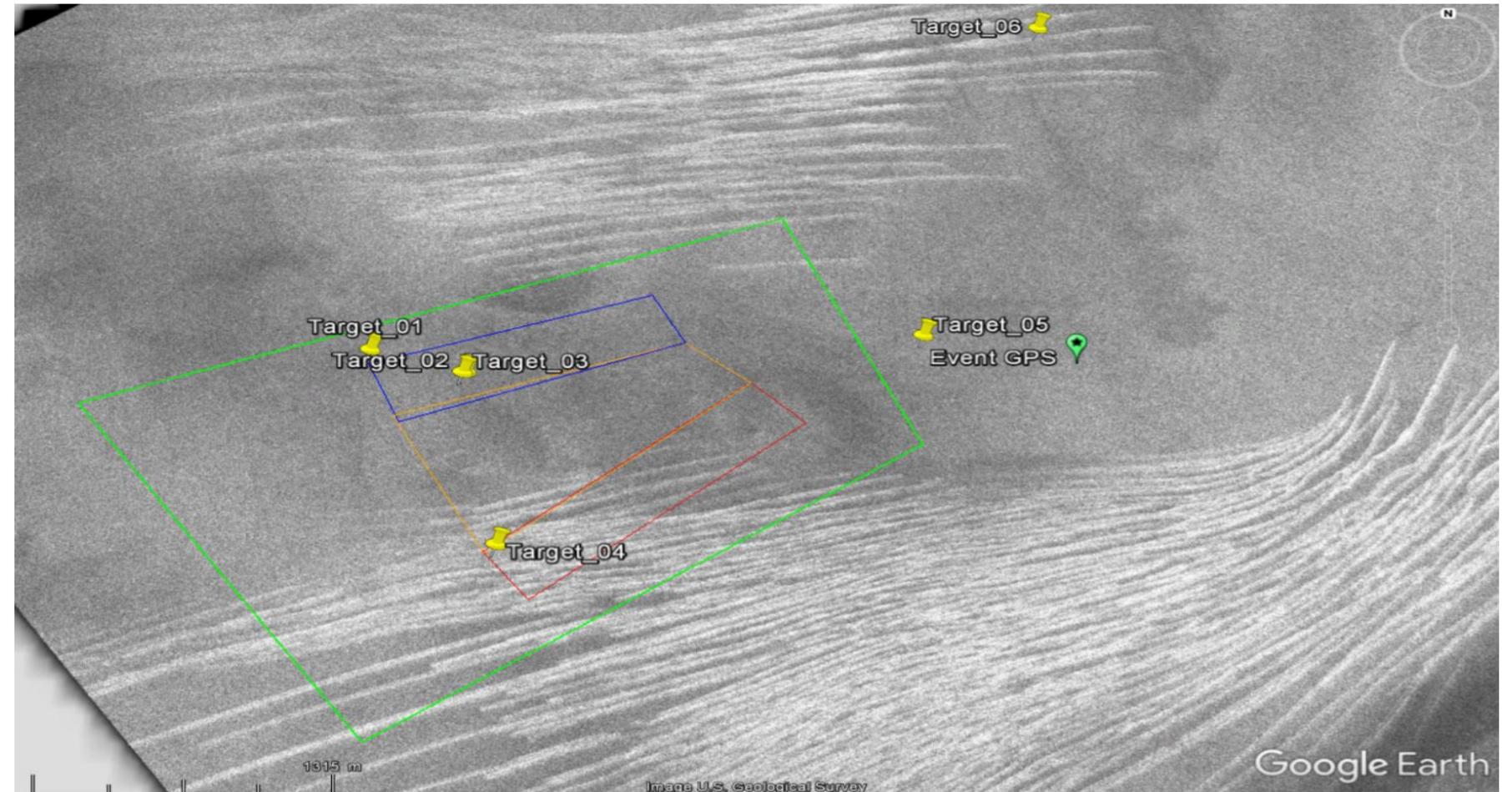
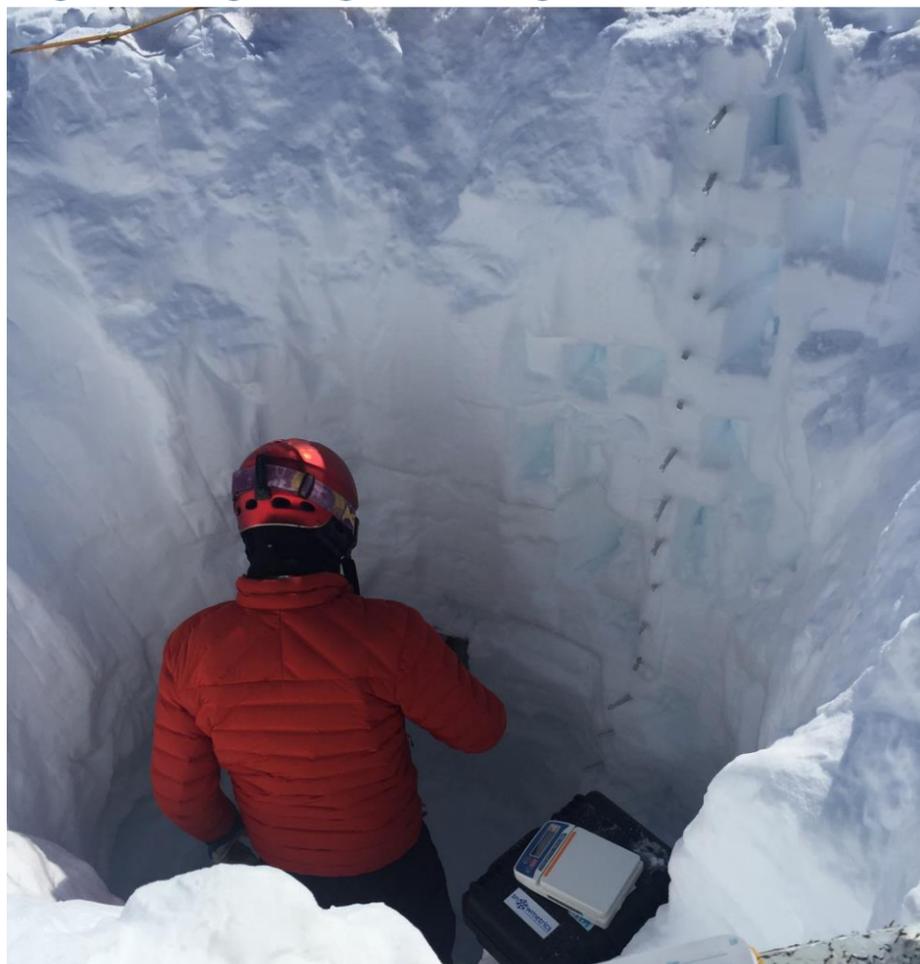
- Geological survey institution of Denmark and Greenland (GEUS)
- Highly experienced in field work in Greenland

-35°C  
Wind 25m/s gusting 40  
Snowfalls



# Complex Radar Data Treatment - Ground Search Stepbacks

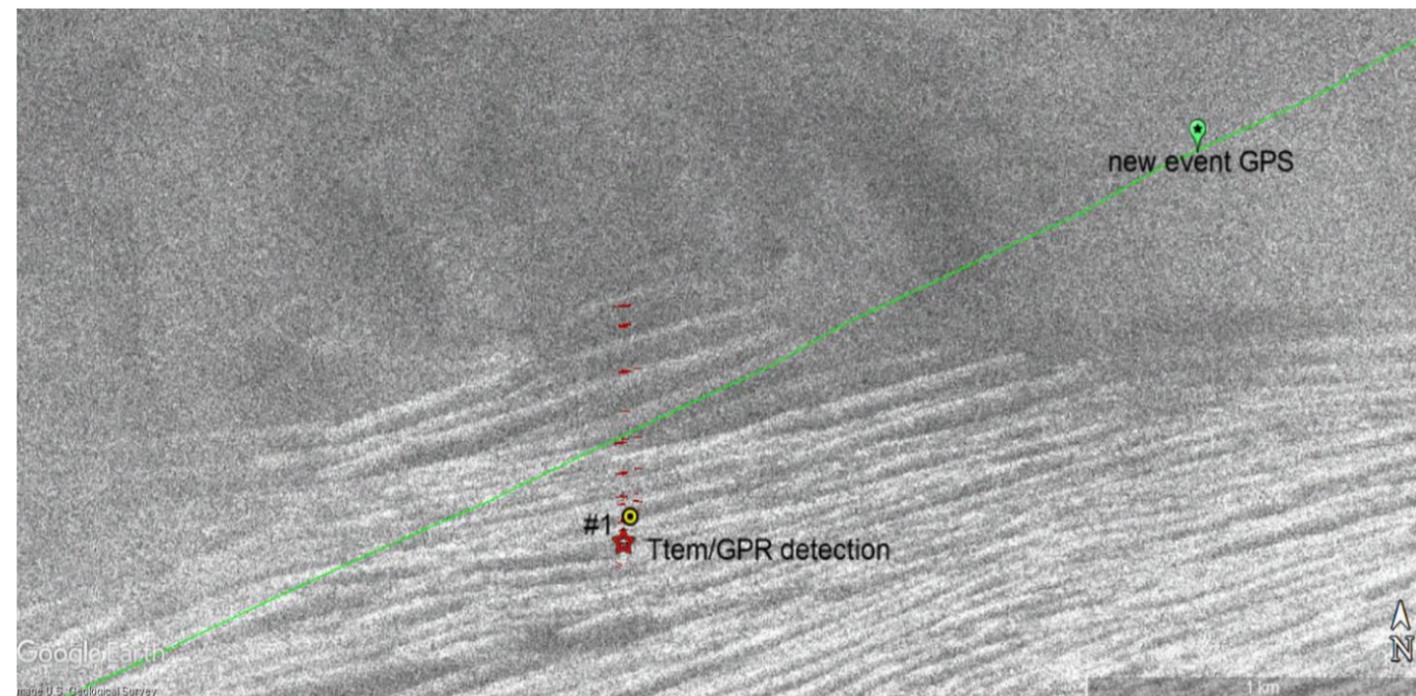
- Radar scanning of defined area over April 2018
- Recovered data less readable than expected
- Strongest targets given to ground team



- Hazardous terrain and weather conditions
- Tons of snow and ice removed without success
- Search phase closure in June 2018
  - Unsafe ground conditions

# Never Give Up Mindset - Efforts Maintained till Success

- Further processing of radar data by ONERA
- One high-confidence target identified
- May 2019 ground expedition confirmed consistency with a hub fragment
- Extraction in June 2019
- 2 years effort



## Evidence Based root Cause - Material Issue

- Maintenance damage hypothesis dismissed with facts
- Root cause identified
  - Titanium material issue
  - Fatigue failure due to Micro Texture Regions
  - Refer to [BEA report](#) for details
- Repetitive NDT fleetwide inspection of the EA GP7200
- The whole Airbus fleet reviewed with engine OEM's for susceptibility to the identified failure mode
  - No fleet actions needed on other products
- Standards for future products discussed at industry level



# Conclusion - Our Investigation Values

- Evidence driven investigation
- Collaboration spirit
  - With investigation partners
  - Within the Airbus Company
- Never give up mindset
- Global products review
  - The one involved
  - The Airbus fleet
  - The future products



# Thank you

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