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Investigation of a UAS Fly-away over The Hague

Investigation outcomes and experiences

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Dutch Safety Board

EASA CASIA

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ONDERZOEKSRAAD VOOR VEILIGHEID

Part 1 Preliminaries

Part 2 Fly-away investigation outcomes

Part 3 Experiences and challenges

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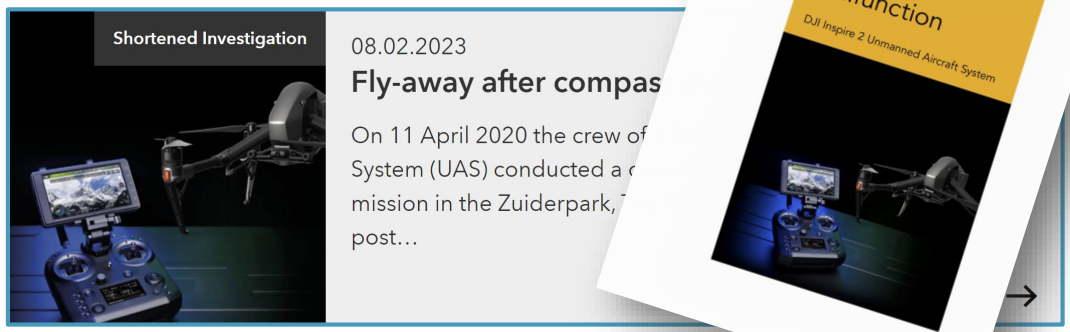
Part 1
Preliminaries

Preliminaries

- DJI Inspire 2 (3.4 – 4.2 kg) with Cadence Remote Controller.
- UAS use a combination of sensors and instruments for stability-enhanced control. Different flight modes: P(osition)-mode (GPS and compass), A(ttitude)-mode (IMU).
- UAS operated under national legislation (Dutch regulation on remotely piloted aircraft / ROABL).
- State aircraft, EU 996 not applicable: see article 3(c).
- Kingdom Act Dutch Safety Board: no difference between unmanned and manned aviation in terms of obligation to notify.
- Kingdom Act Dutch Safety Board: no obligation to investigate, liberty to do so. Investigation initiated given potential risk to third parties.
- Previous experience with UAS investigations.

Published and ongoing investigations



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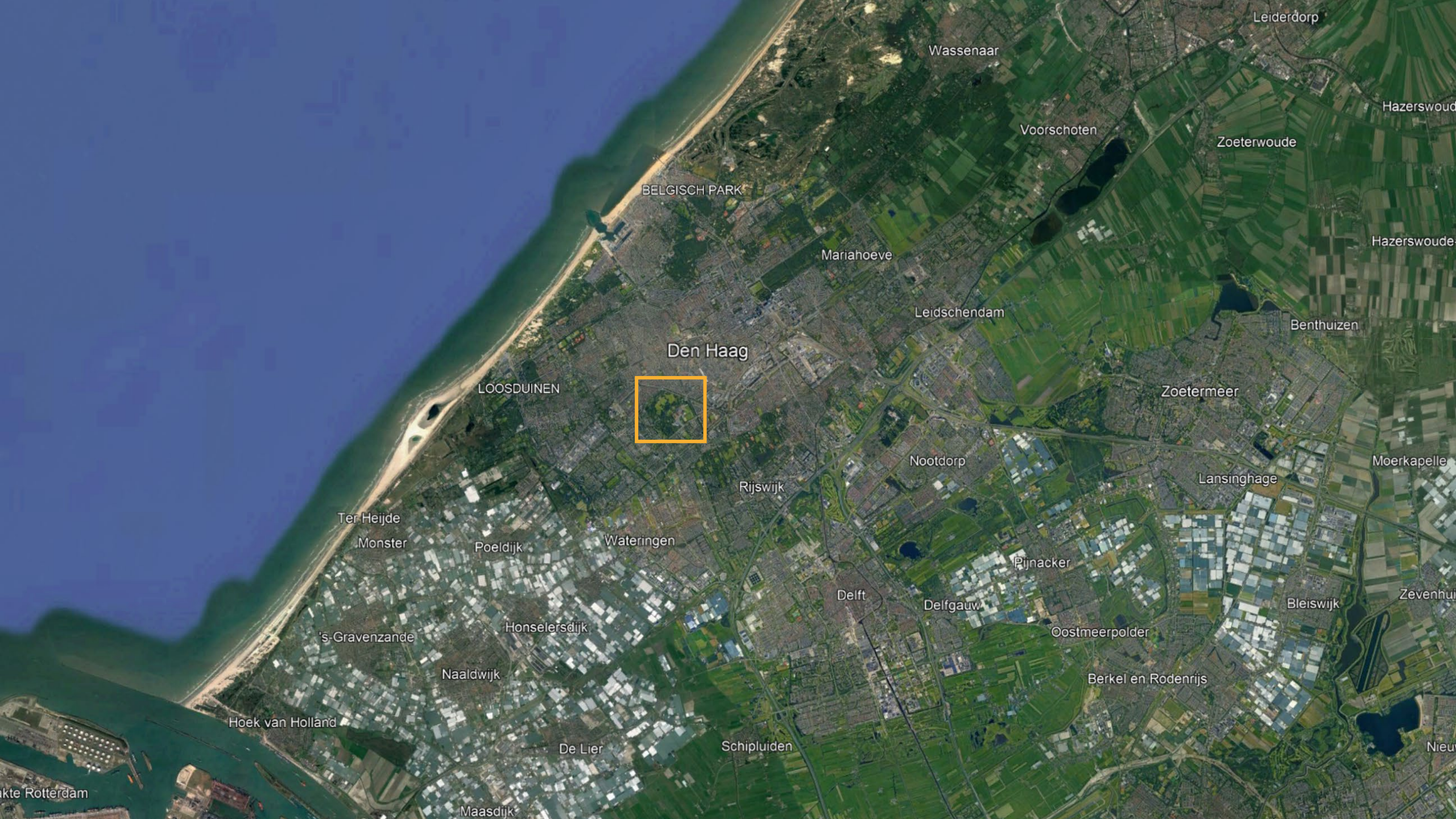
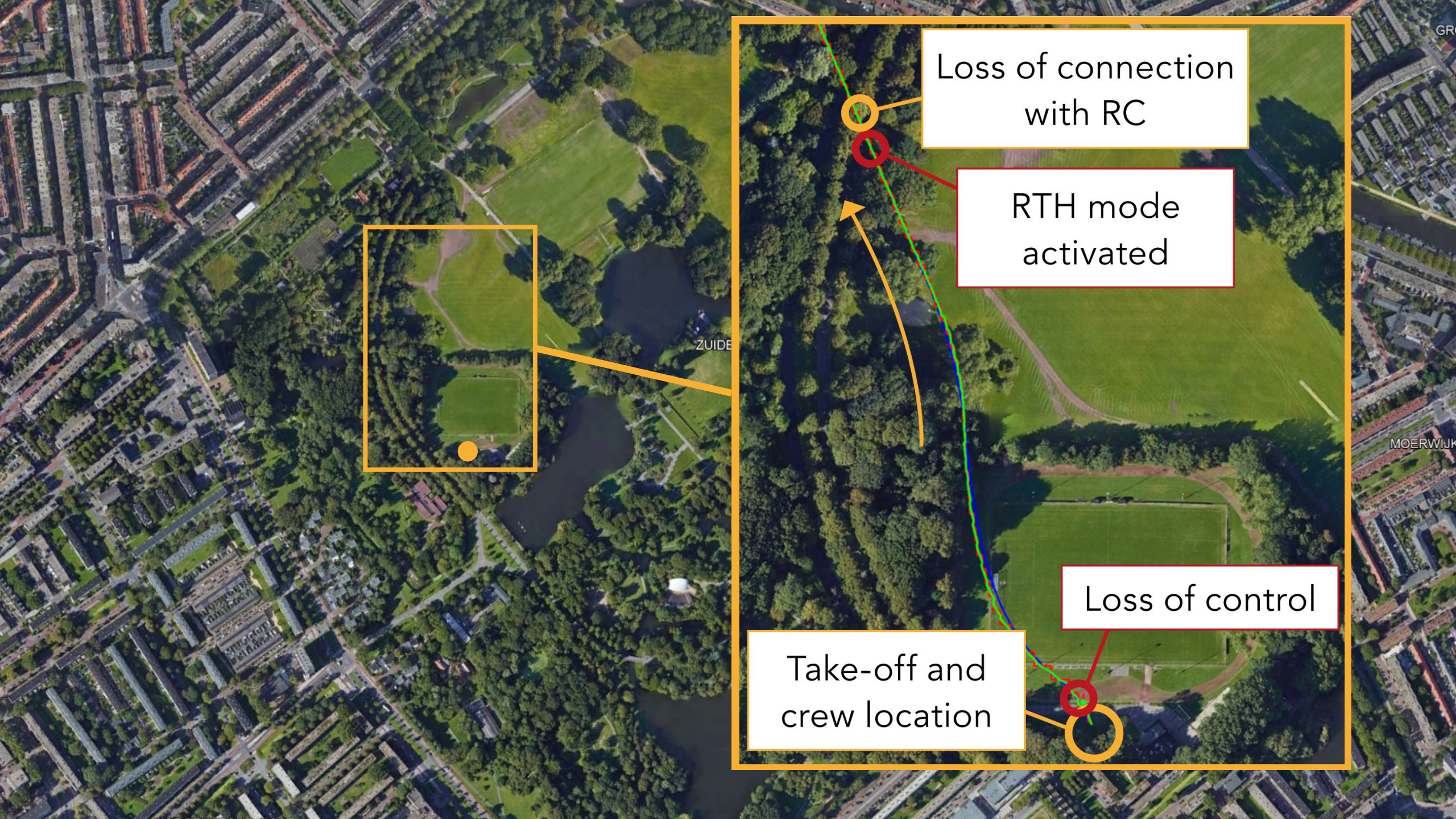
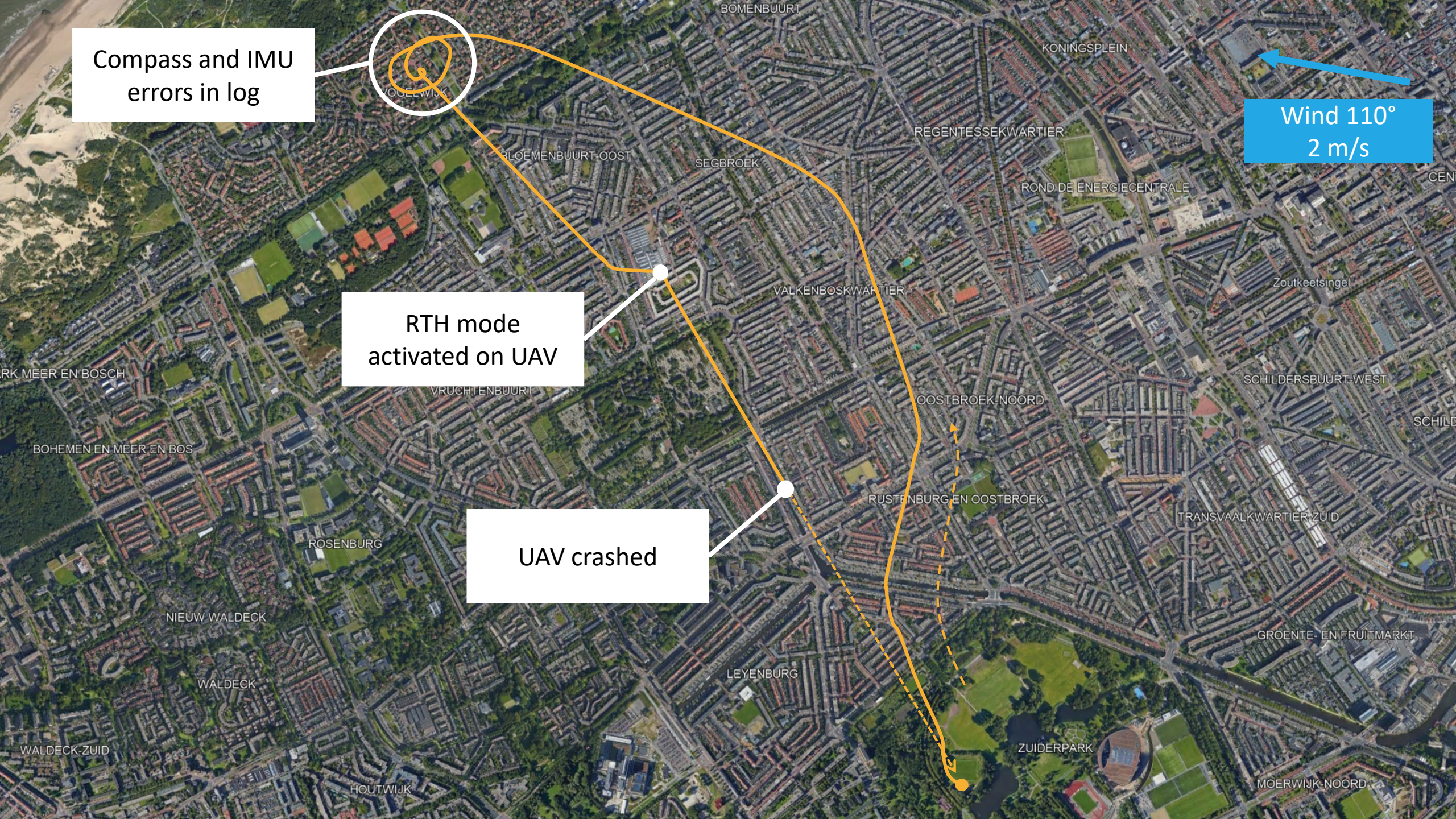
Part 2

Fly-away over The Hague investigation outcomes


Leiderdorp
Wassenaar
Hazerswoud
Voorschoten
Zoeterwoude
BELGISCH PARK
Hazerswoude
Mariahoeve
Leidschendam
Benthuizen
Den Haag
LOOSDUINEN
Zoetermeer
Nootdorp
Moerkapelle
Lansinghage
Rijswijk
Ter Heijde
Monster
Poeldijk
Wateringen
Pijnacker
Delft
Delfgauw
Bleiswijk
Zevenhui
's-Gravenzande
Honselersdijk
Oostmeerpolder
Naaldwijk
Berkel en Rodenrijs
Hoek van Holland
De Lier
Schipluiden
Nieu
kte Rotterdam
Maasdijk


Loss of connection with RC
RTH mode activated
Loss of control
Take-off and crew location


Compass and IMU errors in log
RTH mode activated on UAV
UAV crashed
Wind 110°
2 m/s
BOMENBUURT
KONINGSPLEIN
REGENTESSEKWARTIER
BLOEMENBUURT-OOST
SEGBROEK
ROND DE ENERGIECENTRALE
VALKENBOSKWARTIER
Zoutkeetsingel
SCHILDERSBUURT-WEST
VRUCHTENBUURT
OOSTBROEK-NOORD
BOHEMEN EN MEER EN BOS
RUSTENBURG EN OOSTBROEK
TRANSVAALKWARTIER-ZUID
ROSENBURG
NIEUW WALDECK
GROENTE- EN FRUITMARKT
LEYENBURG
WALDECK
WALDECK-ZUID
ZUIDERPARK
HOUTWIJK
MOERWIJK-NOORD


Compass and IMU errors in log
Wind 110°
2 m/s
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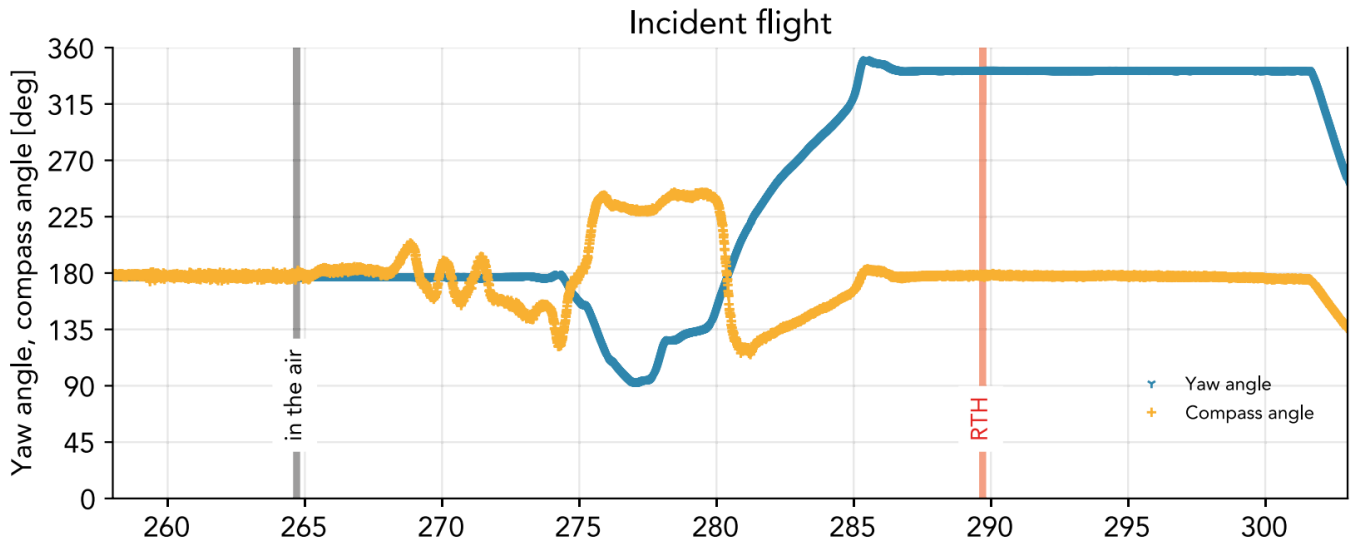
BOHEMEN EN MEER EN BOS
ROSENBURG
NIEUW WALDECK
WALDECK
WALDECK-ZUID
HOUTWIJK
Zoutkeetsingel
SCHILDERSBUURT-WEST
GROENTE- EN FRUITMARKT
MOERWIJK-NOORD

Findings (1/2)

- Flight logs indicate offset yaw angle (IMU) and compass angle
- Different (third party) payload used during previous flight, no calibration performed after change (spoiler: complies with guidelines)
  - Fly-away simulated during flight tests performed by operator
- Pilot did not receive any warning from software, flight status GREEN/READY TO GO



Findings (2/2): user manual and safety guidelines

- Little to no guidance on the use of third party payload
- Lack of clarity among users on which flight mode to use, manual does not help
- Unclear when to calibrate compass/IMU (after payload change?)

Calibrating the Compass

Only calibrate the compass when the DJI GO 4 app or the status indicator prompt you to do so. Observe the following rules when calibrating your compass:

Lessons

In some cases, priority should be given to switching to A-mode.

Be particularly observant when using different payloads.

Advisable to perform manual compass calibration after payload changes.

Recommendation (1) to DJI

Review the user manual and safety guidelines using the safety lessons learned from this incident and clarify the following aspects:

a. Actions in the event of controllability issues
b. In which cases the compass must be calibrated
c. The risks associated with flying with (different) payload types.

Second recommendation, see next slides…

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Part 3

Experiences and challenges

Experiences with UAS manufacturer

- In this case, operator was very proactive. That is why a number of factors were identified as contributory.
- Manufacturer has been reluctant to share information with the safety board. Other countries face similar problems.
- Difficulties in keeping the manufacturer engaged, similar problems during earlier investigations -> recommendation

Recommendation (2) to DJI:
Ensure that safety investigation authorities and operators are timely provided with technical support and relevant information for the purpose of safety investigation regarding UAS manufactured by DJI.

Experiences with UAS manufacturer

- OEM changed their support procedure
  - Legal affairs main point of contact
  - Need to identify, request to show court order, subpoena, …
  - Still no adequate support
  - Pending reaction to recommendations

- Other attempts/possibilities:
  - In case no support from State AIB, possible route through Foreign Affairs/embassy/consulate
  - Cooperation of OEM through EU 2019/945 art 36.1 (involving market surveillance authority, may lead to national/EU wide restrictive measures). However, long and difficult route. Certainly not doable within the timeframe of an investigation.

Challenges

- Still not many UAS related serious incident/accident notifications.
  - Users aware of difference between incident, serious incident and accident? Examples in Annex to EU 996 not directly applicable
  - CAA NL facing same issue
- Some examples of occurrences for which no notification was received

De Telegraaf

Permanent eye injury from drone flying around: pilot culpable, but no punishment

27 aug. 2021 in BINNENLAND

HAARLEM - Een 42-jarige man uit het Zuid-Hollandse Valkenburg heeft op 4 mei vorig jaar met zijn drone permanent eye injury veroorzaakt bij een fietsster in Katwijk, die in haar gezicht werd geraakt door het apparaat. De kantonrechter verklaarde de man vrijdag schuldig, maar legde hem geen straf op.

https://www.telegraaf.nl/nieuws/1085244613/blijvend-oogletsel-door-rondvliegende-drone-bestuurder-schuldig-maar-geen-straf

DRONES.nl

Drone crashed onto garage in Westzaan

Een drone is vandaag **crashed onto the roof** an een garage in Westzaan. Er werd gemeld dat de schade groot was, maar dat bleek ter plekke mee te vallen, meldt Dichtbij.

Politie

De politie is ter plaatse gekomen om de zaak te onderzoeken. Het onbemande vliegtuigje is niet in beslag in genomen, maar de eigenaar is wel meegenomen naar het bureau voor verder verhoor.

Boete

De eigenaar hangt een boete boven het hoofd die kan oplopen tot 7.800 euro.

https://www.drones.nl/nieuws/2014/09/drone-stort-neer-op-garage-in-westzaan

BN DeStem

Drone of a man (53) nearly causes collision with Chinook at Woensdrecht airbase

Woensdrecht vloog, heeft dinsdag near collision **met een langsvliegende Chinook-helikopter veroorzaakt. De beide toestellen vlogen ‘op dezelfde hoogte in dat gebied’ en dat leidde tot gevaar, zegt de Koninklijke Marechaussee. Die heeft de drone en de geheugenkaart die erbij hoort in beslag genomen.**

ANP 08-02-23, 15:08 **Laatste update:** 08-02-23, 15:11

https://www.bndestem.nl/bergen-op-zoom/drone-van-man-53-veroorzaakt-bijna-botsing-met-chinook-bij-vliegbasis-woensdrecht~a045b9fc/

Veiligheidsonderzoek naar ongevallen met drones

DSB launched awareness campaign in NL

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Occurrence reporting

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