

Safety in the skies

Creating flight safety and safety for citizens through enhanced situational awareness and increased actionable decision making time

Weibel Scientific by Thomas Øiseth Munkholm, VP Global Business Development & Owner 2021-04-29



• Weibel Scientific A/S, the radars and situational awareness

• Safety in the skies - the safety conundrum

 Solving the safety conundrum - Weibels solution to the lack of situational awareness and safety in Urban Air Mobility

WEIBEL Weibel Scientific A/S

- Danish family owned tech company founded by Erik T. Larsen in 1977
- Headquarters and Weibel Test Center north of Copenhagen
- All R&D and production in Denmark and Oslo
- 210 employees and growing
- Subsidiaries in the US, Germany and Norway
- Aerospace and defense sector
- Global standard in **Doppler radars** with more than 5000 radars delivered:
 - High precision ballistic tracking systems
 - Space launch safety systems
 - Air surveillance
 - Ballistic missile defense
 - Operational naval & land based systems
- Exports almost 100% to more than 40 countries











Weibel confidential and proprietary

WEIBEL Products: Radars for test, qualification and safety

Modern digital phased array radars



- All X-band
- Customers are public and private test ranges and national space agencies
- Velocity, angles and range measurement (3D) through electronic beamsteering and multiple beams







WEIBEL Products: Radars for air surveillance incl. drones

Modern digital phased array radars







- Customers are public and private entities
- Airports, sport events, air traffic management and short range air defense (SHORAD)







WEIBEL What we create and how we do it

What:

Create **precise real time data/information on situational awareness** through accurate detection, tracking and classification of moving objects so that end users have basis for **making correct decisions in due time**

How:

Radars based on a **unique combination Doppler and Pulse technology**, advanced digital signal processing and machine learning allow us to **detect**, **track and classify drones** and other moving objects

WEIBEL Been delivering radars to Norway since the beginning









KONGSBERG

Nammo



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WEIBEL Safety in the skies... and for citizens on ground

SAFETY FIRST

FAA in the US:

Urban Air Mobility (UAM) envisions a <u>safe</u> and efficient aviation transportation system that will use highly automated aircraft that will operate and transport passengers or cargo at lower altitudes within urban and suburban areas. UAM will be composed of an ecosystem that considers the evolution and <u>safety</u> of the aircraft, the framework for operation, access to airspace, infrastructure development, and community engagement.

WEIBEL Are we ready for the future of a SAFE Urban Air Mobility?



Source: Flying High: shaping the future of drones in UK cities

WEIBEL Flight safety is already compromised

The mystery of the Gatwick drone

A drone sighting caused the airport to close for two days in 2018, but despite a lengthy police investigation, no culprit was ever found. So what exactly did people see in the Sussex sky?

by Samira Shackle

on after 9pm on Wednesday 19 December 2018, an airport security officer who had just finished his shift at Gatwick airport was standing at a bus stop on site, waiting to go home, when he saw something strange. He immediately called the Gatwick control centre and reported what he had seen: two drones. One was hovering above a vehicle inside the airport complex, and the other was flying alongside the nearby perimeter fence. The message was relayed to senior management. Unauthorised drone activity is considered a danger to aircraft and passengers because of the risk of collision. Within minutes, Gatwick's only runway had been closed and all flights were suspended.

Pilots report TWO drone near-misses every week with more than 400 incidents in the last five years, investigation finds

- Aircraft pilots are reporting two near-misses every week, investigation reveals
- There have been 405 near-misses between drones and aircraft since 2015
- This includes 115 in the year to November 44 which were serious collisions
- MP Huw Merriman said Parliament should act on this if aviation industry don't

By TOM PAYNE and RICHARD MARSDEN FOR THE DAILY MAIL PUBLISHED: 22:10 BST, 3 January 2020 | UPDATED: 00:46 BST, 4 January 2020



Britain's skies are in the grip of a drone epidemic with aircraft pilots reporting two near-misses every week, a Daily Mail investigation has found.

Aviation insiders say the number of incidents has reached 'alarming' levels - with more than 400 incidents in the past five years.

The problem has been described as a 'real concern' as the gadgets - which are too small to appear on air traffic radar screens - can easily destroy an engine or smash a cockpit windscreen, potentially causing huge loss of life.



UAS Sightings Report

Reports of unmanned aircraft (UAS) sightings from pilots, citizens and law enforcement have increased dramatically over the past two years. The FAA now receives more than 100 such reports each month. The agency wants to send out a clear message that operating drones around airplanes, helicopters and airports is dangerous and illegal. Unauthorized operators may be subject to stiff fines and criminal charges, including possible jail time.

Bloomberg

Trump's Plane Was Nearly Hit by a Small Drone Sunday, Witnesses Say

Alan Levin · 8/18/2020

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(Bloomberg) -- President Donald Trump's jet was nearly hit by what appeared to be a small drone as it approached an air base near Washington Sunday night, according to several people aboard Air Force One.

INCIDENT: DRONE - HELICOPTER COLLISION, OCCUPANT INJURY

by Spyros | Jan 25, 2021 | News | 0 comments

A helicopter of the Chilean Navy had a collision with a drone, which broke through the windscreen **and injured the on-board mechanic.** The incident happened last Saturday.

The aircraft was a **Bell UH-57B**. This is essentially **the military version** of the well-known **206B JetRanger III**. Photos show that the helicopter had a single pilot, with no left seat and the mechanic sitting in the main cabin. **The drone pierced the helicopter's plexiglass windscreen**, apparently striking the mechanic on the head.



Drone ved Oslo lufthavn stengte for innkommende flytrafikk i 20 minutter

Oslo lufthavn ble tirsdag ettermiddag stengt for innkommende flytrafikk i 20 minutter etter at det ble observert en drone i luften i nærheten av flyplassen.

Av NTB 15. mai 2018

> Det var piloten i et fly som observerte en drone i rundt 1.000 fots høyde, rundt fem kilometer nordøst for Oslo lufthavn.

Ulovlig drone stengte flyplass

Stavanger lufthavn Sola måtte stenge i ettermiddag på grunn av en drone som ble observert inne på flyplassens område. Ledelsen ser alvorlig på hendelsen.



Stavanger lufthavn Sola var stengt i nesten en halvtime lørdag ettermiddag. Et Norwegian-fly på vei inn fra Oslo, måtte vente i 20 minutter før det fikk lande. *7670: SURVAR MORSUND / INK:

WEIBEL Citizens safety on ground is already compromised



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Mexico cartel used explosive drones to attack police

21. April 2021



Center Site





Pennsylvania Man Arrested for Crashing Drone at World Trade

NEW YORK (New York Daily News/TNS) - A Pennsylvania man was arrested for crashing his drone onto the roof of 3



04. Juli 2017



Bergenspolitiet har delt ut si første drone-bot. Det skjedde etter ulovleg flyging over 15.000 menneske på The Weeknd-konserten på Koengen.





31. March 2021





- Drones (UAS) provide many opportunities and everyone can by one
- Technological advancements happen every day through huge investments in the market
- Drones are able to fly from one point to another point without any human interaction

The safety conundrum:

- The UAS technological development is **ahead of legislation** for autonomous flights
- Law enforcement is mostly not possible with existing and traditional technologies (do not detect the drones) and investments in counter-UAS is lacking behind
- Flight safety and safety on ground cannot be maintained because a whole situational wareness picture is not available

WEIBEL Like finding a needle ind the haystack

WHY is the vast supply of technologies not working?

Drones are characterised as Low, Small and Slow targets \rightarrow

Difficult to detect, track and classify \rightarrow

Traditional technologies such as pulsed surveillance radars are not designed/well suited to detect drones but only larger, faster and more predictable targets



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Detect your enemy/ Non-cooperatives

How can we solve the detection problem of non-cooperative drones?

WEIBEL XENTA is designed to detect, track and classify drones



Type: AESA (Digital Array Radar) primary air surveillance radar

Transmission Frequency: X-Band

Azimuth Coverage: 360 deg.

Rotation Rate: 0 - 60 RPM (Selectable)

Elevation coverage: Up to 60^o

WEIBEL Detection and classification of drones

XENTA:

- Detects the **body** of the drone
- Detects the velocities of the rotors on the drones (Doppler shift)
- Has **10 times more time on target** compared to traditional radars



* The observed detection ranges is what typically is expected during test however subject to weather condition

WEIBEL Multiple drones detected, tracked and classified



WEIBEL Detection, tracks and classification of a drone at 5 km



WEIBEL 3D display of the tracking of birds and an airplane



WEIBEL Concluding remarks

- Urban Air Mobility infrastructure is **not safe enough** to reach max potential of drones
- Traditional technologies cannot detect, track and classify the low, slow and small drones
- Flight authorities need to be able to control all air traffic and keep people safe
- Flight safety can reach the safety levels known before civilian drones emerged in modern airspace
- Weibel has a radar that can solve to the safety conundrum facing urban air mobility
- We are ready to demonstrate the capabilities in an urban setting in Oslo



Questions?



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