UAVs for or against Flight Safety?

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MZ NDU Aviation and Air Defense Institute

UAVs for or against Flight Safety?

- Airline-, General-, Military Aviation
- Air Traffic Management

- UAS Technical Challenges
- Human Factors

Peter van Blyenburgh

bmvit

Federal Ministry for Transport, Innovation and Technology

Invitation

TAKE OFF

UNMANNED AIRCRAFT SYSTEMS –
TOWARDS CIVIL APPLICATIONS

A conference financed by TAKE OFF
The Austrian Aeronautics Research and Technology Programme

Tuesday, 10 November 2009, Graz/Austria

TAKE OFF

FFG

Remotely Piloted Aircraft (System) or Unmanned Aircraft (System)

GLOBAL ACCESS INITIATIVE

AIRCRAFT

Certified/Approved | Not Certified (models)

Civil | State (Military & Non-Military)

Europe: < 150 kg | > 150 kg

Piloted | Pilot-less (tethered objects)

Remote Pilot | Optional Remote Pilot | Onboard Pilot

Human | Machine

Pilot in Command

Current Non-Military LUAS Applications in Europe

GLOBAL ACCESS INITIATIVE

Scientific & Research

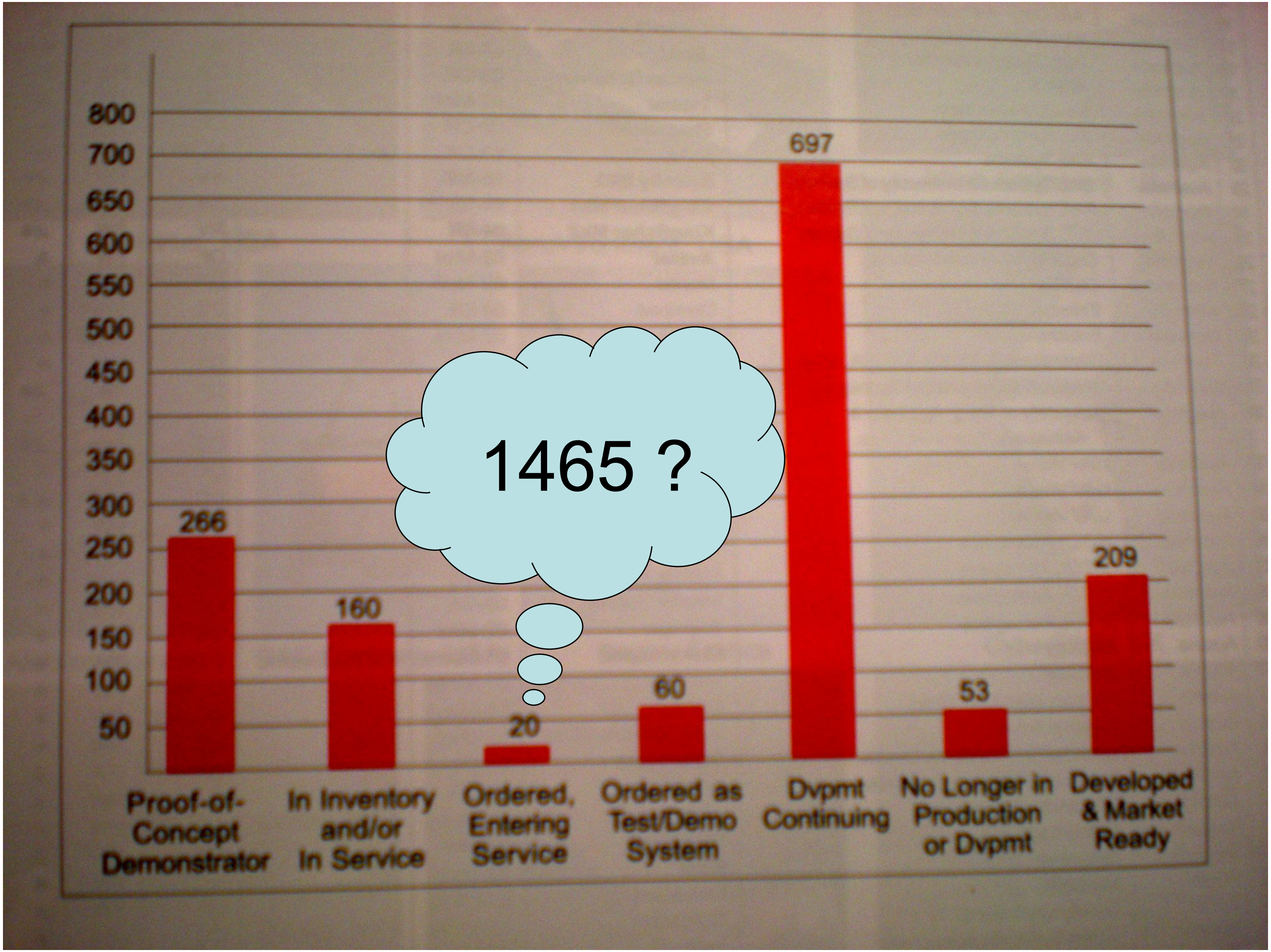
Aerial photogrammetry (BE,CH,DE,NL)
Agricultural monitoring (ES, UK, USA)
Arctic research (DE, NO, UK, USA)
ATM Research (DE, ES)
Climate monitoring (NO)
Coastal mapping (NL)
Coastal zone studies (NL)
Crop monitoring (USA)
Forestry management/research (SE)
Geophysical survey (BR)
Glacier & ice cap monitoring (DK, NO)
Iceberg monitoring (NO)
Invasive species identification/analysis (USA)
Marine mammal monitoring (USA)
Meteorological research (DE, NO, USA)
Ocean & sea research support (NO)
Plant growth vigour mapping (USA)
Salt water infiltration detection (NL)
Thermal imaging of buildings (heat wastage)
Vegetation identification (USA)
Volcano monitoring (JP)
UAS sensor research (CA,DE,ES,FR,NO,USA)
Wildlife census (ES, USA)

Security-Related

Border surveillance (IL, USA)
Crowd surveillance (CH, CN, FR, ZA)
(Forest) Fire fighting support (ES, HU, UK, USA)
International summit surveillance (CA, FR)
Maritime & Sea lane surveillance (BE, ES)
Natural disaster site surveillance (CN, IN, RU, USA)
Police applications (CA, DE, FR, NL, UK, ZA)
Regional surveillance (Gasa & Occupied Territories)
Road traffic surveillance (CH)
Experimentation (AT, AU, BE, CA, CH, CN, CZ, DE, ES, FR, IT, MY, NL, NO, SG, PT, SE, SI, ZA, UK)

Contractor Supplied Flight Services

Advertising (light-than-air UAS)(indoor & outdoor)
Aerial data collection (AU,AT,BE,CH,ES,IT,NL,SE,UK)
Aerial photography & video (many countries)
Agricultural fertilizer dispensing (CN, JP, KR)
Agricultural insecticide spraying (CN, JP, KR)
Cinema (aerial shots & special effects)
Critical infrastructure inspection (FR, NL)
Forest fire operations support (ES, USA)
Historical monument inspection (FR)
Illegal cannabis cultivation detection (NL)
Magnetic field survey (AU)
Oil & gas pipeline monitoring (RU)
Terrain mapping (BE, DE, NL)



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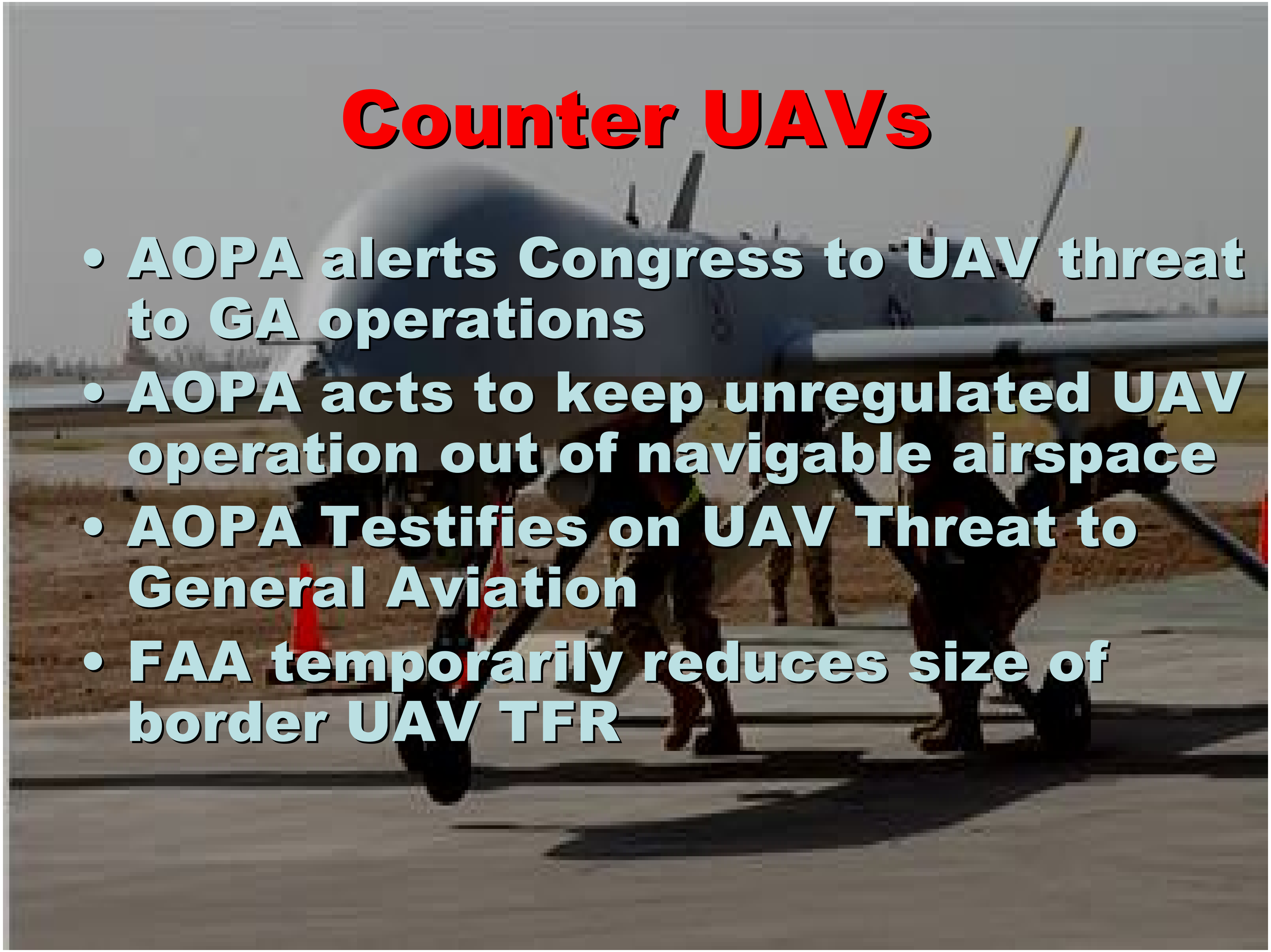
Proof-of-Concept Demonstrator
In Inventory and/or In Service
Ordered, Entering Service
Ordered as Test/Demo System
Dvpmt Continuing
No Longer in Production or Dvpmt
Developed & Market Ready

Counter UAVs



Counter UAVs

- AOPA alerts Congress to UAV threat to GA operations
- AOPA acts to keep unregulated UAV operation out of navigable airspace
- AOPA Testifies on UAV Threat to General Aviation
- FAA temporarily reduces size of border UAV TFR

UAVs

Benefits	Disadvantages
• UAVs do not require incremental pilot	• Lack of onboard (emergency) pilot
• UAVs can be extremely small	• Low visibility - risk of collision
• Precise tracking	• No visual aid
• IFR by nature	• No cooperative
• Autopilot more reliable for dull tasks	• Autopilot has no idea in extreme situation
• Ready for dirty and dangerous mission	
• Lower cost of training	

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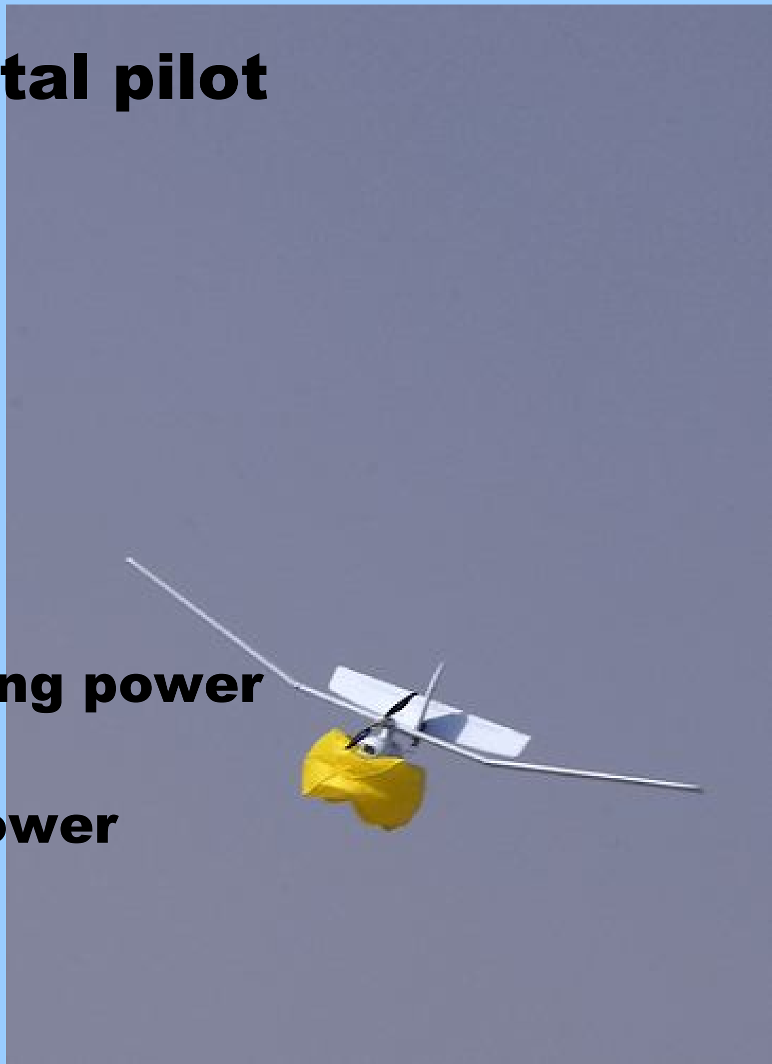
Benefits of UAVs

UAVs do not require incremental pilot

- displays and instruments
- ejection seats
- environmental controls
- Airframes
    - are smaller and lighter
    - can be designed more aerodynamically efficient
    - all component costs including power plant costs are lower
    - fuel consumption is much lower



Disadvantages of UAVs

UAVs have not onboard (emergency) pilot

- No visual aid for situational awareness
- No chance to make an intellectual (unpredictable) decision
- No oral contact (cooperation) with partners

Cost of training

B-52 pilots (average) $ 685,051

Cost of training

UAV operators (average) $ 13,000

Human and Machine

- To know the vehicle where is in space
- Unambiguous indications of what mode the interface and vehicle is in
- Increased Automation: „A human should not have to land the UAV”
- The interface should be robust enough – if the operator is unable to devote attention to the vehicle for a few minutes..

Sense and avoid

other manned aircraft flying under visual flight rules (including non-cooperative aircraft operating without a transponder) a major limiting factor for UAV flight operations

Sense and Avoid Support Technologies

- GPS navigation,
- Automatic Dependent Surveillance - Broadcast (ADSB),
- Traffic Alert and Collision Avoidance System (TCAS),
- Mode S secondary surveillance radar (SSR),
- Identify Friend/Foe (IFF) transponder

The Size is Matter..

The required capabilities can be supported today in the larger platforms, that have enough space and power capacity to operate communications, data-links, IFF and 4D navigational equipment, as well as built-in capabilities to perform collision avoidance, due regard and weather radar.

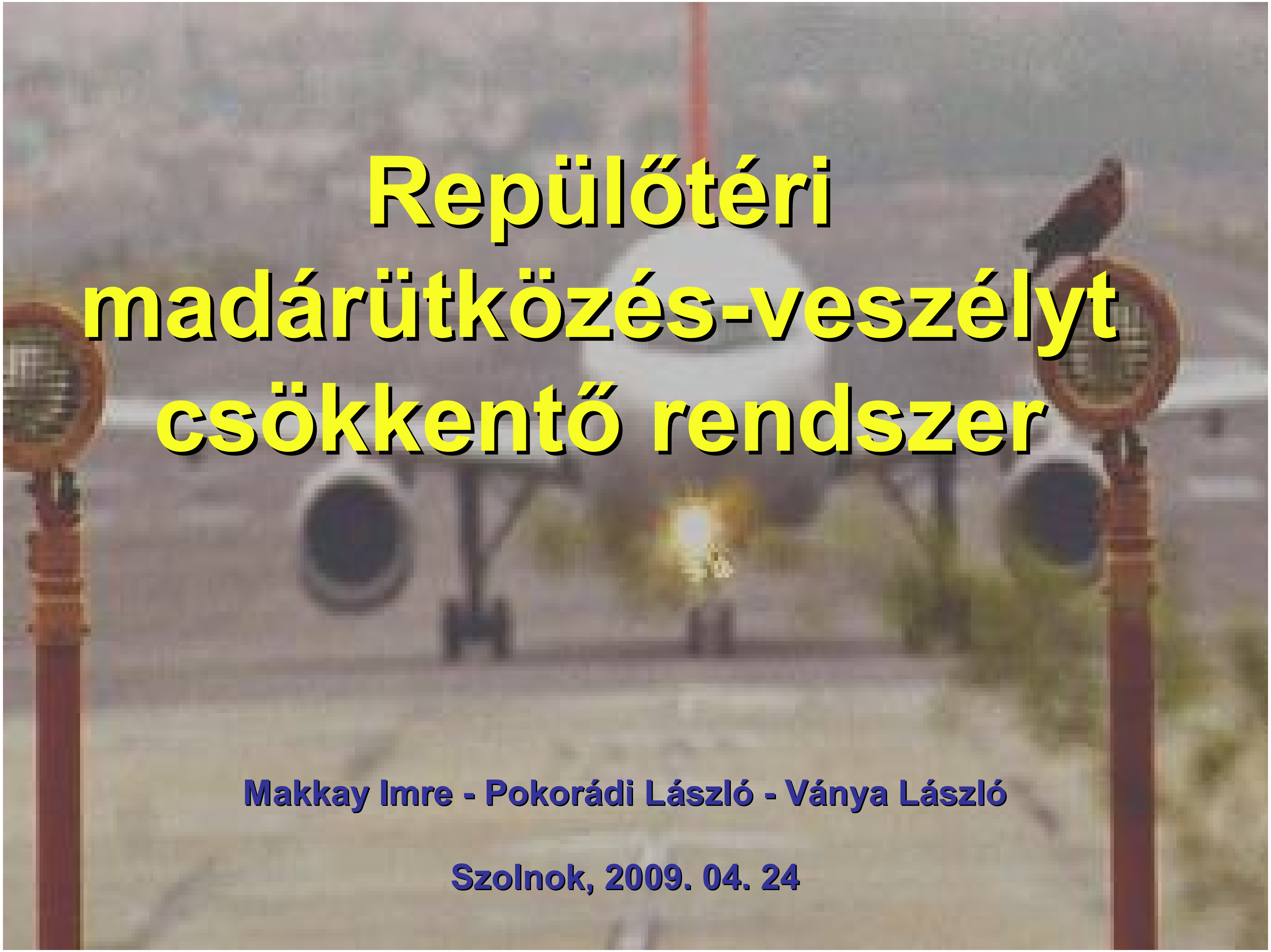
Miklos Zrinyi National Defense University

UAVNET - EU FP5 program (Airobotics, NLR, Finmechanica, Alenia, ONERA, BAeSystems, Frost, QuinetiQ, Politechnico, DLR, EADS, Sonaca, Thales, IAI, WUT, BUIAE, WGTU, MZNDU)

SEVENTH FRAMEWORK PROGRAMME

AAA - EU FP7 program (PATRAS, CRANFIELD, IAS, CIRA, MZNDU, UPC, IAI, NLR, UNILE)

WP12. MZNDU: Reducing collision damages.
Wildlife monitoring and control.



Repülőtéri madárütközés-veszélyt csökkentő rendszer

Makkay Imre - Pokorádi László - Ványa László

Szolnok, 2009. 04. 24

CONCLUSION

- UAVs for Flight Safety
- Collaborative aircrafts in close or medium distance to our UAS could be detected by using systems like TCAS and ADS-B.
- Non-collaborative aircrafts should be detected – by other external visual-, thermal-, laser or radar sensors.
- Concept for European Regulations for Civil UAVs-General Aviation


ROBOTHADVISELÉS 9
TUDOMÁNYOS KONFERENCIA
2009. NOVEMBER 24.
Thank you
Zrínyi Miklós Nemzetvédelmi Egyetem Bolyai János Katonai Műszaki Kar
Repülő és Légvédelmi Intézet
Szolnok