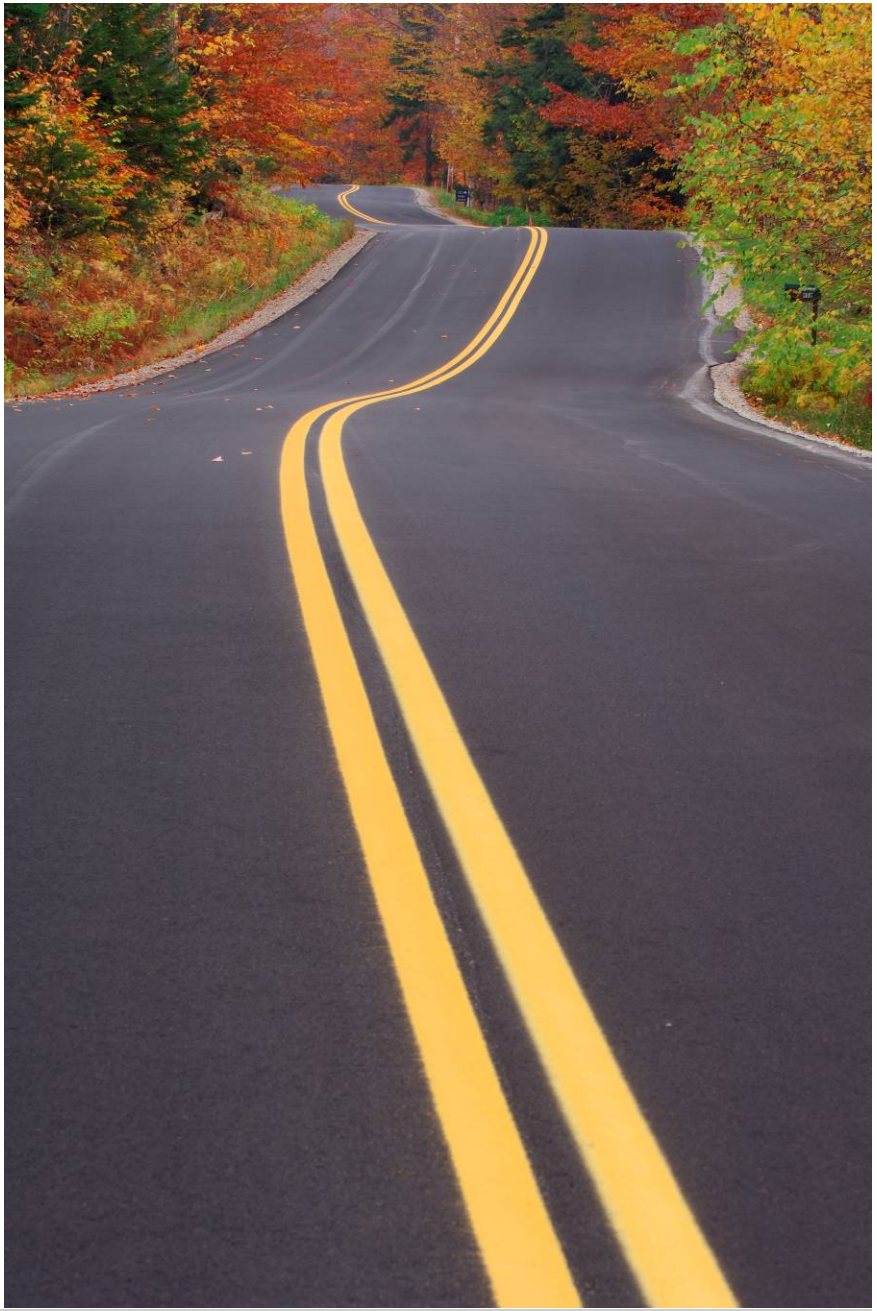
Framtiden är obemmanad

- Saab Aeronautics UAV briefing

Anna Hildebrand
Marketing Manager
Saab Aeronautics

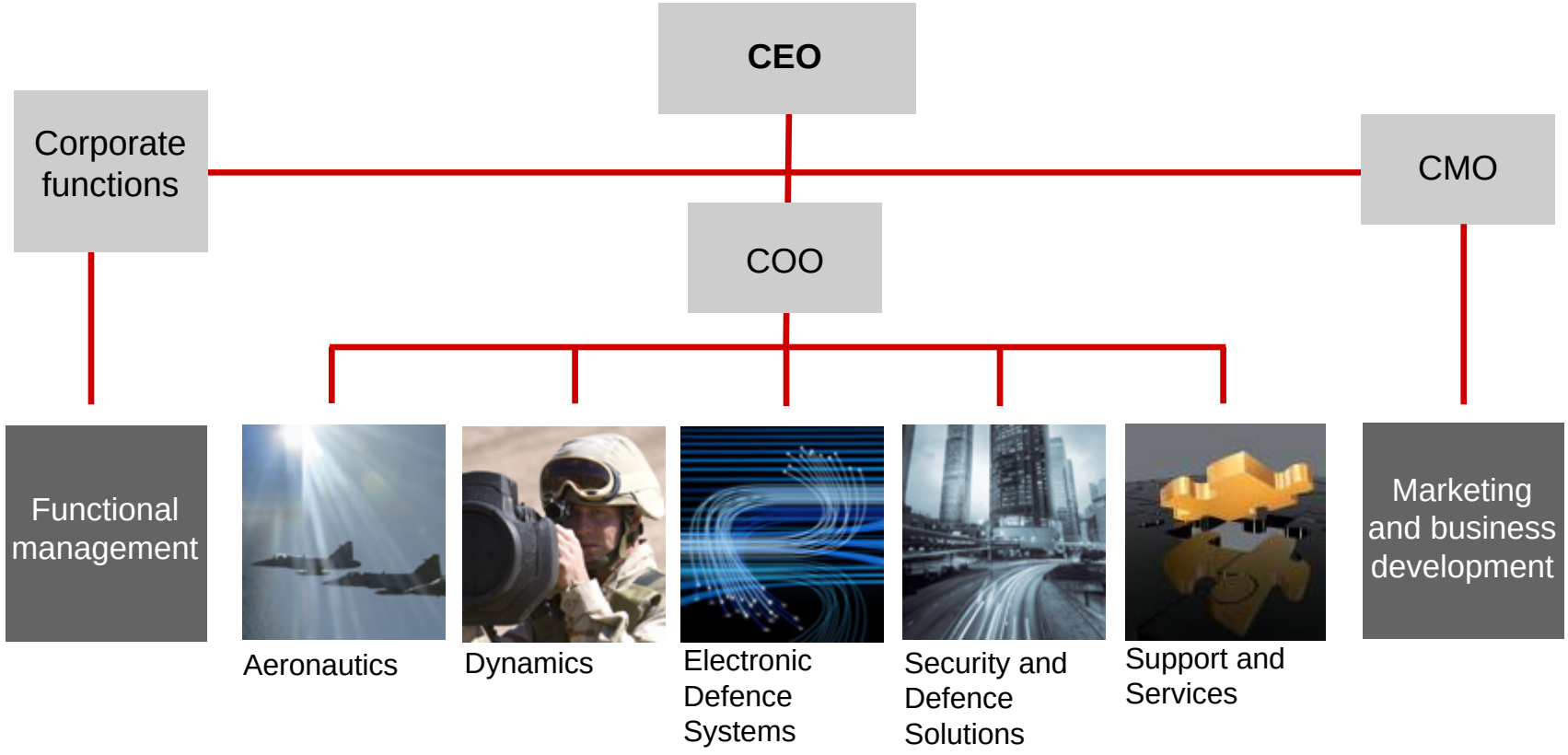
AGENDA

- Saab
- Why unmanned?
  - Challenges
- Skeldar™ and VTOL Family
  - One Control Station
  - Mission Payload
- Saab UAV Program
  - Neuron
  - MidCas
  - TUAV-ISTAR
- UAS Market
  - Competitors



Leveraging from our Family of Systems

FIVE BUSINESS AREAS



AERONAUTICS

Operations

- Gripen program
- Unmanned Aircraft Systems (UAS)
- Supplier to international aircraft programs
- Leasing of Saab regional aircraft

Key strategic issues

- Export Gripen
- Invest in technology to win new business
- Secure position in next European Air Power System

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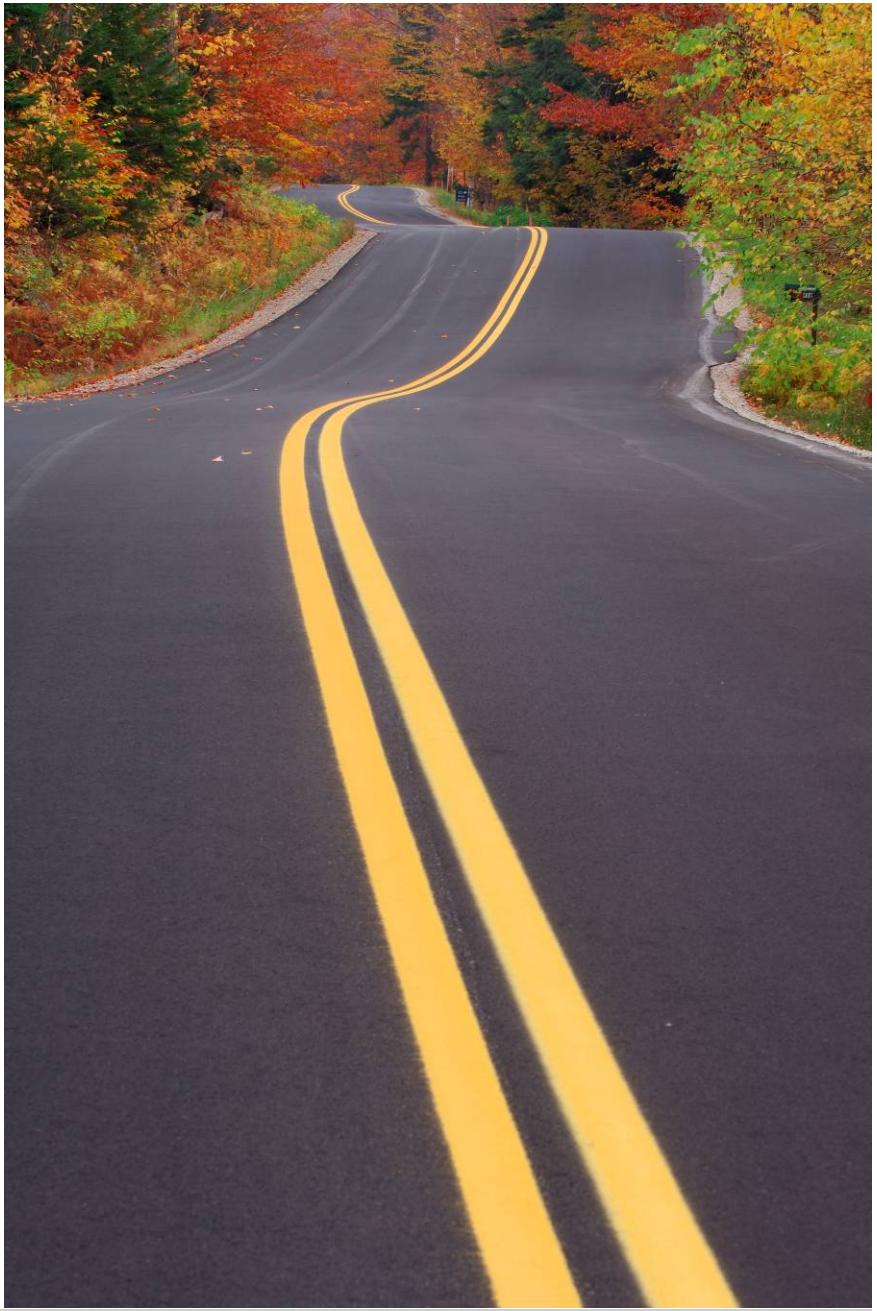


Obemannat flyg

- Från början var flyget obemannat, men sedan bröderna Wright har vi ägnat mycket kraft åt att hantera piloten.
  - Är dags att flytta ner piloten på marken igen?

- Varför obemannat
  - 3D: Dull, Dirty, Dangerous
  - Effektivitet
  - Brist på piloter
  - Ökande andel av olyckor kan hänföras till operatörsproblem
- Vad krävs
  - Traffic insertion och övriga regelverk
  - Acceptans
  - UAV'er
- I vilken ordning kommer applikationerna
  - Militära applikationer, 3D, driver utvecklingen idag
  - Säkerhetsapplikationer (kustövervakning, internationell övervakning, räddningsinsatser och polis..)
  - Frakt
  - Persontransport (vägen dit via trafikflygets automatisering?)

HELICOPTER & VTOL UAV COMPARISON

- Helicopter advantages
  - Fly with less regulated restrictions
  - Less physical limit in range
    - Data link range
  - Carry personnel and VIP
- VTOL UAV advantages
  - Fly dangerous, dull and dirty missions
  - Much harder to detect
  - Longer flight time (~ x 2)
  - Much less pilot training
  - One operator possible incl mission payload
  - Fly > 1 air vehicle
  - Easy to move and deploy in new region
  - Acquisition cost per air vehicle
  - Cost per flight hour

Utmaningar med förarlösa farkoster

Piloten på marken

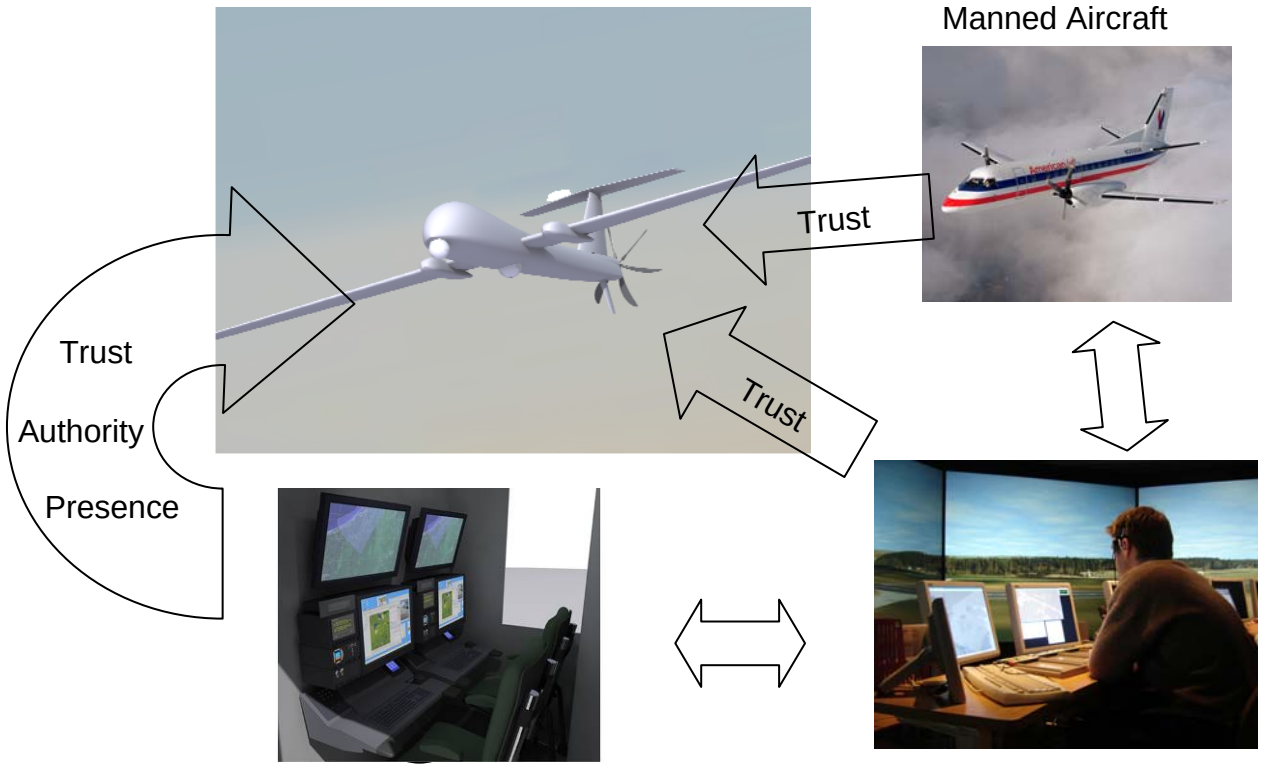
Interaktion
människa- maskin

Sense &Avoid

Command&Control

Acceptans

…



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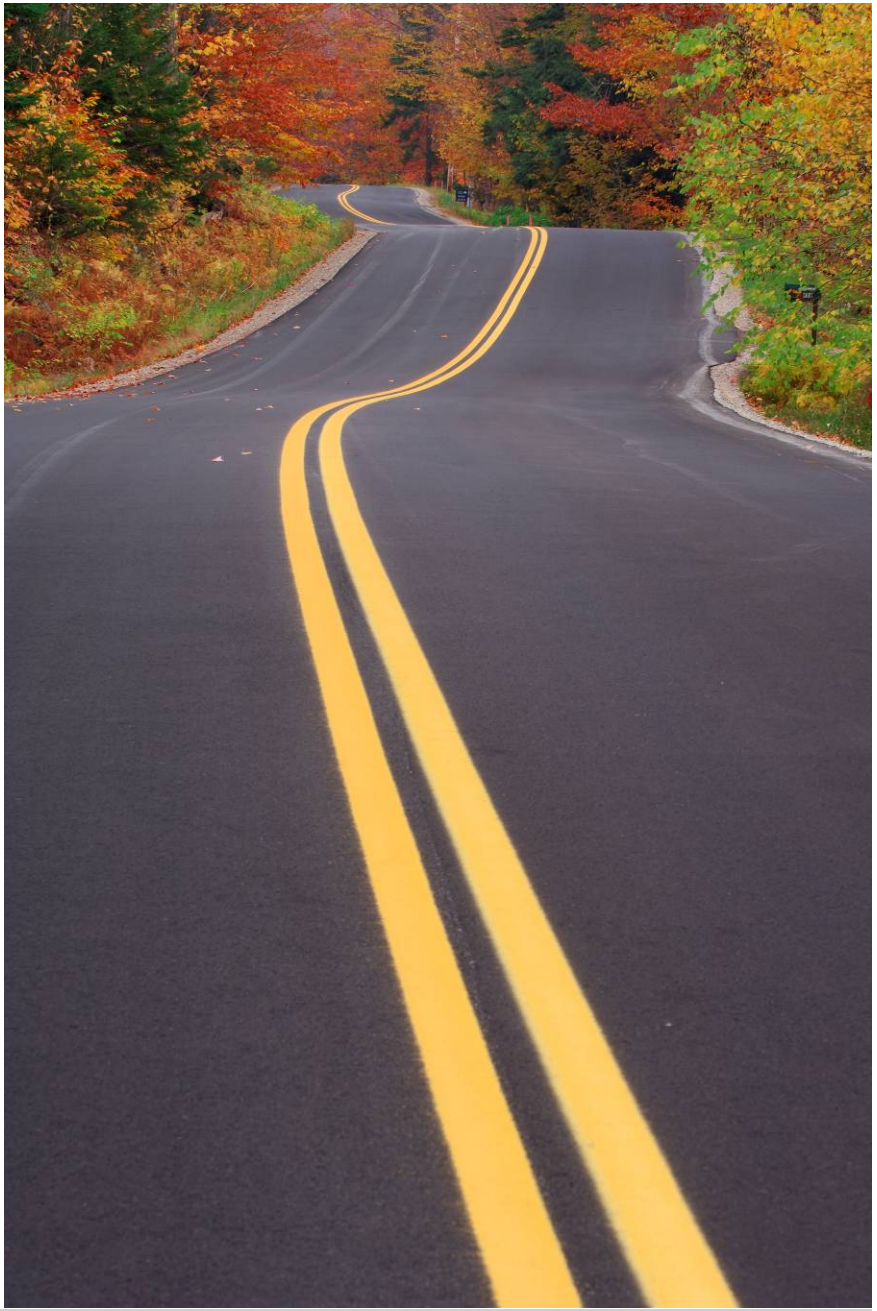
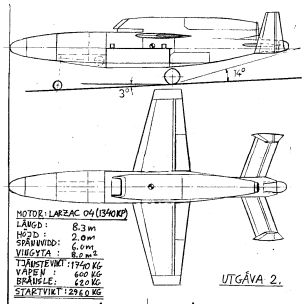


Building Saabs current UAS position - originating in manned aviation



Heavy RPV 1975

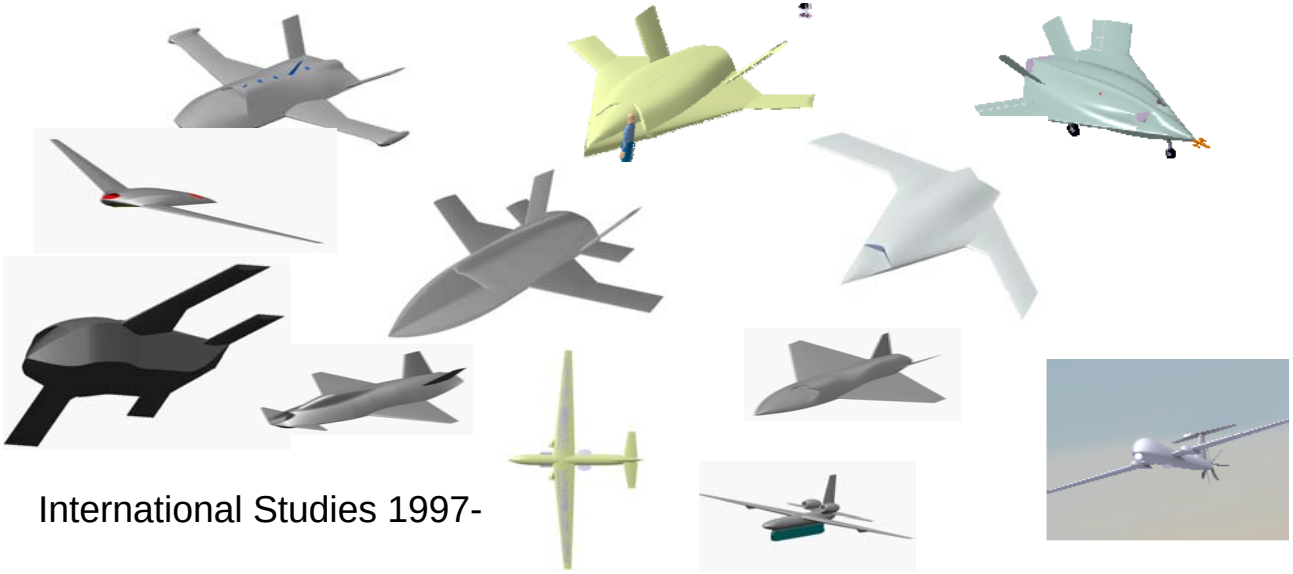
SHARC
First flight 2001
First European fully autonomous flight 2003

FILUR 2005

Neuron

Skeldar

Traffic Insertion



International Studies 1997-

TUAV ISTAR

TECHNOLOGY DEMONSTRATORS

- SHARC
  - Span: 2,1 m
  - Length: 2,5 m
  - MTOW: 60 kg
  - Top speed: 320 km/h
  - First flight: 2002

- Objective to demonstrate autonomous behaviour and decisions.
  - ATOL
  - Flight Plan Navigation

- FILUR
  - Span: 2,5 m
  - Length: 2,2 m
  - MTOW: 55 kg
  - Top speed: 300 km/h
  - First flight: 2005

- Objective to demonstrate the effect of signature management for future aerial vehicles.
  - Structure and material
  - Aerodynamics

UAS – KEY FEATURES

- Airworthiness
  - Develop flight and mission capabilities certified for all airspace classifications
- Availability
  - Design for operative flexibility that improves usability and time in the air
- Ease of operation
  - Develop autonomous functions and intuitive man-machine-interface
- Cost effectiveness with low life cycle costs
  - Design for built in low logistic footprint and low life cycle costs

SKELDAR™

- Skeldar™ – a small to medium range UAS family designed to provide *autonomous* flight functionality in all phases of operation
- A new generation of UAS designed to be prepared for certification according to airworthiness regulations
- Safe and reliable UAV system with high resolution sensors and easy to use man-machine interface

VTOL UAV & FW UAV COMPARISON

- Fixed Wing UAV advantages
  - Endurance longer with comparable airframe size
  - Maintenance is less
    - Availability
    - Cost per flight hour
- VTOL UAV advantages
  - Hovering and slow speed
    - Maintain contact with target in difficult terrain and built-up areas
    - Keep pace with ground/sea units
    - Stare for long period of time
  - No catapult
    - Easier transport and deployment
    - Less personnel
    - Less logistics and service
  - Small ToL area
    - Easier deployment

Skeldar first prototype,
Feb 2007

Skeldar V-150,

Skeldar V-200,

VTOL UAS FAMILY CONCEPT

- The VTOL UAS family consist of four different air vehicles and a common UAS Control Station
- The air vehicles are:
  - Skeldar V-200
  - KOAX X-240 MkII
  - NEO S-300 MkII
  - Skeldar V-125
  - Skeldar V-600

SKELDAR V-200

Payload	30 kg
MTOW	200 kg
Main Rotor	4.7 m
Max. Speed	130 km/h
Service ceiling	4 500 m ASL
Endurance	5 h
Max mission radius	>100 km

KOAX

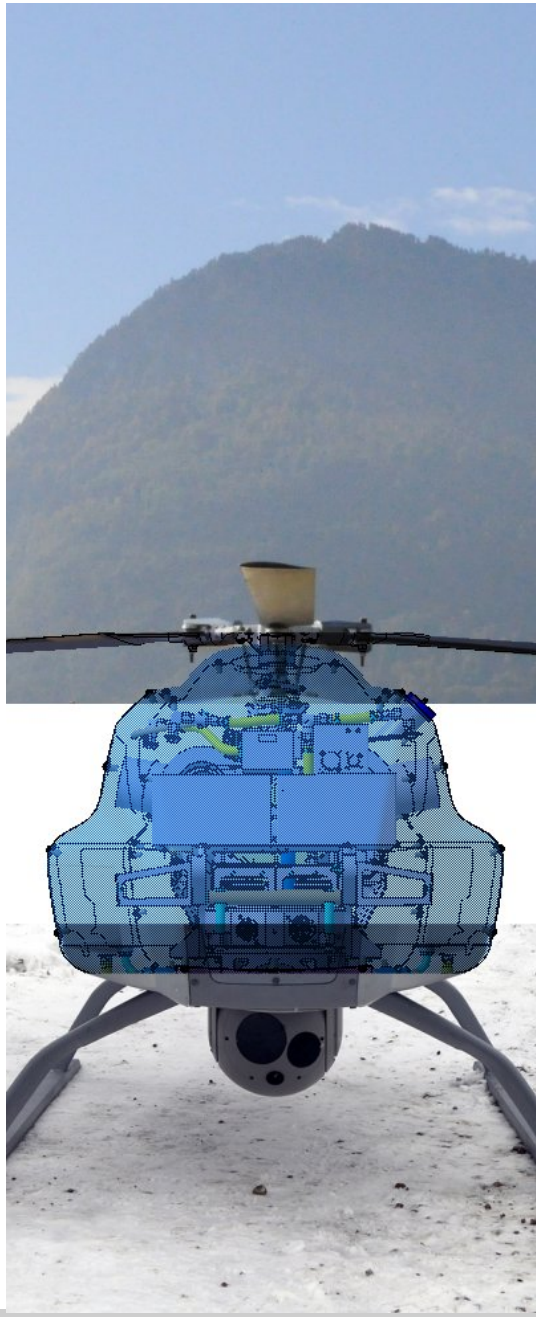
KOAX:

- Payload 8 kg
- MTOW 45 kg
- Main Rotor 2 x 2.65 m
- Max. Speed 75 km/h
- Service ceiling 1 500 m ASL
- Endurance 1.5 h
- Max mission radius (D/L) 30 km

SKELDAR V-125 DEVELOPMENT

Payload	15 kg
MTOW	125 kg
Main Rotor	3.5 m
Max. Speed	>120 km/h
Service ceiling	>2 500 m ASL
Endurance	3.5 h
Max mission radius	>40 km

AVAILABLE 2011



SAAB

SKELDAR V-600 CONCEPT

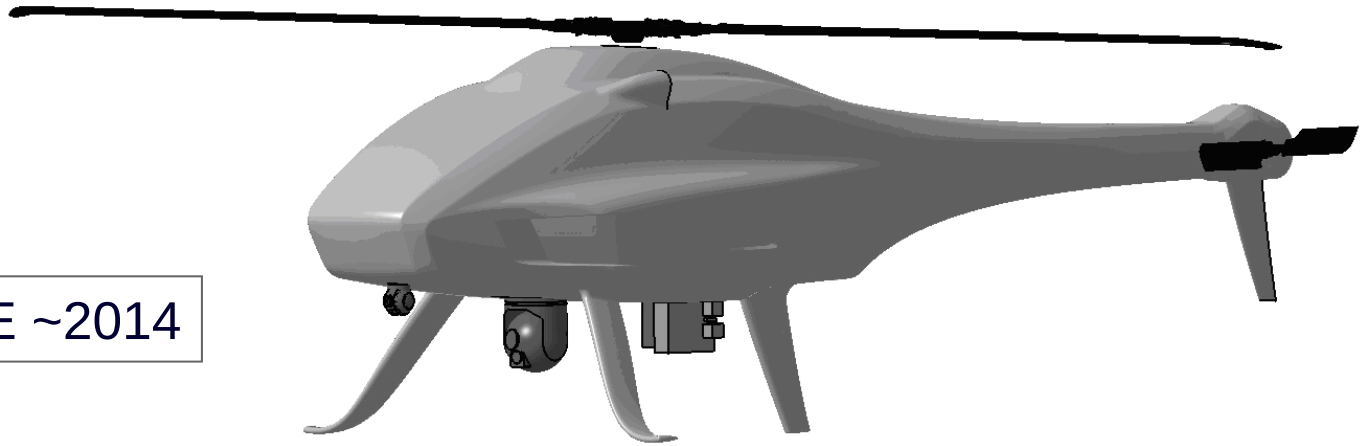
Key features:

- Multi payload capability
- Higher degree of redundancy

SKELDAR V-600 CONCEPT

Typical performance are:

- 8 hrs endurance
- 100 kg payload
- 600 kg MTOW
- 7 m rotor diameter

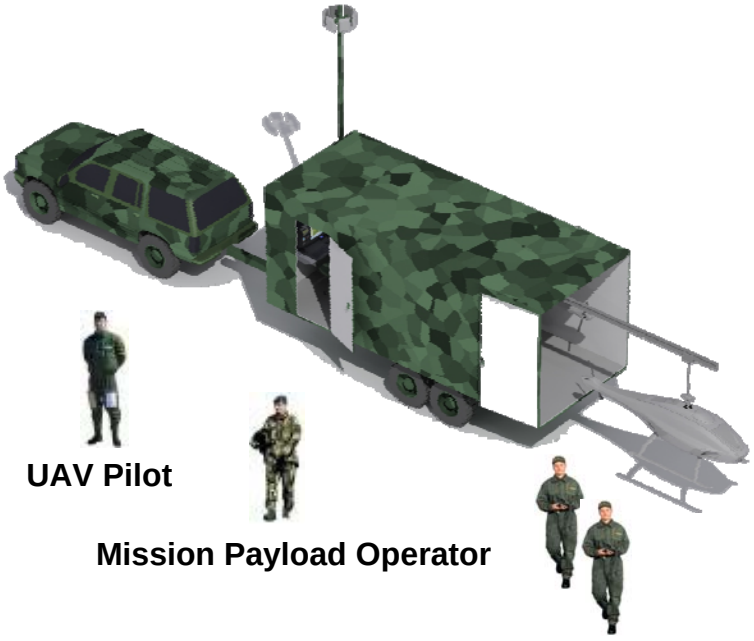


AVAILABLE ~2014

One System

UAV Control Station

2x Air Vehicles



UAV Pilot

Mission Payload Operator

2 x Technician

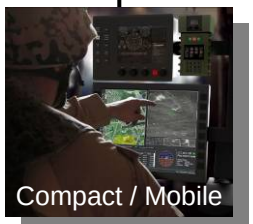
Maintenance equipment

Payloads

Skeldar® UAS

Control Stations


Generic


Compact / Mobile


Ship


Portable/RVT

Air Vehicles


Skeldar V-600

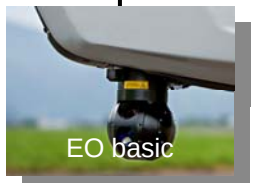

Skeldar V-200

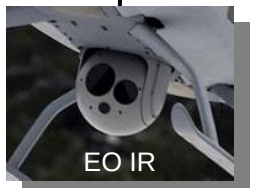

Skeldar V-125

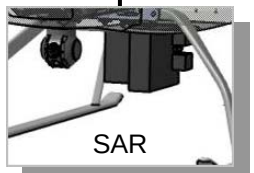

Neo


Koax

Mission Payloads


EO basic


EO IR


SAR

SIGINT

Data Links


2 x UHF C2
C/L-band Data


Mobile


Long range

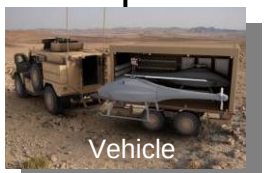

Portable

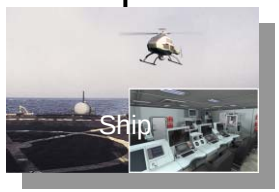
System Integration


SSIC


CMS

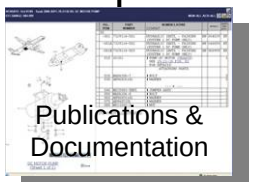

Container

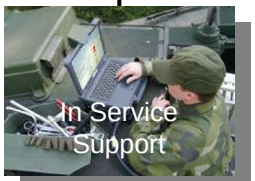

Vehicle


Ship

ILS


Training


Publications & Documentation


In Service Support


Supply Support


Rear Support & Test Equipment

SAAB

SKELDAR™ OPERATIONAL UTILITY

SAAB

BASIC OPERATIONAL CAPABILITIES

- Agile flight envelope
  - Maintain visual contact with object in difficult terrain and urban areas
  - Take-off & Land in small areas
- Situational Awareness
  - Provide real-time imagery to decision maker
- Easy to use
  - Point-and-Fly
  - Point-and-See
- Highly effective UAV system
  - Relatively small unit, minimum 3-4 persons
  - Low logistic foot-print, thanks to no Take-off & Land equipment

SAAB

SKELDAR V-200 during Convoy protection

IMPROVING MILITARY CAPABILITIES

- Situational Awareness
- Surveillance and Reconnaissance
- Target Acquisition & Designation
- Battle Damage Assessment
- Search and Rescue
- Aerial Photography & 3D Mapping
- Area Patrol & Escort
- Communication
- Mine/IED Detection

SAAB

SKELDAR V-200M

SAAB

MARITIME CAPABILITIES

- Enhanced Ship Capabilities
  - UAV system based and fully integrated on ship
  - The mobility enhances tactical response in time and space
  - Within present maritime unit crew and staffing
  - Minimum of UAV dedicated logistics
- Extended Effectiveness in Operations
  - Situational Awareness
  - Precision in Effect
  - Battle Damage Assessment
  - Survivability
  - Communications
  - Occasional Logistics

SAAB

EMPOWERING CIVIL RESOURCES

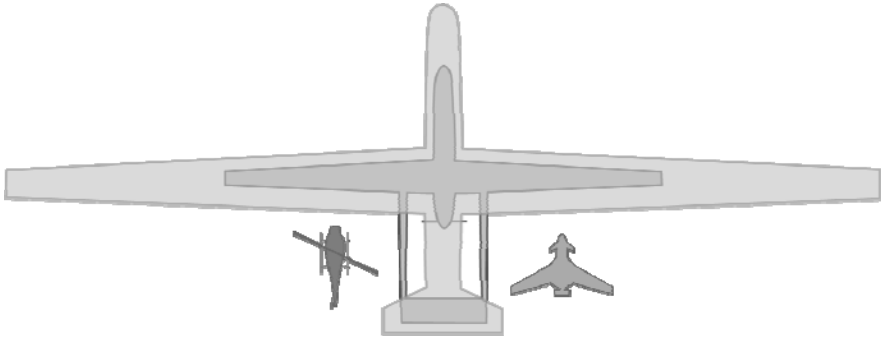
- Surveillance
- Aerial Photography
- Forest Fire Assessment
- Search and Rescue
- Border Patrol

SAAB

SAAB

ONE CONTROL STATION

- STANAG 4586
- Any type of Unmanned Aircraft

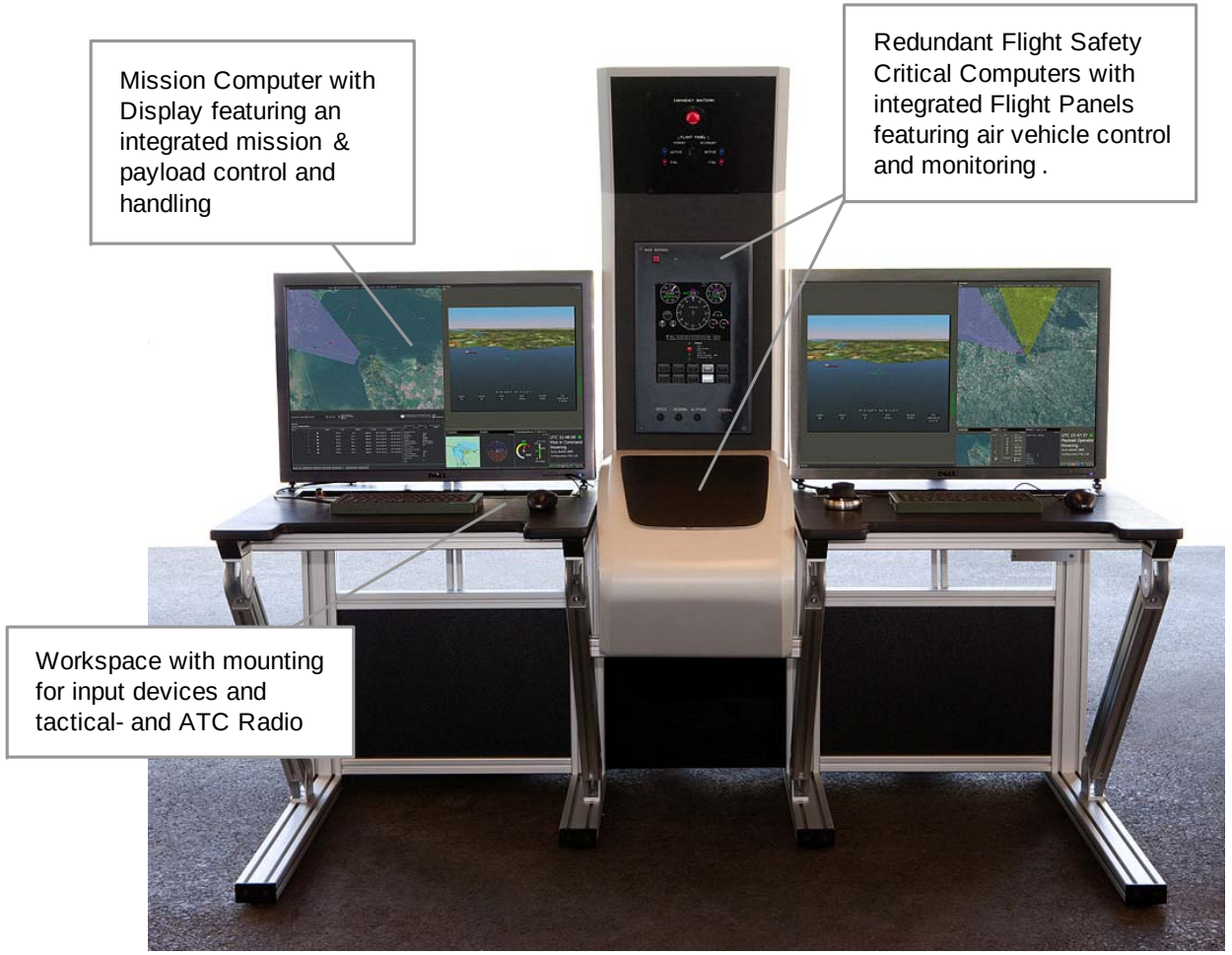


DESIGN GOALS

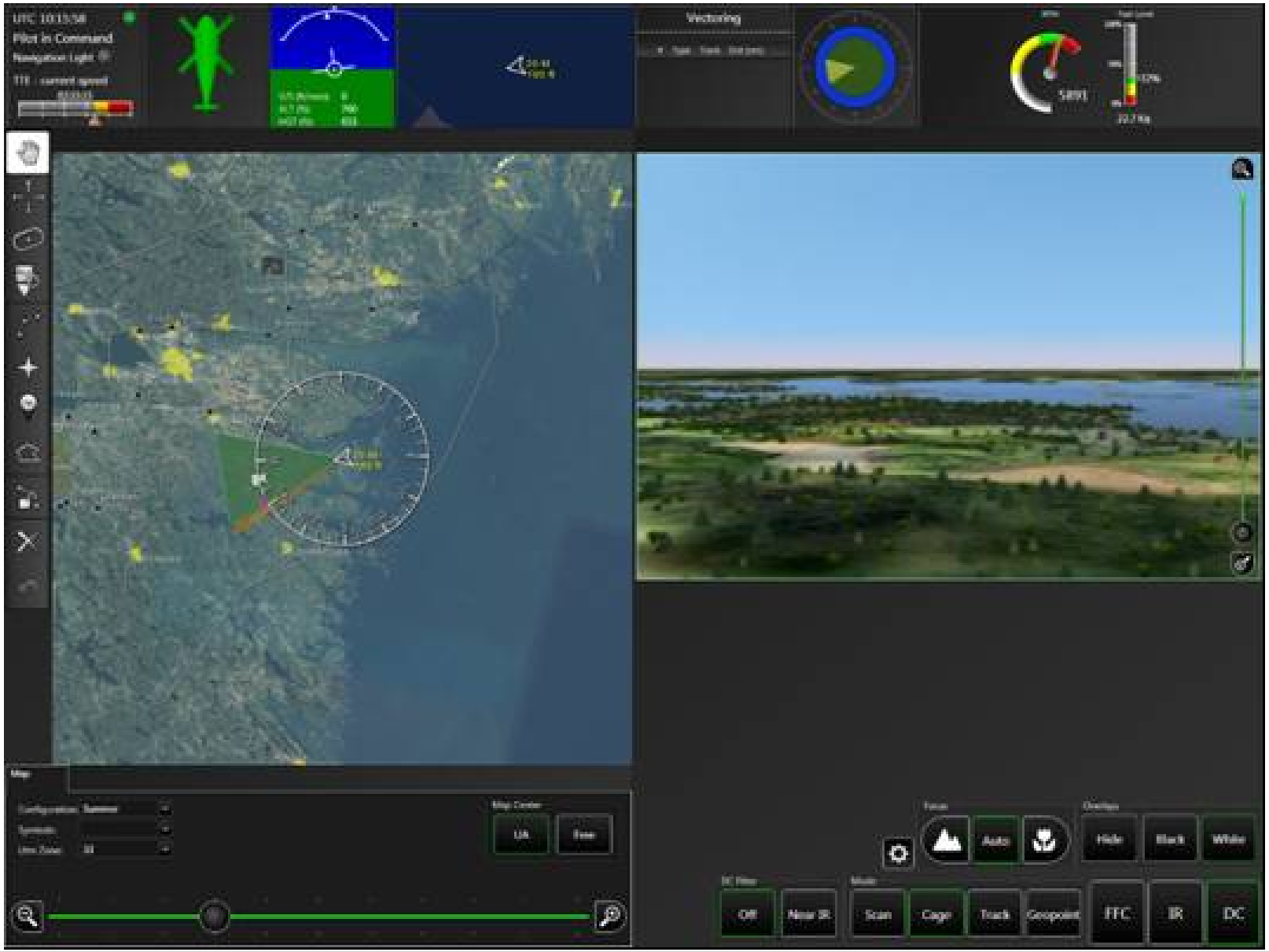
- Airworthiness and safety
- Easy to operate and intuitive

- Mission Planning
- Mission Training
- Mission Execution
- Post-Mission Processing
- Mission Evaluation

A COMMON UCS


Mission Computer with Display featuring an integrated mission & payload control and handling
Redundant Flight Safety Critical Computers with integrated Flight Panels featuring air vehicle control and monitoring .
Workspace with mounting for input devices and tactical- and ATC Radio


UTC 12:52:28
RALT ft
387
VS ft/min
1
26
0 26
GS kts
239
HDG 217 T
500
0 500
MSL ft
Vectoring
UAV123
XPDR
0006
Link 1
Link 2
Fuel
Temp
RPM
Main: 58°24'09,87" N 015°31'57,31" E MSL: 500 ft
Backup: 58°24'09,87" N 015°31'57,31" E MSL: 500 ft
Settings
ATOL »
Adjust Position »
Engine »
GPS »
Transponder »
Mission Computer: Block
Pre-flight & Test »
Arm Engine
Start Engine
Take Off
Hold
Land
Main-tenance
Stop Engine
Abort
Flight
Abort


UTC 10:13:58
Pilot in Command
Navigation Light
Vectoring
Map
Auto
Hide
Black
White
Off
Near IR
Scan
Cage
Track
Geopoint
FTC
IR
DC

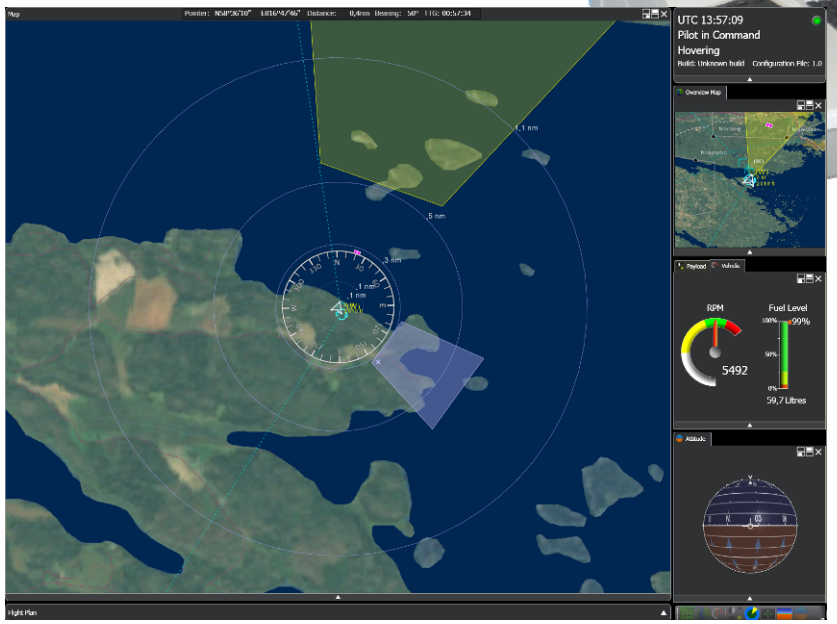
UCS INTEGRATION IN VEHICLE

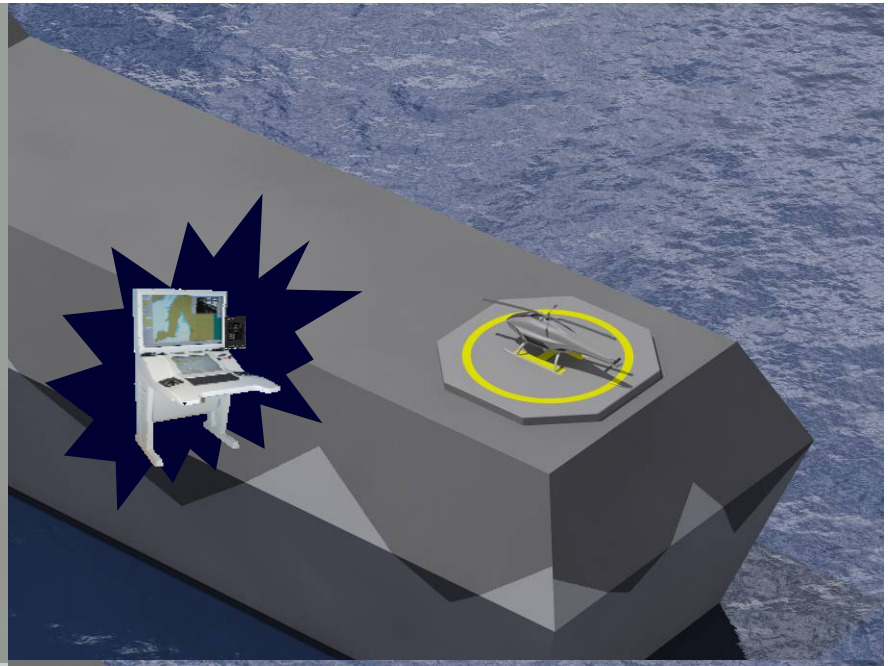
- UCS On-the-Move
  - Electronic Tether
  - Ease of Operation
  - Ruggadized solutions
- Mission Software
  - Service Oriented Architecture
  - Modular
- Flight Safety Computer
  - Stand-alone
  - Easy integration & minimum testing

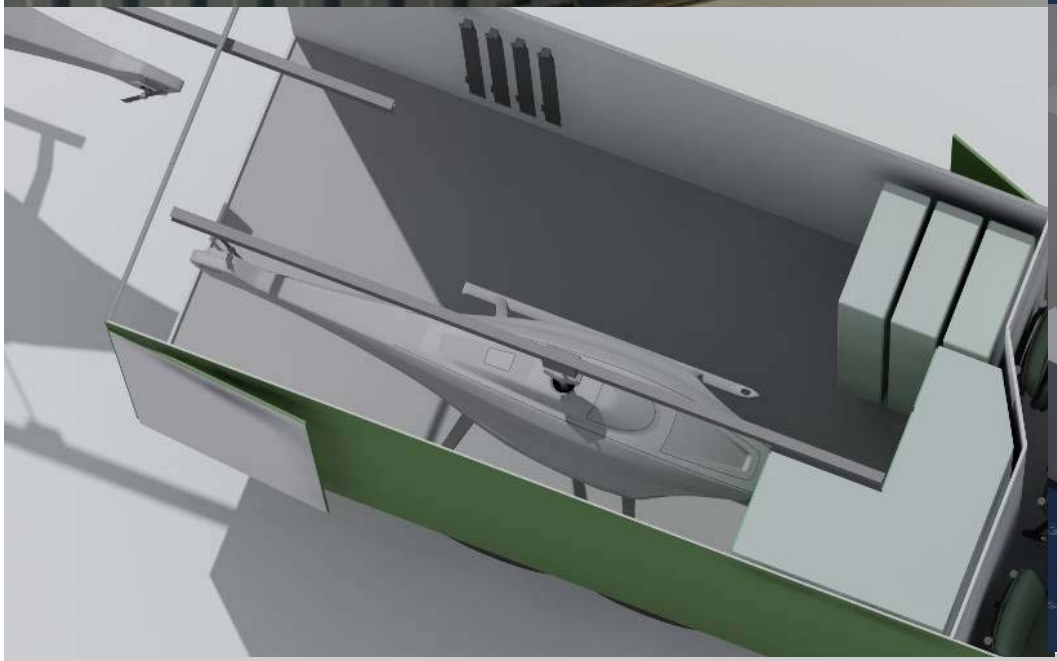
UCS CIVIL INTEGRATION

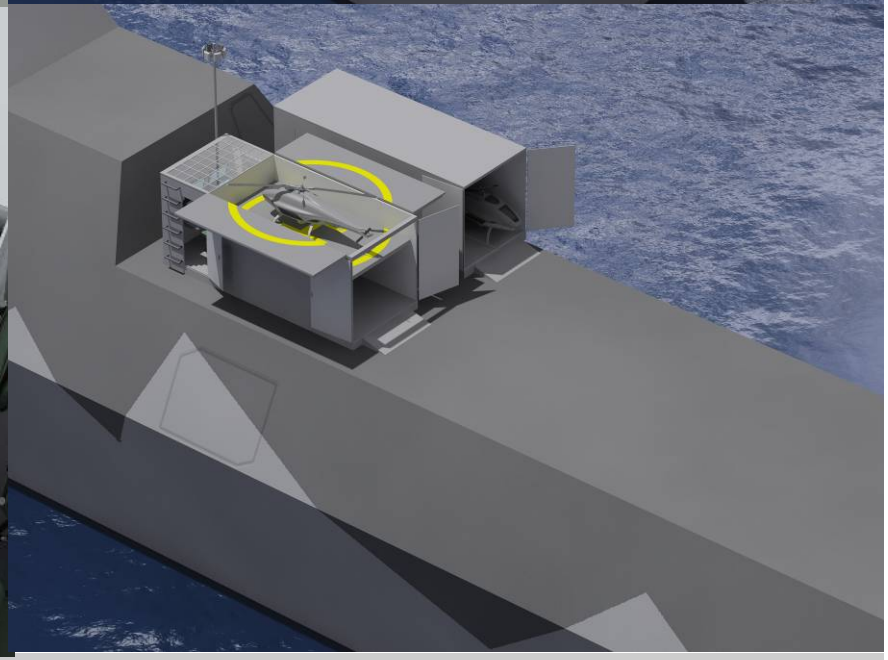
SAAB

UCS INTEGRATION IN SHIP CMS





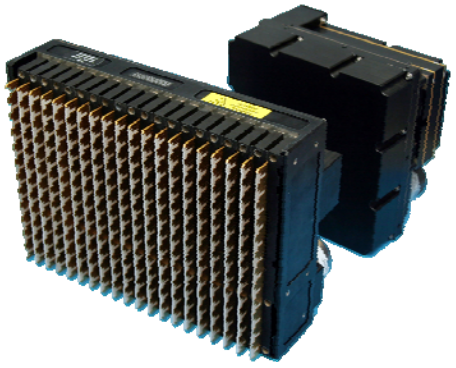




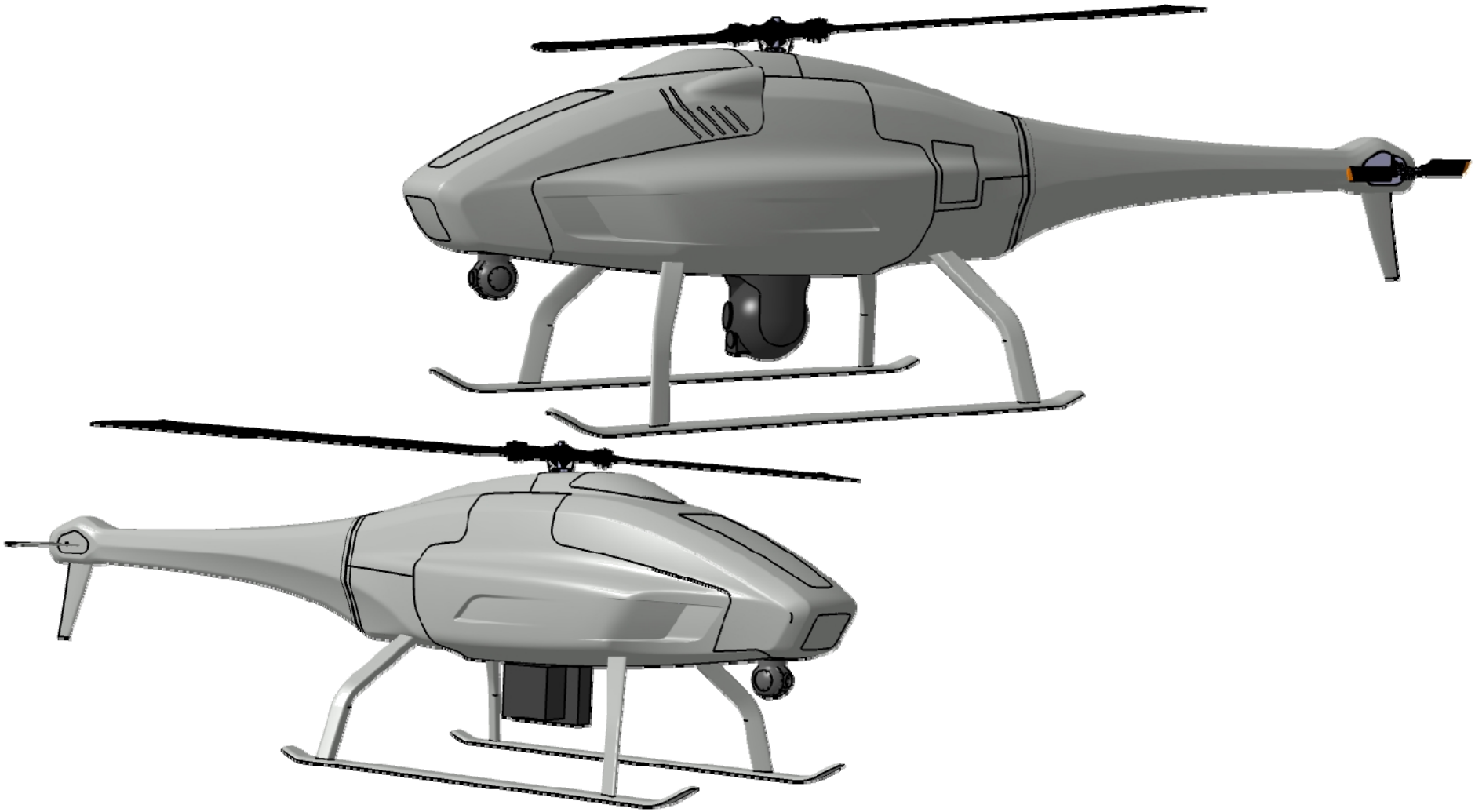
PAYLOADS

- EO/IR gimbal
  - Laser Range Finder
  - Laser Pointer
  - 3D Mapping option
- SAR/GMTI
- SIGINT/ELINT/COMINT
- AIS
- LIDAR
- Maritime Radar
- Communications Relay
- Sonar buoy
- Light cargo hook
- Megaphone
- Searchlight / Illumination
- … and more

Plug & Play Payload Alternatives



PAYLOAD CONFIGURATIONS



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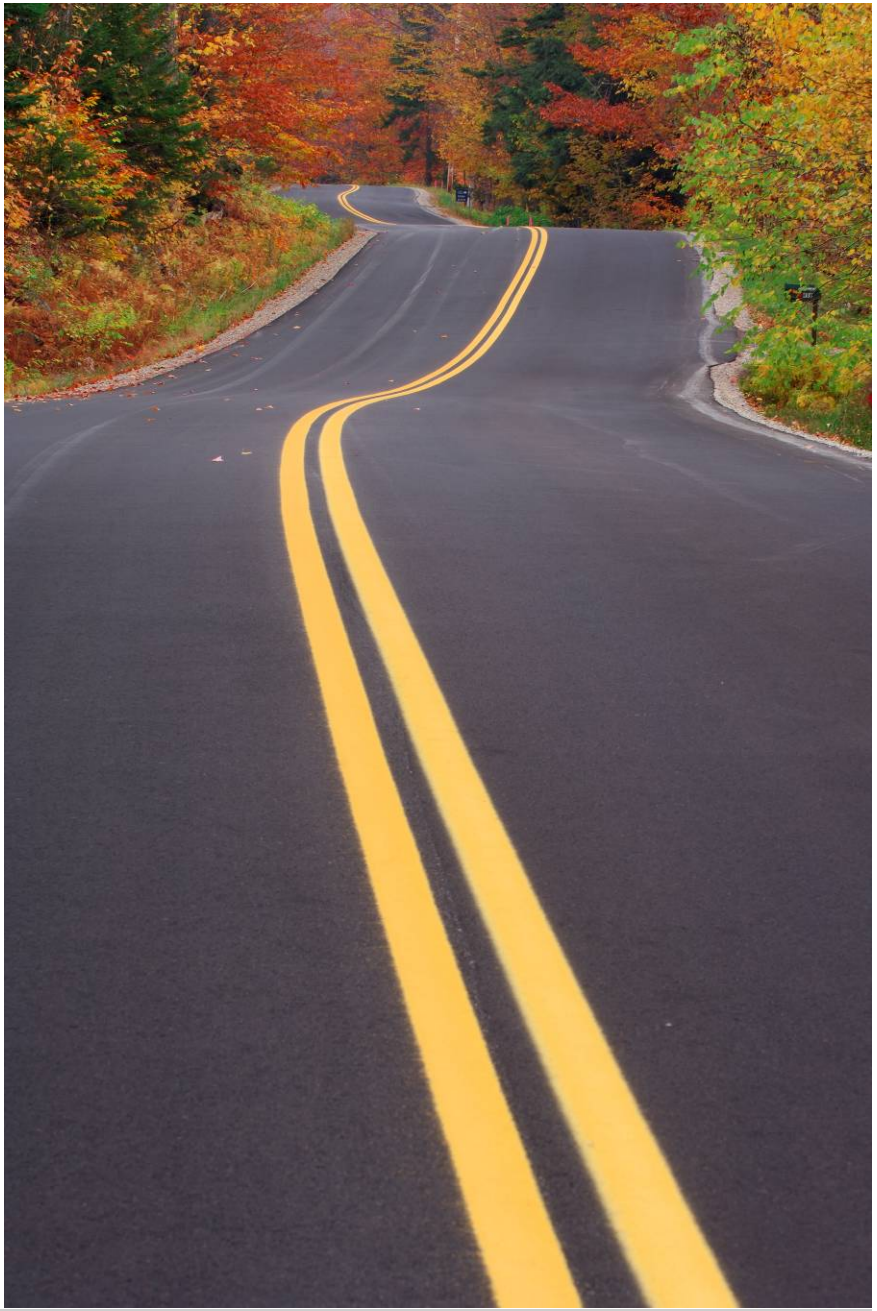
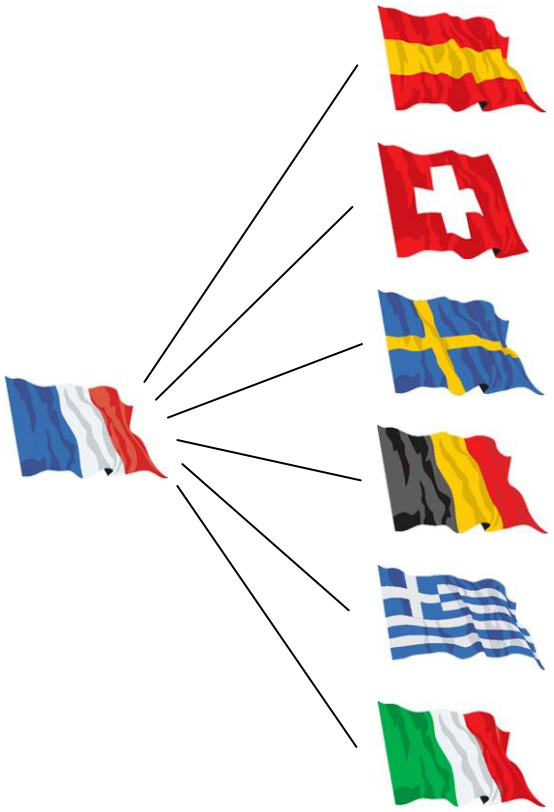


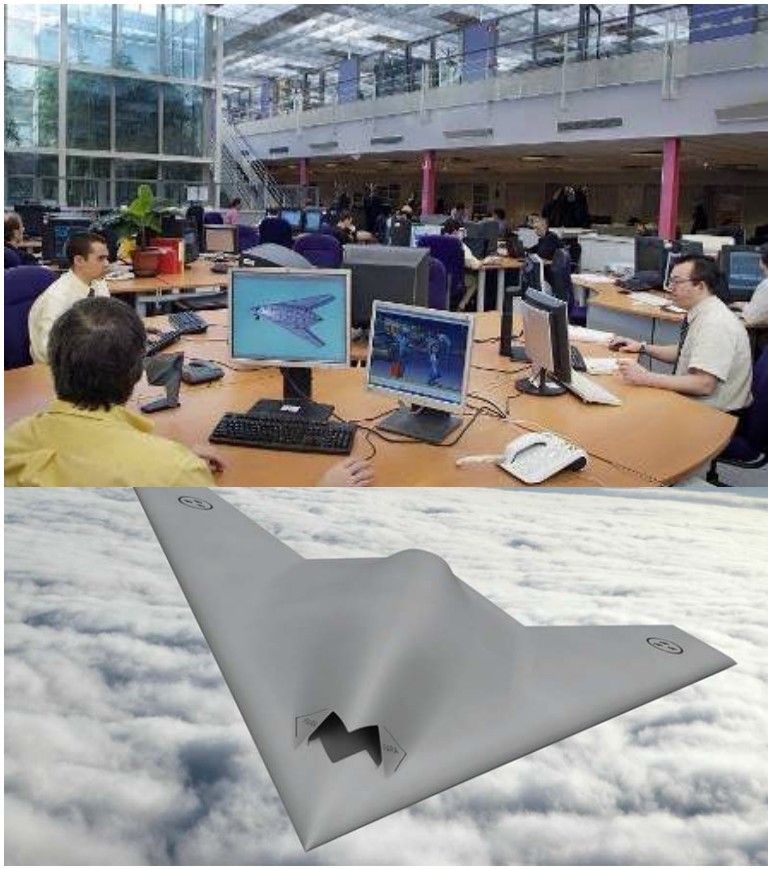
THE NEURON PROGRAM

- France main contractor with Dassault as Prime Industry
- SAAB/Swedish part ~ 25%
- Purpose to develop technology for manned and unmanned air vehicles



PROGRAMME PRESENT STATE

- About 500 engineers working with NEURON
- About 100 engineers at Saab involved whereof about 10 stationed in Paris



Demonstration Goals

One single demonstrator

Low level signature (Radar & Infrared)

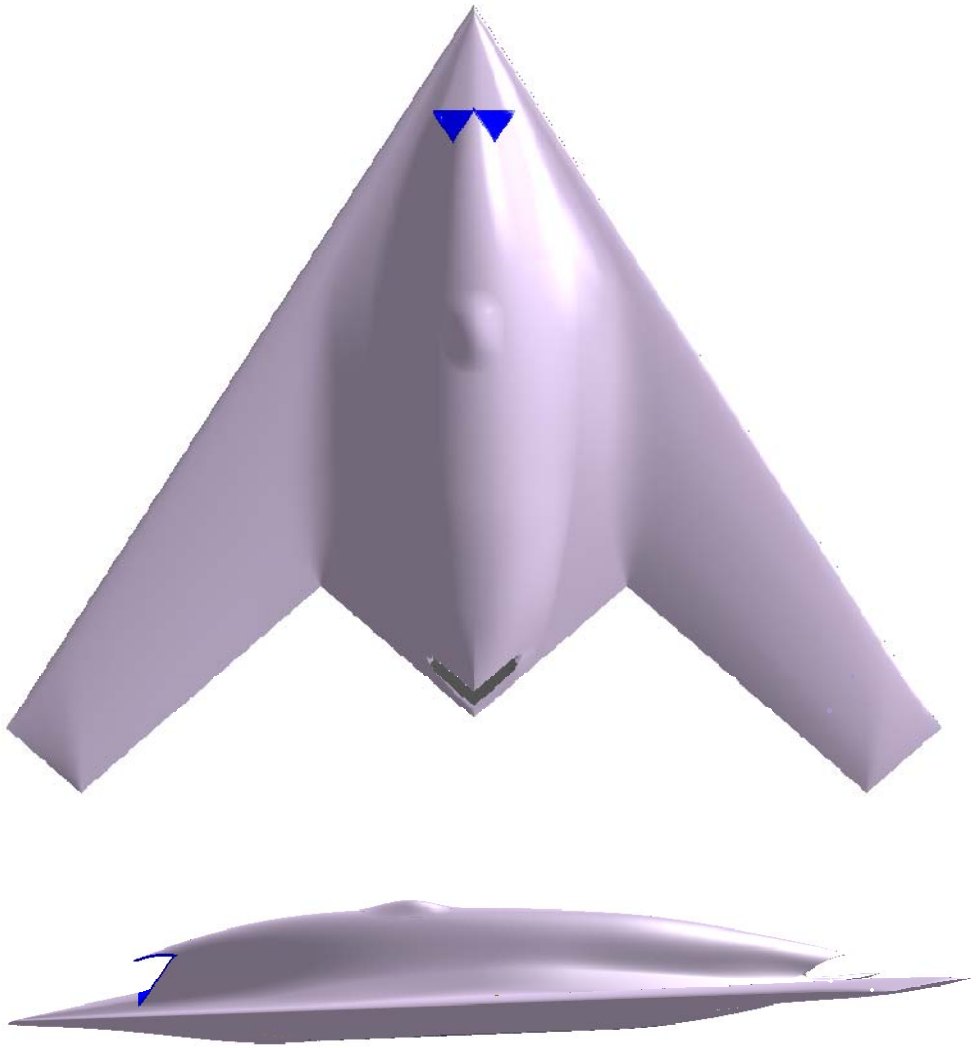
Air to Ground mission, with ground station connected to a C4ISR/NCW network

Air to Ground weapon delivery from internal bay with possibility to re-plan mission during flight

Search from cost breaking-through technologies (airframe, avionics, COTS)

General characteristics

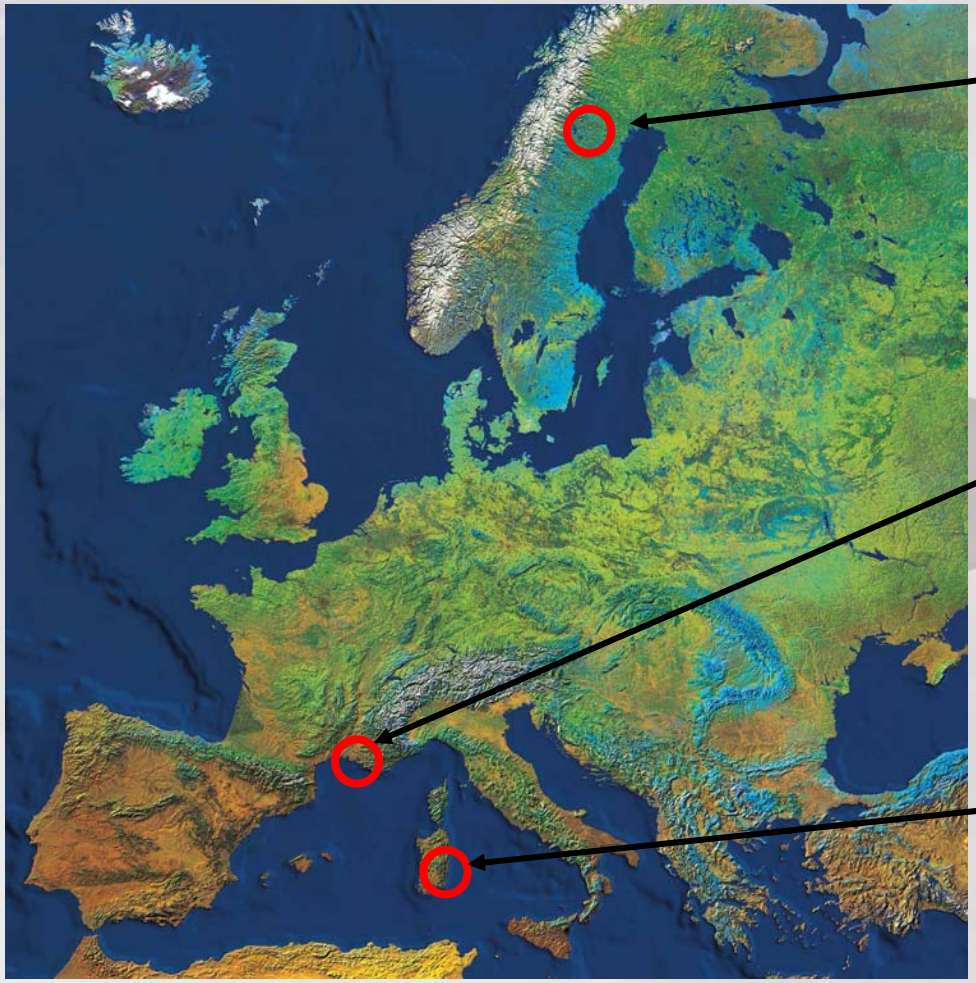
- Main characteristics:
  - Fuselage length ≈ 9,3 m
  - Wing span ≈ 12.5 m
  - 2 Weapon Bays
  - Empty Weight ≈ 4800 kg
  - MTOW ≈ 6300 kg
- Engine pre-selection:
  - RRTM Adour Mk951 hybrid
- Main performance TBC:
  - Approach speed ≈ 110 / 120 kt
  - Mach maxi ≈ 0.8



SAAB IN THE NEURON PROGRAM

- General design and airworthiness
- Flight demonstrations in Sweden
- Low signature, nozzle and doors
- Aerodynamic analysis and design
- Computers and avionics equipment
- Head of avionics and design
- Fuel System
- Design and production of main fuselage

Flight test locations



SWEDEN:
Vidsel Test Range

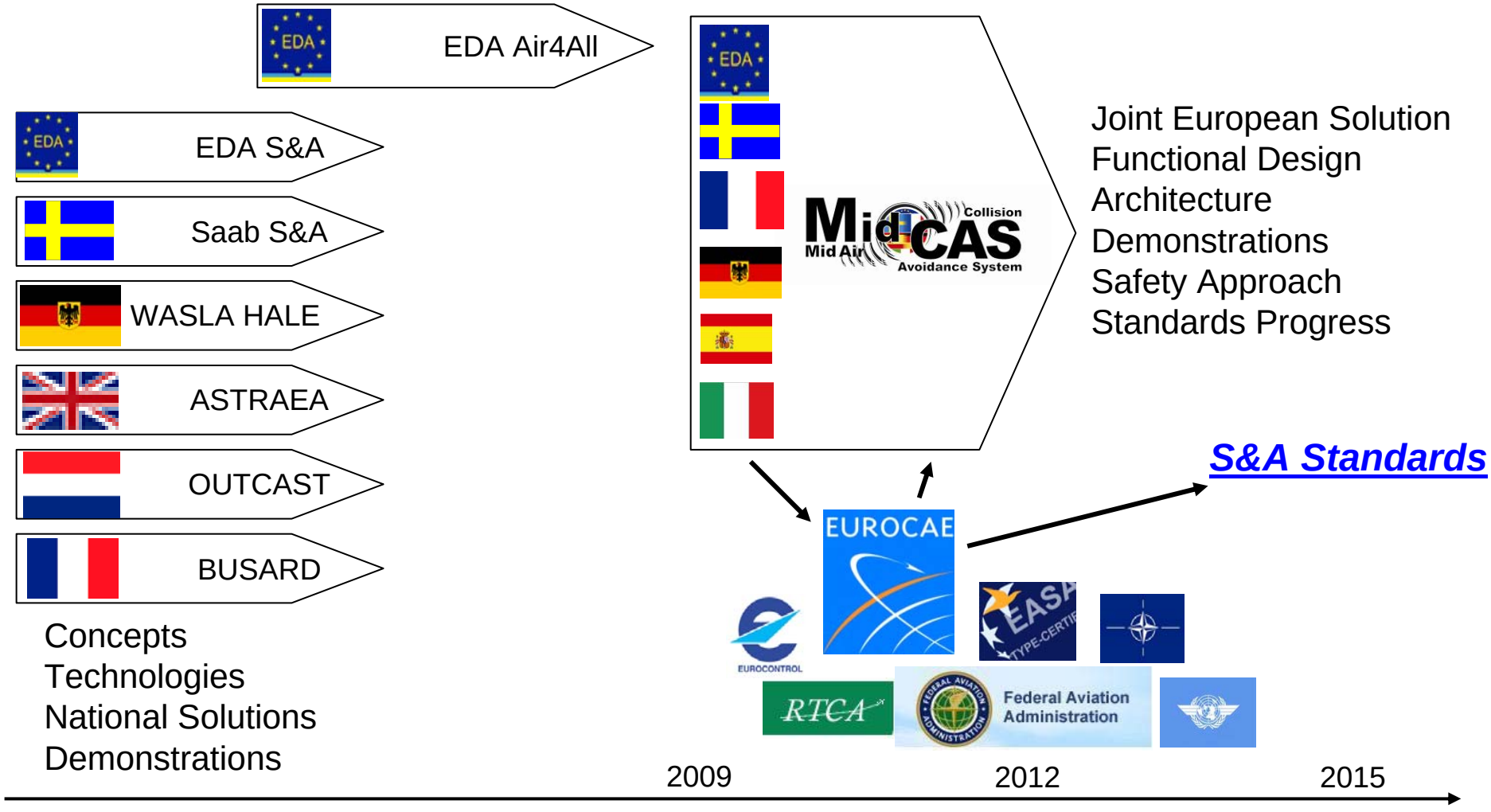
FRANCE:
Istres Test Centre

ITALY:
Perdasdefogu Test Range

UAS Traffic Insertion

- A key issue to resolve for growth of the UAS market beyond military applications
- The Air4All study from EDA established a roadmap primarily in 5 steps to achieve traffic insertion
- Currently EU acts intensively to establish funding for implementation of the roadmap through EDA and EU FP programmes
- Key issues include Sense& Avoid, Command and Control, Frequency Allocation, Certification Basis and Training

FUTURE OF SENSE AND AVOID

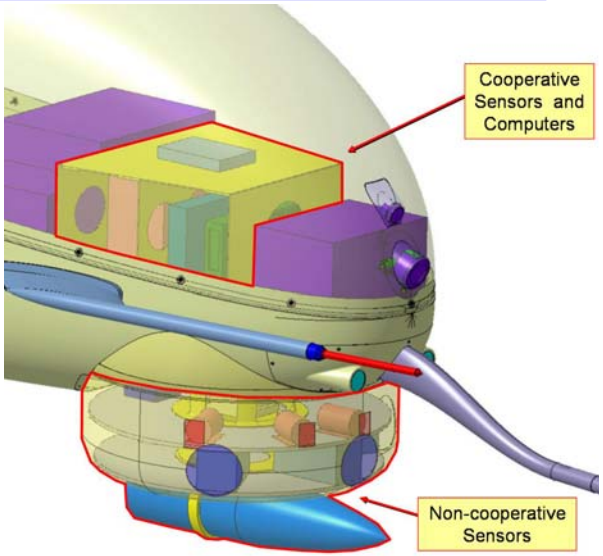


MIDCAS Mission statement

MidCAS will demonstrate the baseline of solutions for the UAS Mid-air Collision Avoidance Function

- Acceptable by the manned aviation community

- Compatible with UAS operations in non-segregated airspace by 2015



THE SHADOW 200 AIR VEHICLE

TUAV ISTAR system for international operations

- An Integrated Solution
  - Mature tactical UAS, Shadow 200
  - Image analysis and interpretation tool, SSIC
  - Integrated and adapted into the Swedish Armed Forces
  - Logistics
  - Training
- Well-proven
  - The Shadow 200 system just recently reached 500.000 logged flight hours

SAAB

THE COMPLETE UAV03 SOLUTION

SAAB

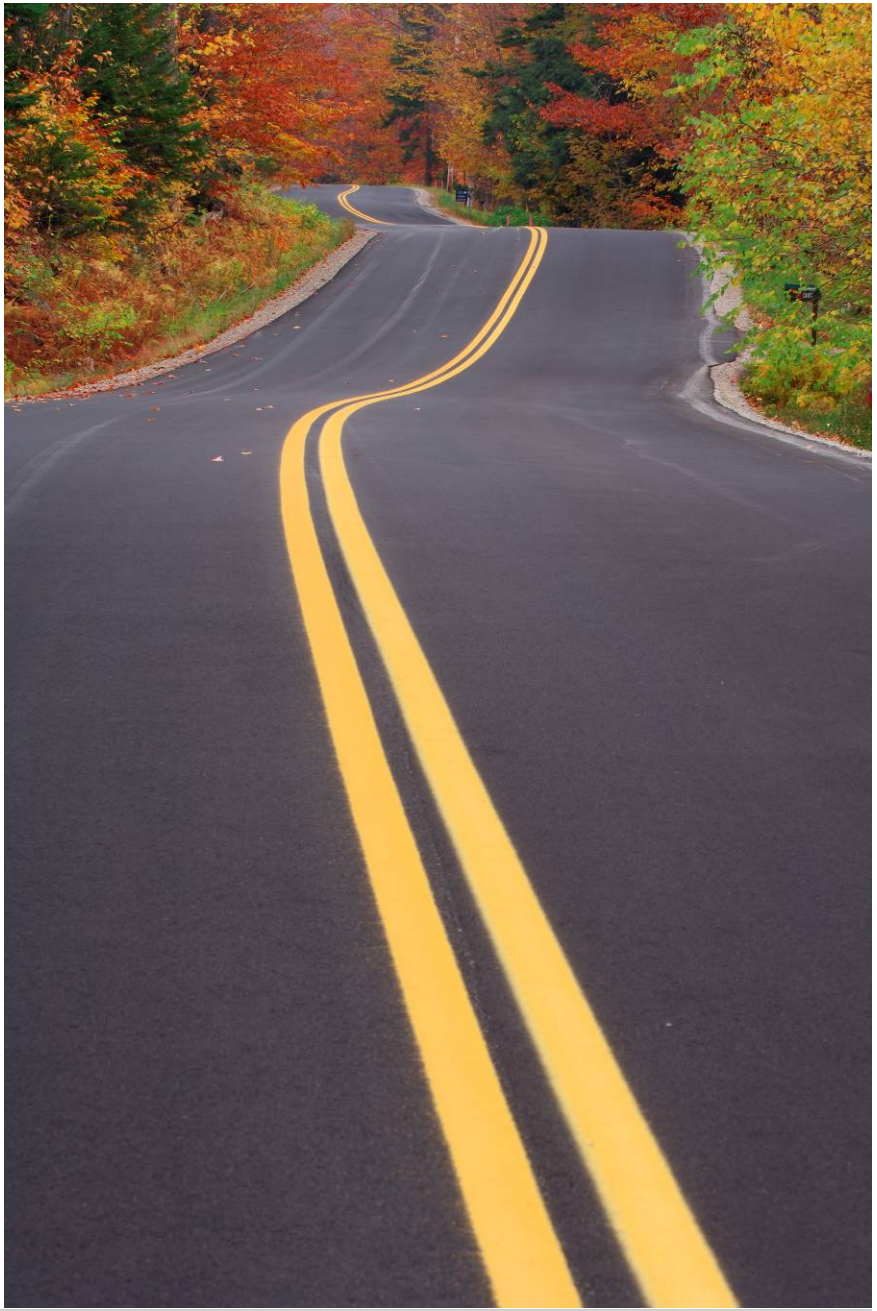
UAV03 ÖRNEN

- A VITAL PIECE OF THE INTELLIGENCE PUZZLE -

SAAB

AGENDA

- Saab
- Skeldar™ and VTOL Family
  - One Control Station
  - Mission Payload
- Saab UAV Programme
  - Neuron
  - MidCas
  - TUAV-ISTAR
- UAS Market
  - Competitors



Marknad forts.

Market Segment	Market Size	Drivers	Comments
Land domain	➢250 systems 2009-2014	IED Surveillance/Recce. ISTAR International Ops.	Payloads that need VTOL Ease of Operation, i.e. need of few personnel Require Heavy Fuel Engine Open architecture solutions for C4I integration
Naval domain	➢150 systems 2009-2014	Piracy Integrated solutions Low footprint	Integration into Naval C4I-systems Automatic TO/L Need ship certification
Security domain	TBD	Harbor Protection Blue Light Forces	Highly interesting Pending civil certification for UAS
Civil domain	TBD	Power plant Power grids Agriculture Media	High growth potential Pending civil certification for UAS

Conclusion The market of VTOL UAS are in the beginning of its era. High interest form customers due to low logistic footprint.

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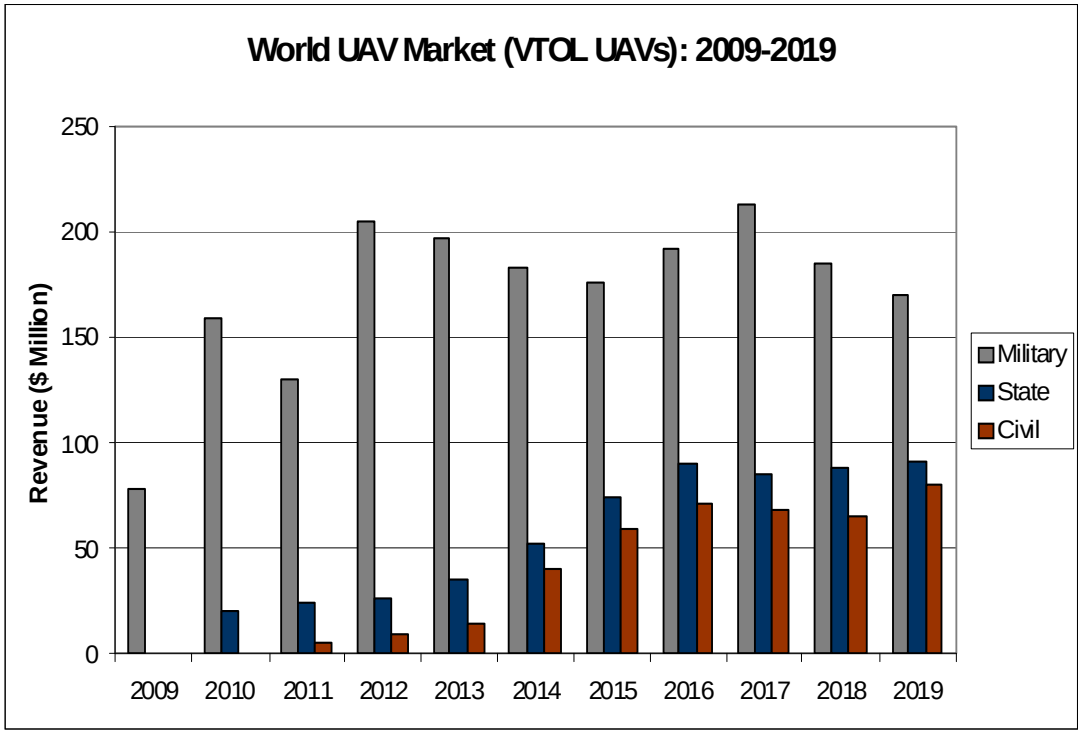
Marknad

- 400 pågående UAS program varav 160 i USA
- Största marknaden är USA följt av Europa och Asia-Pacific



Källa: sammanställning av bl. a Frost & Sullivan

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