Framtiden är obekräftad
- 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
- Dynamics
- Electronic Defence Systems
- Security and Defence Solutions
- Support and Services
- Marketing and business development
- Functional management

- CEO
- COO
- CMO

Corporate functions
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?)
HELIICOPTER & 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 Saab’s current UAS position - originating in manned aviation

**Heavy RPV 1975**

**SHARC**
First flight 2001
First European fully autonomous flight 2003

**FILUR 2005**

**International Studies 1997-**

**Neuron**

**Skeldar**

**Traffic Insertion**

**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
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

Maintenance equipment

UAV Pilot

Mission Payload Operator

2 x Technician

Payloads
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
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
SKELDAR V-200M
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
EMPOWERING CIVIL RESOURCES

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

Workspace with mounting for input devices and tactical- and ATC Radio

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
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
AGENDA

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UAS Market
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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)
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

EDA Air4All

Joint European Solution
Functional Design
Architecture
Demonstrations
Safety Approach
Standards Progress

EDA S&A
Saab S&A
WASLA HALE
ASTRAEA
OUTCAST
BUSARD

Concepts
Technologies
National Solutions
Demonstrations

S&A Standards

2009 2012 2015
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
THE COMPLETE UAV03 SOLUTION
UAV03 ÖRNEN
- A VITAL PIECE OF THE INTELLIGENCE PUZZLE -
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Marknad forts.

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

Conclusion

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