CHALLENGES FOR UNMANNED FLIGHTS IN CONTROLLED AIRSPACE

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PREAMBLE

• **Challenges for Unmanned flights in Controlled Airspace** is largely linked to the fact that there is no pilot onboard
  - In general terms, the challenges are to make the concepts, procedures and technologies involved, **safe**. I.e. being certified to meet **regulatory requirements**, that to some extent do not exist today. And at the same time **cost-effective**.
  - This in turn links to challenges of any **remotely operated system** and **increased automation**, in safety-of-life-type of applications.

• In a wider context, the challenge also include protecting Controlled Airspace from those (small “drones”) that should not be there
  - In my presentation, I will be wider than strictly controlled airspace (airspace class A-D) but also uncontrolled (airspace class F & G) and “new drone airspace” (low-level, VLL, UTM)

• Note: “**Unmanned is manned**”, they are piloted from remote and not “drones” flying on “their own”. Pilot/operator always in charge!
  - **RPAS:** Remotely Piloted Aircraft System – the official (ICAO) terminology
  - **UAS, UAV:** Unmanned Aircraft System, Unmanned Aerial Vehicle
  - **Drones:** Becoming the “general term” to encompass all types of RPAS

• Additional slides (not presented) available in the online version
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Quick overview of Saab in the next few slides. See additional slides in online (PDF) version and at www.saabgroup.com
IN 1937 WE TOOK OFF
OUR BROAD OFFERING
AN OVERVIEW OF OUR COMPANY (2015)

SALES
27,186 MSEK

14,700 EMPLOYEES

100 CUSTOMER COUNTRIES
HOW WE ARE ORGANISED

BOARD
CEO

MARKET AREAS
- Asia Pacific
- Europe, Middle East & Africa
- Latin America
- Nordic & Baltic
- North America
- Our headquarters…

GROUP FUNCTIONS

BUSINESS AREAS
- Aeronautics
- Dynamics
- Surveillance
- Industrial Products and Services
- Support and Services

Kockums

Our headquarters…

Brasilia, Brazil
Washington D.C., USA
Stockholm, Sweden
London, United Kingdom
Bangkok, Thailand

I’m here!
AERONAUTICS

- Fighter aircraft systems
  - Gripen

- Advanced pilot training systems
  - Developing a trainer together with Boeing (T-X)

- Unmanned aerial vehicle systems, RPAS/UAS
  - Leading technical capability (MIDCAS, Neuron etc.)
AERONAUTICS

Headed by Ulf Nilsson

- Product areas
  - Gripen
  - Advanced pilot training systems

Share of sales 2015 22%

- Locations
  - Sweden

Order backlog, MSEK 59,476
Sales, MSEK 6,262
Operating income*, MSEK 509
No. of employees (FTE) 2,746

Restated following structural change 1 January 2016

* EBIT
TRENDS: COMPARE PAST ACHIEVEMENTS – TO FIND OUT WHAT LIES AHEAD?
TRENDS: FUTURE AVIATION WILL BE REMOTE, AUTOMATED, …

• Increased **Automation** in society, so also in aeronautics
  – Automation, Decision Support, Autonomy

• Future aviation will be **manned and unmanned**
  – Both in civil and military domain
  – Unmanned is manned, remotely controlled (RPAS), pilot/operator still responsible!
  – A mix of remote presence and on-site

• **System and man in collaboration**
  – Mixed initiatives (collaboration man-machine)
  – SoS - System of Systems (cooperative systems/functions)

• **ISR** – information and situational awareness
CHALLENGES
CHALLENGES: OPENING THE AIRSPACE… OR CLOSING?

Threat of opportunity?
CHALLENGES TO INTEGRATE RPAS/DRONES: EVOLUTION OR REVOLUTION?

• *Evolution* of existing aviation, *revolution* w.r.t small drones private and professional use
  – RPAS in traditional airspace: “Business as usual”, with pilot on ground → update of current regulation (traditional Air Traffic Management - ATM)
  – Low flying drones: “Completely new to aviation” → new concept of operations, new regulations (not ATM – UTM, UAS Traffic Management)

• Europe need to address two main goals simultaneously:
  – Safe integration & acceptance
  – Foster RPAS/Drone business in Europe

• The domain is very wide. Integration is not one homogeneous exercise.
  – *Integrate* certified RPAS with manned aviation
  – *Open* the airspace for smaller RPAS – "Drones"
  – Public acceptance to increased automation, integrity

Key challenge is new and updated *regulation* and new *technologies* as enablers (e.g. Sense/Detect & Avoid)
CHALLENGES:
KEY TECHNOLOGIES FOR RPAS INTEGRATION

- **Sense/Detect & Avoid**
  - Replicating the human ability to “see and avoid” – aviation cornerstones “rules of the air”
  - Goes well beyond current manned aviation, e.g. including fully automatic collision avoidance

- **Contingency/Emergency Recovery**
  - E.g. Link-loss, Flight termination

- **Communication - Command & Control (C2)**

Key challenge is the lack of **standards** and **regulation** to certify the equipment to.
SAAB AND THE DOMAIN OF RPAS, REMOTE TECHNOLOGIES AND AUTONOMY
SAAB AND REMOTE AVIATION TECHNOLOGIES

- Building on long experience in the aeronautical domain
  - Over 4000 aircraft built
  - RPAS: Sharc, Filur, Neuron, Skeldar, UAV03 Eagle, Qube, …
  - Remote ATS (R-ATS): r-TWR program since 2006

- R&D “first” innovations, ex:
  - First fully autonomous flight in Europe (Sharc 2003)
  - World’s first operational R-ATS (April 2015)
  - First European fully automatic collision avoidance maneuver RPAS vs. manned intruder (MIDCAS, 2015)
  - World’s first R-ATS+RPAS demonstration (2015) [www.youtube.com/watch?v=qQy6cXYx43M]

- Major R&D contribution
  - Leading the European Detect & Avoid program MIDCAS and Detect & Avoid in SESAR2020
  - Leading RPAS Contingency in the European ERA program
  - Active contribution to ICAO RPAS Panel, EUROCAE, RTCA, JARUS and EASA
  - National RPAS integration programs incl. technology spread to/from mil/civil, manned/unmanned, air/sea/land, academia/industry/authorities etc.
  - R-ATS in SESAR2020

- Product Development
TOP 4 MULTINATIONAL AERONAUTICS R&T PROGRAMS

**JTI Clean Sky** (1600+4000M€)
Environmentally friendly aircraft
European Union’s largest research project

**Neuron** (450M€)
Europe’s largest multinational military demonstrator

**MidCAS** (50M€)
European Defence Agency’s largest research project

**SESAR** (2100+1500M€)
ATM
Together with Clean Sky, EU’s largest research projects

Saab one of 12 Founding Companies

Sweden/Saab Co-project Leader

Sweden/Saab Project Leader

Saab leading Remote TWR and RPAS Detect & Avoid
MIDCAS

- European Detect & Avoid program MIDCAS (2009-2015)
- Industry consortium of 13 partners from the 5 nations under EDA contract
  - Sweden (lead)
  - Germany
  - France
  - Italy
  - Spain
- Follow-on MIDCAS SSP planned to start fall 2016
POTENTIAL AREAS OF COLLABORATION: 
BRINGING IDEAS TOGETHER, CREATING UNRIVALLED PARTNERSHIPS…

• Saab is active in the area of RPAS/Drones, remote technologies, automation to be able to provide complete systems and sub-systems in the future aeronautical domain, both civil and military.

• General areas in Remote Control and Automation
  - Technology - Research & Development, Demonstrations
  - Technology – Products (systems, sub-systems)
  - Standardisation and Regulatory Framework
  - Cross-fertilization between transport modes (air, land, sea, rail) – technology, safety methodology, legal (liability) etc.

• RPAS/Drones integration into the existing and future airspace
  - Airborne solutions (focus on Certified & Specific categories)
    - Detect & Avoid
    - Airborne sensors
    - C2
    - Miniaturization
  - Airspace protection (all categories of RPAS/Drones)
    - Geo-fencing solutions
    - UAS Traffic Management (UTM) (for smaller drones, low flying)
  - Research & Development
    - Live trials, large-scale demonstrations/validations
  - Technology and product development
    - Airborne sensors
Thank you for your attention!

See you in the breaks or industry meetings

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RPAS and Remote Technologies –
"Be where you want, act where you needed"

World’s first R-ATS+RPAS demonstration (2015)
  youtube.com/watch?v=qQy6cXYx43M