SAAB RESEARCH, COOPERATION AND GLOBALIZATION

Tomas Ireman
Saab Aeronautics
2018-06-19

HOW WE ARE ORGANISED

Aeronautics

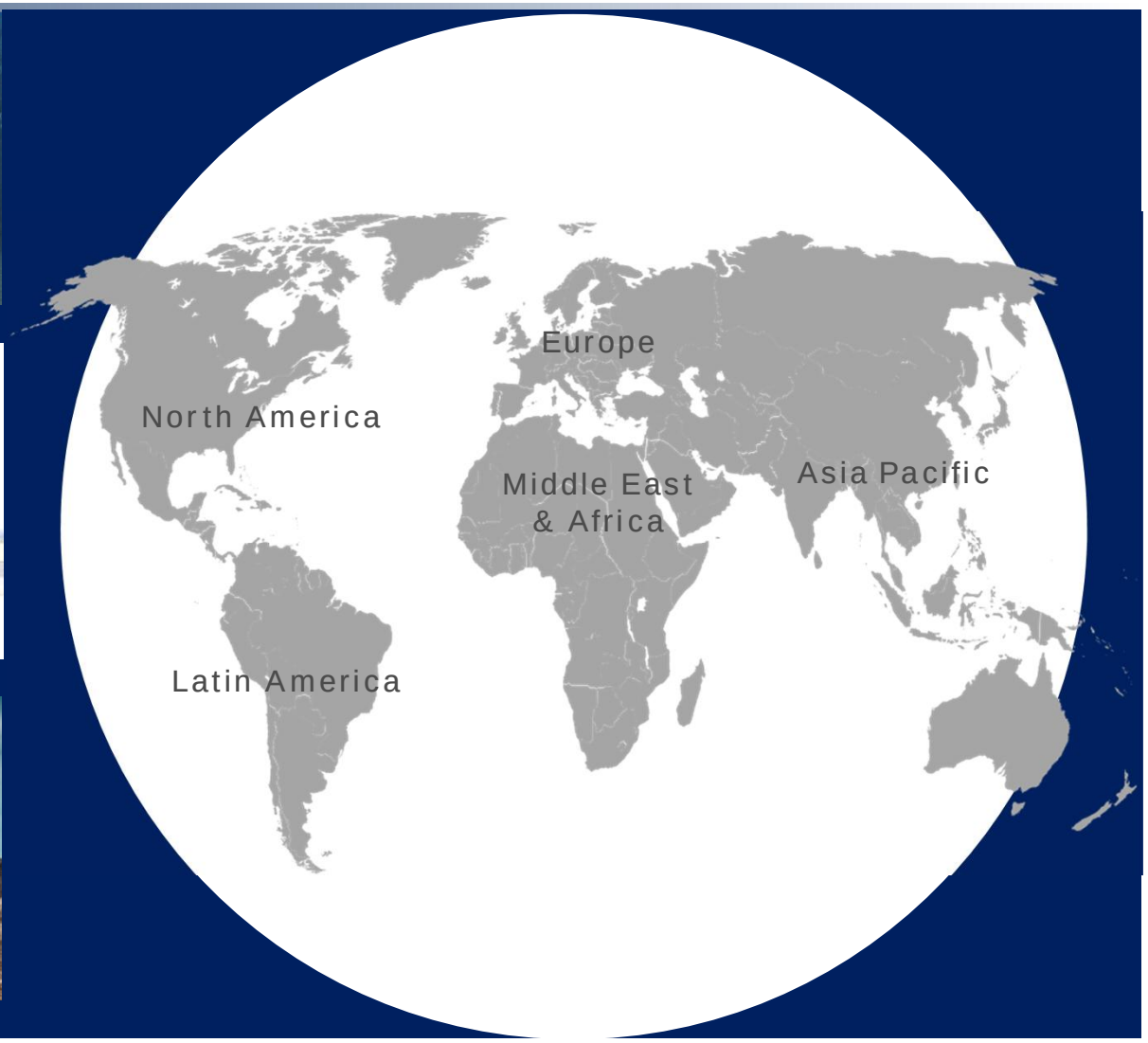
Kockums

Dynamics

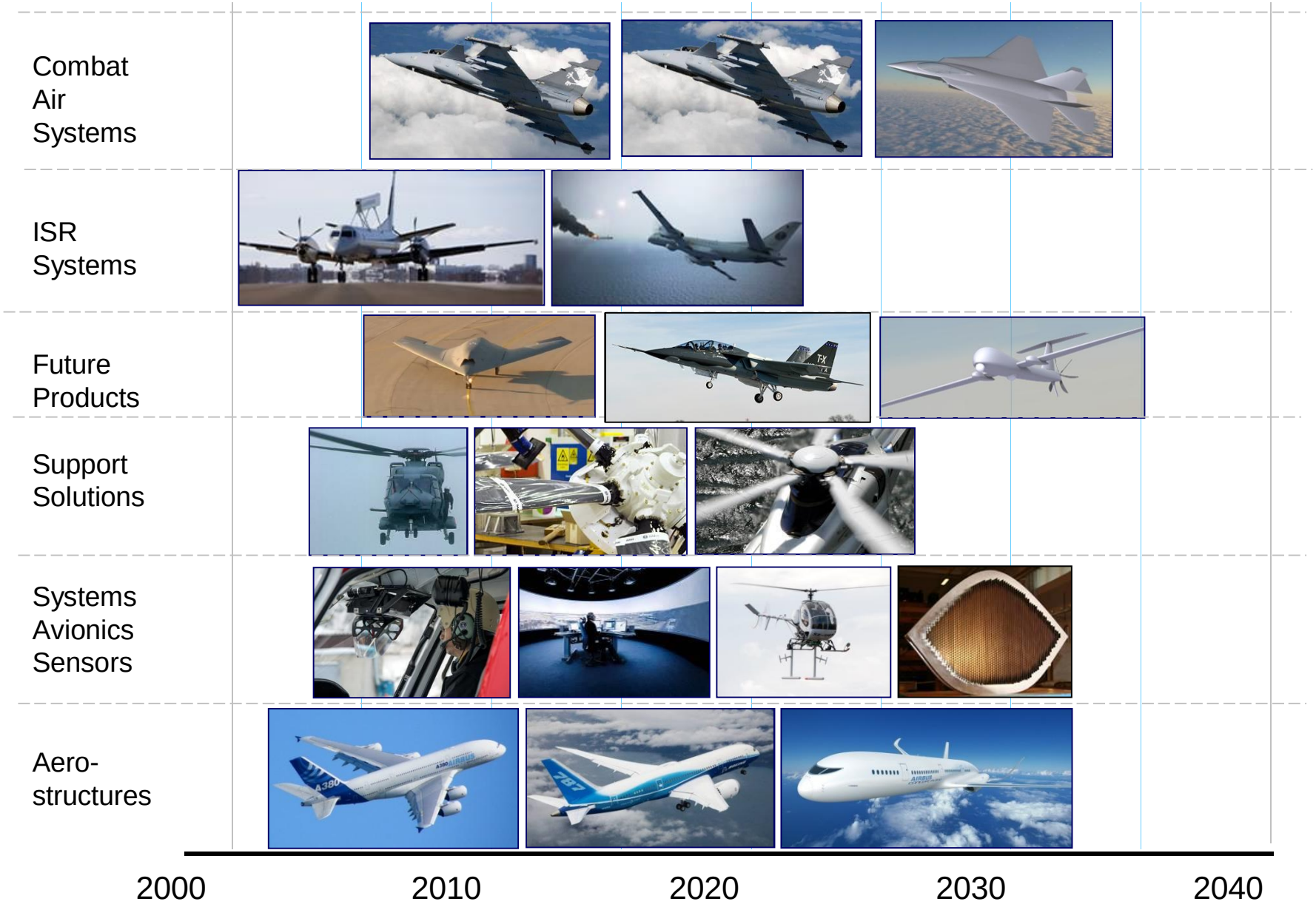
Support & Services

Industrial Products & Services

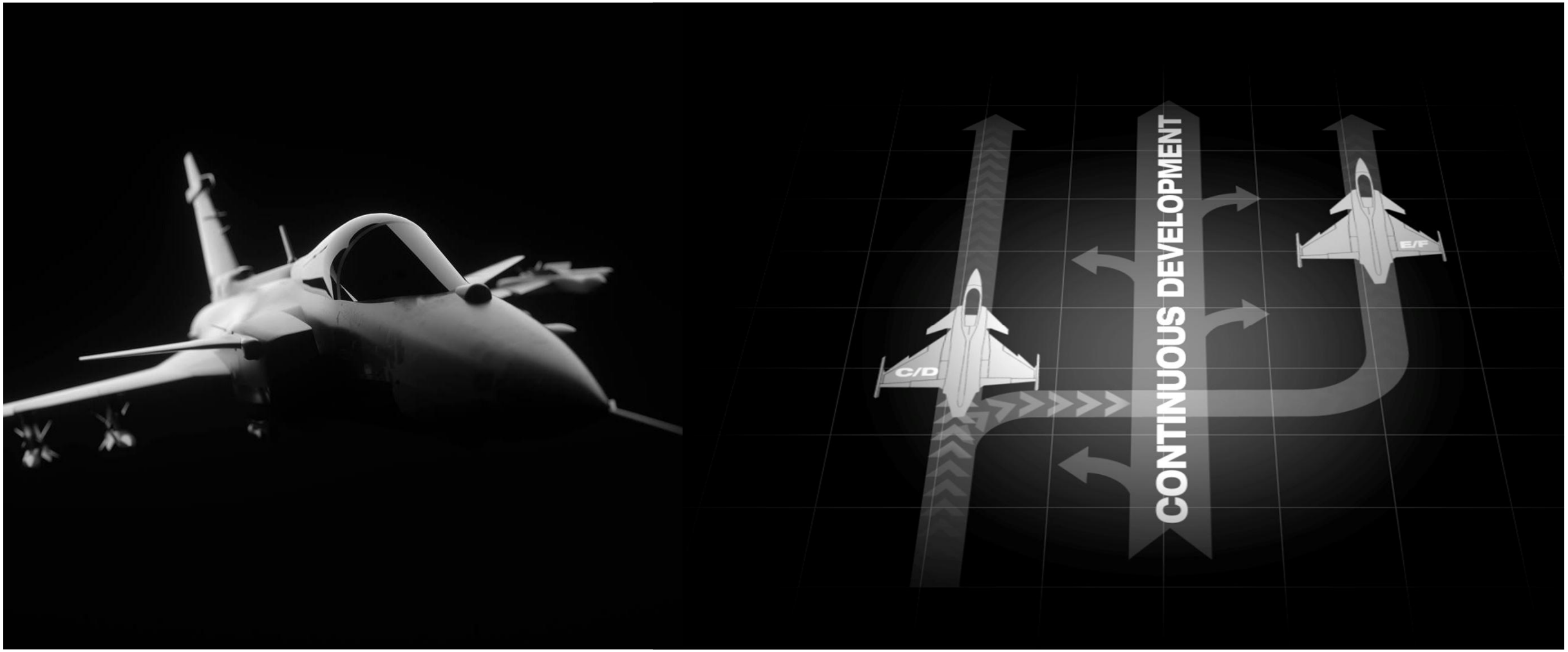
Surveillance



PRODUCT PORTFOLIO WITHIN AERONAUTICS



GRIPEN C/D AND GRIPEN E/F



SAAB – BOEING T-X TRAINER CANDIDATE

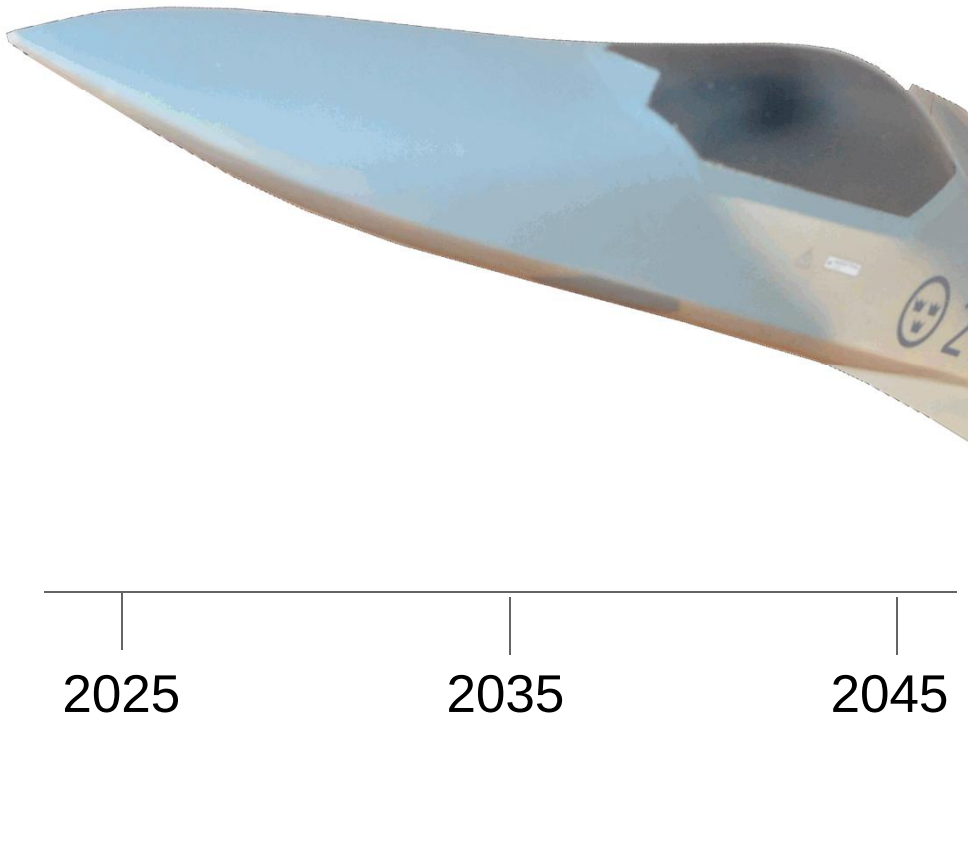
SAAB GLOBALEYE – MULTIROLE AEW&C

CIVIL AIRCRAFT PRODUCT STRATEGY

INNOVATION TRACK RECORD 1937-

• 1st Ejection Seat	J21	(prod.1944-47)
• 1st A/C modified from propeller to jet engine	J21	
• 1st Swept Wing Jet in Europe	Tunnan	(1st flight 1948)
• 1st production A/C with afterburner	Tunnan	
• 2 world speed records	Tunnan	
• 1st Saab Supersonic A/C	Lansen	(1st flight 1952)
• 1st Saab System A/C ex Radar	Lansen	
• 1st Double Delta Wing	Draken	(1st flight 1955)
• 1st Canard configuration in production	Viggen	(1st flight 1967)
• 1st A/C w Central Computer	Viggen	
• 1st Tactical Data Link bw A/C	Viggen	
• 1st Digital FCS	Viggen	
• 1st Auto Gun Aiming	Viggen	
• 1st HUD in production	Viggen	
• 1st virtual target training aid	Viggen	
• 1st metal bonded wing panels in Mach 2 A/C	Viggen	
• Unprecedented capability- size ratio	Gripen	
• First Nato fighter of 4th generation	Gripen	
• First fully autonomous flight in Europe	Sharc	
• First fighter to fire Meteor	Gripen	
• ….	Gripen	
• ….	Gripen	

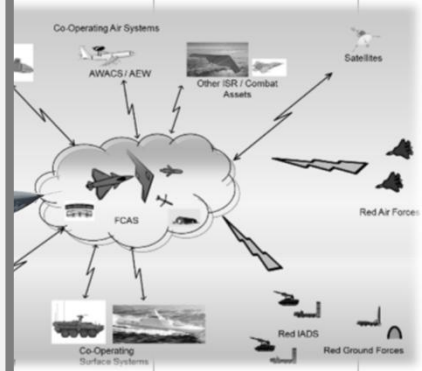
SAAB **FUTURE COMBAT AIR SYSTEM** (FCAS)



2025 2035 2045

SAAB FCAS BACKGROUND

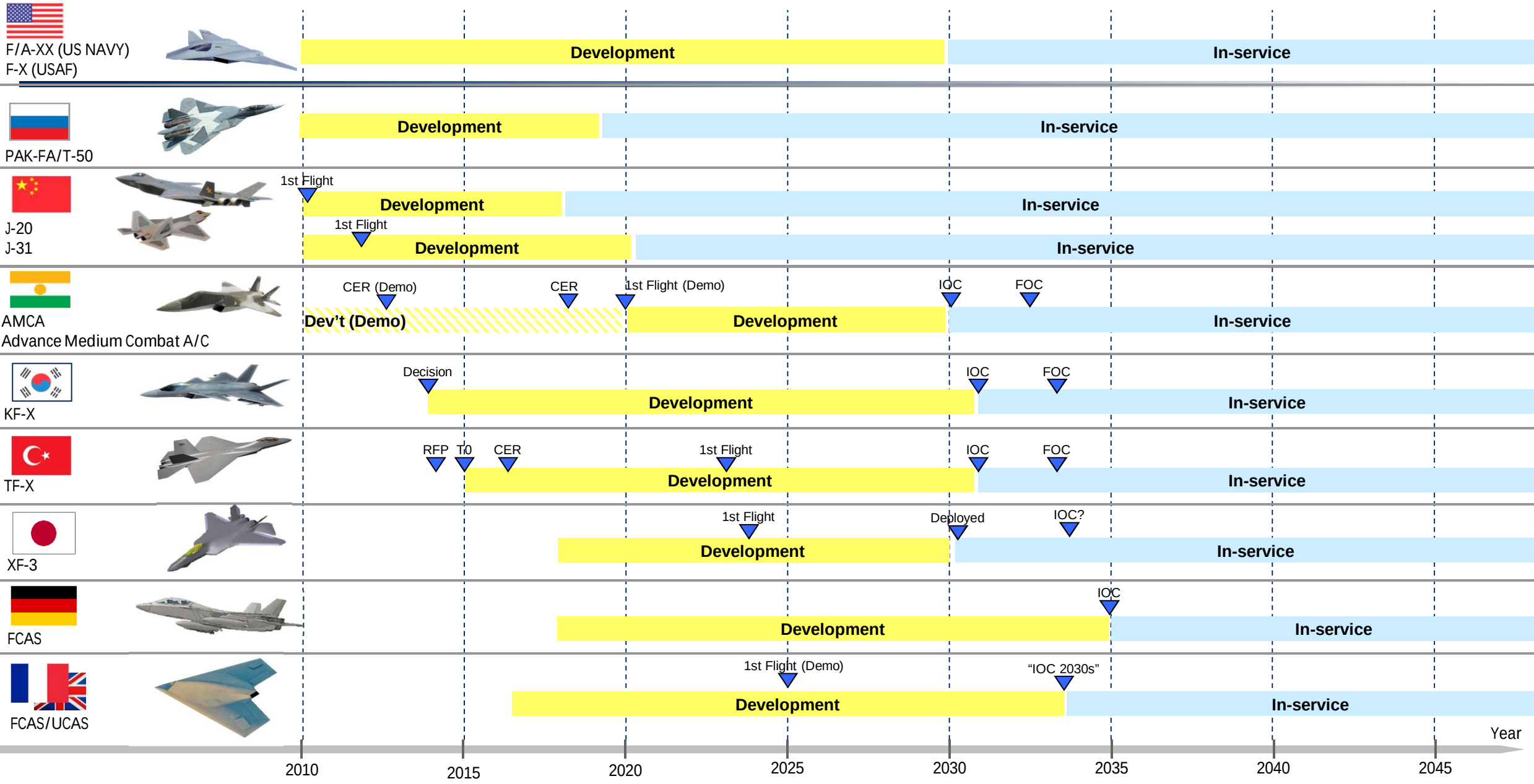
- **Innovative** solutions
- Courage to use new **technologies**
- **Balanced design** adapted to Customer needs and conditions
- **Continuous** and **evolutionary** development
- Close **collaboration** between industry and the Armed Forces



Future Combat Air System initiatives

1950 1960 1970 1980 1990 2000 2010 2020 2030 2040 2050 2060

FCAS WORLD WIDE – PARTNERS AND COMPETITORS



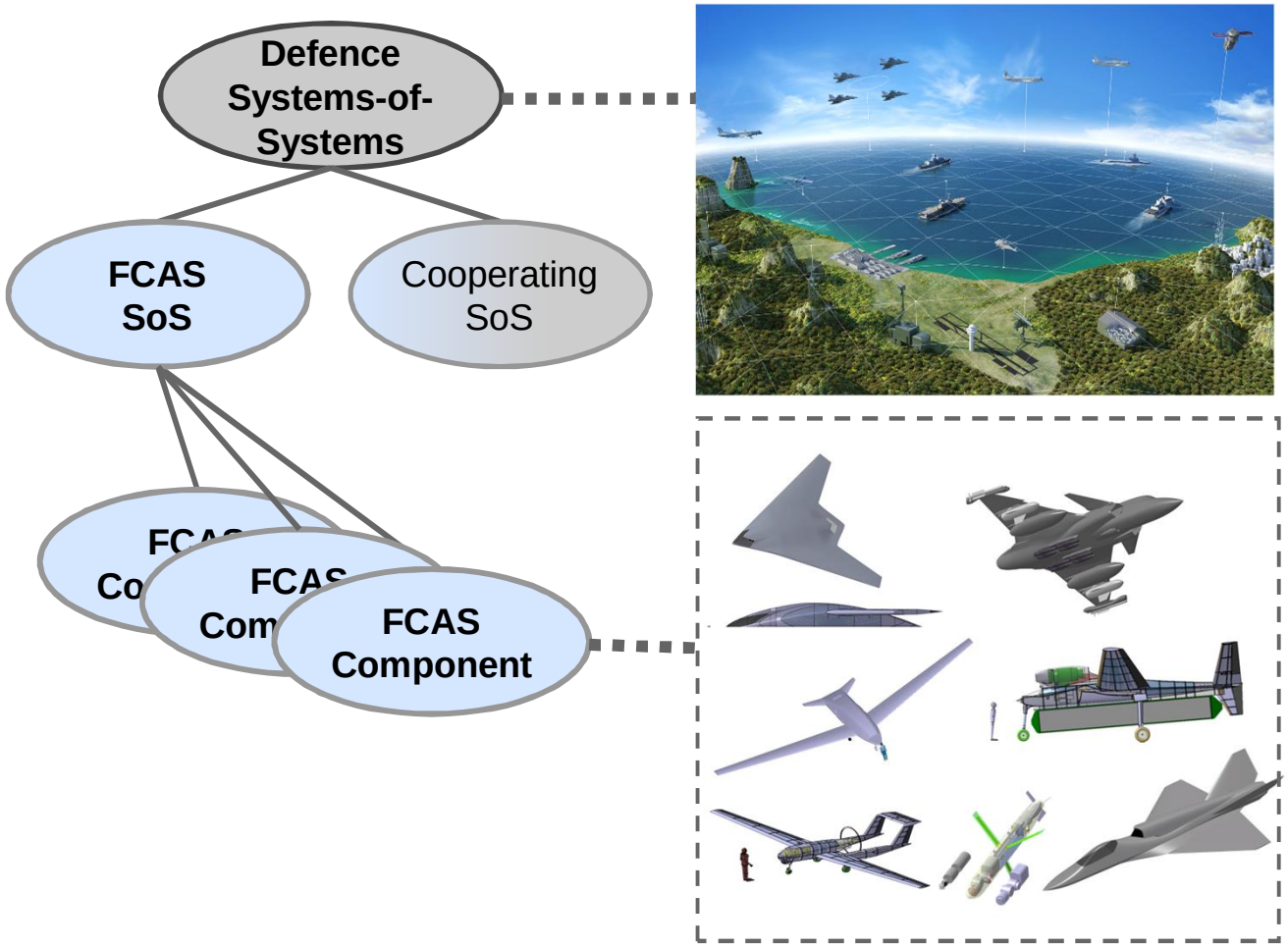
SAAB FCAS PROGRAM

- Study of needs, technologies and concepts beyond 2030 in order to define new Air Defence capabilities for Sweden and Export:
  - Enhancements and upgrades of the Gripen system
  - Enhancements and upgrades of other Air defence systems
  - New Air defence systems
- Ensure Saab's access to required technologies and industrial base for realizing these capabilities, and to be an attractive player in future FCAS partnerships.
- Iterative Top-down and Bottom-up approach with defence system-of-systems (SoS) perspective involving all areas of Saab.

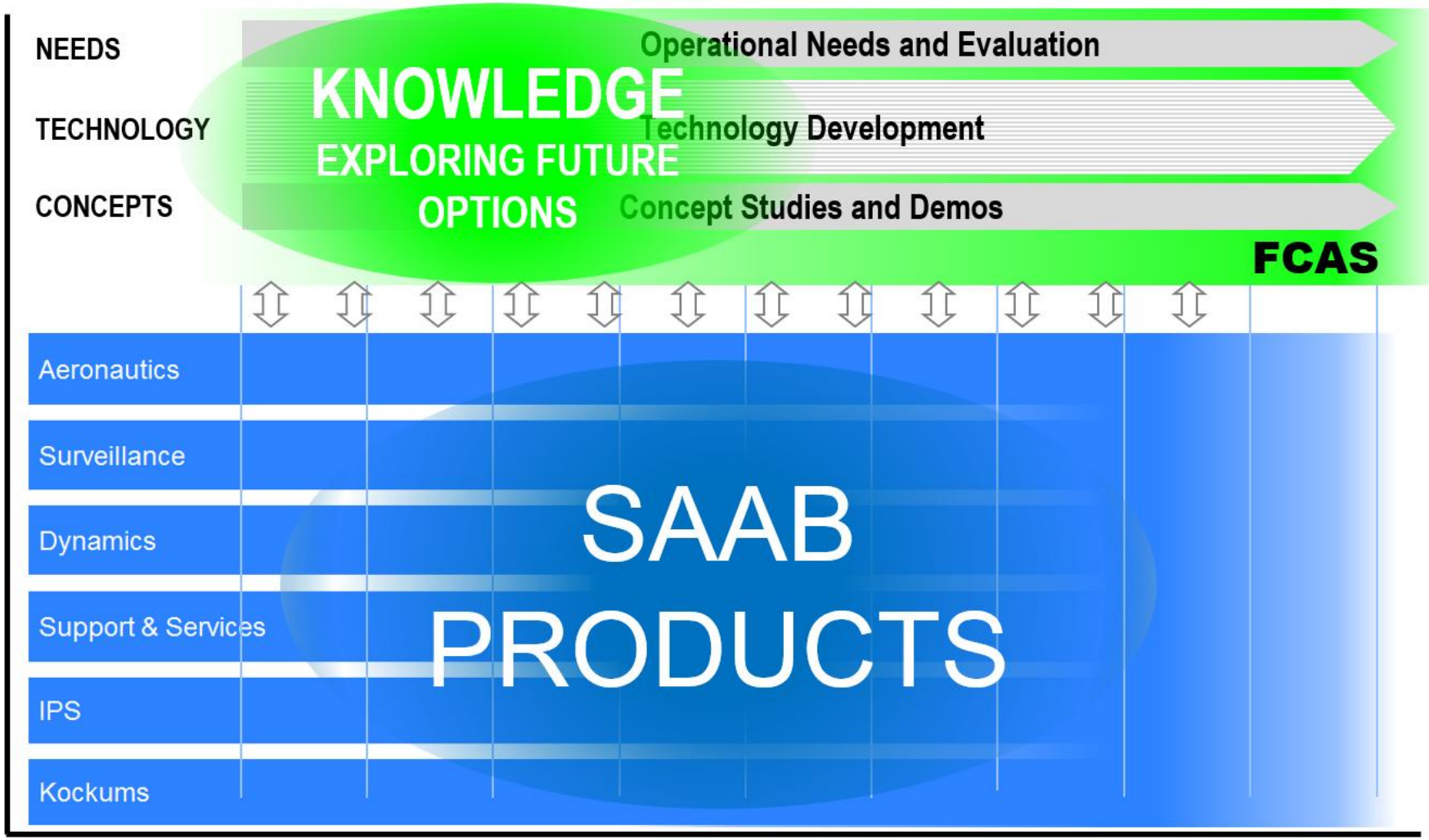
SAAB FCAS SCOPE

System of systems (SoS) solutions in the Air domain comprising:

- **Aircraft platform systems**
- **Sensor, Weapon, Communication and EW systems**
- **Operation Support** and **Training Systems**
- **Logistics Support Systems**
- **Interaction with co-operating systems**
  - Air, Land and Naval forces incl. surveillance systems
  - Air, Land and Naval command and control systems (C2)
  - Space and cyber systems/forces
  - Air traffic control (ATM)

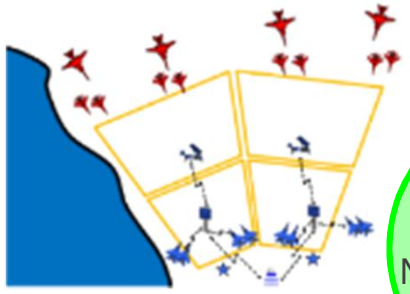


FCAS AND PRODUCT INTERACTION



- **Innovative Approach**
  - Challenge present beliefs
  - Experiment and learn
- **Holistic Approach**
  - Operational Scenarios
  - System-of-Systems
- **Collaboration**
  - Joint Saab AB program
  - Joint stakeholders effort
- **Focus on Value**
  - Operational Needs
  - Business Needs

SAAB FCAS WAY OF WORKING



Operational Needs & Evaluation

- Operational Needs
- Operational Scenarios
- Concept Evaluation and Validation

Operational Context

Needs Evaluations

Technology Threats

Concepts Score Cards

Business Development

Industrial Capability

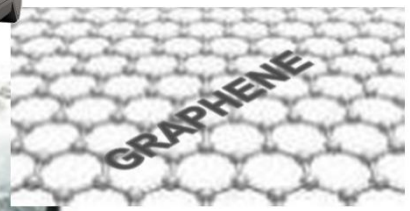
Technology Development

Concept Studies & Demos

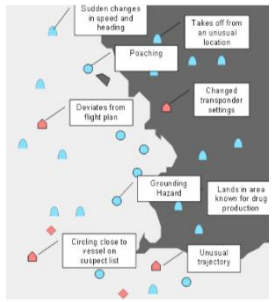
Needs

Technology Opportunities

- Scouting and Forecasting
- Technology Studies
- R&T Portfolio Mgmt

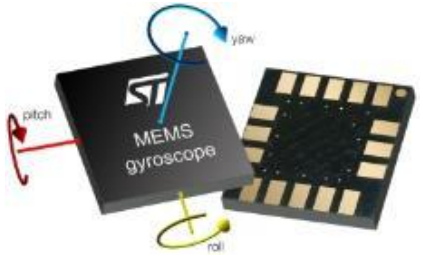


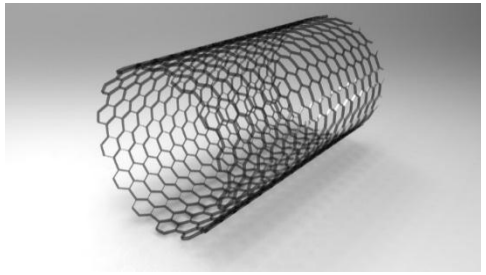
- Concept Studies
- Demo Programs



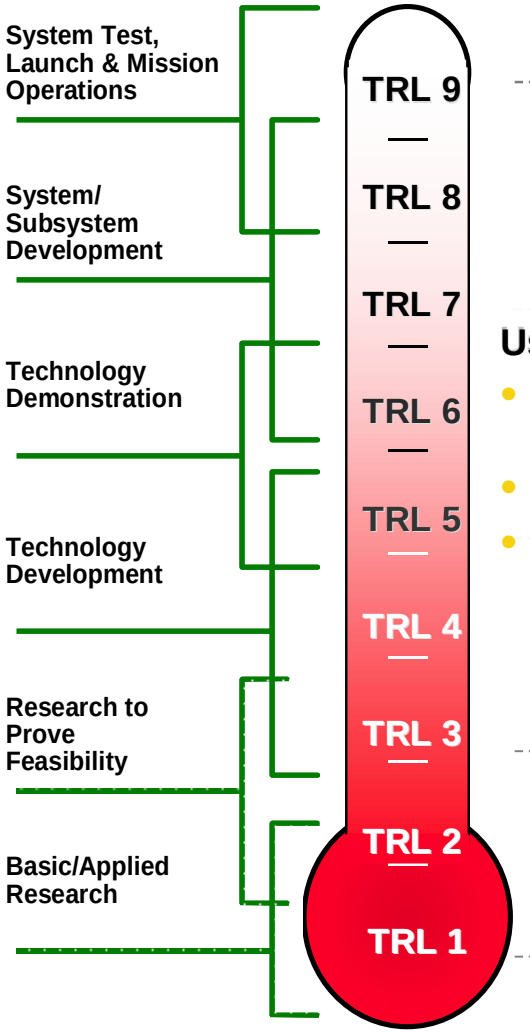
TECHNOLOGY TRENDS

- Internet of Things (IoT)
- Cyber security
- Softwarification (SDN, SDR, SDx)
- Quantum communication / computing
- Big data and data analytics
- AI, Machine learning, Deep Learning
- Autonomous collaborating systems
- Additive Manufacturing & Digital Factory
- New / Functional Materials
- Energy systems/storage
- Virtual and Augmented Reality
- Miniaturization





TECHNOLOGY MATURATION

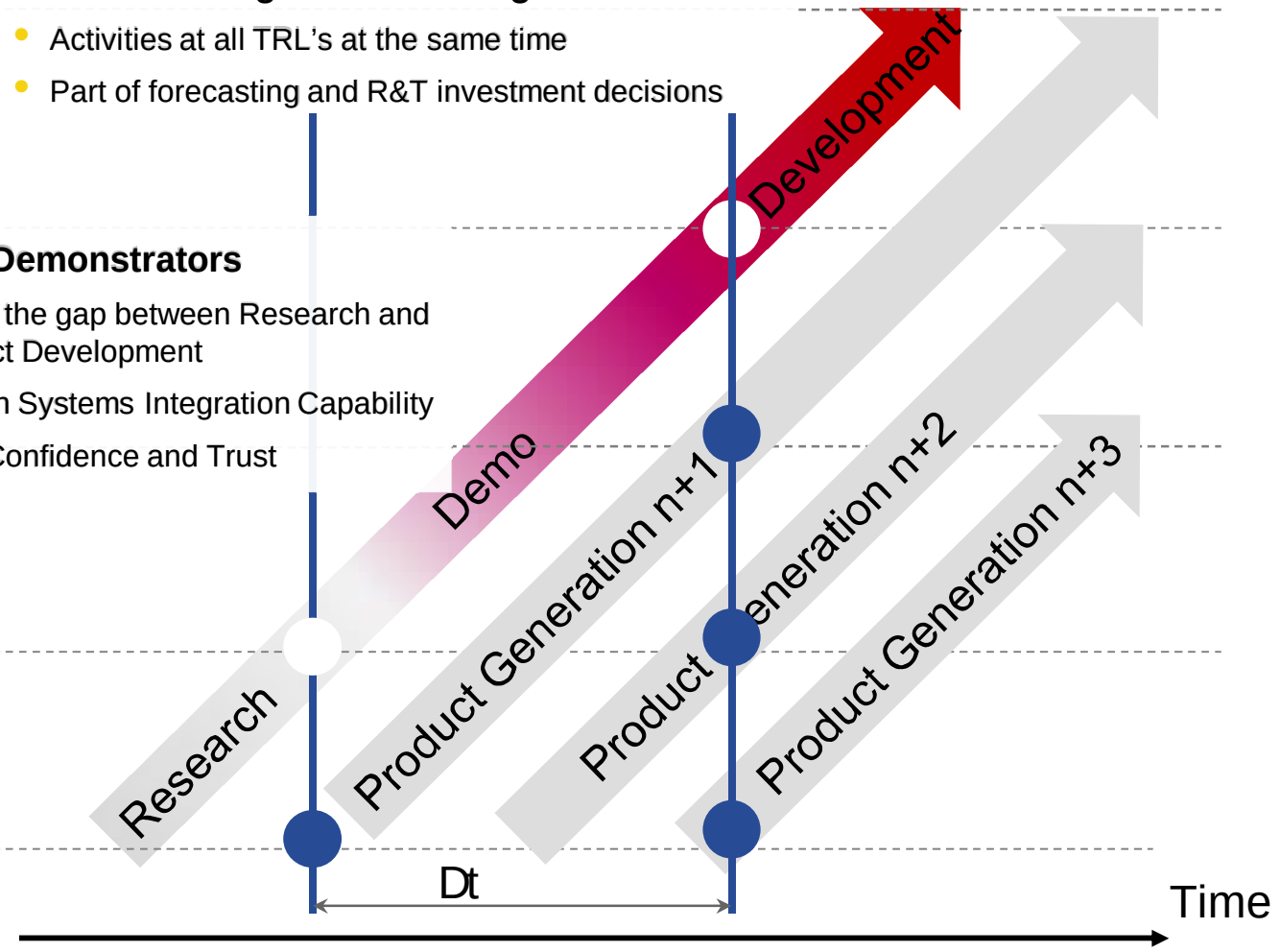


Short and Long Term Thinking

- Activities at all TRL's at the same time
- Part of forecasting and R&T investment decisions

Use of Demonstrators

- Bridge the gap between Research and Product Development
- Sustain Systems Integration Capability
- Build Confidence and Trust



SAAB R&T STAKEHOLDERS

FMV

VINNOVA

NFFP

WASP WALLENBERG AUTONOMOUS SYSTEMS PROGRAM

SARG

System Test, Launch & Operations

System/Subsystem Development

Technology Demonstration (TDP)

Technology Development (ARP)

Research to Prove Feasibility

Basic Technology Research (CRP)

TRL 9
TRL 8
TRL 7
TRL 6
TRL 5
TRL 4
TRL 3
TRL 2
TRL 1

Needs and Innovations

SAAB

MIDCAS Sense & Avoid

SESAR JOINT UNDERTAKING

EUREKA innovation across borders

AIR FORCE RESEARCH LABORATORY

EDA

Clean Sky

Basic Technology

SWEDISH DEFENCE UNIVERSITY

FOI

KTH VETENSKAP OCH KONST

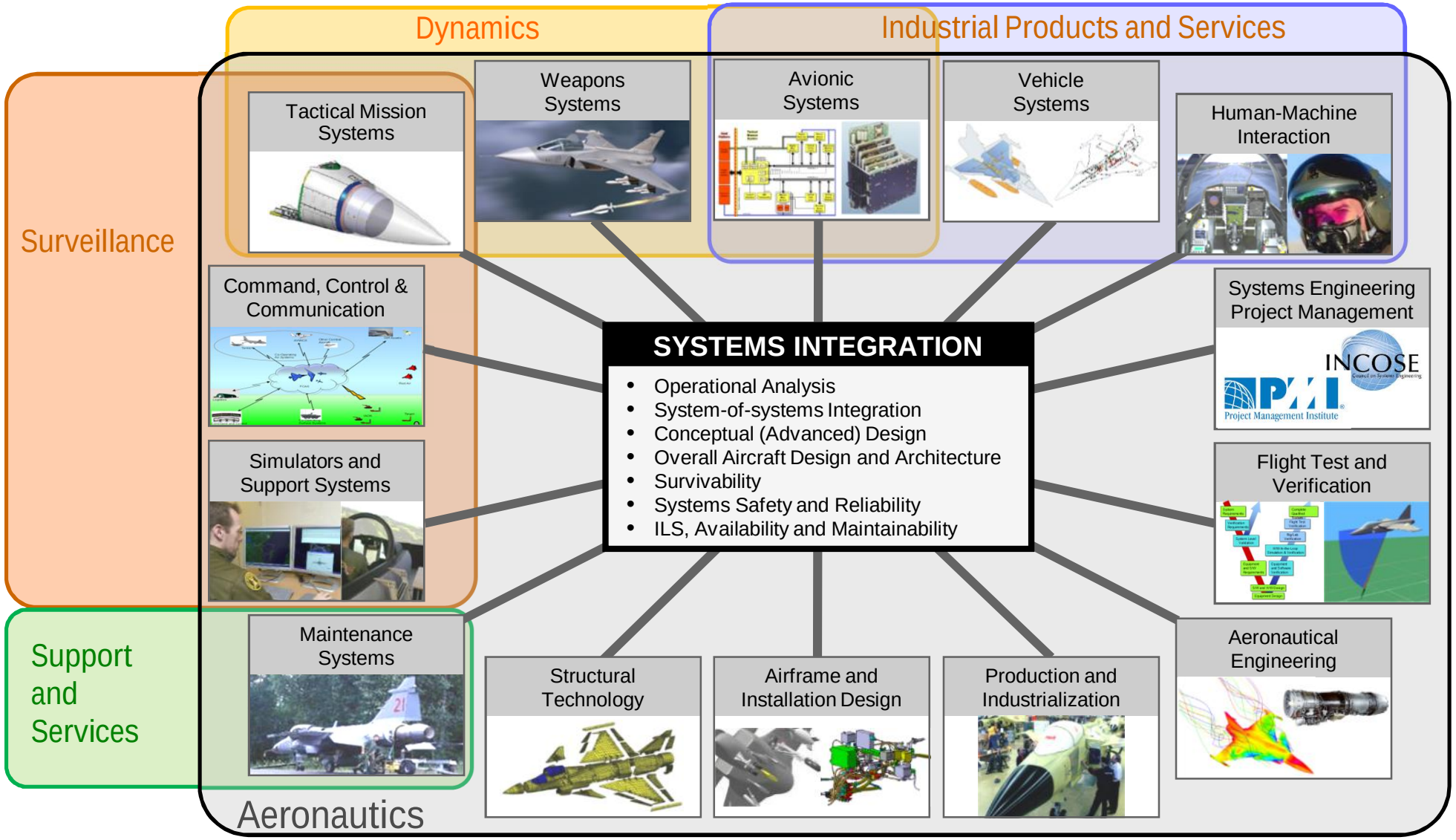
AVANCEZ 1829

LUNDS UNIVERSITET

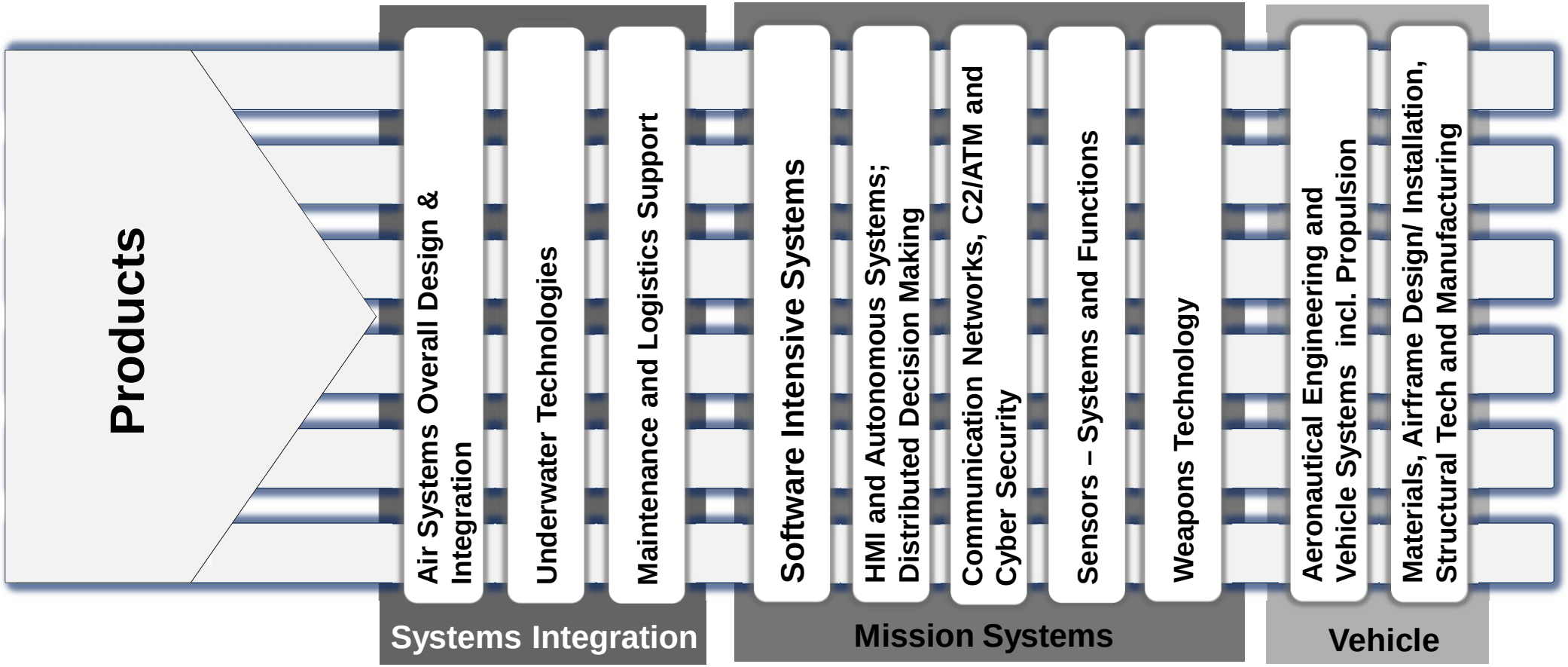
LINKÖPINGS UNIVERSITET

UMEÅ UNIVERSITET

SAAB AIR DOMAIN CAPABILITIES TODAY



ALIGNED R&T ACROSS SAAB



SAAB R&T CLUSTER WAY OF WORKING

Activities

Continuous monitoring of technology trends and provide forecasts of future technology solutions

Initial studies of emerging technologies with potential high impact on own and threat systems

Management of all R&T development projects within the cluster

Input

Operational needs and requirements

FCAS Concepts and Score Cards

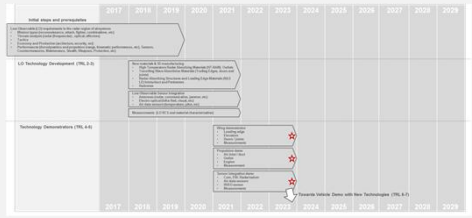
Scouting, Forecasting and Road-mapping

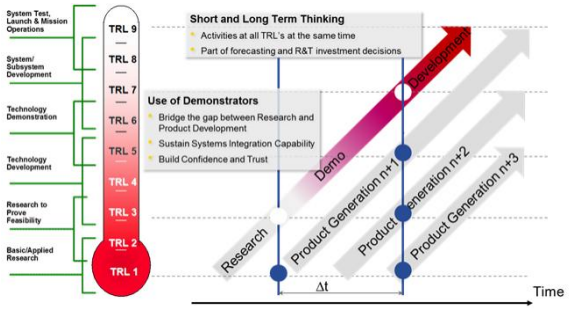
Technology Studies

Portfolio Management

Output

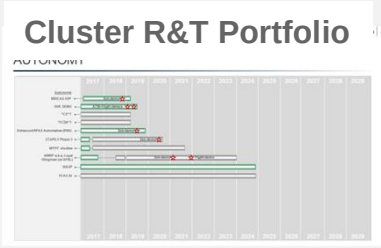
Cluster Technology Roadmap

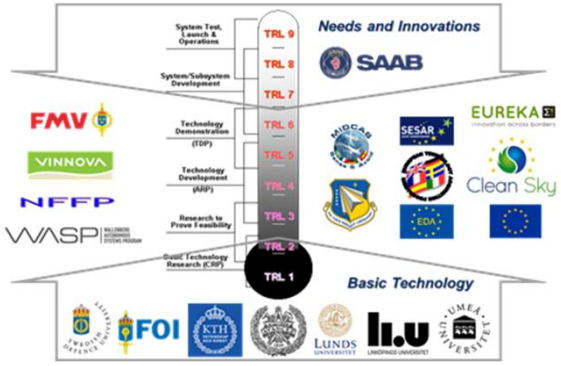




R&T Results
Technology Data Sheets

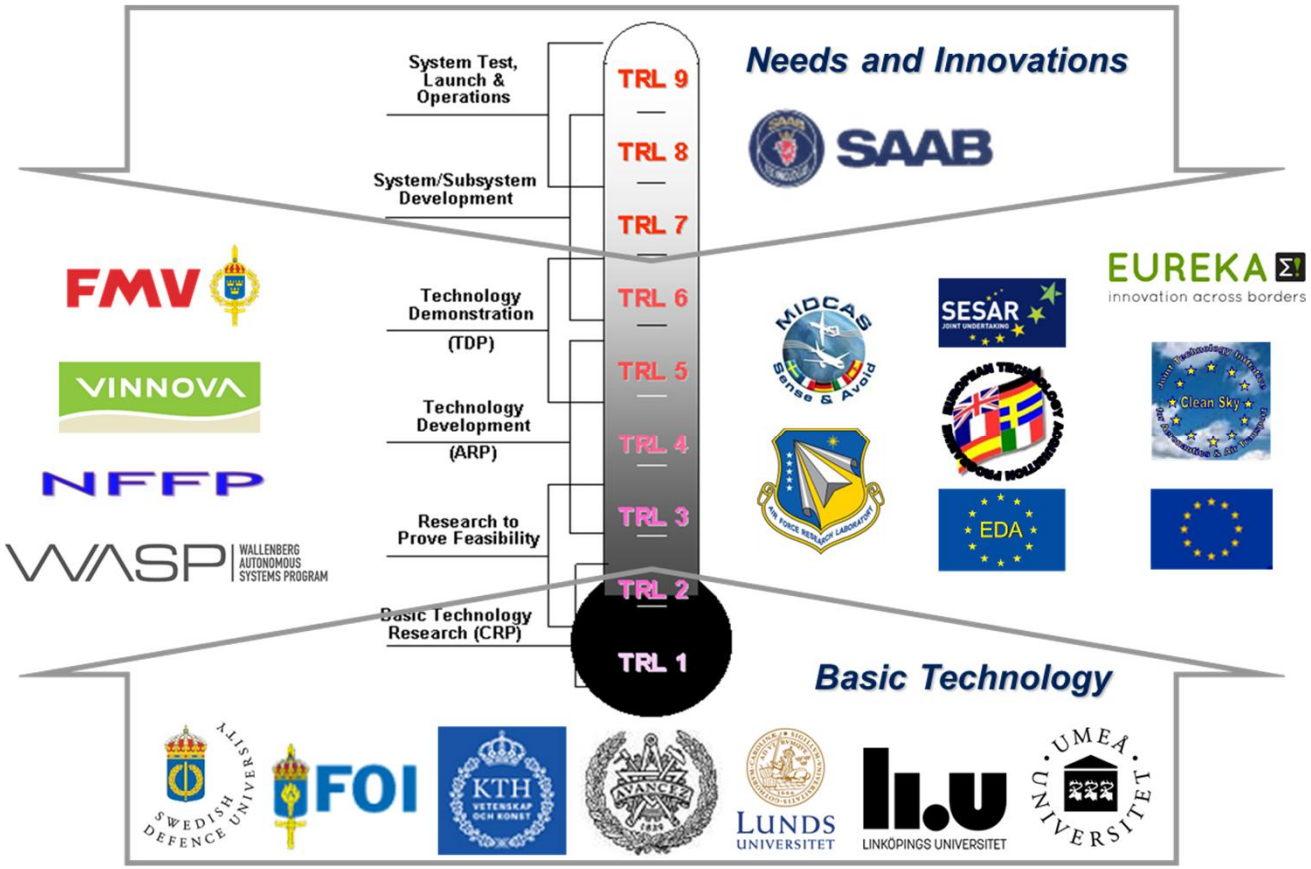
Cluster R&T Portfolio





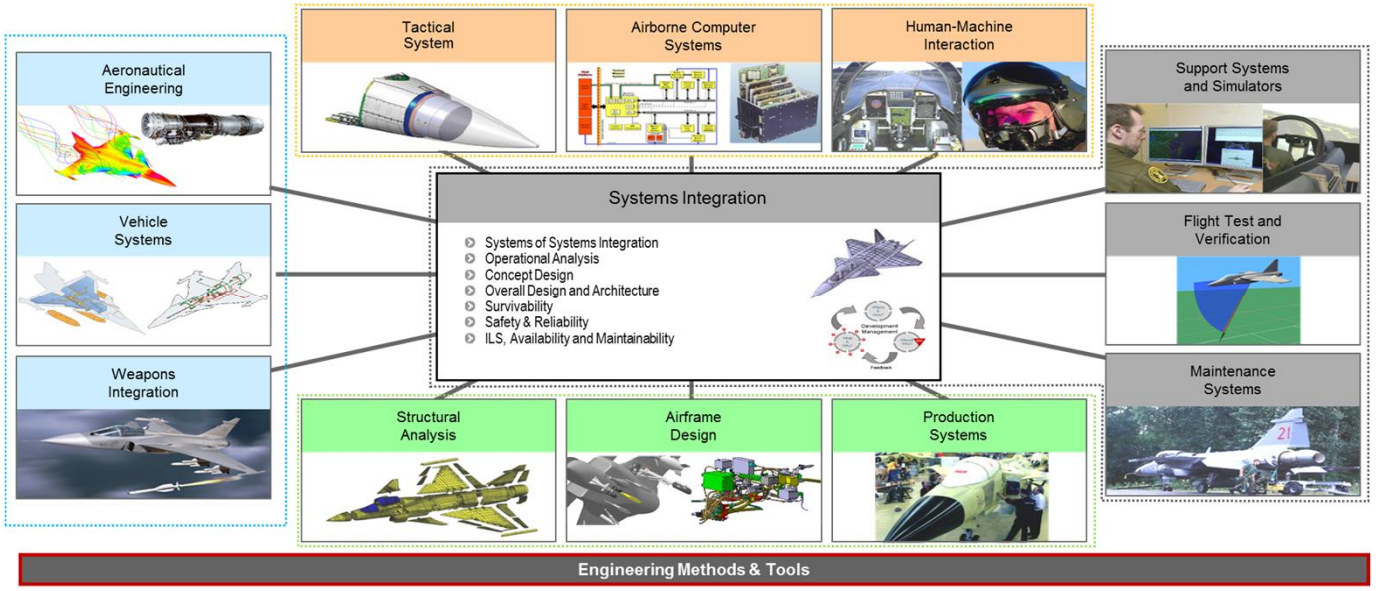
SAAB TECHNOLOGY STRATEGY

- Use commercial technology
  - Leverage on commercial industry
  - Explore and apply dual use and triple use
- Use military technology in selected areas
  - Classification and integrity
  - Required but not commercially accessible
- Design for flexibility and upgradeability
  - Continuous technology insertion
- Strategic collaborations
  - Swedish Academia: KTH, CTH, LIU, LTH, SDU…
  - Swedish Institute: RISE, FOI
  - Bilateral collaborations
  - Systematic and targeted national, European and International R&T programs



TECHNICAL FELLOW PROGRAM

- Started about 30 years ago
- Alternative career path
- Means to stay at the forefront of technical development in areas of strategic importance
- Today ~40 Technical Fellows
- Requires an approved designated area of expertise that fulfils certain requirements
  - Area of strategic importance
  - Business coupling
  - Long term nature
  - Difficult to acquire from outside
  - Academic coupling



UNIVERSITY COLLABORATION

- Collaboration agreements with KTH, LiU, CTH, SDU, Lund University
- 10 Adjunct professors and a number of affiliated faculty at Swedish universities
- ~40 industrial PhD students

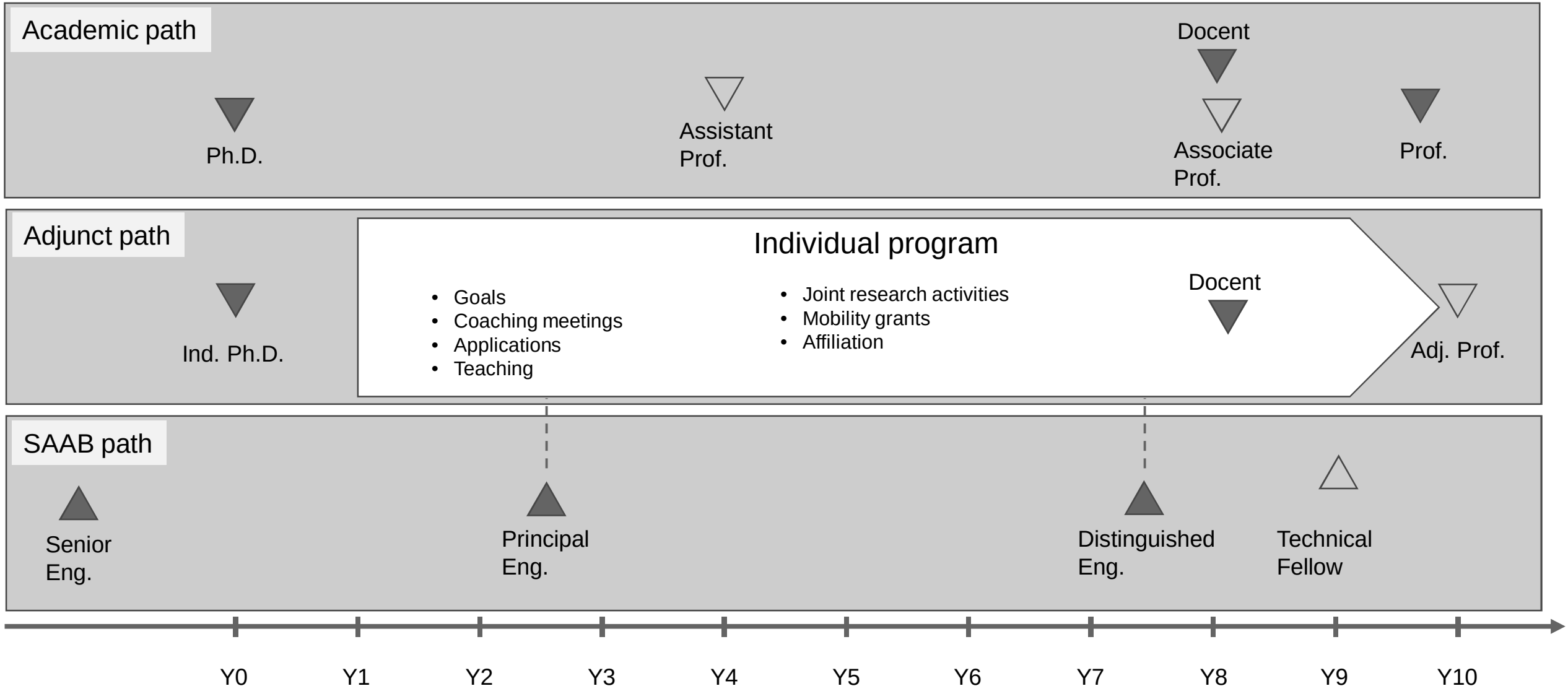
LINKÖPINGS UNIVERSITET

AVANCEZ 1829

KTH VETENSKAP OCH KONST

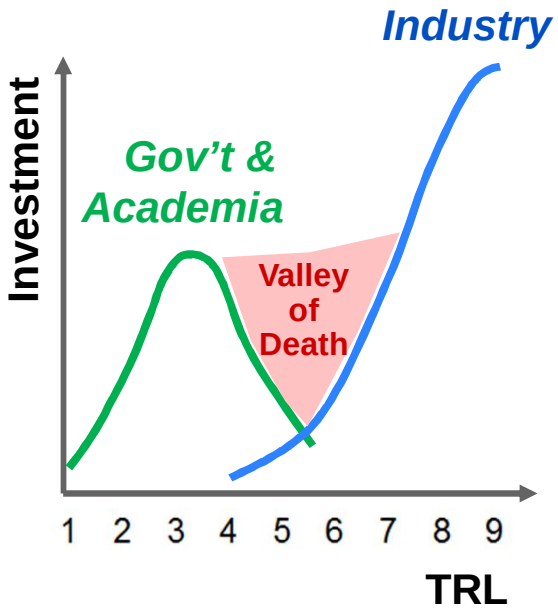
LUND UNIVERSITY

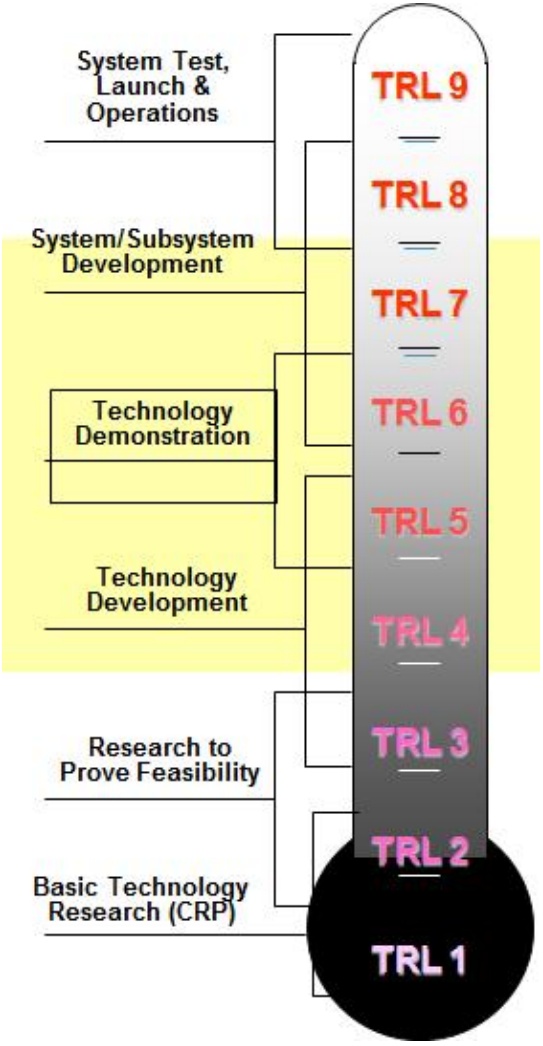
ADJUNCT PATH MODEL



CONCEPT DEMOS

- Demonstrators are important for evaluation and maturing
  - New technologies
  - New features and capabilities
  - Industrial Collaborations
- Advance technology from research (TRL 1-3) to application (TRL 8-9) & Bridge the “Valley of Death”
- Demonstrators create market attention and customer confidence
- From validation in simulators and rigs to flight tests in representative, operational conditions.

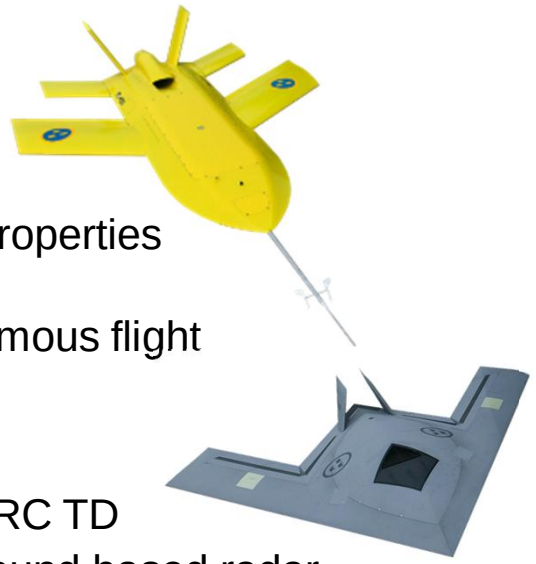




EXAMPLE OF DEMONSTRATORS

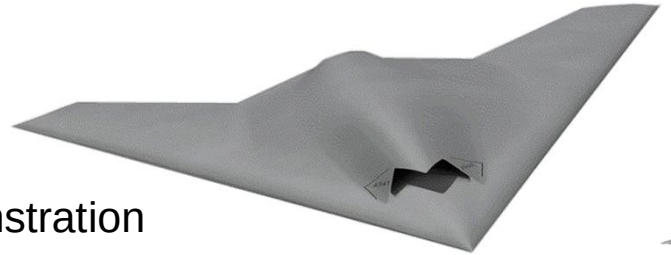
SHARC TD

- Fully autonomous flight
- Sensor data link
- Stealth geometry flight properties
- First flight 2002
- Europe's 1st fully Autonomous flight



FILUR

- Core avionics from SHARC TD
- Stealth demo against ground based radar
- First flight 2005



NEURON

- Full scale Stealth demonstration
- Weapons release from internal bay
- First flight 2012
- Dassault lead, Saab 23%

BIOFUEL

- 100% Biofuel
- First flight March 2017

GRIPEN DEMO

- Demo of Gripen NG capabilities
- First flight May 2008

EU CLEAN SKY

- New laminar wing
- First flight Sept 2017

THE TOP **4** IN MULTINATIONAL AERONAUTICS R&T

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

Saab one of 12 Founding Companies

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

Sweden/Saab Co-project Leader

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

Sweden/Saab Project Leader

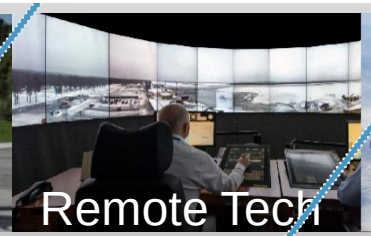
SESAR (2100+1500M€)
ATM
Together wit Clean Sky, EU:s largest research projects

Saab leading Remote TWR and RPAS Detect & Avoid

SAAB R&T ROADMAP, PRINCIPLE

Product application

Development programs and Full-scale demonstrators



TRL 9

TRL 7

International programs

International Demonstrators

International Demonstrators

National Demonstrators

National Demonstrators

National Demonstrators

International R&T projects

International R&T projects

International R&T projects

TRL 6

TRL 3-4

National programs

National R&T projects

National R&T projects

National R&T pro

SARG

TRL 1-3

2005

2010

2015

2020