DEVELOPING INDUSTRY AND BILATERAL COOPERATION THROUGH INNOVATION
THE AERONAUTICS CASE

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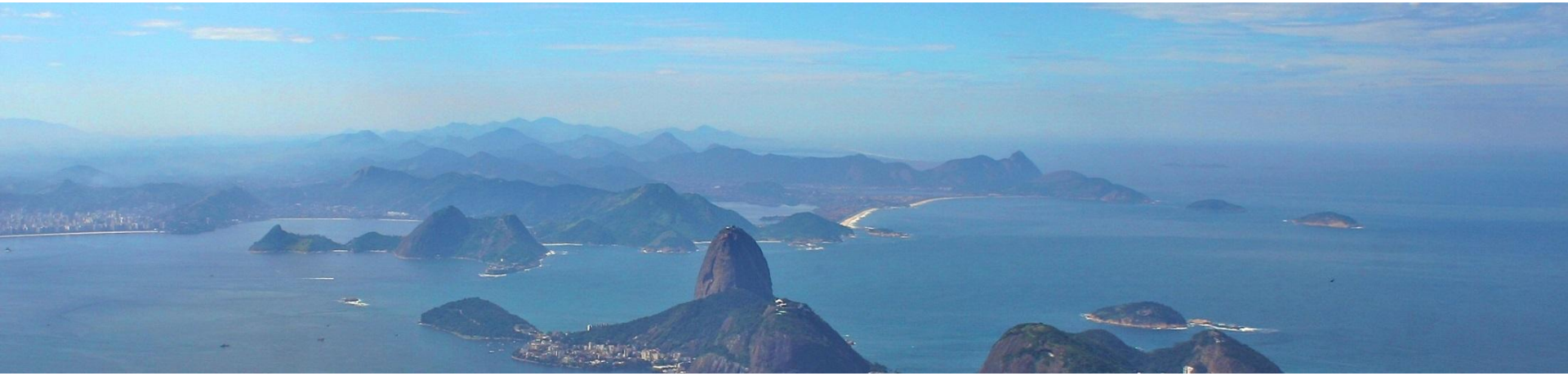
THE AERONAUTICS CASE

- The Brazilian Perspective



AERONAUTICS - A HISTORY OF INNOVATION IN BRAZIL

- Aeronautical Industry (EMBRAER)
- Air Defense Systems (Mectron/Avibrás)
- Air Transportation & Traffic Control (ATECH)
- Aeronautical Certification (IFI)
- Space Research (AEB, INPE)
- Spin out to Automotive (Ethanol Program)

LIFECYCLE – RESEARCH IN AERONAUTICS

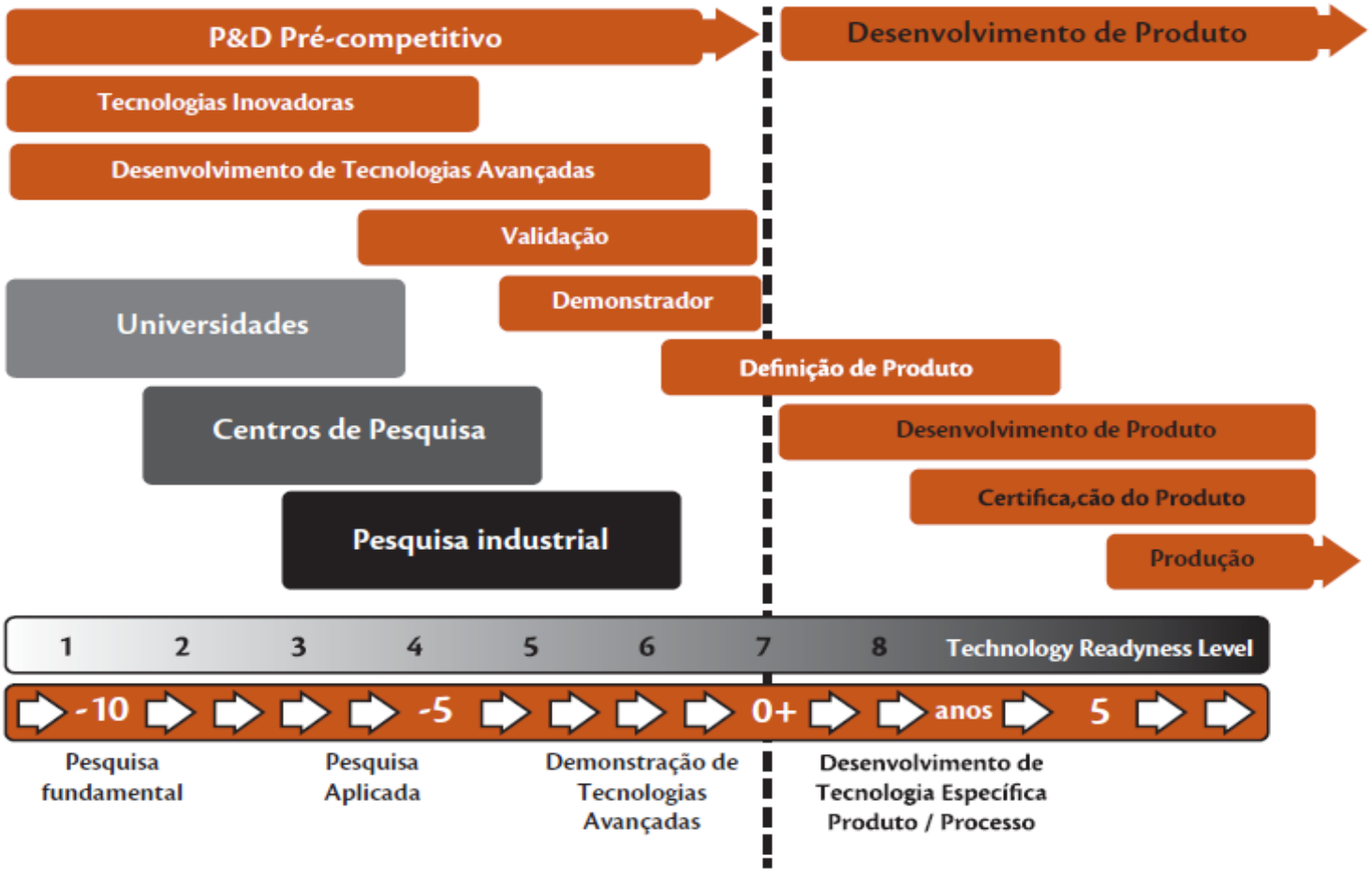


Figura 1. Ciclo de P&D na indústria aeronáutica (adaptado de VON BOSE, 2002 e KELLEY-WICKE-MEYER, 2003) (MATSUO, 2010)

BRAZILIAN AERONAUTICAL AND AEROSPACE SECTOR

- Sector represents 44% of high technology industry exports
- Positive balance of US$ 1.5 Billion in 2013

Trade Balance 2013 (US$ BillionFOB)	Exports	Imports	Balance	(%)
Total	**242.2**	**239.6**	**2.6**	**1.80**
Industrial Products (*)	**151.2**	**205.6**	**(54.5)**	**2.89**
Non-industrial Products	**91.0**	**34.0**	**57.0**	**4.80**
High and Medium-High Technological Industries	**49.7**	**142.6**	**(92.9)**	**8.80**
High Technological Industries	**9.8**	**43.9**	**(34.1)**	**44.49**
AERONAUTICS AND AEROSPACE	**5.6**	**5.0**	**0.6**	**78.14**
NCM 88 – Aircrafts, other aerial equipments/space	**4.4**	**2.9**	**1.5**	**100.00**

Fonte: SECEX/MDIC
(*) Classificação extraída de: OECD, Directorate for Science, Technology and Industry, STAN Indicators, 2003.

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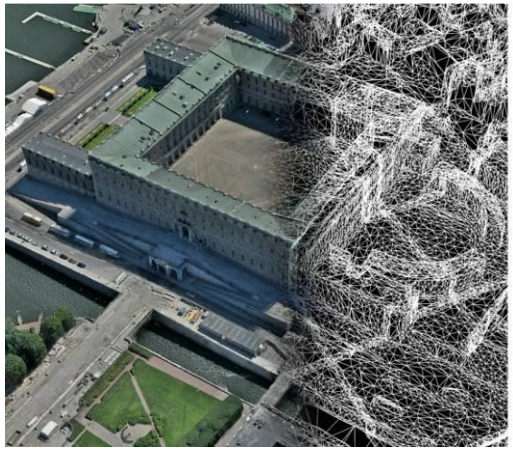
AERONAUTICS, A HISTORY OF INNOVATION IN SWEDEN 1937-

• 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	

A HISTORY OF TAKING INNOVATION INTO OTHER SECTORS

- Innovations to other industry sectors, examples
  - Production technologies
  - Composites
  - Automotive Airbags
  - Telecom



3D mapping

Saab Tank Radar

Airbag

Mobile telephony

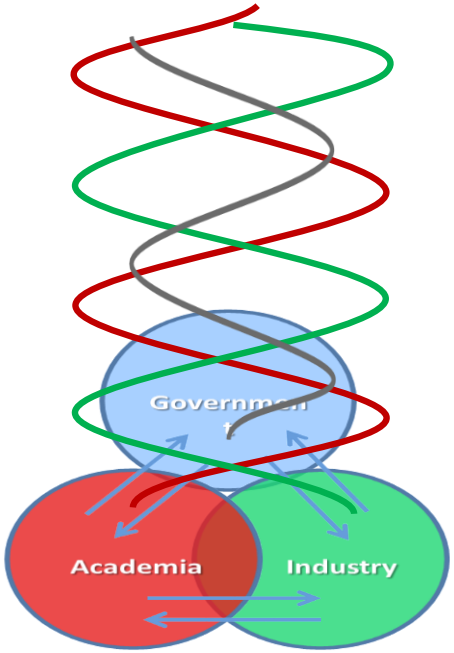
POSITIVE IMPACT ON THE SWEDISH ECONOMY

”The payback of the Gripen project to Swedish society is at least 2.6 times the initial investment, based on technology transfers alone.”

Gunnar Eliasson,
Professor Emeritus of Industrial Economics (EM)
KTH, Stockholm:
Visible costs - invisible profits
(2010, ISBN: 9789186203412)

NATIONAL RESEARCH & INNOVATION AGENDA

Written by Industry, Universities and Government Authorities with Innovair as Coordinating Forum



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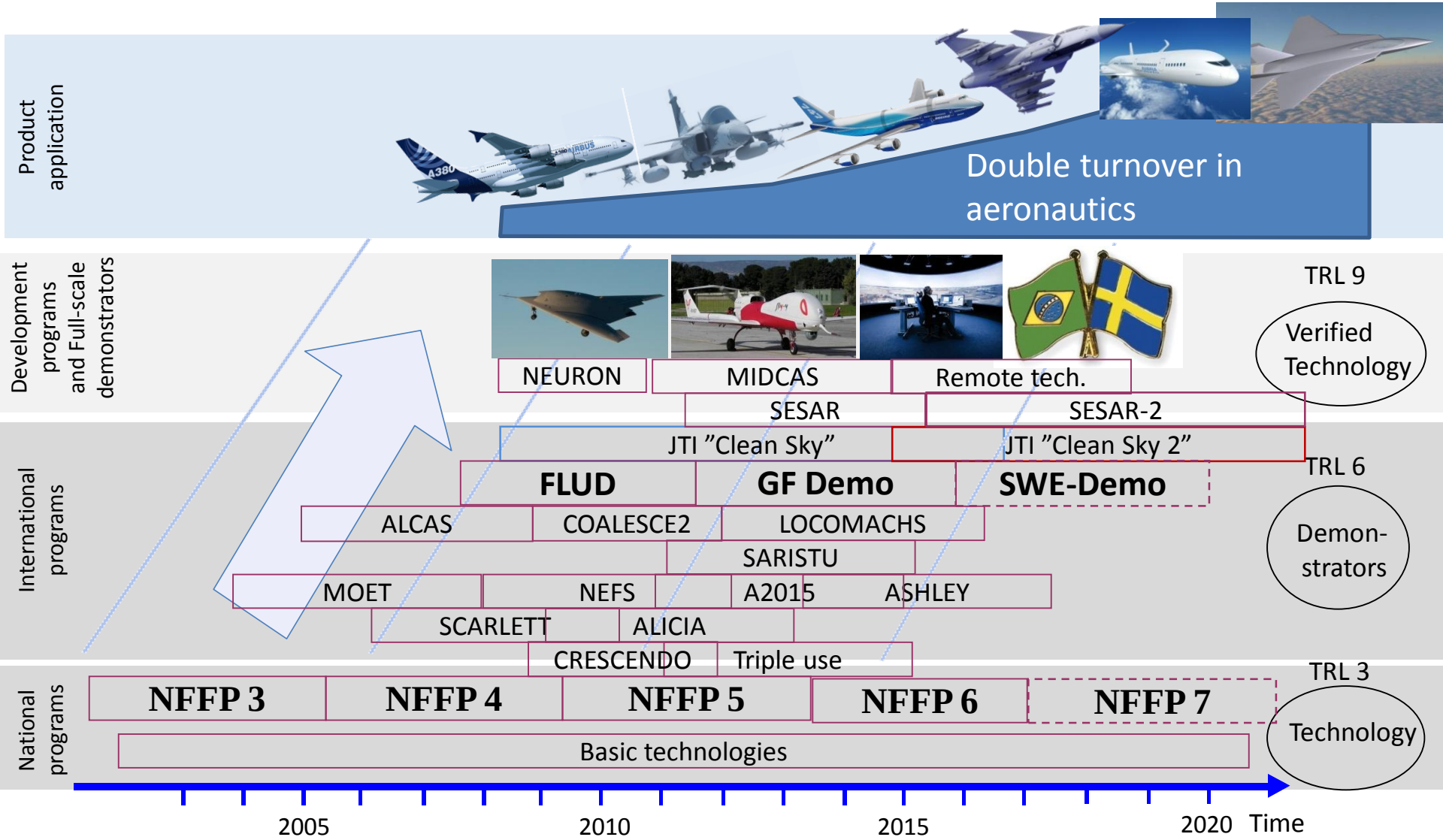
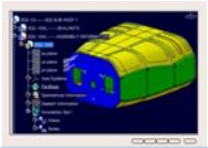
Saab Roadmap

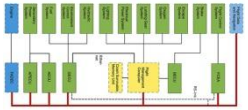


WHAT DOES AERONAUTICS CONTAIN ?

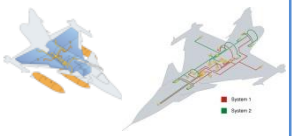
Aeronautical Engineering



Computer Systems



Vehicle Systems



Human-Machine Interaction

Autonomy & Decision Support

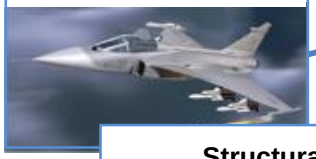
Maintenance Systems

Systems Integration

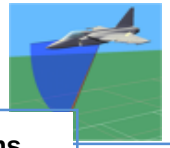
- Systems of Systems Integration
- Decision support
- Operational Analysis
- Concept Design
- Overall Design and Architecture
- Survivability
- Safety & Reliability
- ILS, Availability and Maintainability

Tactical System

Weapons Integration

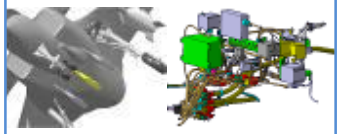


Flight Test and Verification



Structural Technology

Airframe Design



Production Systems

Support Systems and Simulators

Engineering Methods & Tools

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- What's done?

- Where next?

WHAT WE HAVE ACCOMPLISHED !

A flow of gradually more productive activities have verified the interest in bilateral cooperation. We have now reached a good status at low TRL (research). The challenge is to carry this further and include institutes and industries, with demonstrators and product development as further aims.

2009	2010	2011	2012	2013	2014	2015
MoU for cooperation signed High level Network meetings - Vinnova and ABDI	Swedish – Brazilian pre-study projects - Vinnova	CISB founded in SP Swedish CISB office - Vinnova	Industrial Guest Researcher Scholarship Program - CNPq, CISB and Saab	Innovation Training for Aerospace and Defence - CISB	Bilateral research initiative – held at ITA 1st Workshop 500 + participants CISB Travel Grants	Swedish Endowed Professor Chair at ITA Workshops arranged by CISB, ITA, Innovair

WHAT POSSIBILITIES CAN FURTHER COOPERATION CREATE ?

Future needs in Brazilian and Swedish Aeronautics Industry

Brazilian universities + Swedish universities

Research in BR+SE:

- **Autonomous systems**
- **Decision support**
- **Sensors and sensor networks**
- **Materials technology**
- **Production technology**
- **Communications**
- **Software**

Auto-motive

Mining

Robotics

Software

Telecom

Manu-facturing

Civil security

Forestry

+ Possible cost sharing in demonstrators

WHAT´S NEXT ?

1. Create an Aeronautical MoU
2. Establish a Brazil-Sweden High-level Forum to enable and direct strategic cooperation
3. Establish areas for bilateral cooperation
4. Strategy to spin out initiatives outside Aeronautics
5. Define funding mechanisms on different levels
6. Broaden scope of neutral innovation platform – CISB

SUMMARY

- How can we achieve more innovations? -> How can we foster joint developments for innovation?

- Ambitions from Aeronautics can be applied in other sectors
- Explore ways to bridge the gap between academia and industry!

- Proposed practises applied to Aeronautics and other sectors:
  - Bilateral coordination of research agendas, stating challenges and objectives
  - Hi-level governance group with long term vision
  - Coordinating / facilitating committee (CISB-type)
  - 4-way Funded Innovation Programs (industry/academia in SE / BR)