SESAR Open Day

Trond Bakken
Marketing Director, SINTEF Digital

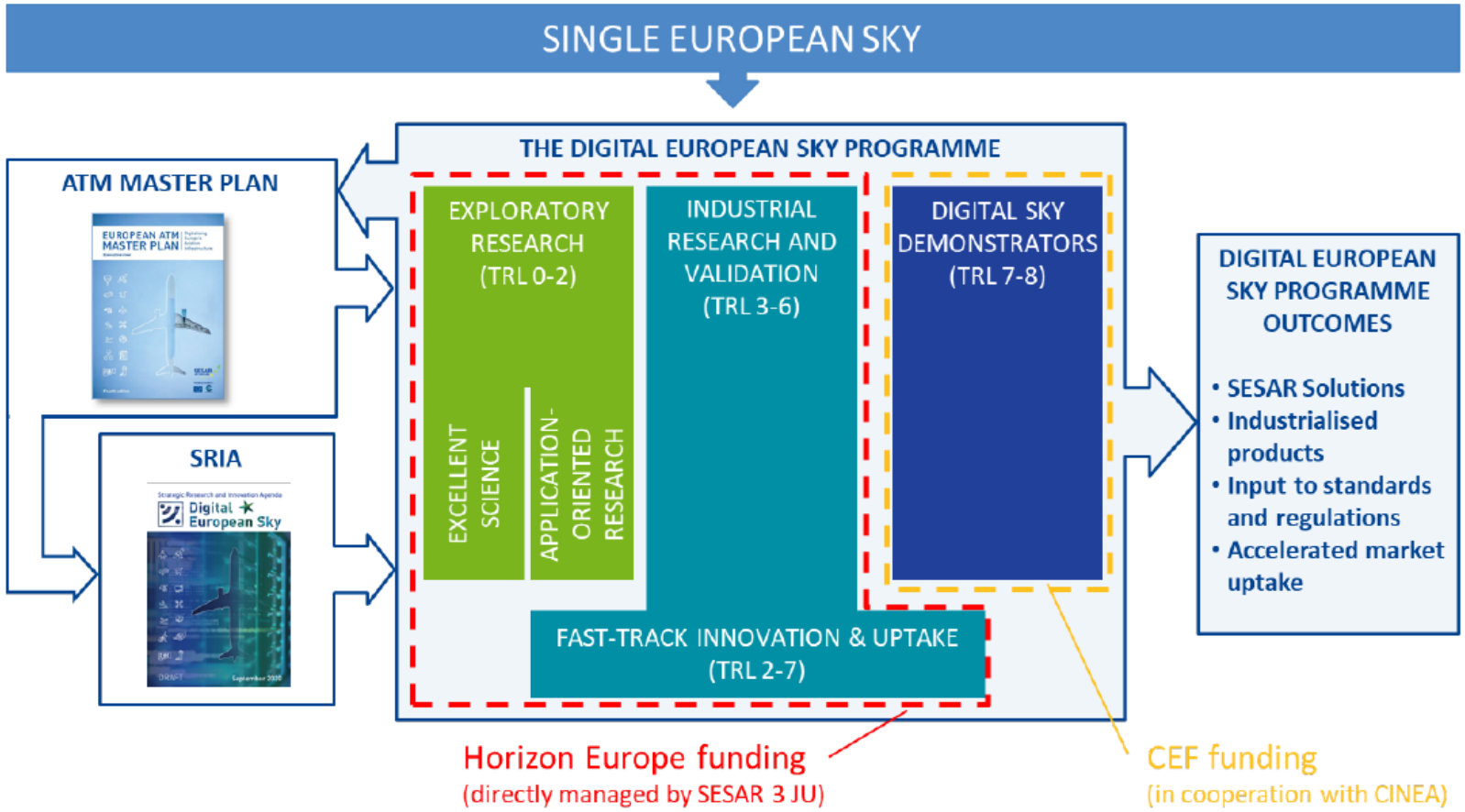
SINTEF

Teknologi for et bedre samfunn

SES, SESAR og SESAR JU

- Big delays of flights in the 90s – fragmented air space in Europe
  - USA is double effective at half the cost
- SES – Single European Sky
  - New legislation in 2004
- A partnership between research, development and industry
  - SESAR – Single European Sky Air Traffic Management Air Traffic Management Research Progamme
  - SESAR Joint Undertaking (SJU) - PPP – Public Private Partnership

The SESAR innovation pipeline



SINTEF in SESAR JU

Member in SESAR 1 and SESAR 2020 through NATMIG*

- SESAR 1 2008 - 2016
  - SINTEF participated to about 35 ATM projects within different aviation topics. Funding about 10 M€
- SESAR 2020 2016 – 2022
  - Wave 1 2016 – 2019 SINTEF funding share 4M€ for about 12 projects
  - Wave 2 2019 – 2012 SINTEF funding share 2M€ for about 10 projects
- SESAR 3 2022 – 2031
  - Calls are open
- Avinor and Indra Navia are other Norwegian partners in SJU

*North European ATM Industry Group; Airtel (IR), Saab (SE), SINTEF (NO)

Example SESAR Innovation

Development of a Decision support tool for Air Traffic Controllers

TRL 1-2

TRL 3-6

TRL 7

AUDIO
AIRSPACE USER SUPPORTING DEMONSTRATIONS OF INTEGRATED AIRPORT OPERATIONS

Open Call

PJ28 IAO Integrated Airport Management Very Large scale Demonstration (VLD)

Improving Runway Throughput - Hamburg

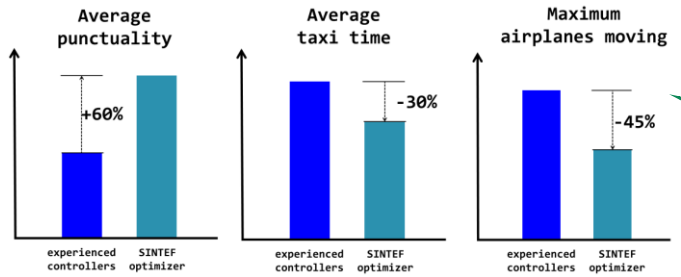
PJ 02 EARTH Enhanced RWY Throughput

Methods and software for dynamic, coordinated arrival, departure, and surface management at Arlanda

SESAR 2020 Demonstration Membership

Zefmap simulation at Hamburg airport

Zero Failure Management at Maximum Productivity in Safety Critical Control Room



SESAR 1 Exploratory Research OPEN CALL

SESAR 2020 Industrial Research Membership

SINTEF focus areas SESAR 2020

- Optimisation
  - Traffic sequencing, routing, taxiing, dynamic airspace(DCB), A-CDM and more
- Human Computer Interface
- System architecture and development
- 3D modelling
- Turbulence and wake-vortex modelling
- Safety, Cyber Security and Resilience
- Navigation (GBAS)
- Digitalisation, Automation (Remote Tower)

AMAN/DMAN/Integrated Runway Sequence Concept

Participants: SINTEF, Swedavia (SEAC), LFV (COOPANS)

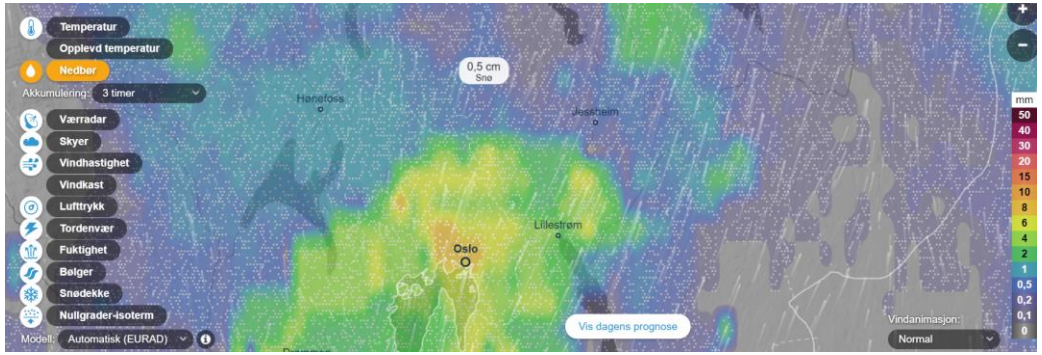
- Optimized runway sequence calculation, including both arrival and departure flights

Integrated Runway Sequence Function is validated with good results and now ready for deployment

PJ04 – Total Airport Management

Wx forecast strong winds and heavy snow with 20% probability

How can OSL best prepare for such situations? In order to draw up a plan that minimizes the consequences of the storm, all operators at the airport must be involved, and good planning can take a long time.



- Structured scenario based collaboration process (what-if)
- Holistic optimisation of the flow for decision support
- V3-validation with the industrial prototype

PJ 05 W2 Digital Technologies for Remote Tower

Two teams working in PJ 05:

- Software Engineering, Safety and Security
  - Cyber-security, security assessment
  - Resilience/flexibility of M-RTM reconfiguration
- Mathematics and Cybernetics
  - 3D-modelling, video processing & machine learning
  - Fast-forward functionality

PJ 28

INTEGRATED AIRPORT OPERATIONS

Showing SESAR solutions in an operational environment and easing their industrial deployment

Automated Assistance to Controller for Surface Movement Planning and Routing

DMAN synchronised with Predeparture sequencing

Airport Safety Nets

AUDIO

Airspace User supporting Demonstrations of Integrated Airport Operations

- Provide information to cockpit via Electronic Flight Bag (EFB) System
- Demonstrate the viability of an innovative advanced and connected moving map application
- Provide local airport data, such as on-ground traffic situation and planned taxi route
- Project is was terminated due to COVID

PJ34 – AURA

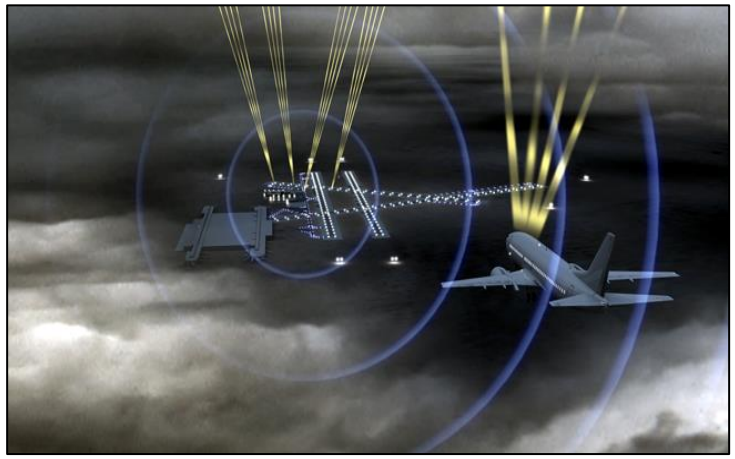
ATM U-Space Interface

- Lay the foundations for the integration of the new entrants, particularly drones, in current and future air traffic environment.
- Collaborative ATM-U-space Concept of Operations for drones in a fully collaborative environment with ATM
- Expert evaluation in workshops, supported by fast-time simulation and interactive visualization

SINTEF

CAT III GBAS

GBAS - Ground Based Augmentation System



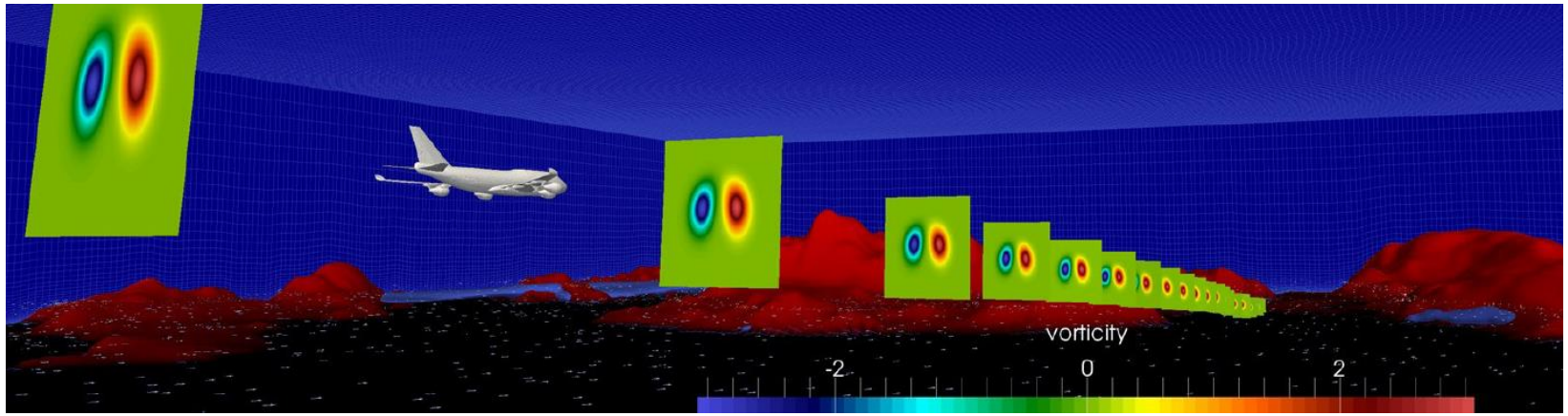
- GLS/GBAS enhances safety, provides improved economics and positive environmental impacts (noise and emission reduction)
- Provides a growth path to readily modifiable autoflight procedures

Multiple projects focusing on different aspects of GBAS

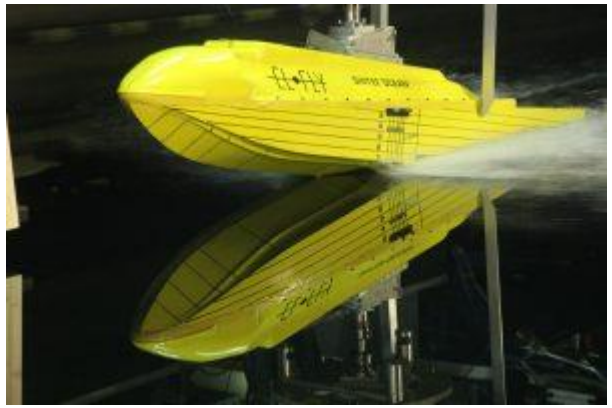
- **(2018-2023)** NFR research project **Cyber-physical Security in Safety Critical Aviation Operations**
- **(2016-2022) SESAR 2 PJ14.03** – GBAS (covering both GAST D (SF/SC) and GAST F (MF/MC))
- **(2014-2017)** NFR BiA **NORGAL** (Nordic concept for CAT III GBAS based Automatic Landing)
- **(2011-2016) SESAR 15.3.7** – Multi Frequency Multi Constellation GBAS (GPS L1/L5, Galileo E1/E5a)
- **(2011-2015)** Norwegian Space Centre funded projects on GBAS (GAST D – GPS L1 concept)

Turbulence and Wake-vortex modeling (CSE)

- Multiscale turbulence forecast system
- Wake-vortex modelling
- Siting and micrositing of airports and runways
- Impact analysis of building induced turbulence



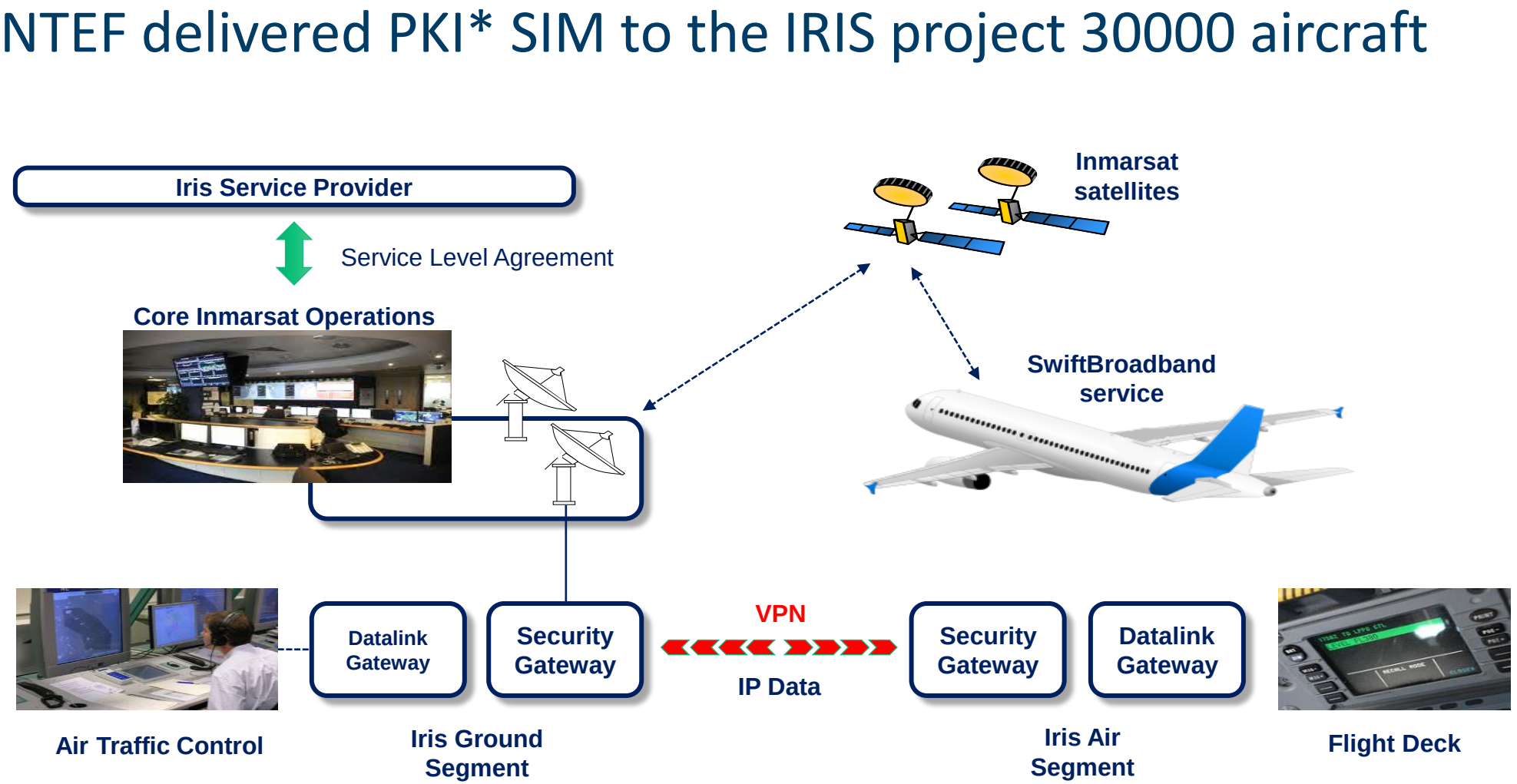
ELFLY AS



- Pilot T prosjekt: Develop X10
  - the world's first full-scale electric amphibious seaplane based on the flying boat concept.
- SINTEF Digital
  - Structure Health Monitoring
- SINTEF Ocean
  - Test av i havbassenget

Iris - A SATCOM system for 4D trajectory management

- SINTEF delivered PKI* SIM to the IRIS project 30000 aircraft



*Public Key Infrastructure

Thanks!!!

ENAV

- Daniele Teotino, Ruggiero Lanotte, Mauro Poponessi, Salvatore Luca Angelo Greco, Daniele Guardigli, Marco Lisatti, Giuseppe Esposito, Debora Palombi, Elisabetta Coppi, Patrizia Criscuolo

IDS AirNav:

- Giuseppe Di Bitonto, Marco Di Donato, Valerio Paciucci, Carlo Andreotti, Pierfrancesco Magarò

Avinor:

- Tom Gunnar Hansen, Rune Straume, Nicolai Jacobsen, June Torsrud, Jens Mikkelsen, Simen Solheim, Thomas Overdale, Endre Abildsnes, Christoffer Vullstad, Thomas Berg, Torkel Skartland

SINTEF:

- Erik G. Nilsson, Kjell Fredrik Pettersen, Morten Smedsrud, Ophelia Prillard, Leo Karabeg, Antoine Pultier, Milan De Cauwer, Patrick Schittekat, Giorgio Grani, Amela Karahasanovic

Organisation: Veronika Wilmann, Birthe Midtun

SINTEF

Technology for a better society