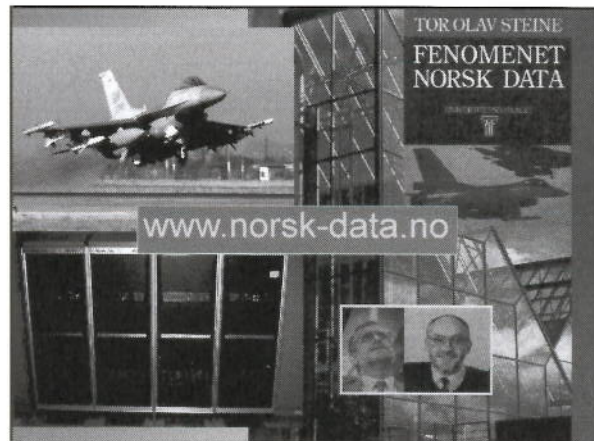


The Cassidian/EADS - Alfatroll AS

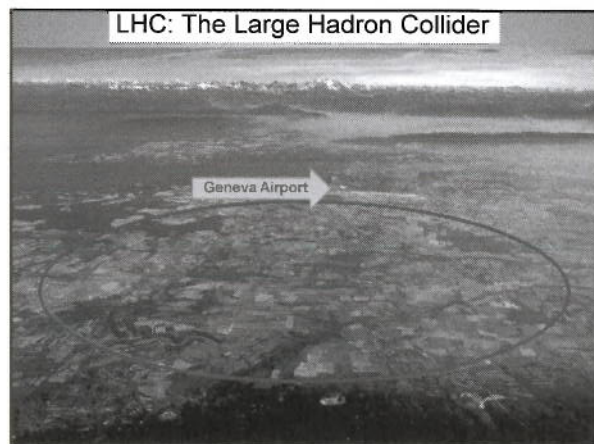
- General level of ambition
 - The project phases
 - The partners



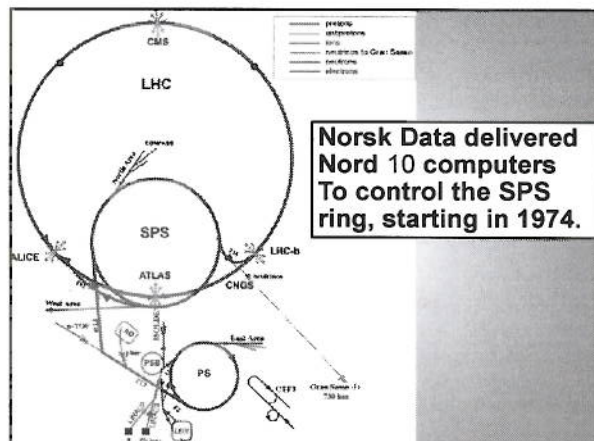
Dave Walden in the Arpanet team



LHC: The Large Hadron Collider

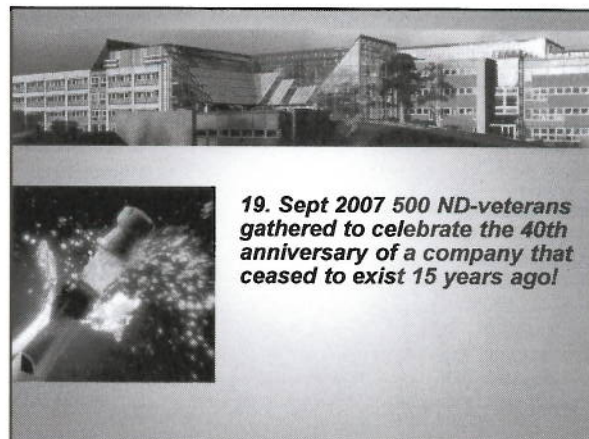
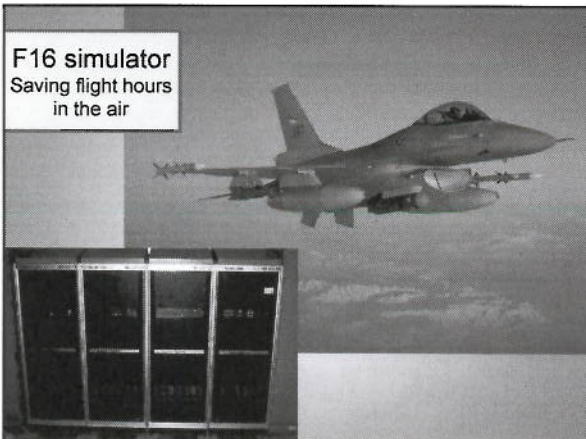


Robert Cailliau, Tim Berners-Lee (left) and Ted Nelson (right) at a WWW conference in Tokyo 1997.

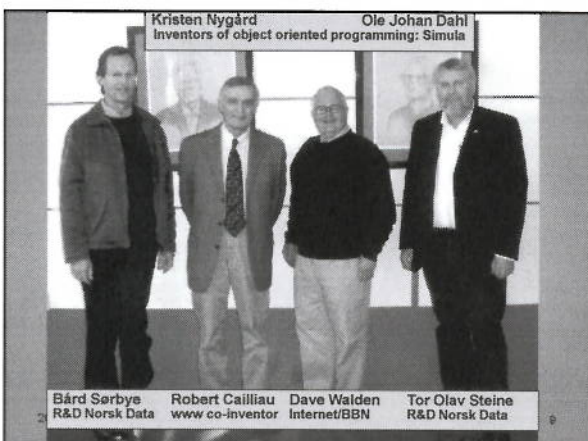


F16 simulator

Saving flight hours
in the air



19. Sept 2007 500 ND-veterans gathered to celebrate the 40th anniversary of a company that ceased to exist 15 years ago!



**The overall goal:
To open for advanced, low cost,
civilian UAS operations, using
European solutions**



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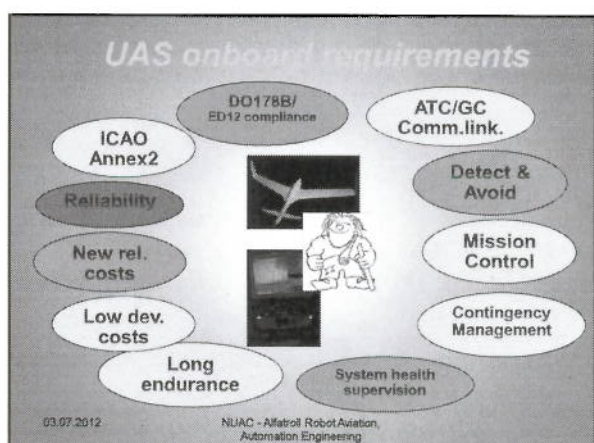
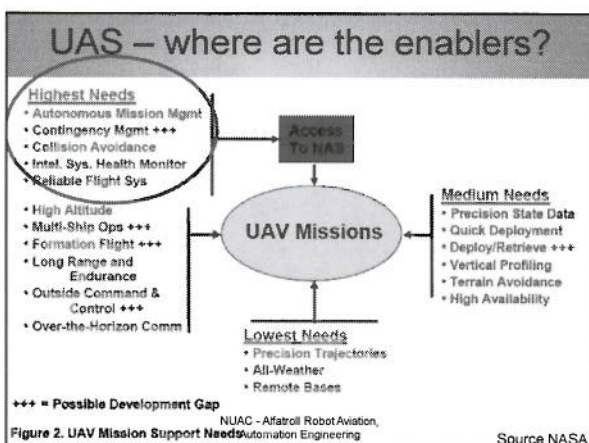
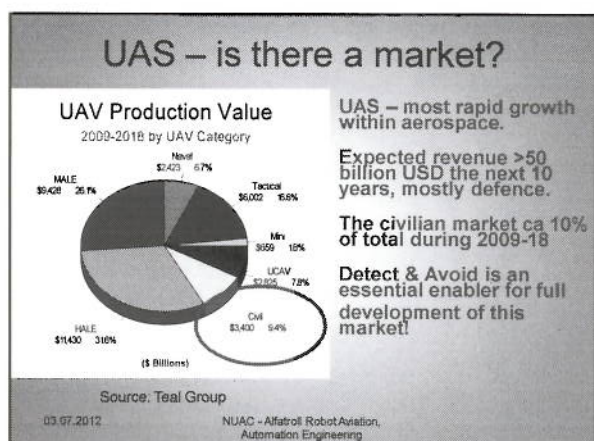
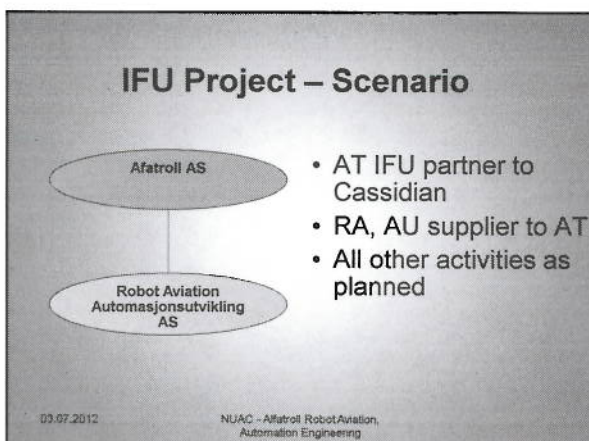
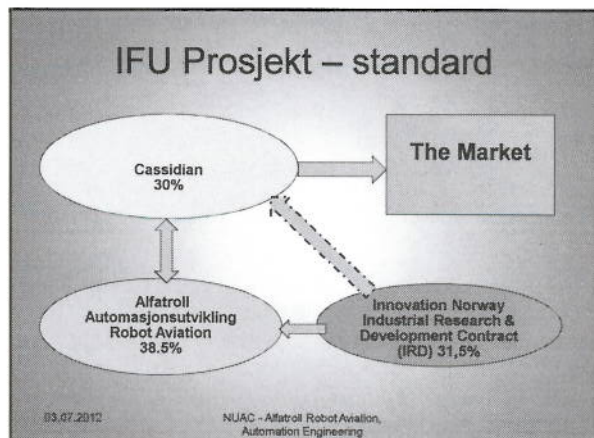
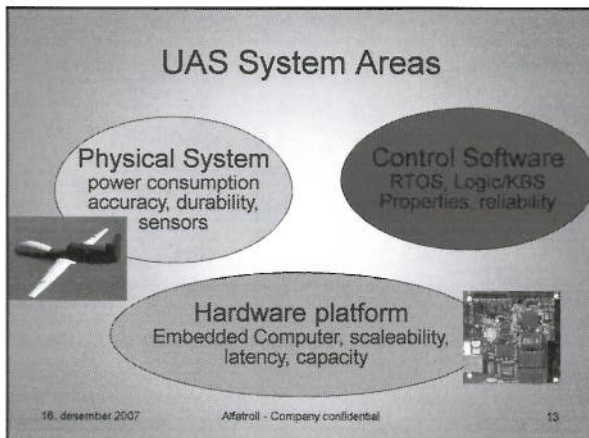
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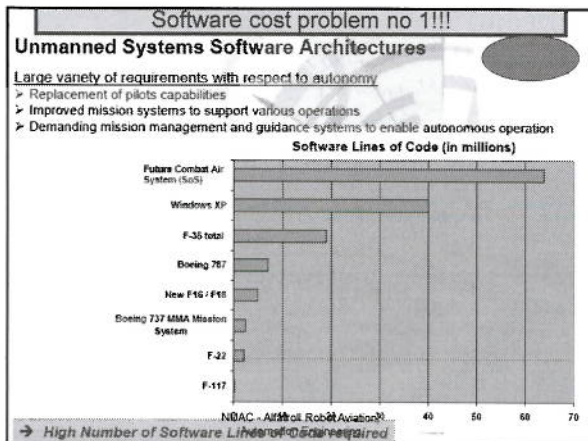
Why?

- The group have unique technologies in their respective fields
 - *Alfatroll: Cognitive Pilot (a prerequisite for flying in ordinary airspace)*
 - *Automation Engineering: Mil.spec datalink (Kongsberg technology).*
 - *Robot Aviation: Unique, long range within the 150kg limit*
- Innovation Norway (IN) is necessary to get going

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What do the experts say?

"Affordability will be treated as a key performance parameter (KPP) equal to, if not more important than, schedule and technical performance" (p. v).

"DoD must continue to pursue technologies and policies that introduce a higher degree of autonomy to reduce the manpower burden and reliance on full-time high-speed communications links while also reducing decision loop cycle time.

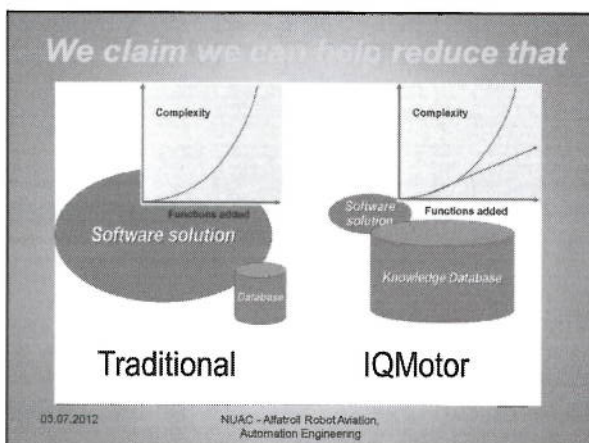
The introduction of increased unmanned system autonomy must be mindful of affordability, operational utilities, technological developments, policy, public opinion, and their associated constraints" (p. vi).

"In 2010, the USAF released the results of a year-long study highlighting the need for increased autonomy in modern weapon systems, especially given the rapid introduction of UAS.

This study, "Technology Horizons," identified the need for greater system autonomy as the "single greatest theme" for future USAF S&T investments." (p. 43)

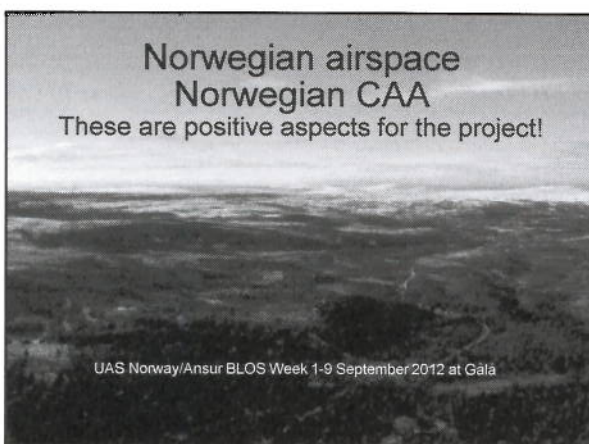
"... the ability to understand and control future costs from a program's inception is critical to achieving affordability requirements."

—Under Secretary of Defense Memorandum for Acquisition Professionals, Better Buying Power, September 2010 (p. 45)



What is so unique here?

- **Unique Technology:**
 - Compact software solution – independent of the amount of decisions required.
 - Decision engine, based upon stored knowledge
 - Smart data organization yields fast and precise response, almost unaffected by the amount of knowledge added.
- **Lowered development costs:**
 - Changes and additions are applied on a layered basis.
 - No changes in software necessary when new knowledge is added.
 - Certification of initial version and new releases is less expensive.
- **Step-by-step progression:**
 - Allows verification of knowledge platforms to be built upon
 - New functions are added on top of already existing knowledge
- **Low level of complexity**
 - The software and the knowledge are totally separated.
 - New knowledge can be added without affecting the software.
- **Fits both SMALL and LARGE autonomous systems**
 - Systems developed by traditional methods may require heavy computer systems.



European Aerospace Company wants to use our technology...

- Border Surveillance
- Inspection and supervision of..
 - Oil and gas lines
 - Oil and gas terminals
- European Aerospace Comp. Would like to integrate UAS technology from:
 - Robot Aviation
 - Alfatroll
 - Automation Engineeringg
- ..and sell in large quantities
- (#500 was mentioned)

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Alfatroll's contribution: Reduced development cost and complexity



- Knowledge based reasoning engine
- Reduced complexity solution
- Faster development at lower cost
- Less expensive version costs

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More than an Autopilot

**Cognitive pilot
(on board)**

API

**Autopilot
(on board)**

High level decisions
- Gives the autopilot orders
- Makes decisions based upon the information available.

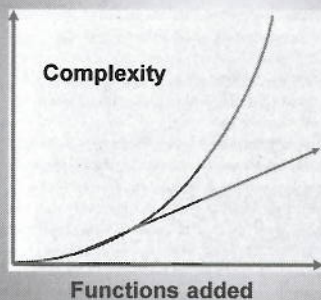
Only low level decisions
- Follows order
- Bone marrow driven reflexes

...while maintaining simplicity!

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Is exponential growth in complexity necessary?



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Automasjonsutvikling AS

www.automasjonsutvikling.no



- Long experience with the MOD projects
- Speciality: DataLink w/ multiple data streams & priority management
- Also makes, UAV fully equipped
- Cameras, FLIRS.

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Telemetric links

Performance
UHF 220MHz to 400MHz 1W BR-600
Frequency Band: 220MHz to 400MHz
Power Output: 100mW to 1W (optionally 5W) ground controlled
Indoor/Urban Range: up to 1km
RF Line-of-sight Range: 10km
Spread Spectrum Type: FHSS (Frequency Hopping Spread Spectrum)
Encryption: 256-bit AES
Operating Temperature: -40 to 85° C (industrial)
Bit rate: up to 2.3Mbit/s (on air, approx. 1Mbit/s payload)

72MHz Safety Radio
Frequency Band: 72-75MHz
Power Output: 1W
Indoor/Urban Range: up to 500m
Outdoor Line-of-sight Range: 1km
Spread Spectrum Type: FM, dual tone
Addressing: 20kHz deviation pr. channel
Encryption: proprietary PCM
Operating Temperature: -40 to 85° C (industrial)

80kHz Analog Video
Analog video down link: Rover III compatible downlink, readable from all Rover units in area.

Certifications:
- UHF mil. Spec., Safety commercial.



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Robot Aviation's contribution...



- UAV optimized for the 150 kg limit
- UAV built according to JAR22 (...)
- Long range, long endurance platform
- Rich know-how

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3 View drawing

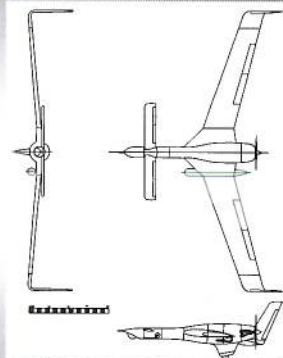
Specifications:

Wing span: 7.00 m
Length: 4.15 m
Max width: 0.55 m

Cruise speed: 120 km/h
Stall speed: 55 km/h
Endurance: 25 hours

Engine: 220 ccm
Payload: 50 kg

Rescue: Ballistic
Recovery System



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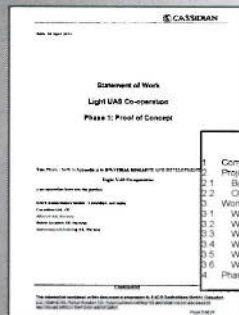
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Prosjektet for Cassidian



- ...er beskrevet over 20-30 sider i et Statement of Work (SOW), som omhandler:

Table of Contents

1	Company Information
2	Project Objectives
2.1	Background
2.2	Objectives
3	Work Breakdown Structure
3.1	WP 1 Project Management
3.2	WP 2 Use Case and Requirements Definition
3.3	WP 3 Light UAS Design
3.4	WP 4 Data Development
3.5	WP 5 UAS Demonstration
3.6	WP 6 Exploitation and Phase 2 Preparation
4	Phase 1 project schedule

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The NUAC project a staged approach

Phase 1
(4months)
IFU

Phase 2 12-18 months)
IFU and consulting?

Phase 3 18-24 months)
Consulting

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The NUAC project

Phase 1
(4months)

Phase 2 12-18 months)

Phase 3 18-24 months)

- Goal: Proof of concept!
– all systems work (separately) as promised!
- Use cases and SOW (Statement Of Work) to mirror this goal!

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The NUAC project

Phase 1
(4months)

Phase 2 12-18 months)

Phase 3 18-24 months)

- Goal: System thrust for BLOS operation
– All systems work combined as promised!
– Long range operation under full control demonstrated
– Correct reactions to interfering traffic and emergencies
- Use cases and SOW to mirror this goal

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The NUAC project

Phase 1
2007-2012

Phase 2 12-18 months

Phase 3 18-24 months

- **Goal: System certified/prepared for certification for BLOS operation**
 - All systems reworked to comply with required standards
 - Long range operation under full control tested according to standard requirements
- Use cases and SOW to mirror this goal

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The Business Concept

IFU-prosjekt
Utvikling,
Sertifisering

Prosjektfasen
Tilpassinger, prosjekt-
leveranse

Produktfasen
Volumleveranse via
OEM-distributør

- IFU Project for the development phase
- The project phase for repeated sales
- The product phase for volume sales

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IFU totaløkonomi FASE 1-3

Project	2012		2013		2014		2015		Hours	Total
	Hours	Total	Hours	Total	Hours	Total	Hours	Total		
Casidian/EADS Phase 1	2 874	2 894 604							2 874	2 894 604
Casidian/EADS Phase 2	8 066	7 562 517	8 066	7 562 517					16 132	15 125 034
Casidian/EADS Phase 3 (est)			7 223	6 772 175	7 223	6 772 175	7 223	6 772 175	21 669	20 316 525
Total Hours/project costs	10 940	10 257 121	15 289	14 334 692	7 223	6 772 175	7 223	6 772 175	40 675	38 136 163
Manyears	7,3		10,2		4,8		4,8		27,1	

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Prosjektsalg

	2 012	2 013	2 014	2 015
Prosjektsalg:		2 100	3 500	7 400
IFU prosjekt inntekter:	5 043	5 896	2 778	4 000
Totalt prosjektsalg	5 043	7 996	6 278	11 400

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IFU Prosjekt – utfordringen

NUAC:
Alfatroll
Robot Aviation,
Automasjonsutvikling

- Prosjektet og partneren er OK
- Bedriftene i konsortiet er "for svake – dårlig overlevelsessevne"
- NUAC bedriftene trenger mer kapital/trygghet

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IFU Prosjekt – Mulig Løsning..

Venture
Capital
injection

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Automasjonsutvikling

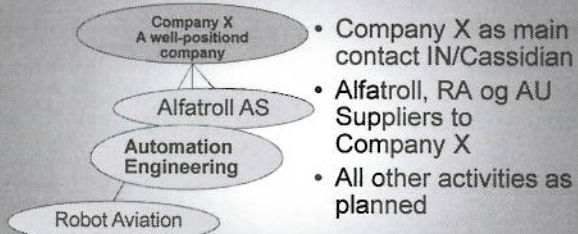
- Ulempe: Man er "for billige" i tidlig fase => stor utvanning
- VC sikter mot "going business"
- Fordel: Aksepteres av Innovation Norway

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IFU Prosjekt – Mulig Løsning



- Company X as main contact IN/Cassidian
- Alfatroll, RA og AU Suppliers to Company X
- All other activities as planned

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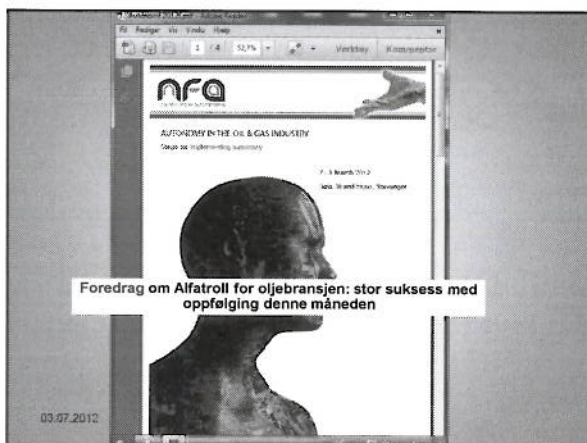
What are we talkin about here??



Probably the most exiting aerospace project in Norway since Norsk Data sold computers to the Singer-Link F-16 simulator

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