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THE SAAB NETDEFENSE CONCEPT

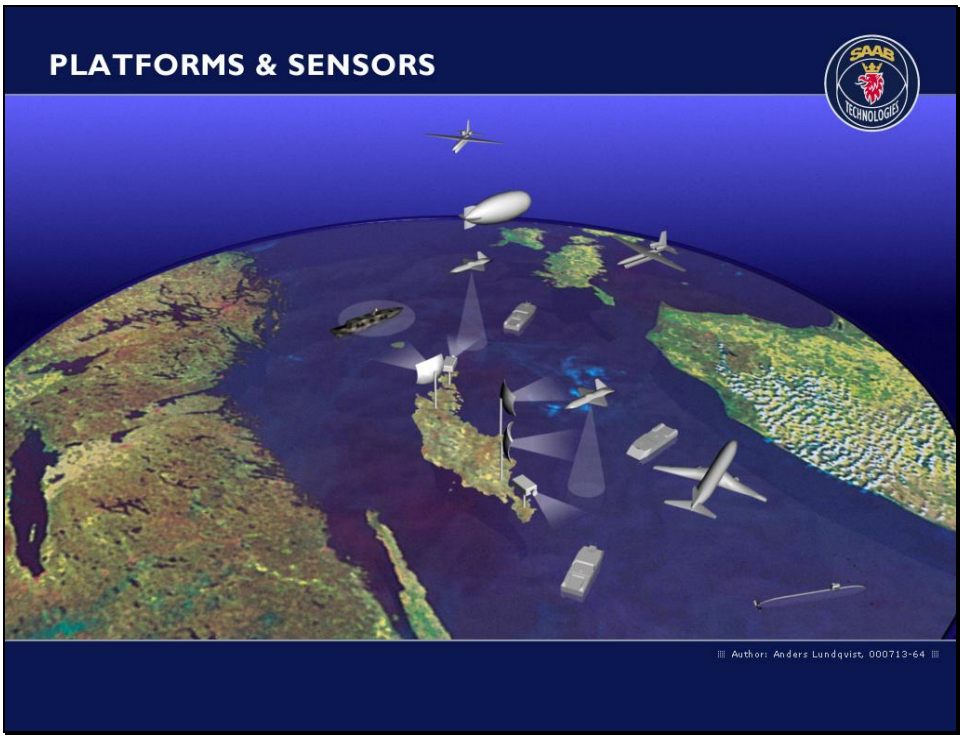
The Swedish armed forces will be drastically re-organized within the coming decade according to a government bill accepted by the Swedish parliament 1999. The emphasis will be put on what is called Net Centric Warfare, NCW, to certain extent at the expense of the traditional armed forces. Instead the system will allow them operate in more efficient way than before. This process has already started.

It should be mentioned that the ideas behind this change came from the US but there is probably no country where the plans have proceeded further than in Sweden.

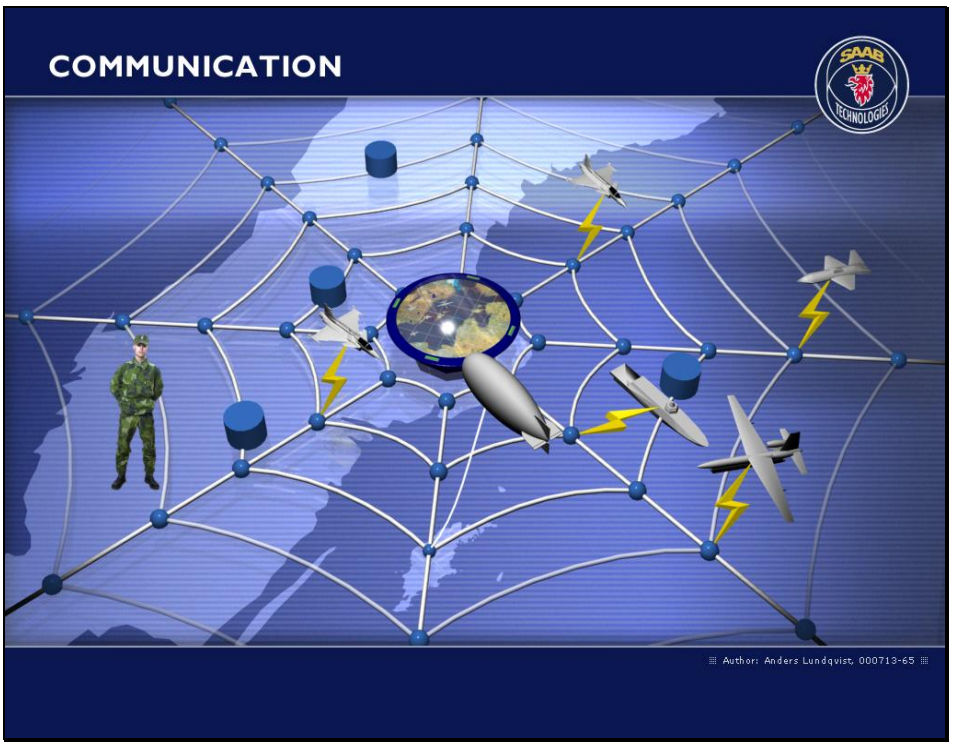
The presentation represents Saab´s view on NCW which we call the Saab NetDefense Concept, in particular with respect to the role of Unmanned Aerial Vehicles, UAVs.

The NET-Centric System constitutes a common net in which Army, Navy and Air Force units,Command Centers etc. are tied together. The user will have the possibility to have access to all relevant information, depending on the user´s role. Actually the infrastructure of the existing Internet will be used, and a virtual net created with secure access control.

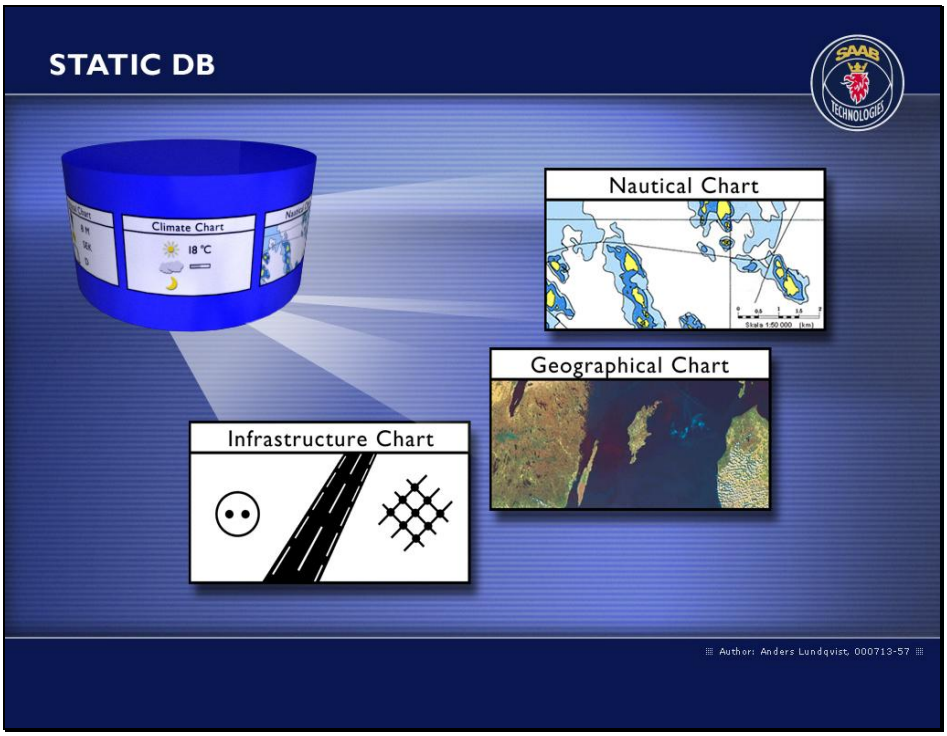
Decision Superiority will be obtained from quick from quick access to data gathered from different sensors which can be airborne, e g by UAVs, or on ground, on ships or in the sea. Also open information e g from the ordinary Internet will be used. The data will processed, compiled and presented in a way that simplifies the decision tasks.



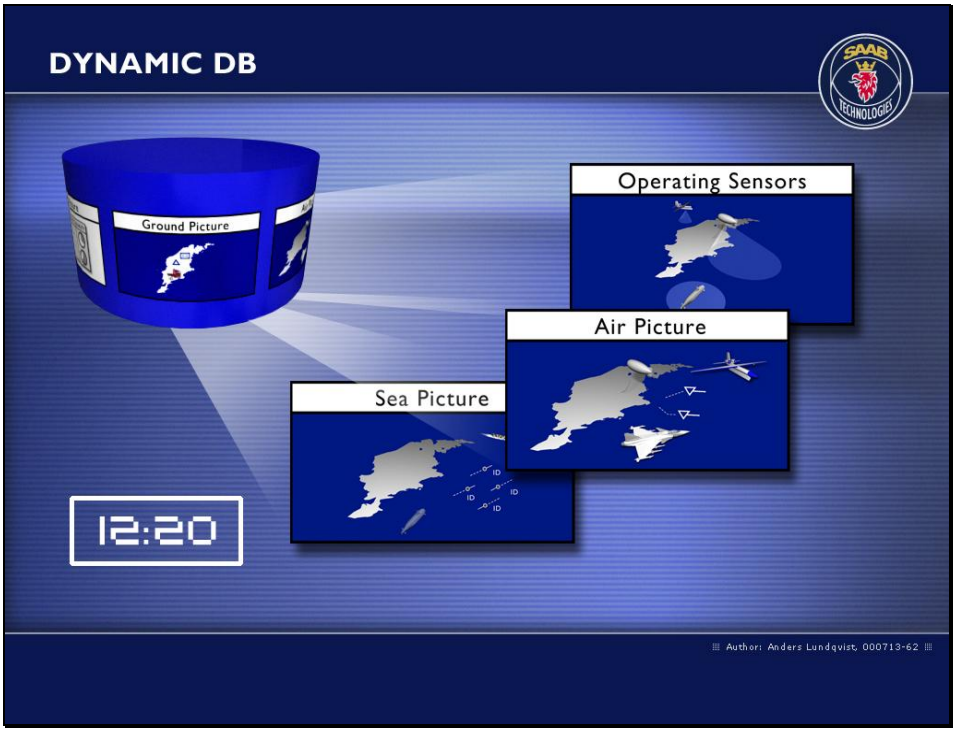
This picture illustrates different sensors and sensor platforms that can be used for surveillance over sea, in this case the Baltic.



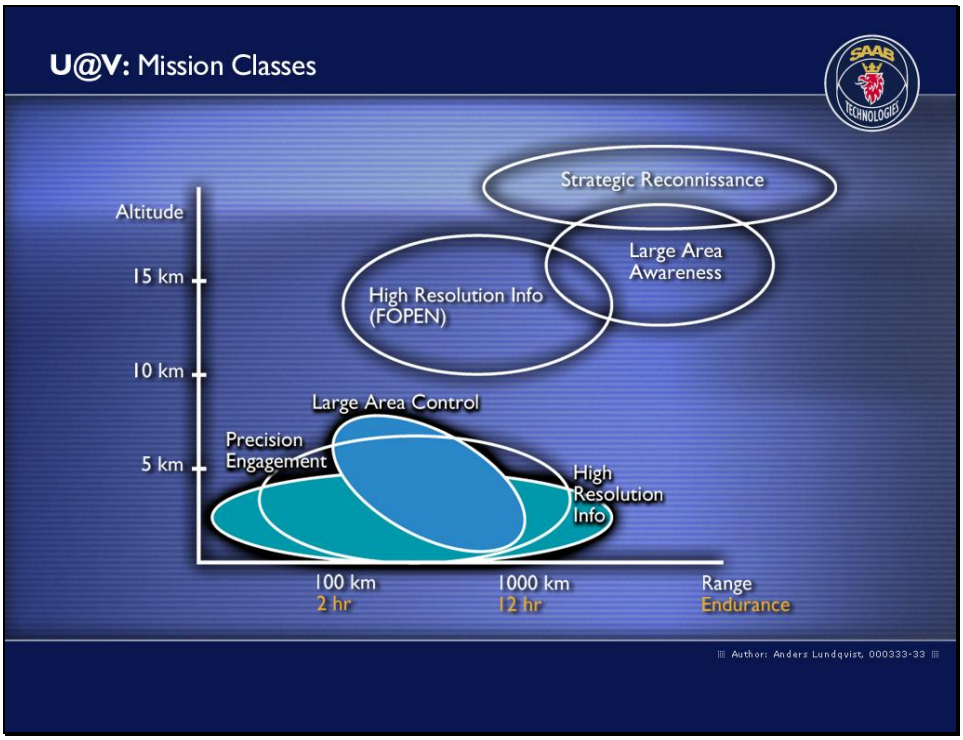
The different sensors or sources of information are connected to the net.



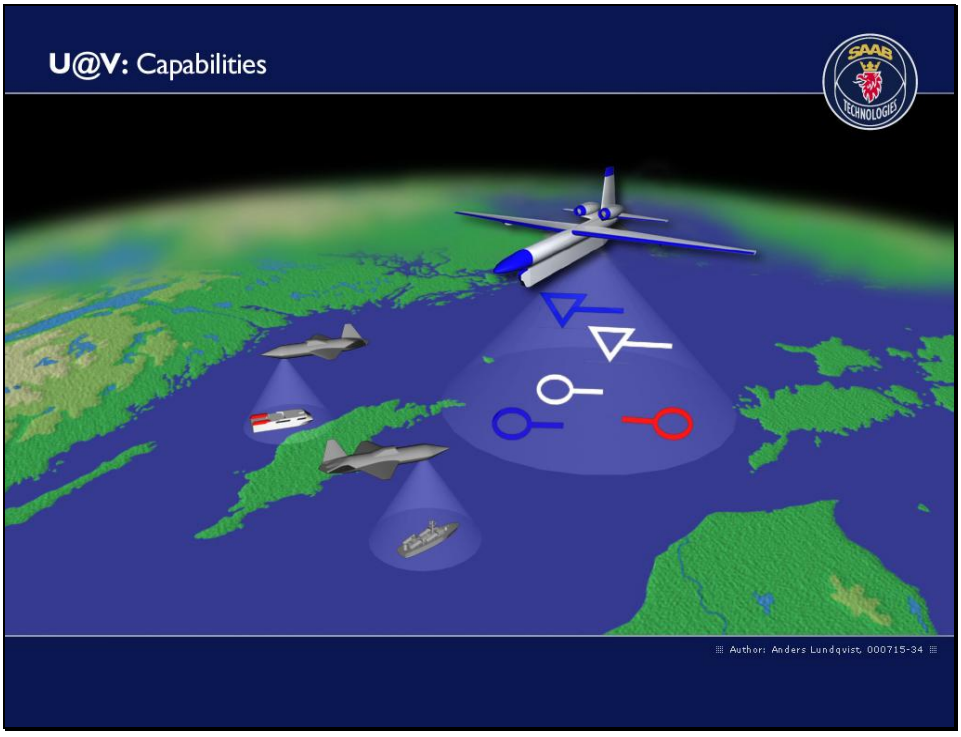
A number of data bases will be available in the system.
There will be data bases with more or less static data e g geographical and nautical charts and infrastructure charts.



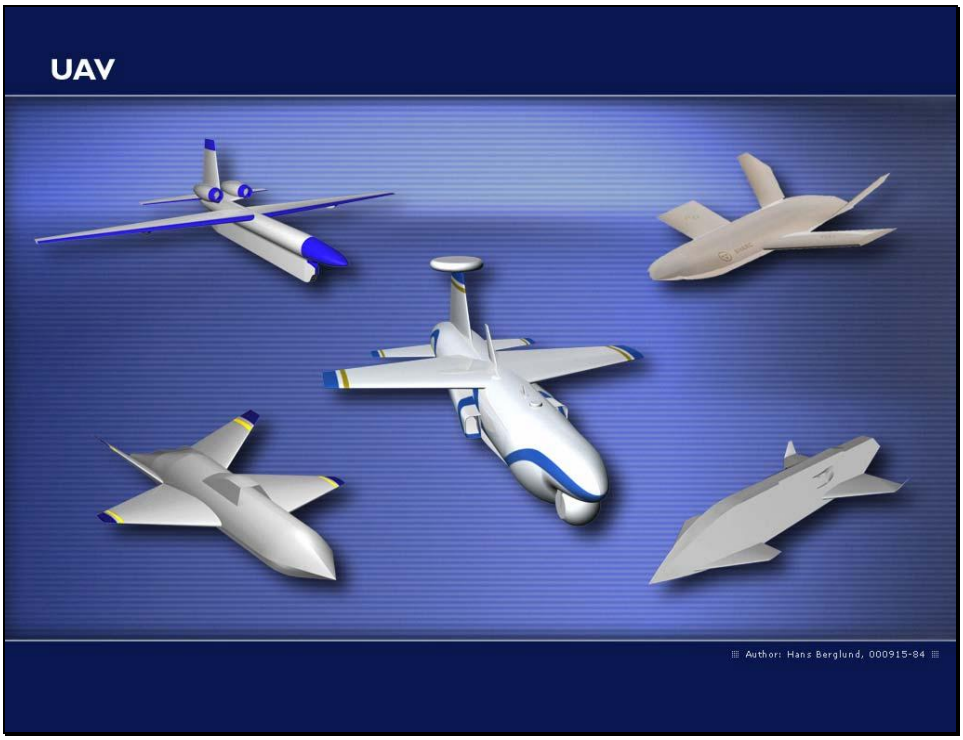
Dynamic data bases which will be created and continuously updated, containing data about available sensor platforms, sensors, sensor data etc



There are a great number of different tasks where UAVs could be useful, and also preferred compared to manned aircraft. The different tasks will require rather different UAV designs and different sensor equipment, Electronic Warfare (EW) equipment and weapon loads.
For Strategic Reconnaissance long range and endurance on high altitude is required. (Typical example: Global Hawk)
Large Area Awareness can be achieved on somewhat lower altitude.
High resolution radar reconnaissance with Foliage Penetration (FOPEN) can also be performed from high altitude and great distance.
Other sensors like EO/IR are normally operated at lower altitude to achieve high resolution.
Precision engagement with ground attack weapons is performed from low altitude.



This is an example where potential intruders have been detected by a HALE, and quick reaction UAVs with high resolution sensors have been sent out to identify two ships on the sea (one ferry out of schedule, one military vessel). The symbols below the HALE represent known, unknown and hostile ships.

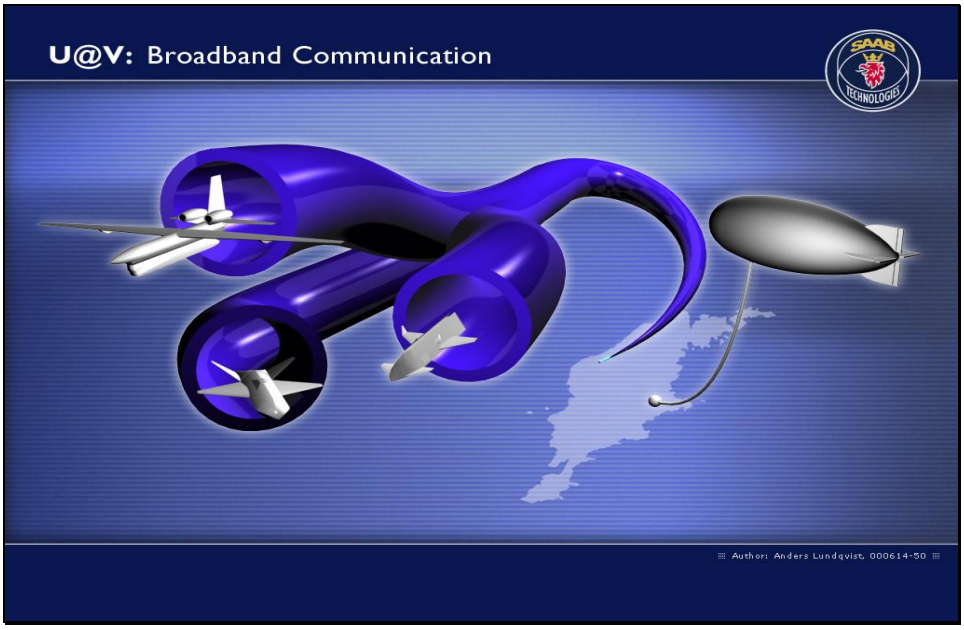


Saab has performed a number of conceptual studies on UAVs for different tasks.

- —a HALE for Large Area or Strategic Reconnaissance;
- —a medium altitude UAV for Ground Surveillance and quick reaction Precision Reconnaissance;
- —an UAV with similar tasks as the former one but with less performance;
- —a small medium altitude reconnaissance vehicle with limited range It is to be carried eg by a Gripen a/c and released not too far from the area of interest. Recovery by parachute;
- —an UCAV with precision weapons for ground attack.

Note that the scale in the picture is not consistent!

The vehicles are jet driven, and have Lo Observable features, with exception for the HALE and the (low cost) Reconnaissance vehicle in the center.



To be of any use the sensor data usually have to be transferred to ground, and when possible this should be done without any substatial delay. Normally a wide band point-to-point data link is required, but still there are physical limitations regarding the possible data rate. Typical factors are:

- antenna size;
- weather;
- line-of-sight conditions; affected by UAV height, ground/relay station height, and terrain masks;
- ground reflections;
- Lo-Observable requirements.

For these reasons the UAV will have on-board:

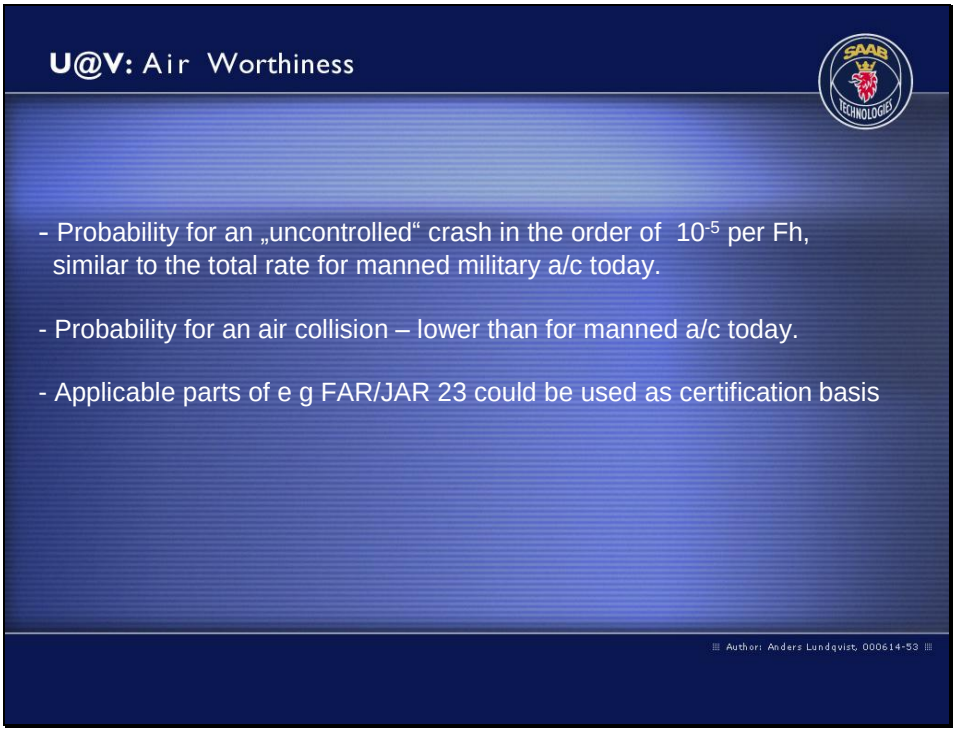
- High capacity data recording equipment for re-playing of data later during the mission and/or on ground;
- data processing capabilities for data reduction.

Satellite communication will be a solution to some of the problems, however.

As mentioned before we envision a number of UAV types equipped for different roles. By standardizing the Man-Machine interface and the command links to the vehicles, we believe that different UAV types, and also more than one UAV, can be controlled by the same operator.
One category of tasks for the operator is to plan, control and monitor the UAV flight path (ref FLIGHT OPS). Normally the planning will be performed before flight with possibility to modify during flight. No „direct“ flying via a control stick is assumed.

The other task category is to control the sensors and other payloads (ref SENSOR OPS). We envision that these tasks may be transferred to an authorized commanding officer connected anywhere in the net. To a limited degree he may also control the flight path, especially in the target area. For flying in civil airspace in peace time all regulatory operational requirements have to be fulfilled which seems difficult, to do without additional aids and personell, normally available in a control station.

There are presently no generally agreed airworthiness regulations and operational rules for unrestricted UAV flight outside closed military areas. This situation we feel is quite unacceptable. However, the situation is not quite as dim as this picture, and we have at least a feeling for what the requirements will be.



In Sweden a dialogue has started between the civil and military regulatory agencies, and with the industry, while waiting for international rules. Certain key probability figures have to be defined:

- probability for an „uncontrolled“ crash we think should be in the order of $1*10^{-5}$ per Fh which is similar to the total rate for manned military a/c today;
- probability for an air collision – lower than for manned a/c today.

Applicable parts of e g FAR/JAR 23 or could be used as a certification base

To fulfill those requirements will require high integrity/redundant systems for flight control, navigation including flight planning, command data links, and functions for autonomous flight. To minimize the risk for air collisions an Automatic Air Collision Avoidance (Auto ACAS) system seems necessary, especially for VFR flight.

Saab is actively working on those issues, and other UAV issues, and we think we can offer solutions. We are also working together with other European nations e g within the so called ETAP program to develop technologies critical for UAVs.

As a summary we are confident that SAAB will be able to deliver the UAVs needed for the future Net Centered Warfare system.