BLOODHOUND MK II IN SWEDEN

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SWEDEN´s ”ROBOTSYSTEM 68”, BLOODHOUND Mk II, FIRED AT RFN TEST RANGE CLOSE TO THE ARTIC CIRCLE

BACKGROUND

A defense study during the 50-ies indicated:

- Lack of defens capabilities at high altitudes

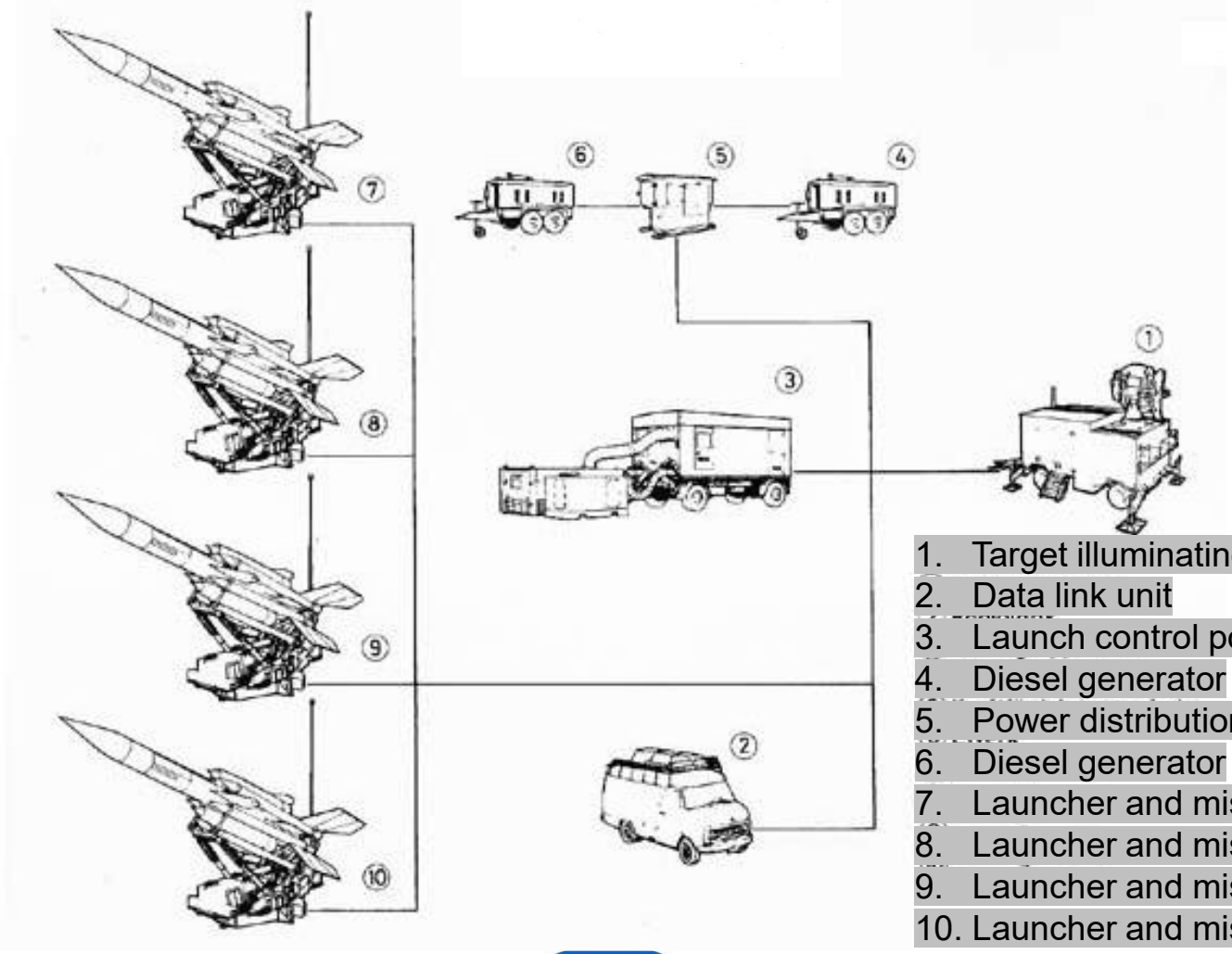
- SAM´s are assumed more suitable than aircraft for this

- **Decision to try SAM was made in 1957**
- **BAL was contracted for a Bloodhound MK I (evaluation system) in 1958 to be delivered in 1959/1960, followed by learning, testing and evaluation period in Sweden by both the Army and the Air Force**
- **The Army buys Hawk systems in 1960 from Raytheon**
- **The Air Force procures 12 off Bloodhound Weapon sections from BAC in 1961 to be delivered in 1964-1966**

MISSILE ALTERNATIVES

Parameters/ System	Bomarc USA	Bloodhound I UK	Hawk USA	Bloodhound II UK
Lenght, m	14,6	7,7	5,1	8
Weight, kg	7000	2000	570	2000
Launching metod	1 booster rocket	4 booster rockets	1 booster rocket	4 booster rockets
Engine	2 ramjets	2 ramjets	Rocket	2 ramjets
Range, km	600	110	25	240
Max height, km	25	15	12	24
Speed, Mach	M 3	M 2	M 2	M 2
Note	Politically impossible	Evaluation system for the Army and Air Force	Final choice for the Army	Final choice for the Air Force

MAIN UNITS OF THE BLOODHOUND SYSTEM



1. Target illuminating radar
2. Data link unit
3. Launch control post
4. Diesel generator
5. Power distribution box
6. Diesel generator
7. Launcher and missile
8. Launcher and missile
9. Launcher and missile
10. Launcher and missile

SYSTEM PARAMETERS

Range:	**240 km**
Max. height:	**24 km**
Speed:	**Mach 2-3**
Numbers of launchers:	**4/firing unit**
Number of missiles:	**8/firing unit**

The system is mobile, interconnected with Air Defence Centres in the area and is extremly difficult to jam.

BLOODHOUND USERS

THESE SAM SYSTEMS, IN DIFFERENT VERSION, ARE PROCURED BY:

- **Australia Mk 1**
- **Singapore ex. RAF Mk 2**
- **UK Mk 1 and Mk 2**
- **Switzerland Mk 2 (BL-64)**
- **Sweden Mk 1 (BR 65) and Mk 2 (RB 68)**

The system was also procurced by Libya, but for political reason the deal was stopped after the equipent had been manufactured but not shipped

THE SWEDISH STRATEGY FOR BLOODHOUND MK II

- 4 AIR WINGS ALONG THE SOUTH AND EAST COASTS (AREAS FACING WP COUNTRIES) WERE EQUIPPED WITH MISSILES UNITS

- EACH AIR WING (AW), WITH ONE EXCEPTION, WAS EQUIPPED WITH 2 BLOODHOUND UNITS EACH

- ONE BLOODHOUND UNIT/AW WAS INTENDED TO BE FULLY OPERATIONAL ALL THE TIME THE OTHER UNIT WAS USED FOR TRAINING, EXERCISES AND TESTS

- I CASE OF PREPAREDNESS THE UNITS WERE SUPPOSED TO REGROUP TO PREPARED MISSILE SITES IN THE COUNTRYSIDE 10-50 KM FROM EACH AIR WING

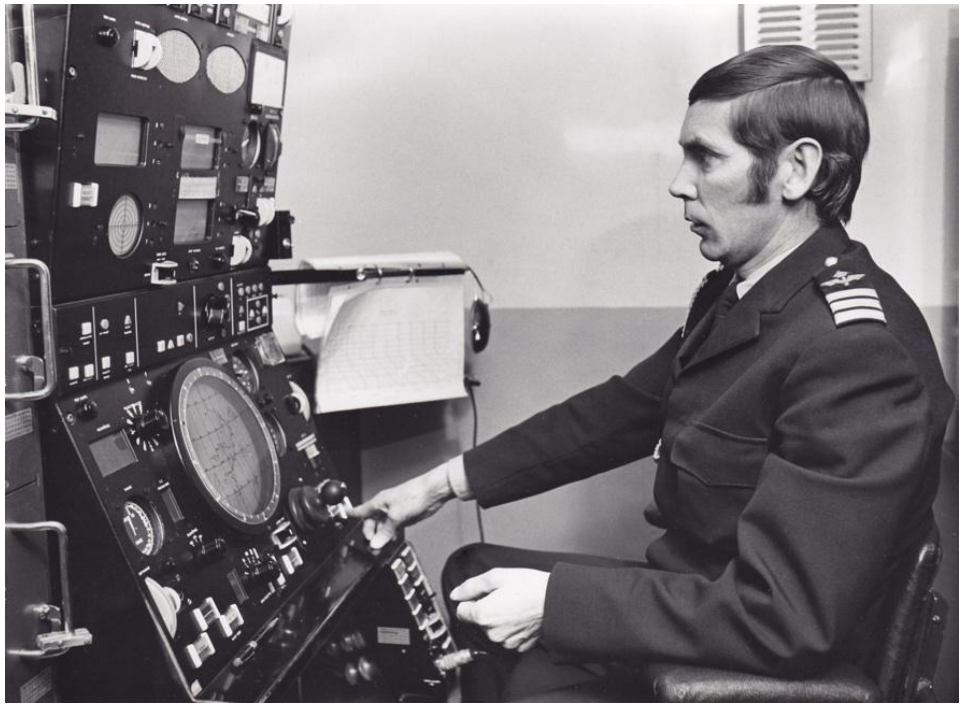
- THESE SITES CONTAINED TELECOM TO THEIR AIR DEFENCE CENTRES AND CONCRETE SLABS FOR THE LAUNCHERS

- AFTER LAUNCHING 1-3 MISSILES THE PLAN WAS TO RAPIDLY MOVE TO ANOTHER PREPARED SITE IN THE NEIGHBOURHOOD

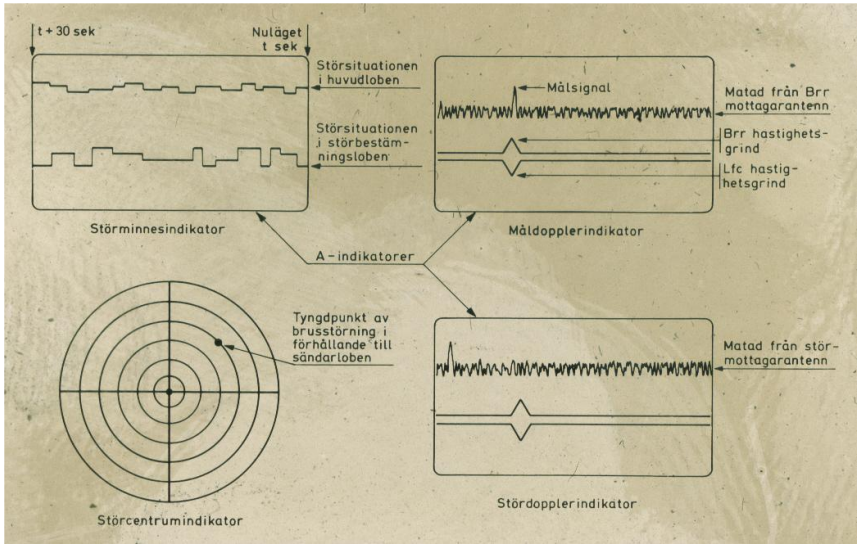
ONE BLOODHOUND UNIT IN 1966 AT AIR WING BARKARBY/STOCHHOLM

LAUNCH CONTROL POST

ENGAGEMENT CONTROLLER IN THE LCP



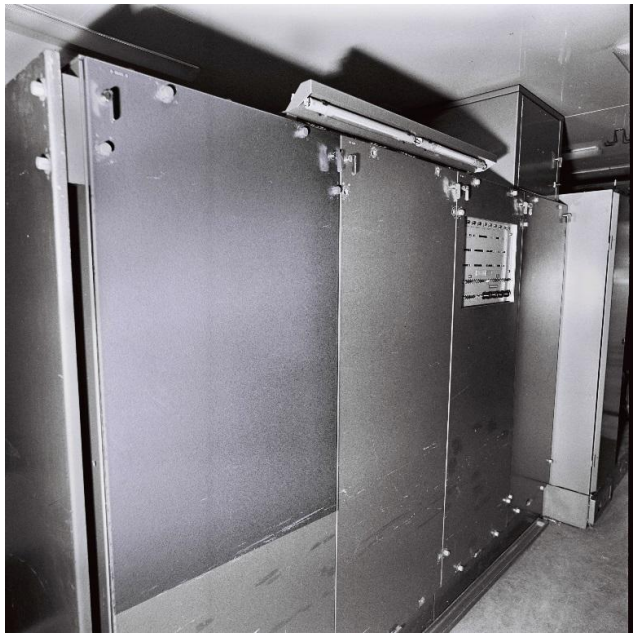
EC ”in action”



Some of the EC displays

THE ARGUS 200 COMPUTER IN THE LCP

- First computer used by the Swedish defence forces
- Developed in the late 50´s by Ferranti
- Contained 600circuit cards with:
  - 64 pegboards för programming
  - One 64 kb ferrite core memory
- Programmed in asci code
- Included advanced functions like DMA (Direct Memory Access)



- Calculated flight passes for the missiles and display presentationes in the LCP
- Could perform 48-bits multiplication in one instruction

TARGET ILLUMINATING RADAR, TYPE 86 (FIRELIGHT)

Parameters:

CWFM radar

X-band (8 GHz)

3 kW power output

Loobwith 1,35°

7 antennas

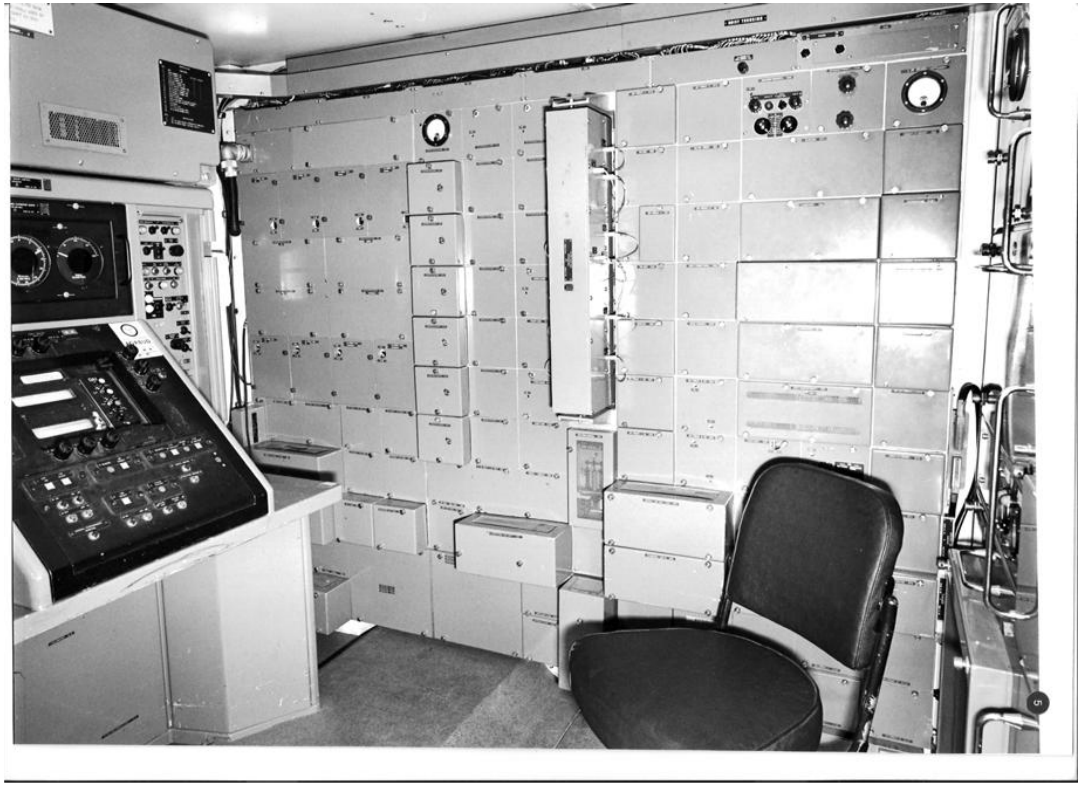
Max range 240 km

Accuracy 0,1° (elevation)

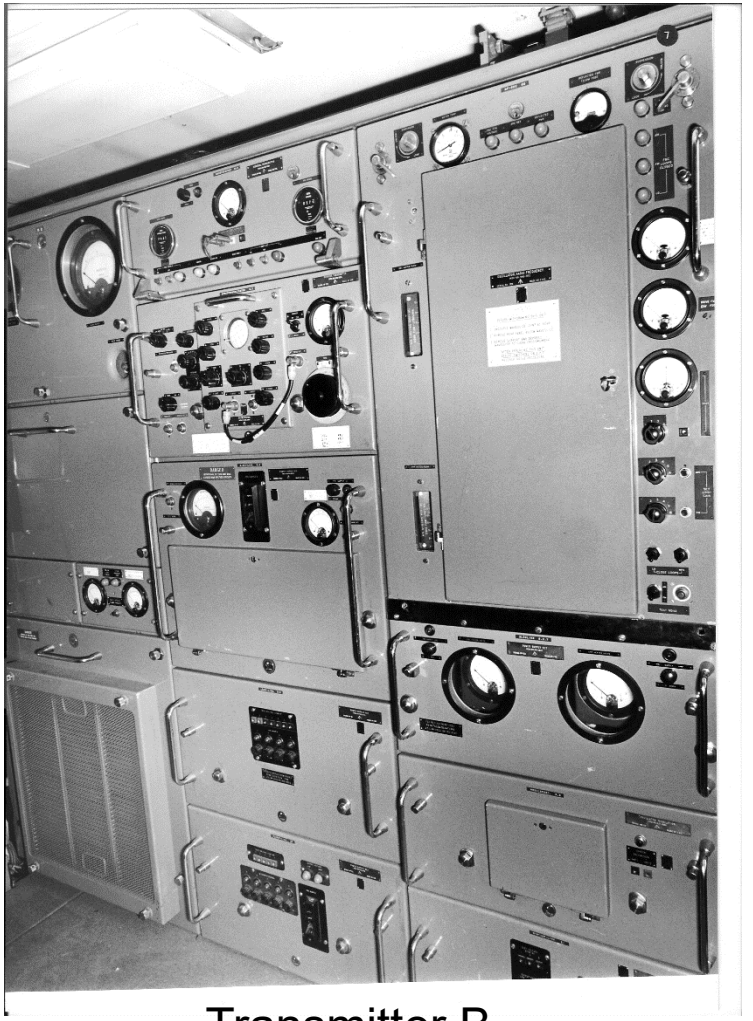
Accuracy 0,2° (bearing)

Radar with attached aerial boom

RADAR INTERIOR



Radar Console D (left) and video unit C



Transmitter B

MISSILE DATA

Length: 8 m

Weight: 2 tons

Cruisig height: 50/300 m – 24 km

Speed: Mach 2,2 - 3,2

Range: 240 km

Fuel: Kerosene

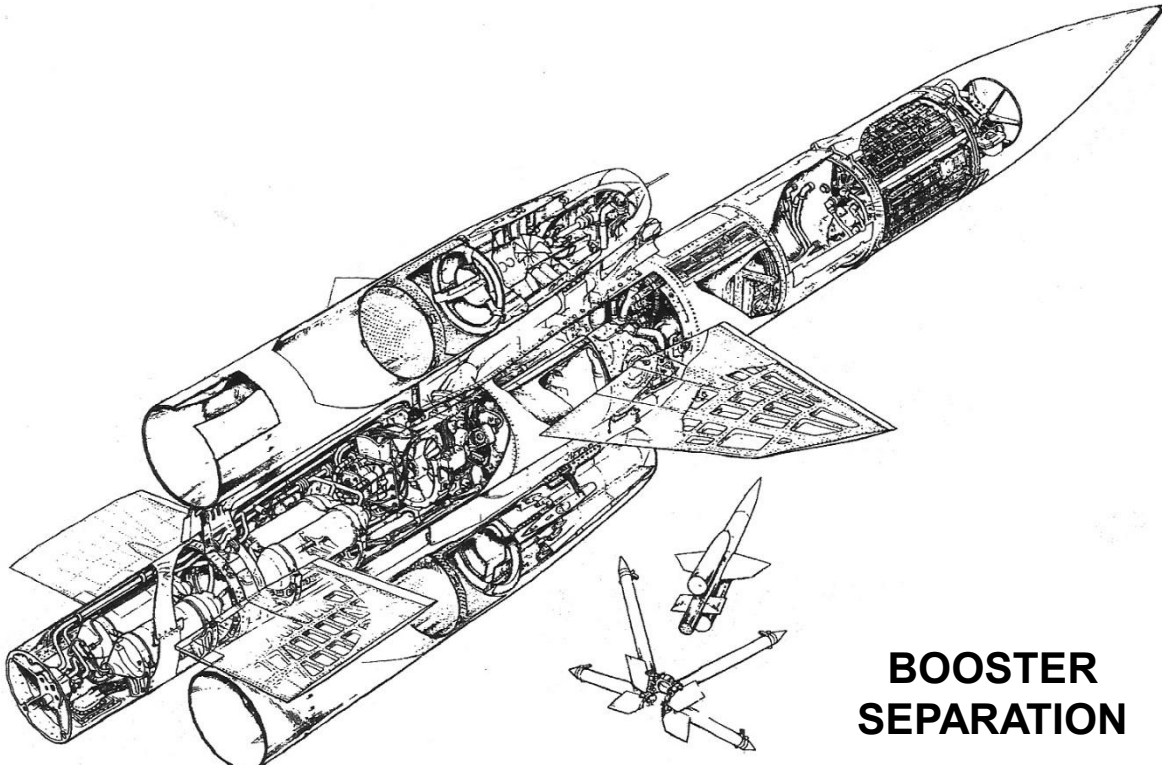
Engines: 2 ramjets delivering 40,000 hp each

Launching system: 4 booster rockets delivering 43 Mp thrust which after 2 s results in a speed exceeding Mach 2.0 (= 2450 km/h)

MISSILE

Main units:

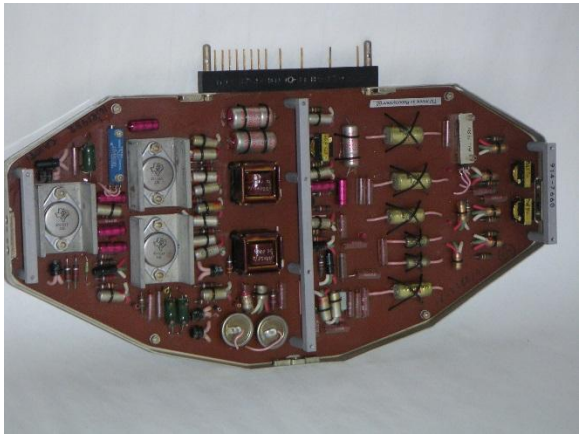
- 4 booster rocket
- 2 ram jet engine
- 2 fuel tanks
- 2 wings
- 2 stabilizer wings
- Radom
- Disc antenna
- Receiver
- Control unit
- Battery
- Fuze
- War head



BOOSTER SEPARATION

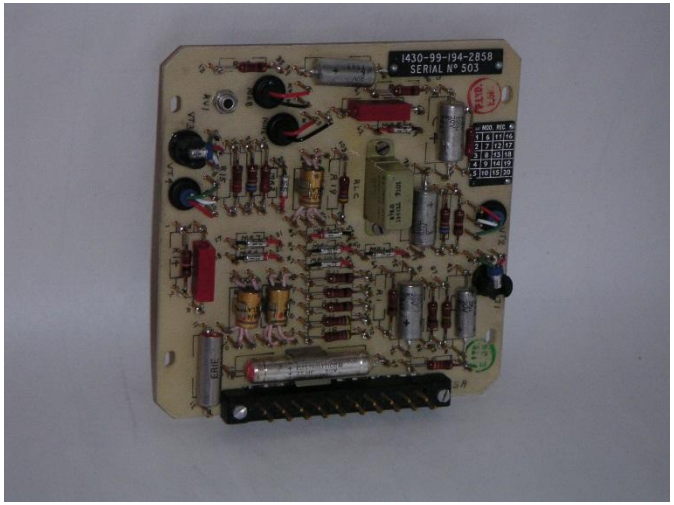
Technology

Missile circuit card

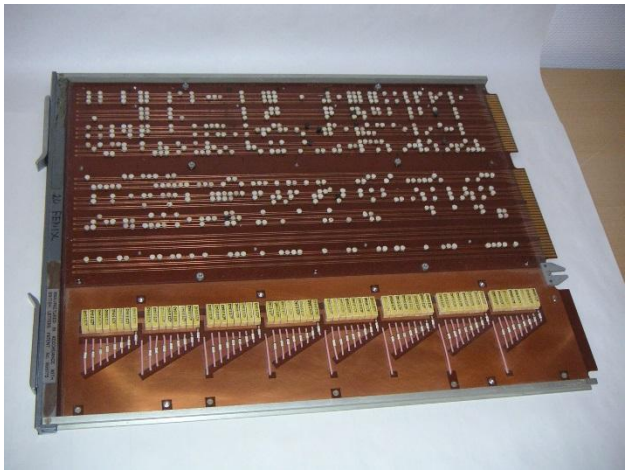


LCP circuit card

TIR video card



Program tray LCP



SECURITY

- The majority of H/W, S/W and docmentation were subject to various levels of classification. Since many years the system is now fully declassified.

- Speciellt sensitive were information regarding:
  - Prepared sites
  - Involved personell
  - Tactics and mobility
  - Capabilities and limitations
  - ECM and ECCM
  - Sensitive frequencies
  - Special functions

- The fact that UK levels Restricted and Confidental do not exits in Sweden these levels had to be handled as Secret, resulting in a lot of red tape.

The Swedish mainenance concept

Local level: Air force technicans, instruments and
(A level) interchangable units (IU)

Regional level: Service teams with test equipments and
(B level) interchangable units

Central level: Central workshop for repair of IU´s
(C level) Technical experts
Central store for IU´s and spare parts
Resources for major overhaul

The missiles are cycled to the workshop in Risinge every 6th month for tests in the MOTE (Missile Overall Test Equipment)

The ground equipment at each Air Wing are mainly repaired by replacing faulty IU´s by the site technicans

TELUB AND BLOODHOUND

During Telub´s first years (founded in1964) of operation Bloodhound was its biggest project.
Telub was a private company, founded in 1964 and partly owned by the Swedish government involved in supporting and maintaining several technical defence project for the Army, Navy and Air Force. Telub was taken over in year 2000by SAAB AB and is still in operation
For Bloodhound Telub provided these functions:

- **Missile workshop with 100 employees in Risinge**
- **Repair workshops for IU´s with 10 employees**
- **Mobile field service teams with10 employees**
- **Publication department with 5 employees**
- **Technical support unit with 15 employees**
- **Logistic functions for IU`s and spare parts**

MISSILE WORKSHOP IN RISINGE

The Telub missile workshop was built specially for the Bloodhound project and was located in Risinge 5 km outsite Växjö city to facilitate handling of highly explosive and flamable materials with no other buildings in the neighbourhood

Map showing the workshop area in Risinge

1. Storage.
2. Storage
3. Reception, office, workshop
4. Guarded Gate
5. Fuel handling
6. Pump house
7. Workshop
8. Office
9. Workshop

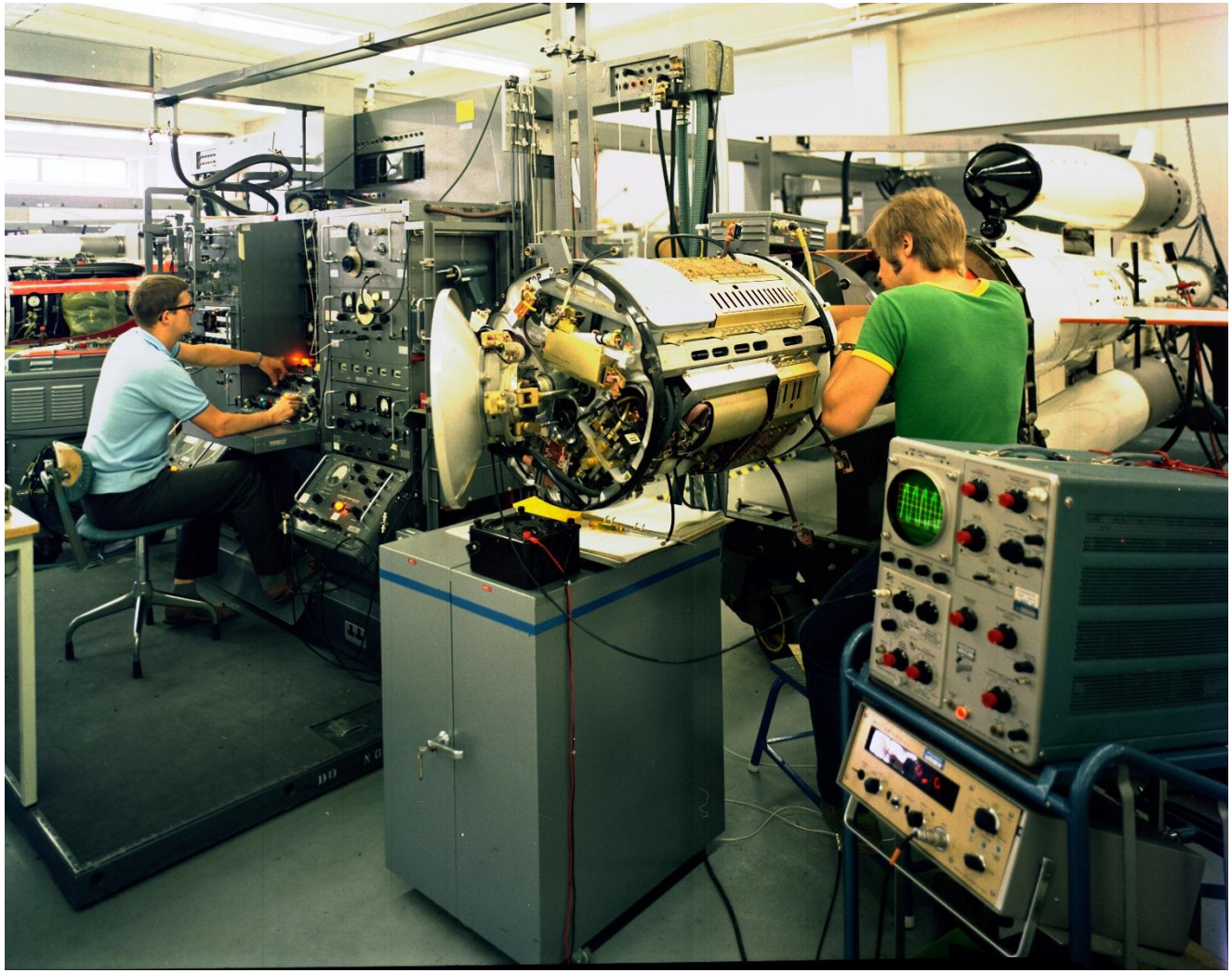
ONE OF TELUBs MISSILE LORRIES READY FOR DELIVERY

FUEL HANDLING IN RISINGE

STRIPPING OF MISSILES BEFORE MOTE TESTS

CIRCUIT CARD REPAIR

MISSILE TESTING IN THE ”MOTE”



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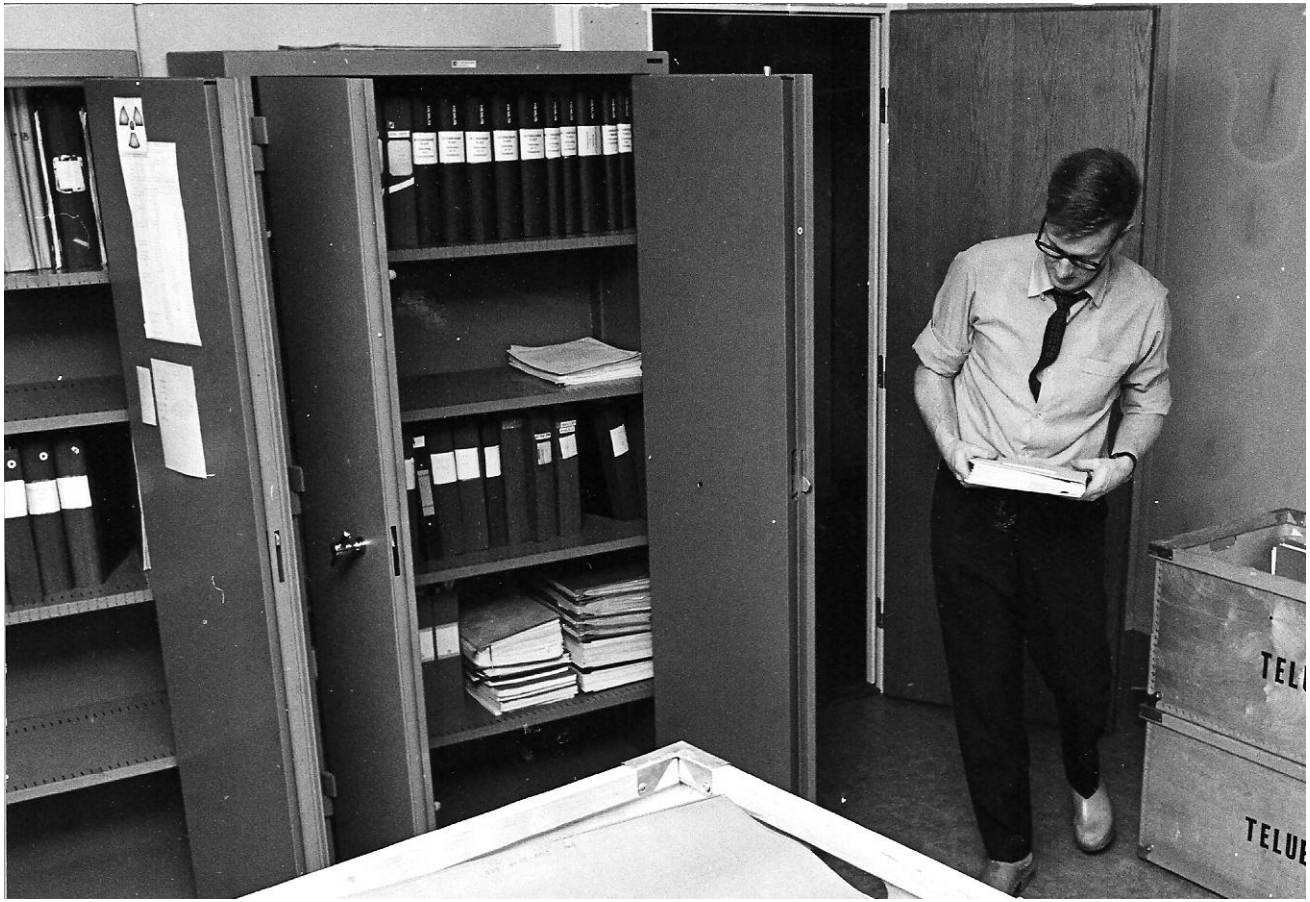
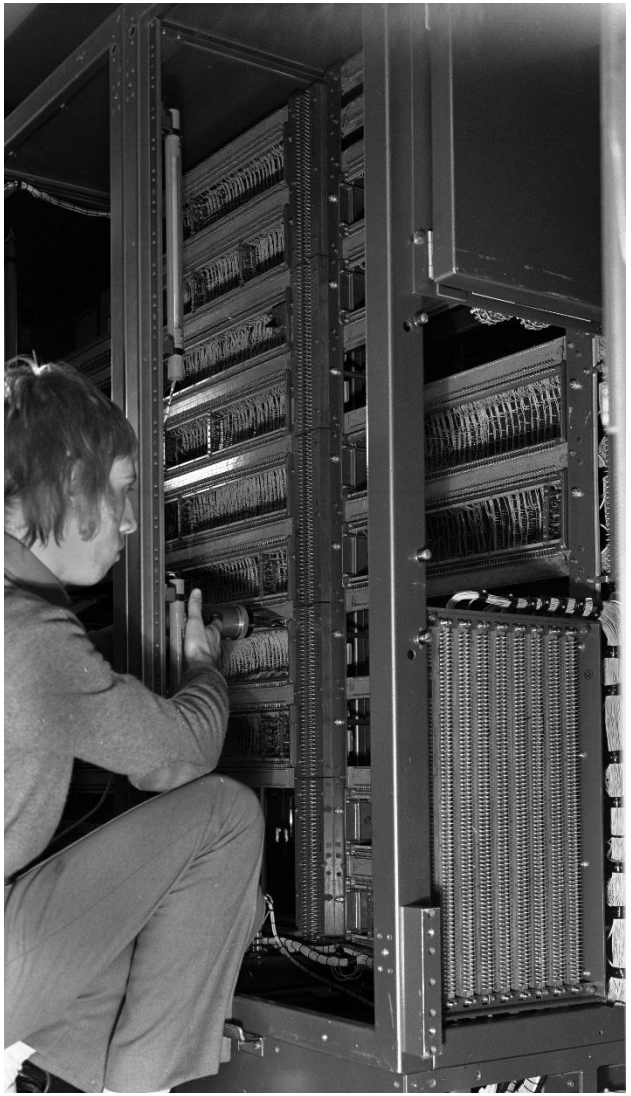
TELUB MAIN OFFICE IN VÄXJÖ INAUGURATED IN 1966

A LOT OF PAPER WORK



MODIFICATIONS

Several extensive modification and overhaul programmes, containing both British and Swedish modificationes, were carried out on both the TIR and the LCP after the vehicles were transported back to Telub



TELUB FIELT SERVICE TEAMS

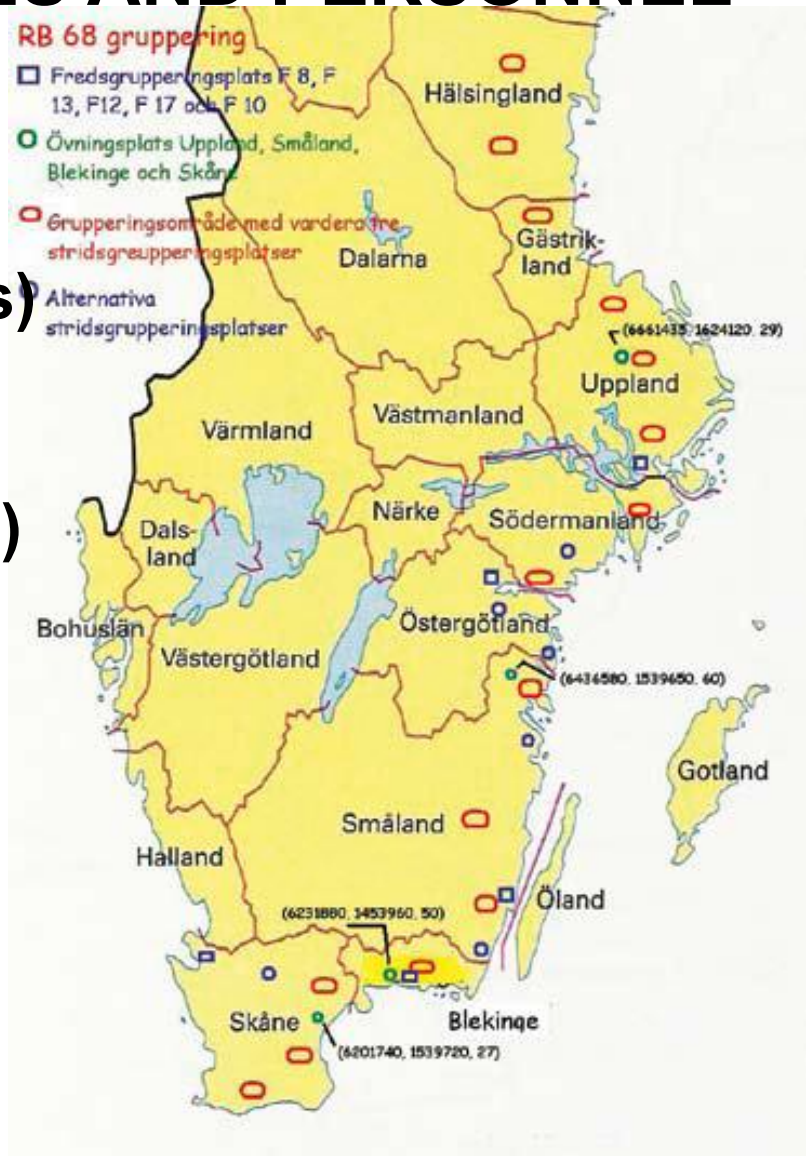
Telub established Bloodhound service teams for:

- TIR
- LCP
- Simulator
- Fuze

AIR WINGS, PREPARED SITES AND PERSONNEL

BLOODHOUND UNITS AT:

- Air Wing F8 Barkarby (4 units)
- Air Wing F13 Norrköping (2 units)
- Air Wing F12 Kalmar (2 units)
- Air Wing F17 Kallinge (2 units)
- Air Wing F10 Ängelholm (2 units)

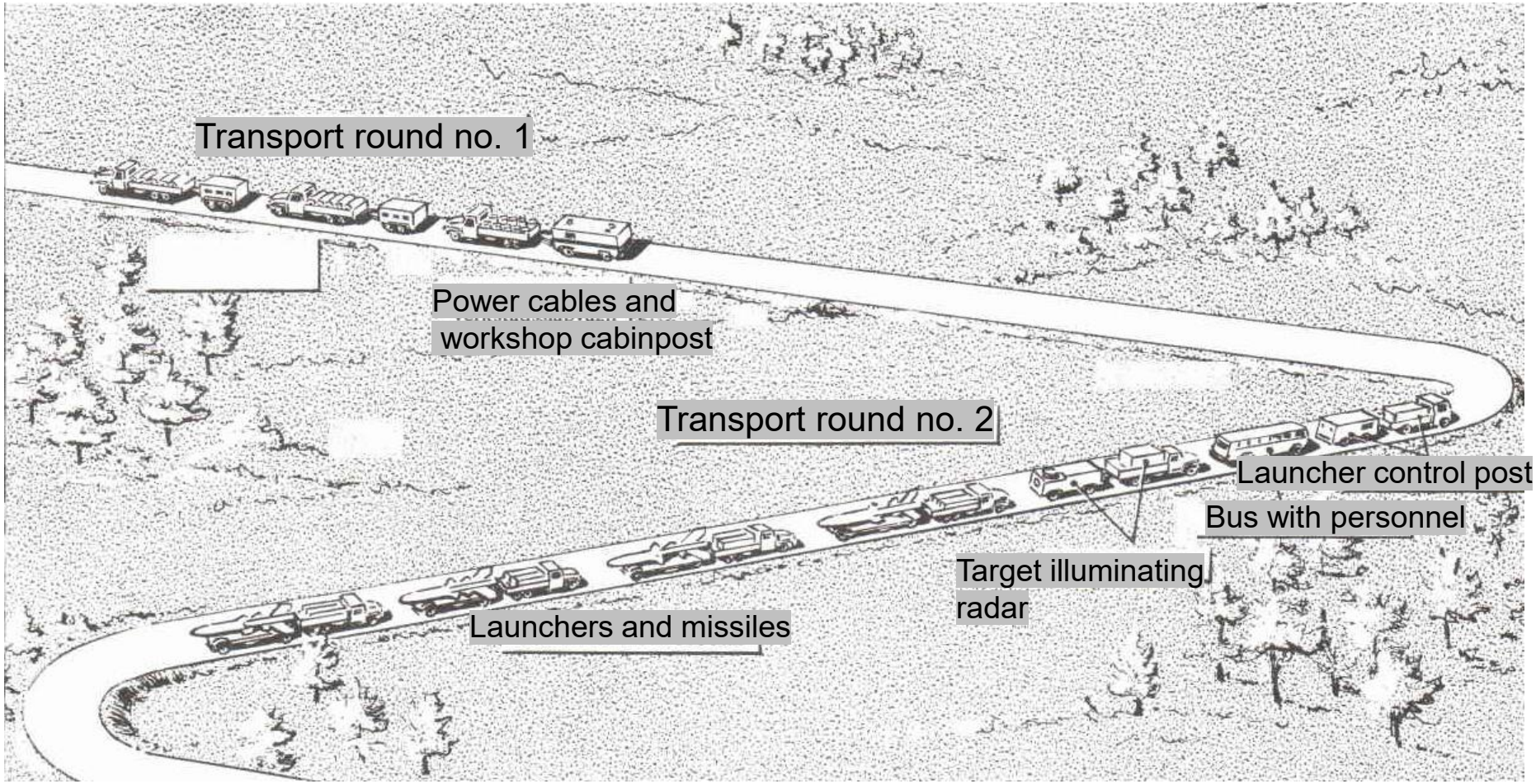


Each missile unit is manned with:

138 men, of which:

- 12 officers
- 126 conscript soildiers, renewed every year

MISSILE UNIT DURING TRANSPORTATION



TRANSPORT TO A SITE IN THE FORREST

MISSILE ON LAUNCHER AT A FOREST SITE

TIR WITH CAMOUFLAGE NET ON AN HILL

Survived concrete slabs for launcher/missile use. Built in the sixties and photographed in 2017. These sites belonged to Air Wing F12 in Kalmar

Located in Trekanten
9 km west of Kalmar

Located in Läckeby,
12 km north of Kalmar

DECOY MISSILES MADE OUT OF PLASTIC TUBES

FIRING TRIALS

All units carried out firing trials at RFN test site in Vidsel from 1968 to 1975 against different types of targets.
A total of 12 missiles were fired, out of these one missile missed its target.

BLOODHOUND FUNERAL FEAST AT TELUB IN OCT 25, 1978

THE PROJECT THAT AROSE OUT OF THE ASHES

PROJEKT FENIX (CONVERT THE TIR TO A SURVEILLANCE RADAR)

Purpose:

To with a very limited budget improve the radar surveillance capability of the air defence system especially during jammed by:

- **exploit the ECM capability of the TIR**
- **using the possitilities to passive and active scanning**
- **facilitate direction finding using two radars in conjunction with a sector operational centre**
- **take advantage of the mobility of the system**
- **reuse of existing materiel, infrastructure, trained personnel, documentation and organization**

MAJOR CHANGES TO CONVERT THE TIR & LCP TO FENIX SURVEILLANCE RADAR & OP CABIN

- Extensive logic changes in the Argus S/W
- The system operator is given a new role enabling him to simulate various types of targets and jammings
- New unit developed to produce targets and jammings
- The scan pattern (D.11) generator is replaced with software control of more flexible aerial scan patterns
- The power distribution box is replaced with a smaller PDB
- One diesel generator is removed, one generator is enough
- Several missile related devices are removed, e.g. the M-racks and on launcher referens aerials
- ACU´s are replaced with modern, smaller and quieter ones

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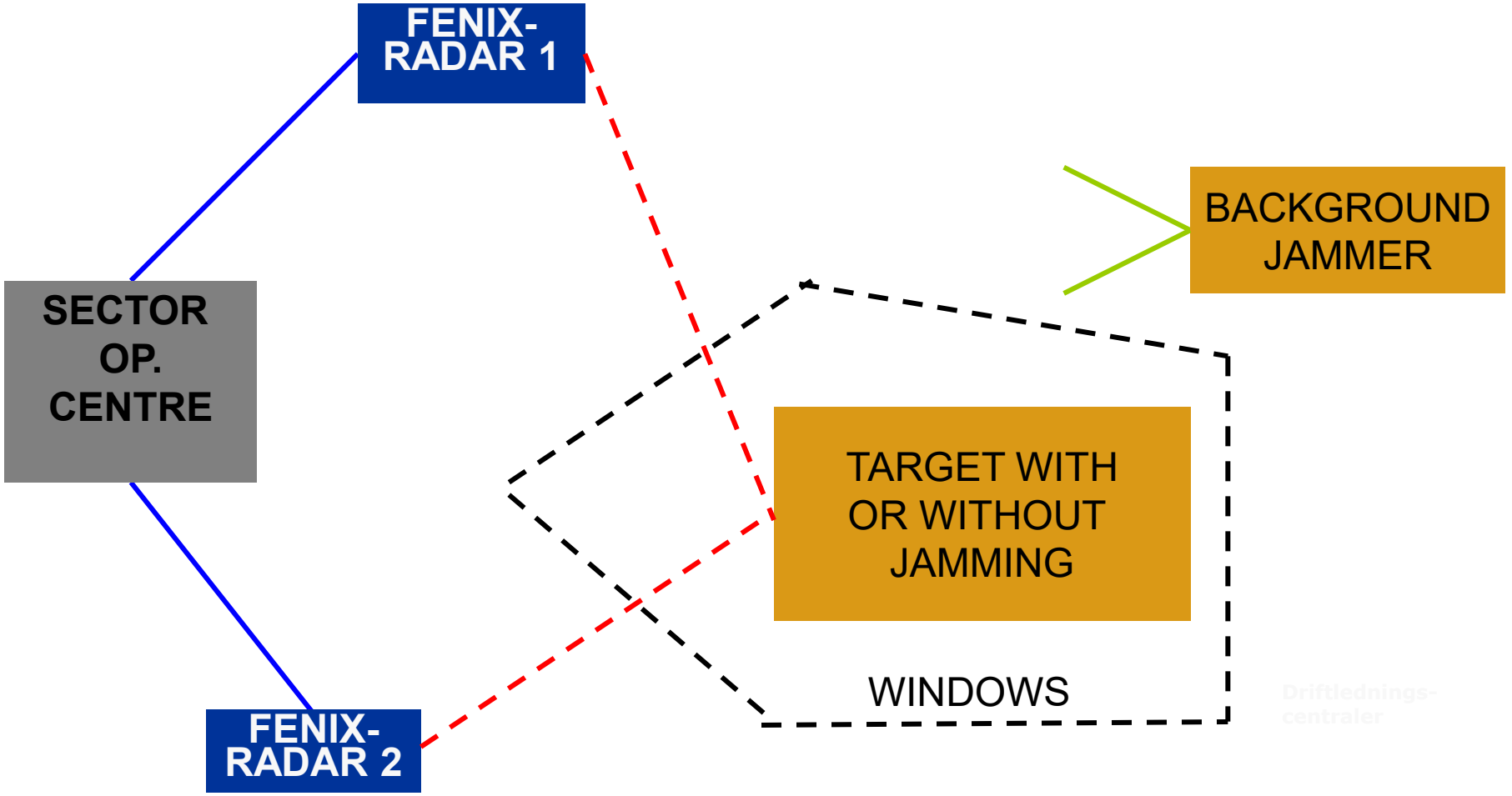
FENIX BASIC FUNCTION

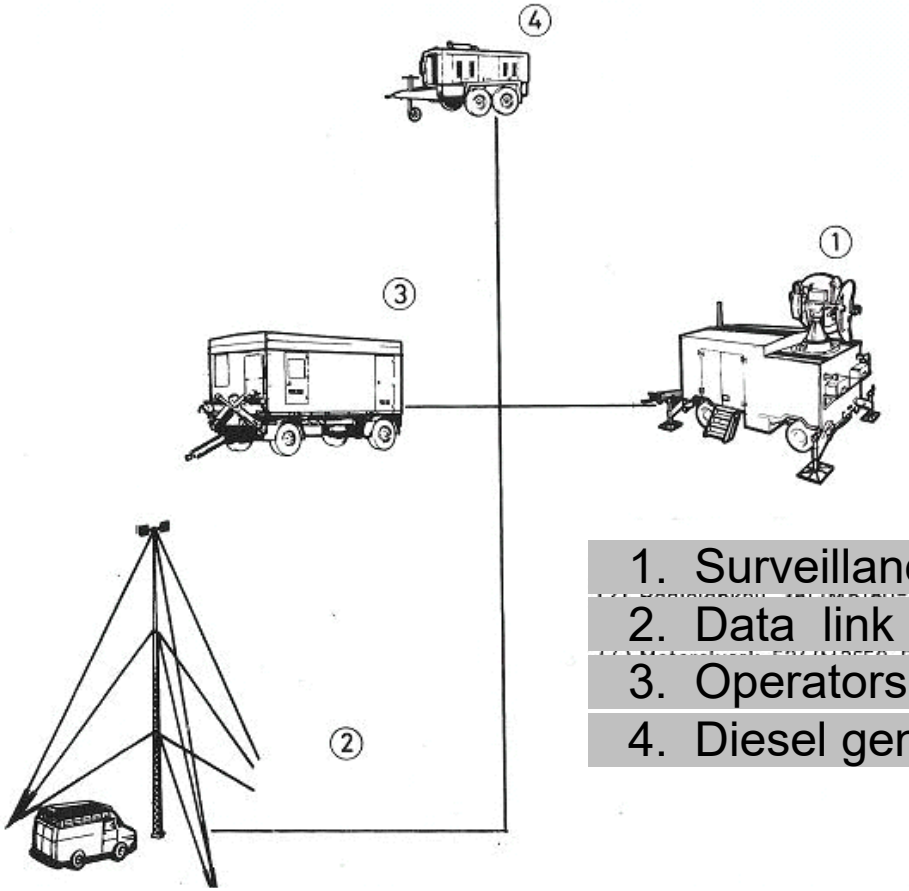


FENIX; PROJECT PLAN

System requirements	Oct -75
Modif development	Oct-75 – Dec -75
Installtion Radar 507-508	Nov-75 – Aug -76
S/W development SOC	Nov-75 – Mar-76
Field tests Radar 507-508	Aug-Sep-76
S/W update SOC	Oct-76 – Apr-77
Installation Radar 501-506	May-77 – Apr-78
Comissioning Radar 501 - 508	May-77 – Apr-78

PROJEKT FENIX

Surveillance radar based on Bloodhound TIR



1. Surveillance radar
2. Data link unit
3. Operators cabin
4. Diesel generator

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KEY PHASING OUT EVENTS

1974. The number of BH missile units are reduced from 12 to 4. The remaining units stationed at AFB Norrköping and AFB Kallinge

1976. Six missile units are converted into Fenix surveillance radar unit

1977. Approx. 30 missiles are sold to Switzerland

1978. The BH missile units are closed down. Approx. 70 missiles and 16 launchers incl. interchangable units are sold to MOD/RAF

1978. Three TIR´s and six LCP´s are scrapped

1981. Three TIR´s are sold to MOD/RAF

1982. The Fenix units are taken out of service

1983. Six Fenix radars, incl. interchangeable units, spare parts, test equipment, and klystrons are sold to MOD/RAF. Remaining equipment is scrapped

THE FINAL TRIP

The transpost team that took the last Swedish TIR´s and LCP´s to the harbour for the final voyage to UK and RAF for reuse

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THE END