Stridsfordon

idag och imorgon

Ett föredrag om Svenskt Pansar med utgångspunkt i historien

Arsenalen den 8 november 2012

av

Rickard O. Lindström






Agenda

- Förhistorien
- Strv m/21
- Strv fm/31
- Strv m/42
- Strv 103
- Pbv 302
- Ikv 91
- UDES XX 20
- Strf 90
- Strv 2000
- T-80U
- Hotstridsvagnar
- Strv Ny
- Merkava – M1A1 – Leopard 2
- SEP – FCS – FRES
- Irak & Afghanistan
- Ny Materielförsörjningsstrategi
- AWV – Patgb 360 ”AMV”
- BvNy – BvS10 MkIIB
- ARCHER
- RG32M
- RENO/REMO
- Ny teknik
- Nästa generation stridsfordon?

Och vem är jag?

- I Egypten 1971-72 vaknade intresset för stridsfordon; besök i Sinai & El Alamein
- Ryckte in som PBS:are på P5 1978 (utbildning på IKV 91) – därefter reservofficer
- Civilingenjör vid Tekniska Högskolan i Luleå – började på FMV 1986
- Ansvarig delprojektledare skydd för Strv 2000, Strv Ny, Strf 90
- Chef Teknik- och studiesektionen vid Stridsfordonsbyrån
- Ansvarig FoT 23 - forskning och teknikutveckling inom fordonsområdet
- Projekt- och produktledare SEP - splitterskyddad enhetsplattform
- Strategisk Specialist inom området Stridsfordon (2002)
- Ledamot Kungliga Krigsvetenskapsakademien (2005)
- Skrev boken ”Svenskt Pansar” tillsammans med C-G Svantesson (2009)

”Trots alla tekniska förändringar genom årtusenden har kriget behållit vissa strukturella drag – de viktigaste principiella fördelarna man alltid strävat efter har varit:

Slagkraft
Rörlighet
Skydd

Tekniska uppfinningar av olika slag har ändrat kvalitén och inbördes relation mellan egenskaperna bakom slagorden!”

Jan Hummelgren, Juni 1985, FOA Rapport C 10268-M4

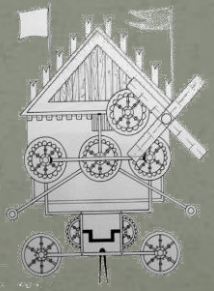
Från ”Chariots”…

3000 f.Kr. 1500 e.Kr.

Ur, Mesopotamia

Zizka

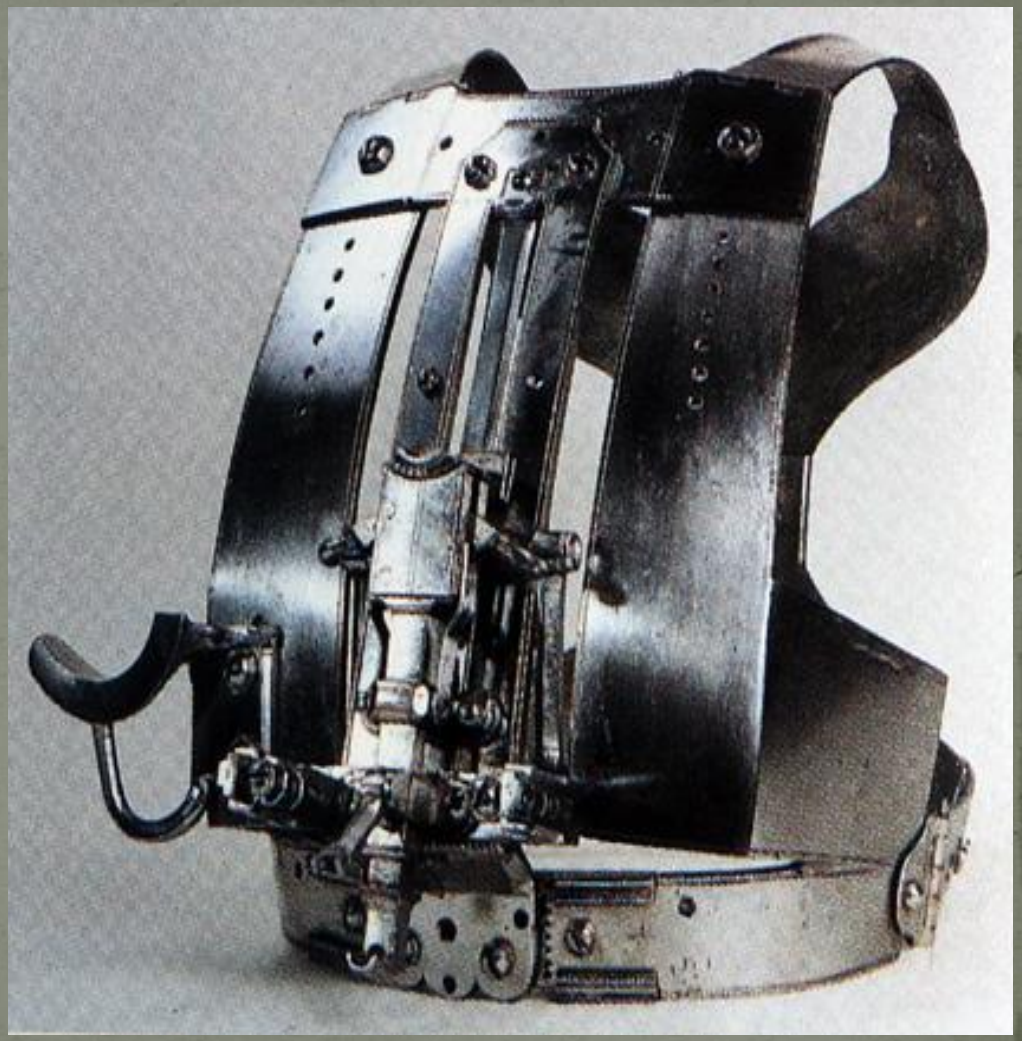
Vigevano



Valturio

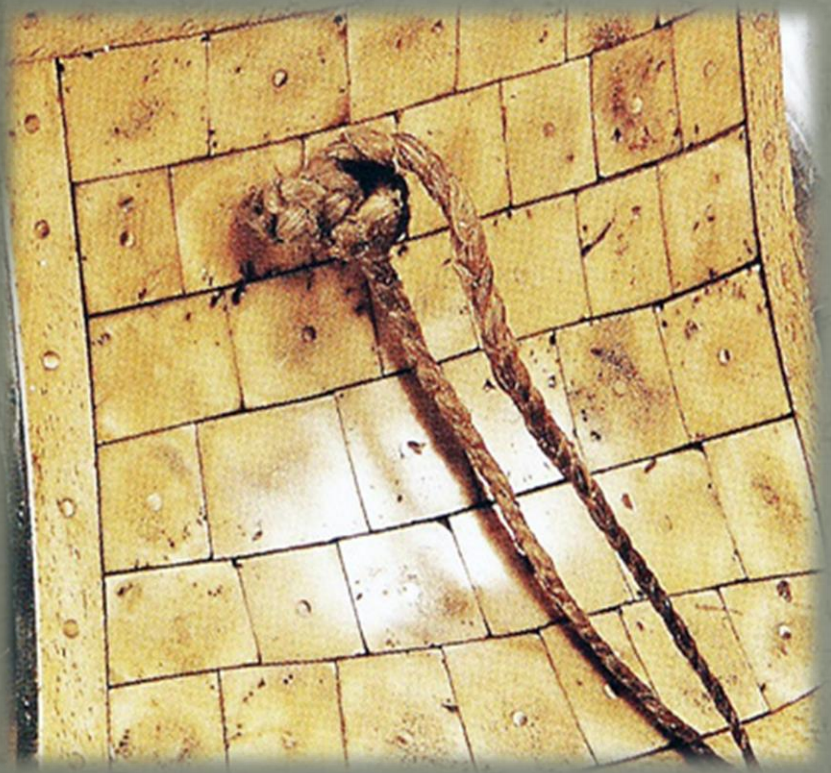
HJUL, SKÖLD, SELDON, STIGBYGEL, BRONS, JÄRN, LÅNGBÅGE, ARMBORST

…via olika tekniska uppfinningar som ”reaktivt pansar”…



TYSKLAND 1512-1515

…och ”kompositpansar” …

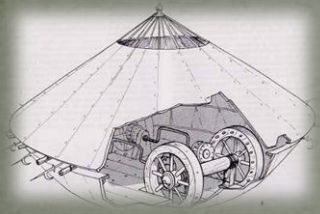


TILLÄGGSSKYDD…

…INTE PÅ PBV 302 MED KERAMISKT TILLÄGGSSKYDD I BOSNIEN 1994…

MEN TILL MAXIMILIAN I 1490-1500

…till pansrade stridsfordon



Leonardo da Vinci

Amfibiskt fordon

Broläggare

Cowan patent, 1855

1500 1900

1558, stridsfordon

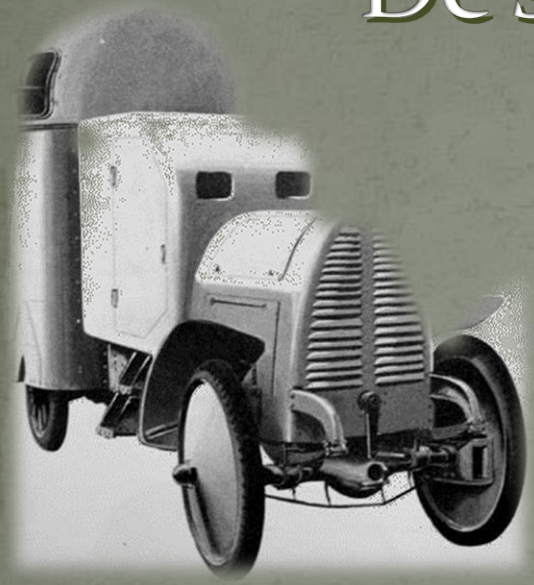
~1600, amfibiskt fordon

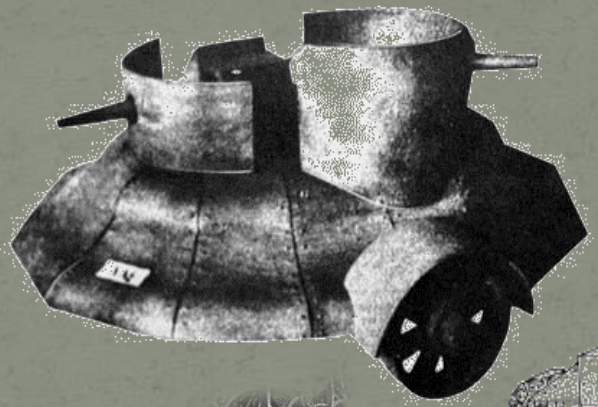
Vasa (1628)

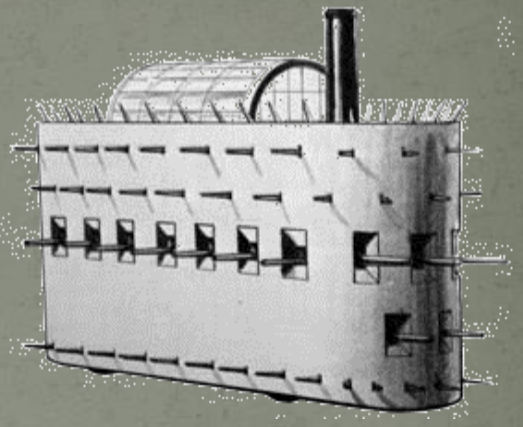
”Jagdpanzer”

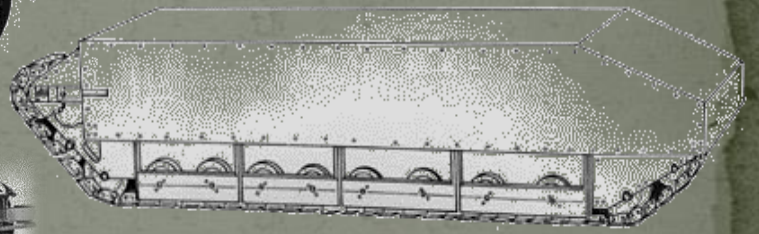
MUSKÖT, STÅL, ÅNGMASKIN, KULSPRUTA, FÖRBRÄNNINGSMOTOR

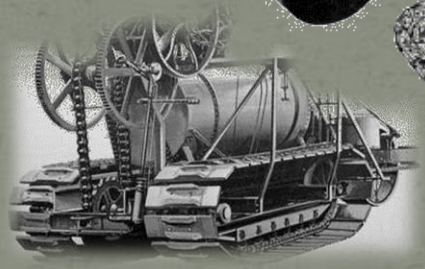
De sista pusselbitarna…

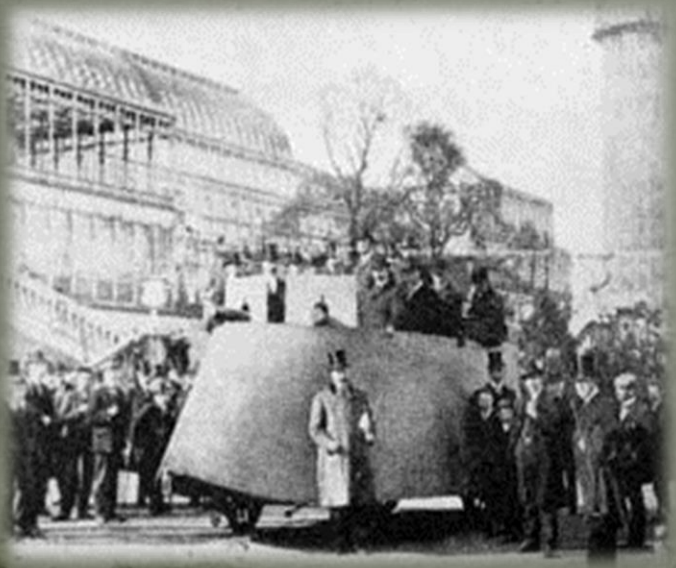




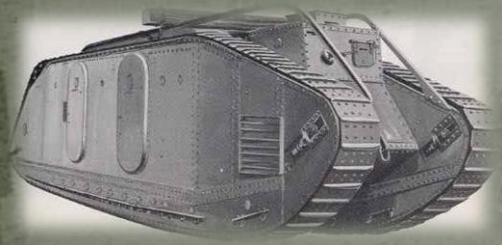








Ett århundrade av stridsfordonsutveckling



”Mother”

Renault FT 17

T-34

AMX-13

M60

1916

1966

Strv m/21

Strv fm/31

Strv m/42

Strv S

A.F.V. Genealogical Tree


Mother

HEAVY TANKS

LIGHT TANKS

MEDIUM TANKS

S.P. GUNS

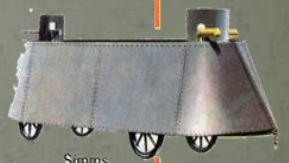
ARMOURED CARS


Char B


Renault FT


Whippet


St. Chamond


Simms


Tiger 1


Lt. Tank Mk. 1


Christie T 3


Sturmgeschutz III


Birch Gun


Charron


Maus


Locust


T 34/76


SU 85


Wasp


Crossley 4 × 2


Conqueror


Scorpion


Panther


M 109


Sd Kfz 232


Chieftain


M 60 A2


FV 438

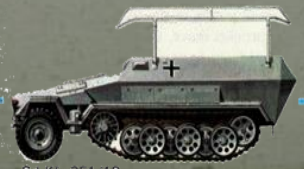

Strv 103 (S)


Saladin

A.P.C.s


Mk. IX


Bren Carrier Mk. 1


Sd Kfz 251/18


M 113

Hur det hela började…

En svensk delegation fick studera en erövrad brittisk stridsvagn i Berlin i början av 1918 – resulterade i att behov uttrycktes 1919

HEMLIG

GUSTAF, med GUDS Nåde, Sveriges, Götes och Vendes Konung.

Vår ynnest och nådiga benägenhet med Gud Allsmäktig!

Uti underdånig skrivelse den 29 juni 1921 har Vår Arméförvaltnings artilleridepartement meddelat, att möjlighet yppat sig att för ett sammanlagt belopp av omkring 200.000 kronor inköpa 10 pansarvagnar. Då detta syntes vara ett enastående tillfälle att för en relativt ringa kostnad erhålla en första uppsättning av detta stridsmedel, ansåge departementet, att ifrågavarande pansarvagnar om möjligt borde inköpas. Emellertid disponerade departementet för ändamålet endast omkring 100.000 kronor; och hemställde departementet på den grund, att ytterligare erforderligt belopp måtte av OSS ställas till förfogande.

I ärendet har Försvarsrevisionen avgivit utlåtande.

Vid föredragning av detta ärende hava VI funnit gott medgiva, att ett belopp av högst etthundratusen kronor må för ifrågavarande ändamål tagas i anspråk av fjärde huvudtitelns anslag till extra utgifter (1921:IV 2.H.2.). Vilket vederbörande till efterrättelse länder.

Avskrift av detta brev tillställes Försvarsrevisionen.

Stockholms slott den 7 juli 1921.

Till Arméförvaltningens artilleri-, fortifikations- och civila departement;

angående anvisande av medel till inköp av pansarvagnar. H.D.N:r 89.

K. Arméförvaltningens Art. Dep:t.
Ink. d. 17/7 1921 Nr 498 M.I.

Svensk stridsfordonsanskaffning…

Strv m/21 & m/21-29

- Inköpt från Tyskland 1921 som traktordelar / bleckslageriarbeten
- Joseph Vollmer var konstruktör
- LK II (förlagan var ”Whippet”)
- 10 st sattes ihop i Sverige

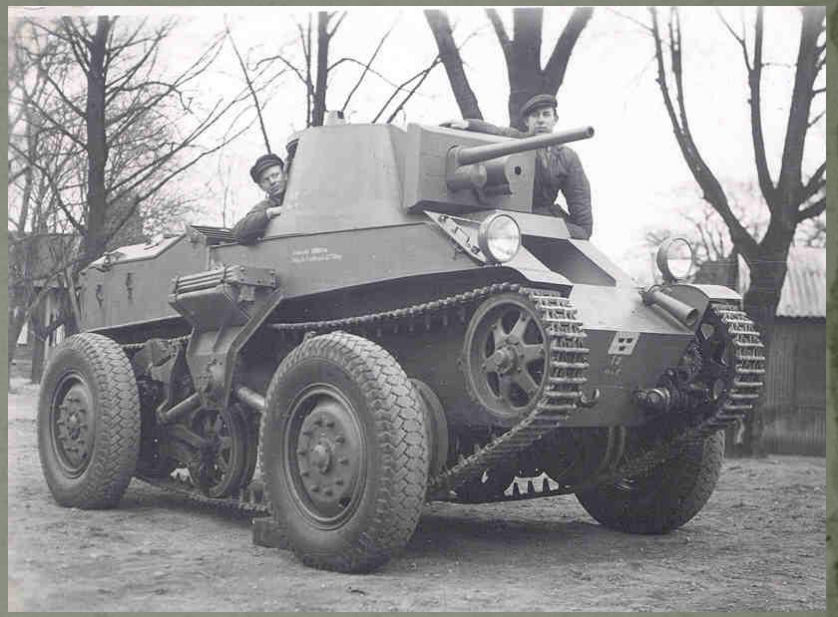
- Försök vid Svea Livgarde (Burén)
- 9.7 ton, 2x8mm ksp, 16 km/h, 55hk
- 4 man, 4-14 mm pansarstål
- 5 st ombyggda ~1930, 85hk
- Idag är 4 st bevarade

Strv m/31

- 3 prototyper beställdes 1930
- Landsverks L-10, klar 1935
- Flera tekniska nymodigheter, bl a
  - Svetsat pansarskrov
  - Prismaperiskop
- Många ”barnsjukdomar”

- 11 ton, 4 man, 8-24 mm pansar
- 150 hk V12, 40 km/h
- 37 mm kanon + 2 st 6.5 mm ksp
- Bandstället designat av Porsche
- Svårt få tag på reservdelar i orostider

Strv fm/31



- En prototyp beställdes 1930
- Landsverks L-30, klar 1935
- Kombinerad band- och hjuldrift
  - ”HB-vagnen” (Vollmers design)
- Gemensam konstruktion med m/31
- 3-4 man (inkl. bakåtförare)

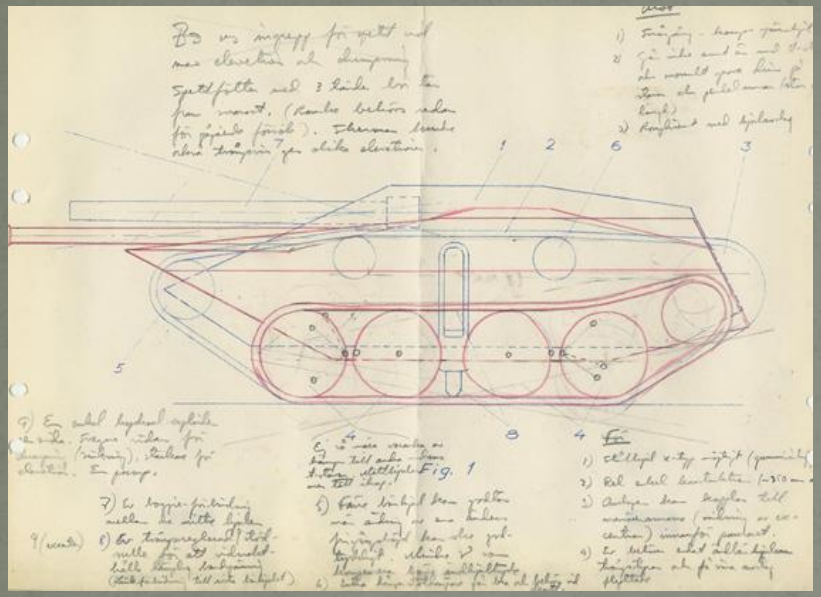
- 11.5 ton, 8-24 mm pansar
- 150 hk V12 från Maybach
- 35 km/h (band), 75 km/h (hjul)
  - Skifte tog ½ min under gång
  - 300 km aktionsradie
- Dyr komplex konstruktion

Strv m/42

- Vidareutveckling av Toldi & Lago
- Maxbredd 2,35m enl trafikstadga
- Beställningar dec 1941- jun 1942
  - 100 TM vid Landsverk (ändras)
  - 125 TH vid Volvo och Landsverk
  - 57 EH vid Volvo och Landsverk
- Leveranser apr 1943 – jan 1945

- Elektromagnetisk växellåda (M), problem
- Hydromekanisk växellåda (H)
- Två motorer från Scania (T) á 160hk
- En motor från Volvo (E) på 380 hk
- 22 ton, 9-50 mm pansar, 4 man
- 75 mm kanon L/28 + 4 st 8 mm ksp
- Blev Ikv 73 och Strv 74

Stridsvagn ”S” (Strv 103)

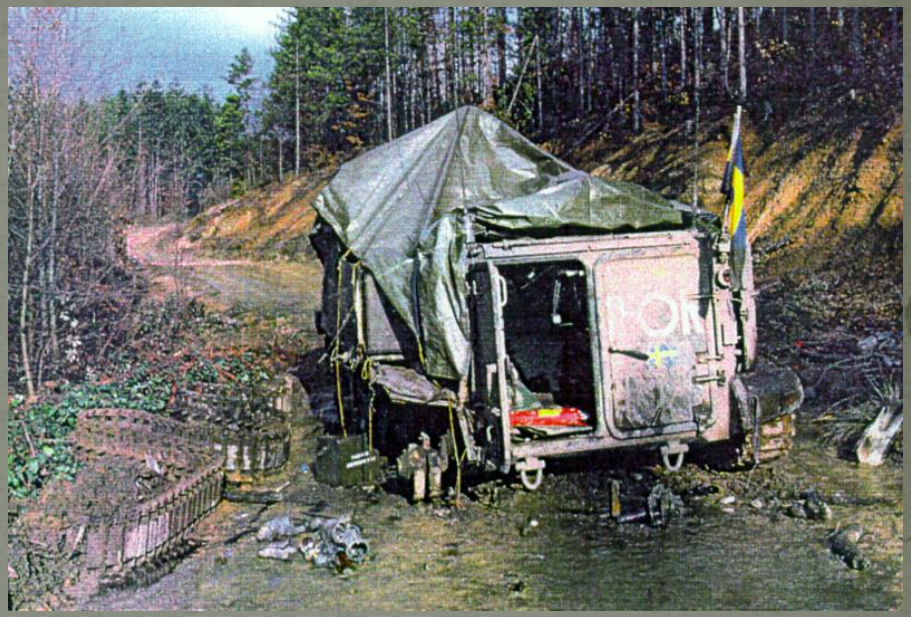


- Unik idé från Sven Berge 1956
- Fast lagrad kanon, hydrauliskt chassi
- Automatladdning, ”1-mans besättning”
- Låg silhuett, skyddsstaket, amlagring
- Principförsök med riggar 1957-1960
- 2 prototyper + 10 st 0-serie (1961-66)
- 290 st i serie, lev 1967-1971
- 38-43 ton, 3 man, 50-55 km/h
- Dieselmotor/gasturbin (540-780 hk)
- Testad i NO, GE, UK & USA
- REMO Strv 103C

Körmilskostnader halverade
Avsevärt ökad tillgänglighet

- Avvecklad 2001

Pansarbandvagn 302 (Pbv 302)



- Utvärdering svenskt/utländskt
- Hägglunds 2 prototyper 1961
- Volvomotor i pannkaksutförande
- 20 mm akan från J29 ”Tunnan”
- Hydrauliska takluckor (vagnstrid)

- Serie 1963-66: 518 APC+126 special
- 12.3 ton, 1.2 ton last, 2+9 man
- REMO 1984-1997 (versioner B + C)
- Utlandstjänst i Bosnien & Kosovo
- >370 vagnar delavvecklade (övr till 2014)

Infanterikanonvagn 91 (Ikv 91)

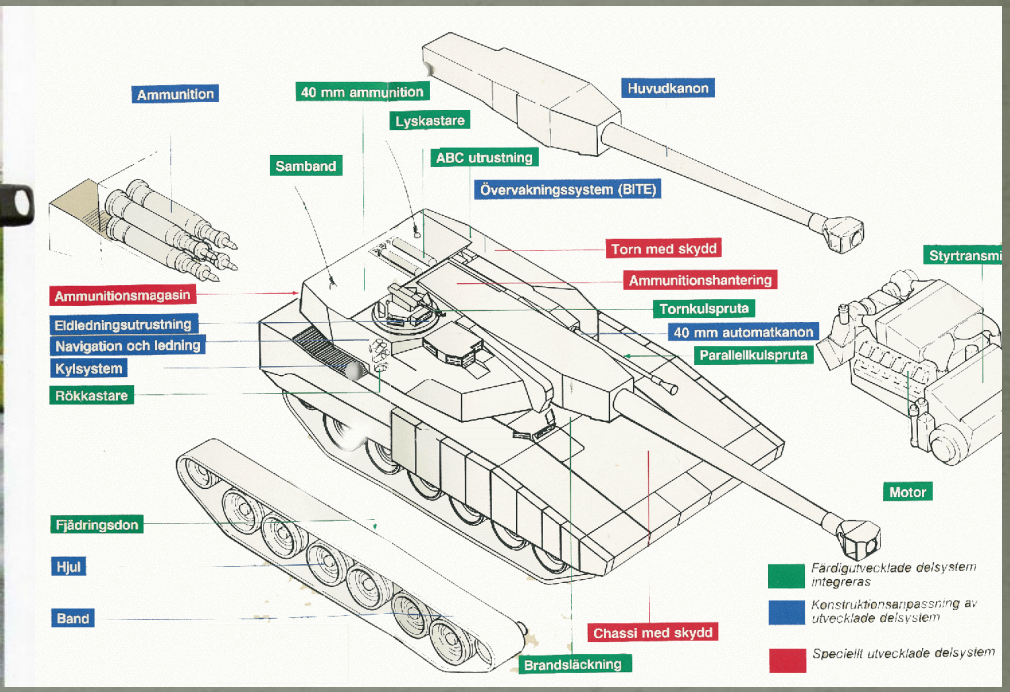
- 14 förslag utvärderades på 60-talet
- Hägglunds lösning förordades
- Komponentgemenskap med Pbv 302
- Prov 1969-72 med 3 prototyper
- Flytförmåga + framkomlighet prio
- 212 st serieleverererades till 1978
- 16.3 ton, 4 man, 9 cm kanon
- Kalkylator + laser + ensning
- Volvo 330 hk, 65 km/h
- Prototyp med 10,5 cm kanon
- Utgallrades början av 2000-talet pga dåligt skydd & beväpning

UDES

- Underlagsgrupp Direkt Eld Strf
- Studier under 1970-talet
- I första hand inriktade mot ny strv
- Lade grunden till Strf 90

UDES XX20 – intressanta försök

Strv 2000



- Studier ny strv återupptogs 1984
- Utgångspunkt i UDES 11,15/16,19
- Fortsatta studier i 3 koncept:
  - Traditionell, kompakt, ovanpålagrad
- T-80 utgjorde hotstridsvagn (flera alt)

- Beväpning 12-14 cm
- Parallellmonterad 40 mm akan
- Försök 1989/1990 (M1A1,Leo2) visade på en operativ svacka
- Projektet avbröts 1991

Strf 90-familjen

- FB 78 inriktning mot lätt strf
- 44+26 koncept utvärderades
- HB Utveckling föreslog strf-familj
- Test kör- & skjutriggar 1984-1989
- Utvecklingsbeslut -85 (5 prototyper)
- Koppling-broms vs överlagrad
- 40 mm akan, 3+7 man, 550 hk, 23 ton

- Seriebeställningar 1-4 1991-1997
  - 354 st Strf 9040 i 4 versioner
  - 42 st Epbv 90 i 2 versioner
  - 56 st Stripbv 90 i 2 versioner
  - 30 st Lvkv 90 i 2 versioner
  - 26 st Bgbv 90 i 3 versioner
  - 1 st Störpbv (fastställd prototyp)
  - 40 GRK-chassier

Stridsfordon 90

Utvecklingen av Strf 90

Studier

Testriggar

Försöksfordon

Hägglunds chassi & Bofors torn

Serieproduktion

- Design + tillverkning
- Tester
- Seriedesign
- Verifiering och validering (accaptans)

Order testriggar
Utvecklingskontrakt
Serieorder 1, Strf 9040
Serieorder 2, familj
Serieorder 3, Strf 9040
Serieorder 4, Strf 9040 + familj

82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 00 | 01 | 02

CV90 requirements for Sweden

Seven requirements had special priority:

1. Extreme mobility in severe terrain
2. Effective against armoured targets
3. Effective against air targets/helicopters
4. Survivability and protection
5. Strategic mobility
6. Maintainability / Reliability
7. Development potential

Given in priority order

By clearly prioritising the requirements the Swedish Army received a superior product (which has contributed to the export successes of CV90)

Other key requirements for CV90

- CV90 should be a family of vehicles
- CV9040 should have design priority

6 family members originally

- CV9040
- CV9040 Anti-Air
- CV90 Command post
- CV90 Forward observer
- Recovery
- Mortar

The 120 mm mortar firing from open hatches was ruled out early

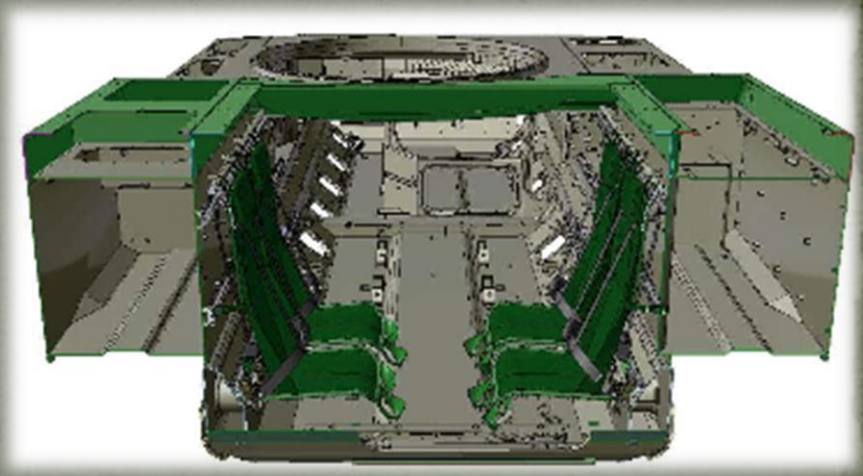
Mission experiences with CV90

- Liberia:
  - UNMIL SWECON 2004 - 2006
  - Part of the Irish Battallion
  - 11 CV9040C, 1 FOV90C, 1 ARV 90C
  - Systems worked very well (12,000 km)
  - Hard wear and tear of tracks
  - Dehydration a must

- Afghanistan:
  - ISAF - International Security Assistance Force
  - In duty since June 2009
  - 8 CV9040C, 1 ARV 90C in Afghanistan
  - 13 CV9040C and 2 ARV 90C (strategic reserve)
  - MLU planned at 12,000 km
  - Systems work very well, dehydration a must!

Plans for renovation & modification

- The CV90 system will go through a renovation programme 2013-2018
- Minor upgrades will be part of the programme:
  - Integration of a new Communication, Command and Control system
  - Extendended roof 170 mm at the rear of the vehicle
  - Replacement of halon in the fire extinguishing system
  - New MMI for the driver (including a new steering unit)
  - Battery surveillance
  - Videosystem with a rear view camera
- Summary:
  - Budget allows 400 (of 509) to be renovated (~5 MSEK per vehicle)
  - Command Post & Forward Observer the first variants to be phased out



CV90 users

Switzerland
186 CV9030 Mk II in service within the Swiss Army

Finland
102 CV9030 Mk II contracted

Norway
104 CV9030 Mk I in service within the Norwegian Army

Netherlands
184 CV9035 Mk III contracted

Sweden
549 CV9040 in service within the Swedish Armed Forces

Denmark
45 CV9035 Mk III contracted

All together 1,179 contracted

Strv 121, 122

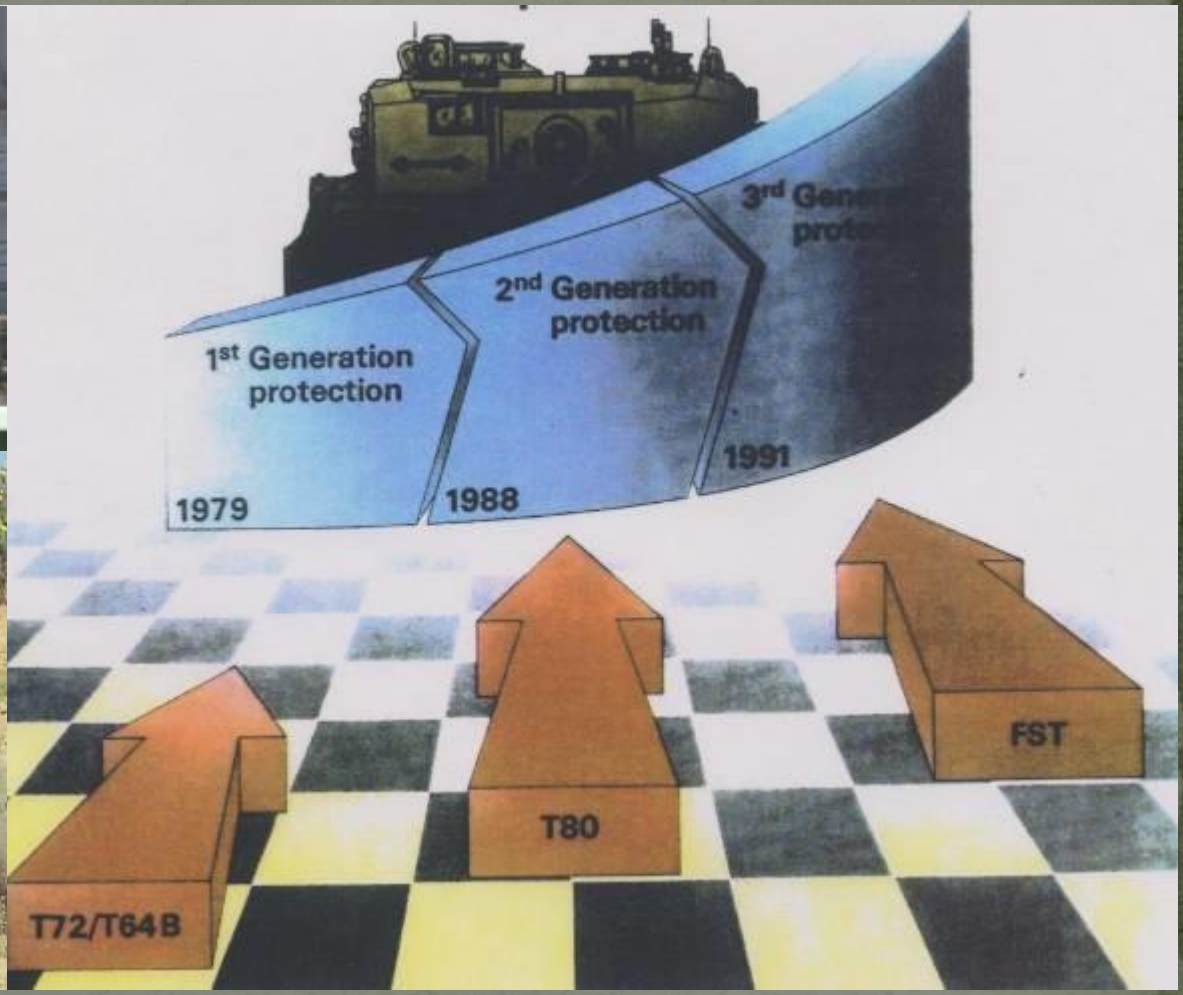
- Konkurrensupphandling 1992-93 med Leo 2 Imp, M1A2, Leclerc, T-80U
- Beslut 1994 om köp av 120 st nya Leo 2 S + leasing 160 st Leo 2 A4
- Licenstillverkning i SE Hägglunds/Bofors
- Svenskutvecklat ballistiskt skydd och svenskanpassat ledningssystem

- 4 man, 12 cm L/44, 1500 hk, 2x7.62 ksp 94, olika rökkastare
- Strv 121: 55.2 ton, 72 km/h
  - Under avveckling
- Strv 122: 62.5 ton, 68 km/h
  - Uppgraderad med minskydd
  - REMO innan 2018

Tests with Leopard 2 A4 & M1A1

- Tests in different parts of Sweden (up north / down south) 1989-1990
- Showed surprisingly good mobility in the terrain characteristic for the Northern part of Sweden (soft soil and deep snow)
- Led to the conclusion that we couldn't wait for a new developed MBT 2000 and that solutions "off the shelf" could meet requirements

Threat development – east vs west

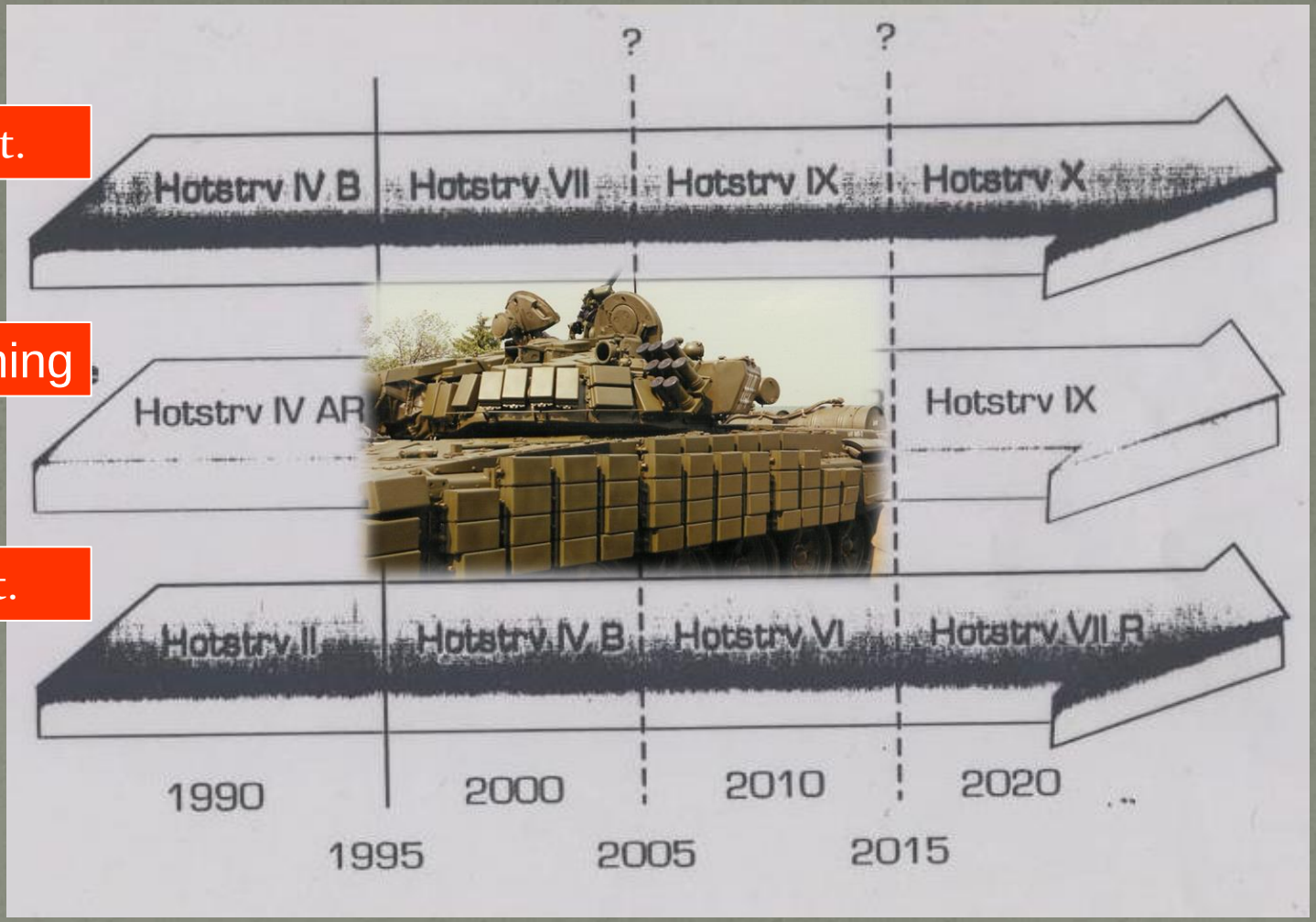


The "Threat Main Battle Tanks"

Higher alt.

Dimensioning

Lower alt.



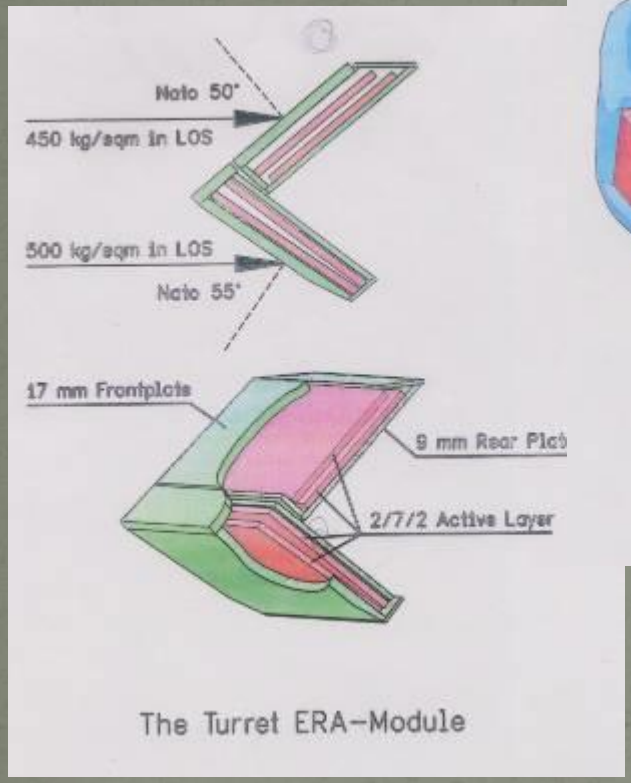
”Threat tank VII” (equal to T80U)

FIRST SHOWN IN MAY 1989

- Very good lethality
  - > 120 mm caliber
  - APFSDS projectiles
  - > 600 mm RHA penetration
- Good mobility
  - Lower weight than western MBTs

- Very good ballistic protection
  - ”Heavy” reactive armour (KE)
  - Composite armour
  - > 600 mm RHA frontal protection
- Good observation capability
  - Day and night

T80U ballistic protection (turret)



The Turret ERA-Module

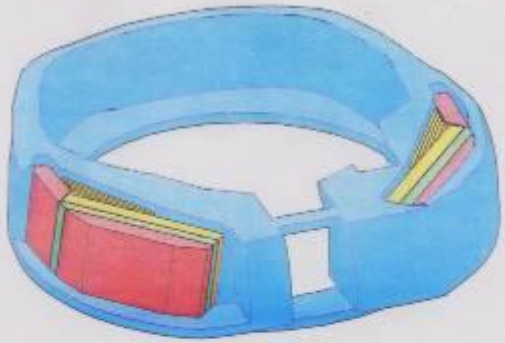
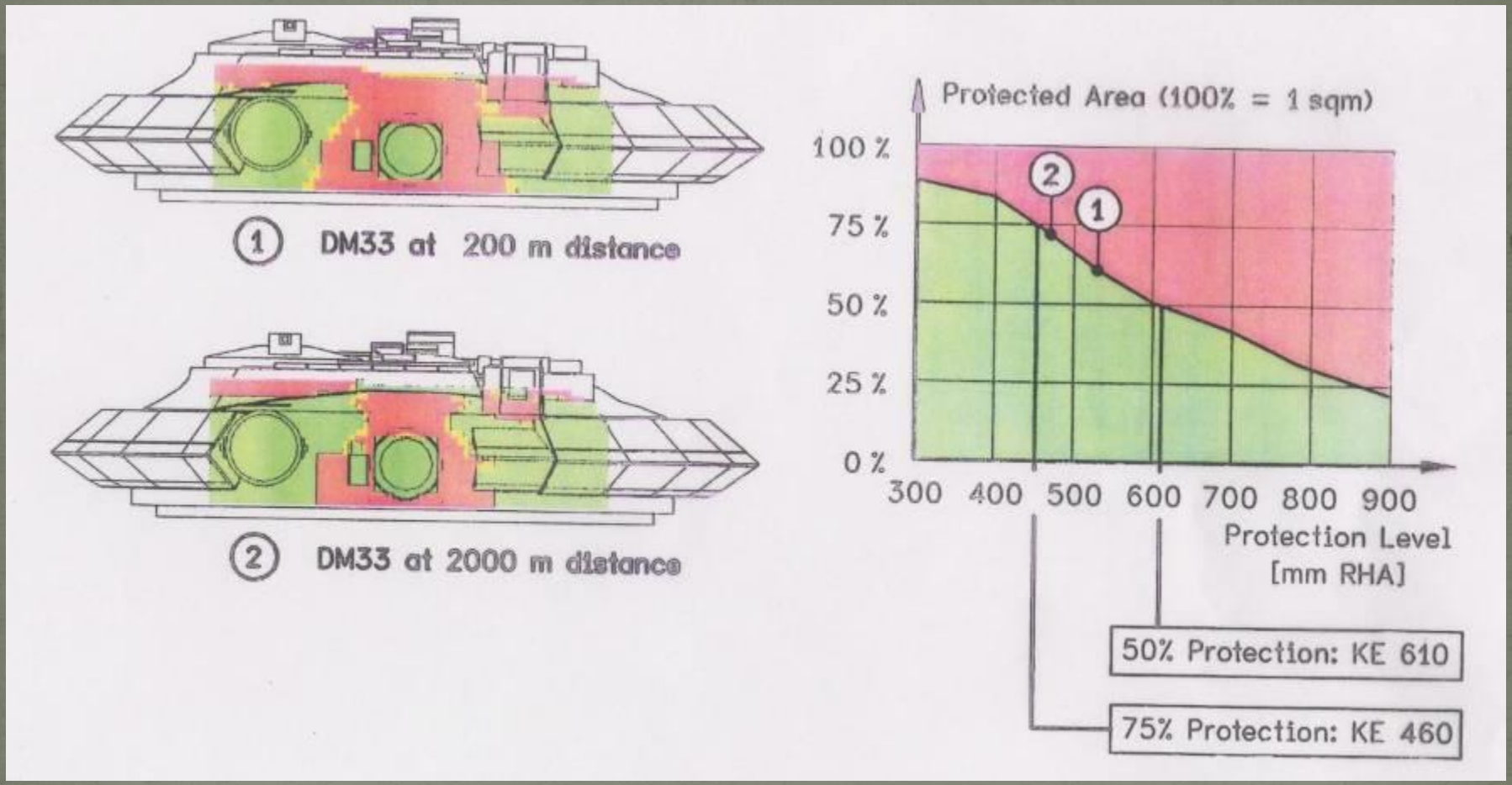
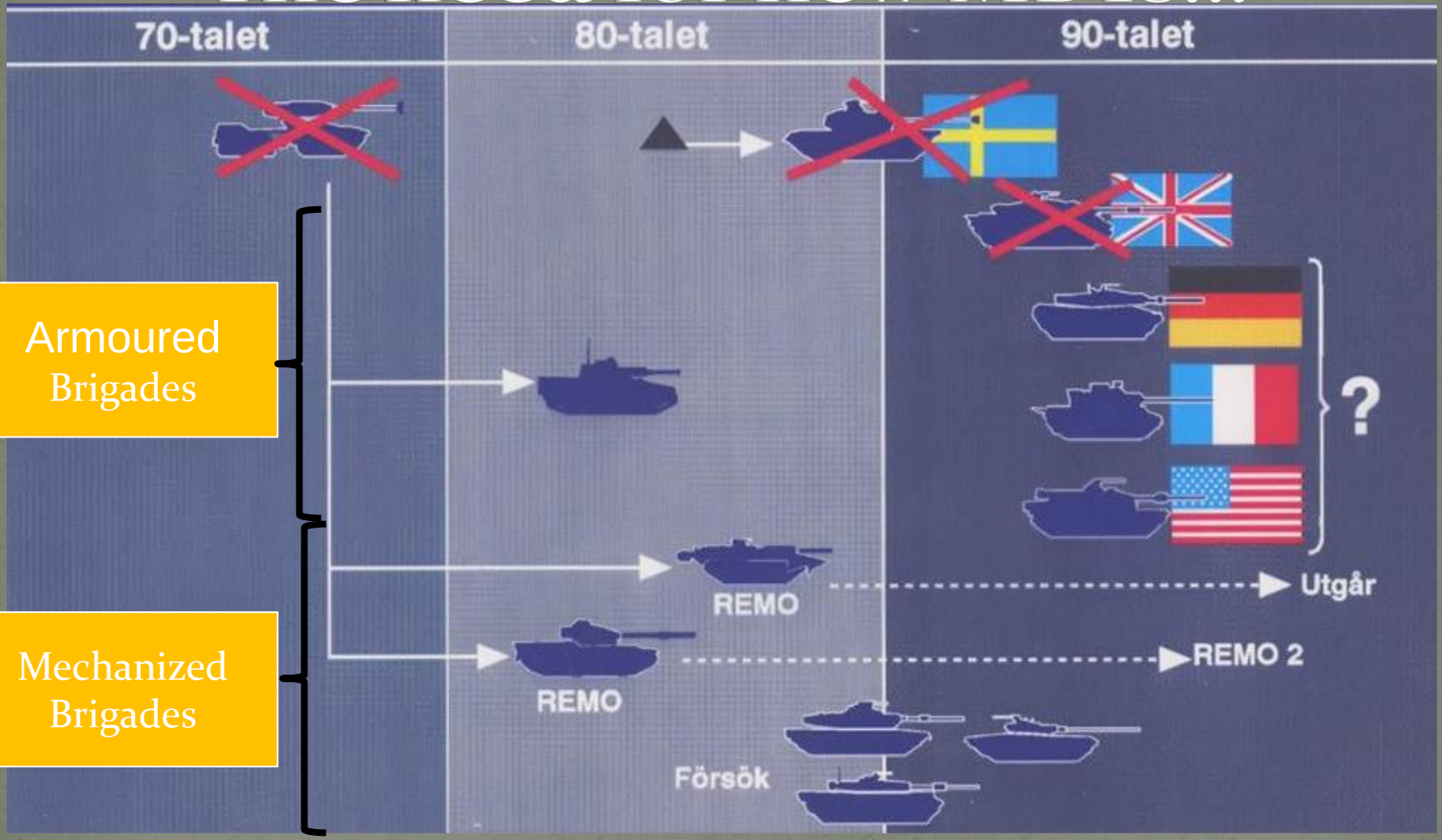

The Turret Armor Pockets

Plate 100 mm With Pocket Holes
Plate 60 mm With Pocket Holes
HH-Steel Plates

Simulation of T80U ballistic protection



The need for new MBTs…



The candidates for "MBT New"

Why MBT tests in Sweden?

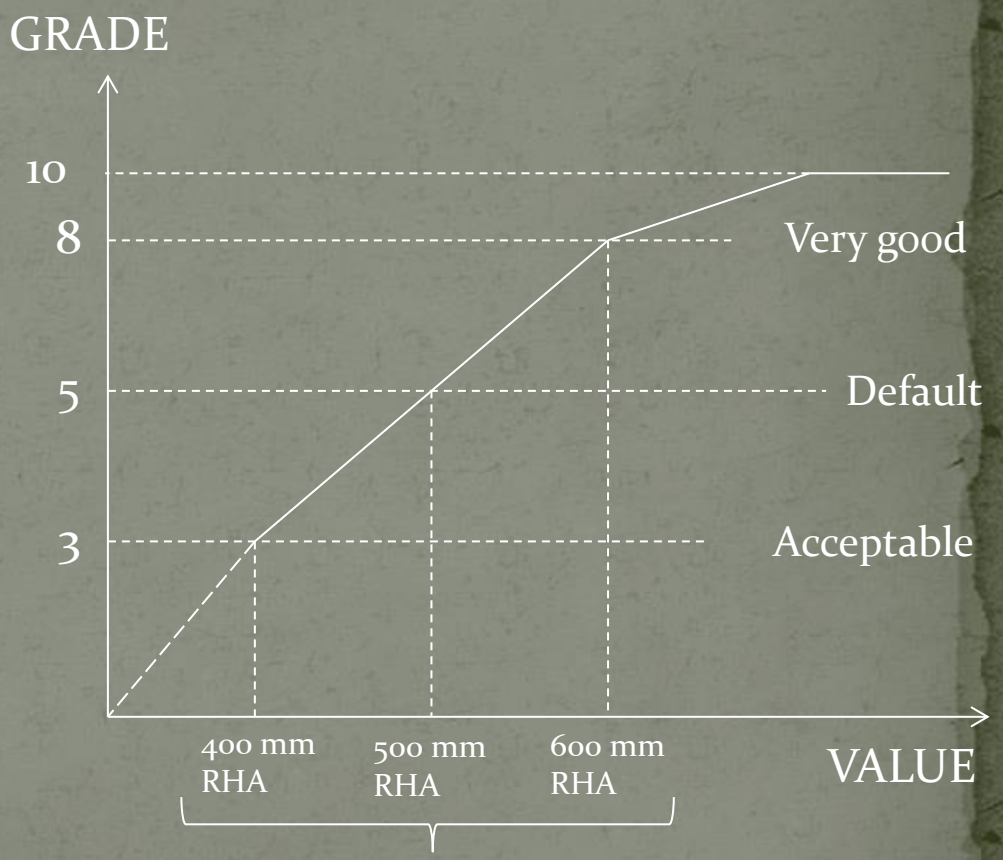
- Important due to:
  - Swedish terrain
  - Swedish climate
  - Swedish crews (conscripts)
  - Swedish control
- This led to:
  - Challenger 2 couldn't participate
  - Tests couldn't start in time
  - Crew training abroad for Leclerc

The purpose of the ”MBT New” trials

- Combat trials
  - To evaluate how the tactical and technical ”Staff requriements” (TTEM) from the Chief of the Army were met
- Technical performance
  - To evaluate how the technical requirements in the ”Technical Specification” from FMV and the ”Product Specification” from the supplier were met
- To give input to the Evaluation model

Evaluation model for the "MBT New"

- Different areas were given given weights
  - 100 % in total
- Example of areas:
  - Mobility
  - Lethality
  - Survivability
  - Commande & Control
  - Human factors
  - Reliability & Maintainability
  - Procurement costs
  - Life Cycle Cost
  - Growth potential
  - Industrial participation



Example: Frontal KE protection level (hull)

The different phases during MBT trials

- Phase 1:
  - Winter trials in the nothern part of Sweden (Boden)
- Phase 2:
  - Shooting with the BT system (Skövde)
- Phase 3:
  - Observation trials (Skövde)
- Phase 4:
  - Shooting with different ammunition (Ravlunda)
- Phase 5:
  - Command & control trials (Ravlunda)
- Phase 6:
  - Mobility trials during summer conditions (Skövde)
- Phase 7:
  - Analysis repairability (Skövde)

The width of the trials for ”MBT New”

	Leclerc	Leopard 2 Imp	M1A2
Range driven	3000 km	3730 km	3800 km
Fuel used	41.400 liter	26.874 liter	56.488 liter
Fuel consumption	138 liter/10 km	72 liter/10 km	148 liter/10 km
Shots in total	235	271	289

- In total 151 different tests were performed within the following areas:
  - Mobility
  - Lethality
  - Survivability
  - Command & Control
  - Reliability & Maintainabilty
  - Human factors
  - Training

Example of tests during the MBT trials

Placing in the different categories

	Leclerc	Leopard 2 Imp	M1A2
Mobility	2	1	3
Lethality	3	1	2
Survivability	3	1	2
C2	3	2	1
R&M	3	2	1
TOTAL:	**14**	**7**	**9**

- The vehicles provided for the trials differed from the MBTs that were offered – for example with regards to:
  - Ballistic protection
  - Communication, C2 system
- The scoring results from trials did the final evaluation

Summary of the ”MBT New” trails

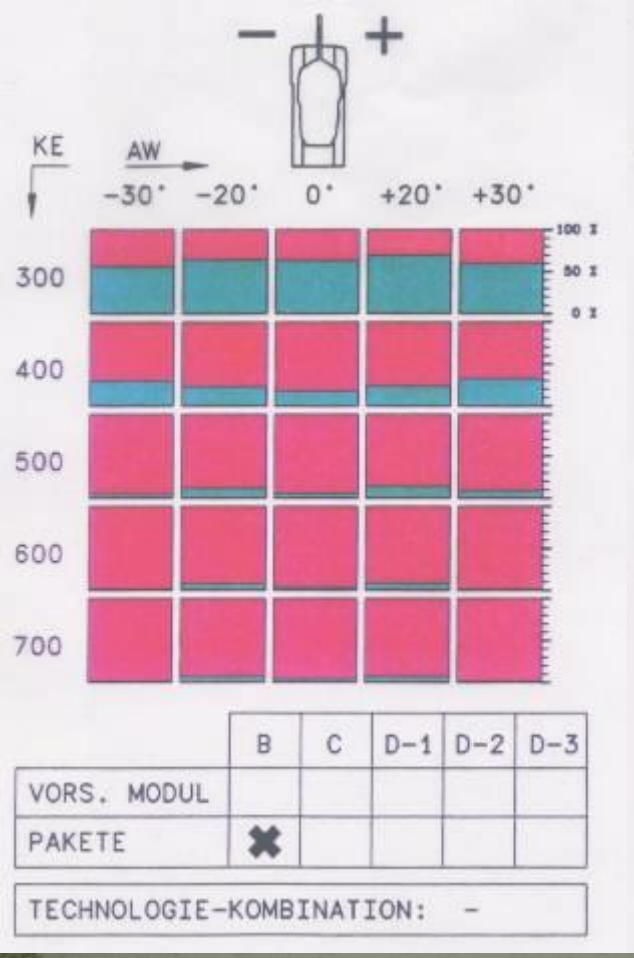
- Leopard 2 ”Improved”:
  - The best scoring result with training ammunition
  - Shortest time to shot
  - The best ballistic protection in a frontal attitude
  - Only MBT with a roof protection
  - The best reliability and least faults during trials
  - The best C2 system to modify for Swedish purposes
  - Lowest fuel consumption
- M1A2 ”Abrams”:
  - The best scoring result with war ammunition
  - The best observation possibilities for commander
  - All ammunition separeted from the crew compartment
- Leclerc:
  - The best acceleration
  - The product was not mature enough

MBT survivability

- ”Threat ammunition” for verification of the MBT ballistic protection levels:
  - 1+2 KE & CE ”Hull threats”
  - 3+4 KE & CE ”Turret threats”
  - 84 mm FFV 651 CE ”Side threat”
- A Swedish developed ballistic protection were built for all of the competing MBTs’
  - A co-operation between IBD & ÅKB
- Additional survivability tests:
  - Signatures (IR, radar, acoustic, magnetic)
  - NBC
  - Simulations (kill probability)

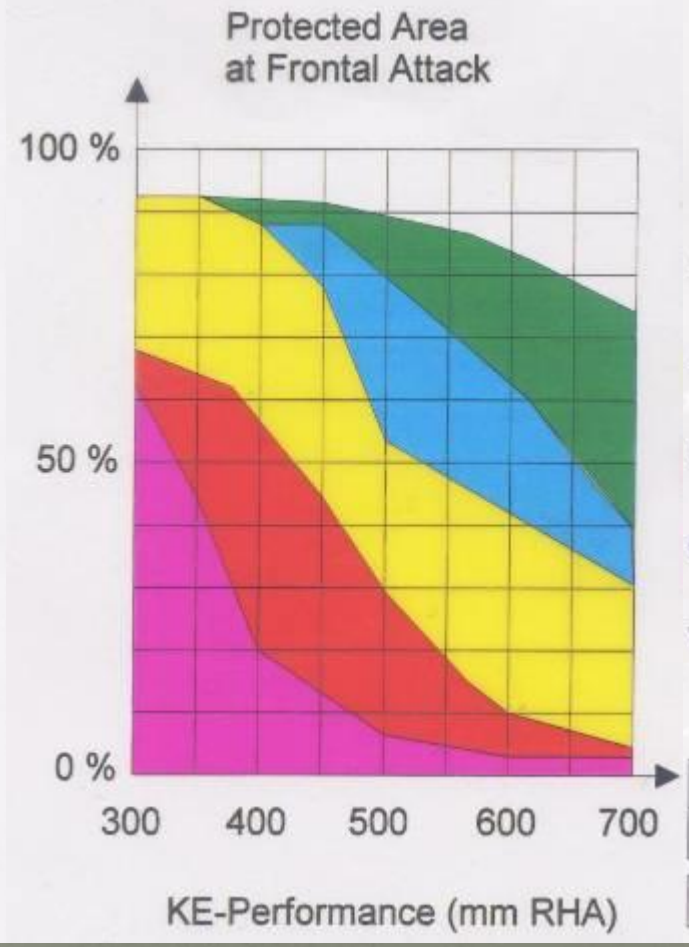

Leopard 2 Improved

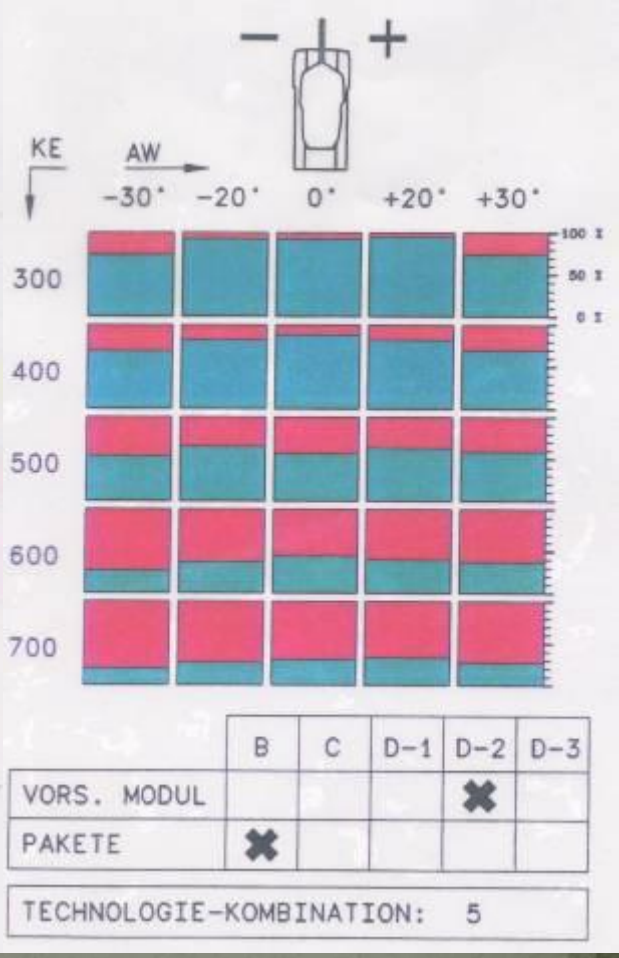
Leopard 2 A4 vs Leopard 2 "Improved"



	B	C	D-1	D-2	D-3
VORS. MODUL					
PAKETE	✖				

TECHNOLOGIE-KOMBINATION: -





	B	C	D-1	D-2	D-3
VORS. MODUL				✖	
PAKETE	✖				

TECHNOLOGIE-KOMBINATION: 5

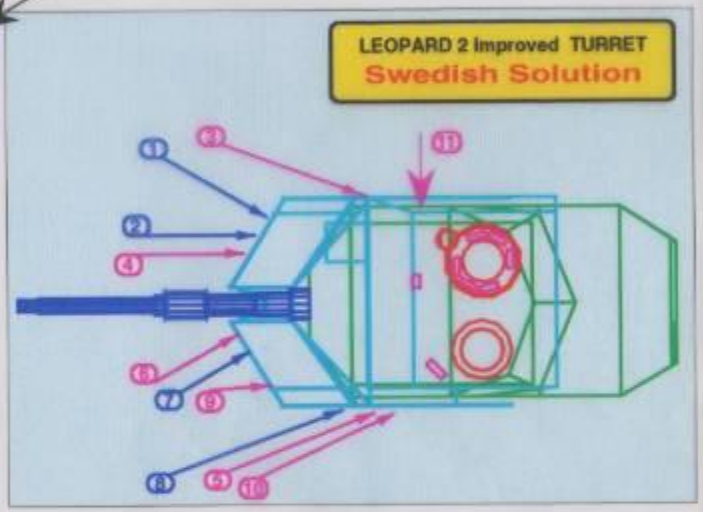
MBT NEW

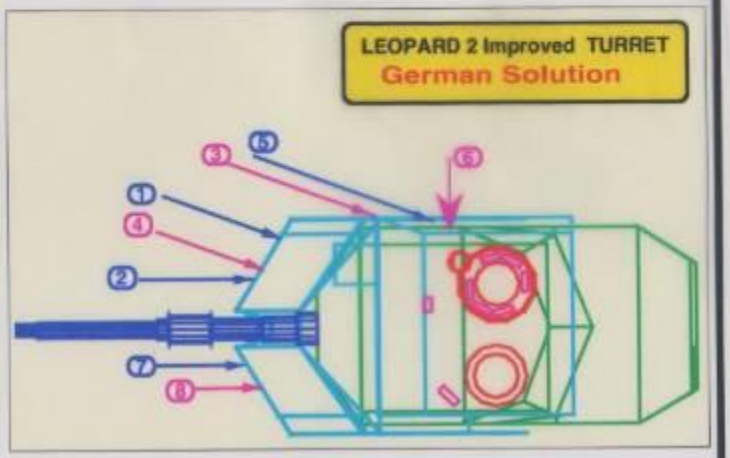
Comparison of the Swedish and German armor of Leopard 2 Improved

SECRET

The exclamation mark points the superiority of the Swedish armor protection compared to the German armor protection.

Shot No.	No	THREAT	AREA	RESULT	PROTEC. LEVEL	ARC	
SWE 921161	1	120 12 C1	Front right	ub	810 mm	30°	!
GER 930687	1	120 12 C1	Front right	ub	758 mm	20°	
SWE 921162	2	120 12 C1	Front right	ub	820 mm	0°	
GER 930701	2	120 12 C1	Front right	ub	817 mm	0°	
SWE 930204	4	CE 165	Front right	ub	1850 mm	0°	
GER 930699	4	CE 165	Front right	ub	1679 mm	20°	
SWE 921156	7	120 12 C1	Front left	ub	720 mm	30°	!
GER 930686	7	120 12 C1	Front left	ub	862 mm	0°	
SWE 921034	6	CE 165	Front left	ub	1670 mm	30°	!
SWE 930303	9	CE 165	Front left	ub	1920 mm	5°	
GER 930697	8	CE 165	Front left	ub	1720 mm	0°	
SWE 921157	8	120 12 C1	Side left	bus	700 mm	20°	!
SWE 921033	5	CE 165	Side left	bus	1400 mm	22.5°	
SWE 930306	10	CE 165	Side left	ub	1470 mm	25°	!
GER 930688	5	120 12 C1	Side right	gor/10 los	690 mm	20°	
SWE 930203	3	CE 165	Side right	ub	1480 mm	20°	
GER 930700	3	CE 165	Side right	ub	1475mm	20°	
SWE 930087	11	CE 84 FFV	Side right	gor/41 los	379mm	90°	
GER 930698	6	CE 84 FFV	Side right	gor/49 los	371mm	90°	





SECRET

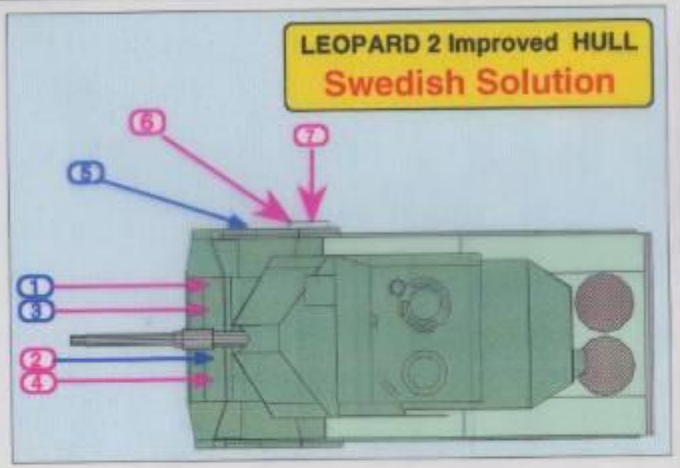
MBT NEW

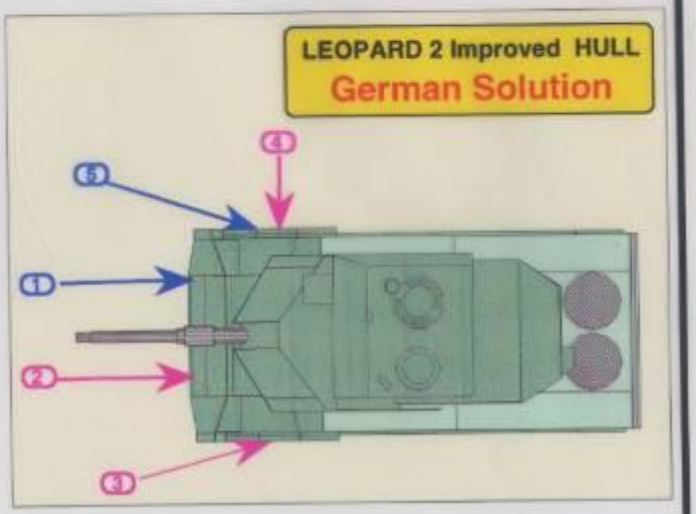
Comparison of the Swedish and German armor of Leopard 2 Improved

SECRET

The exclamation mark points the superiority of the Swedish armor protection compared to the German armor protection.

Shot No.	No	THREAT	AREA	RESULT	PROTEC. LEVEL	ARC
SWE 930205	1	120 12 C1	Glacis	ub	750 mm	0°
GER 930692	1	120 12 C1	Glacis	gor	670 mm	0°
SWE 930298	2	CE 165	Glacis	ub	1580 mm	0°
GER 930696	2	CE 143 FFV	Glacis	ub	1257 mm	0°
SWE 930471	3	105 10 C2	Upper Hull	ub	656 mm	0°
SWE 930532	4	CE 143 FFV	Upper Hull	gor/32 los	968 mm	0°
GER			Upper Hull	NO DATA POINTS		
SWE 921160	5	120 12 C1	Track Skirt	Splash	700 mm	17,5°
GER 930693	5	120 12 C1	Track Skirt	gor /77 los	623 mm	15°
SWE 921030	6	CE 165	Track Skirt	Splash	1400 mm	25°
GER 930695	3	CE 143 FFV	Track Skirt	ub	1273 mm	15°
SWE 930088	7	CE 84 FFV	Track Skirt	gor /107 mm	313 mm	90°
GER 930694	4	CE 84 FFV	Track Skirt	gor / 80 mm	340 mm	90°





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MBT NEW

LEOPARD 2 Improved

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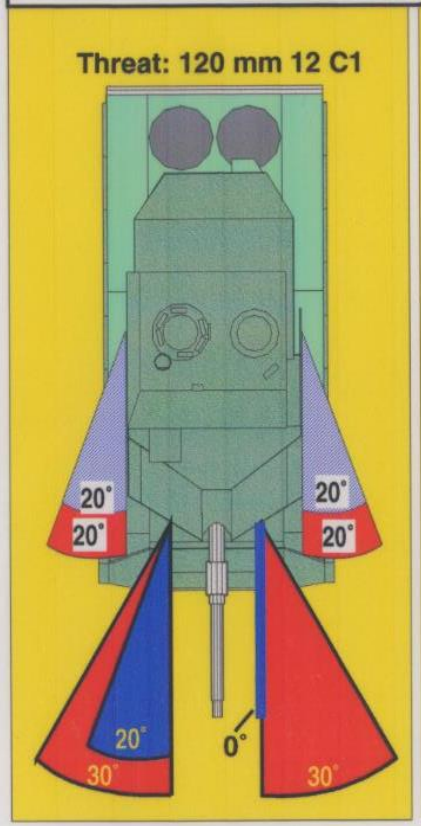
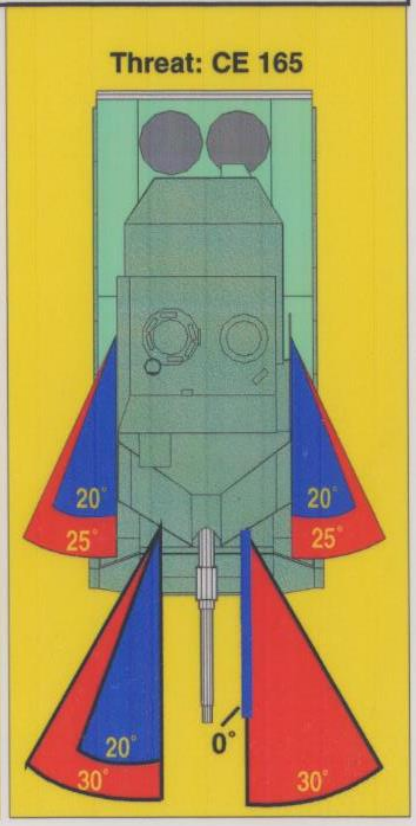
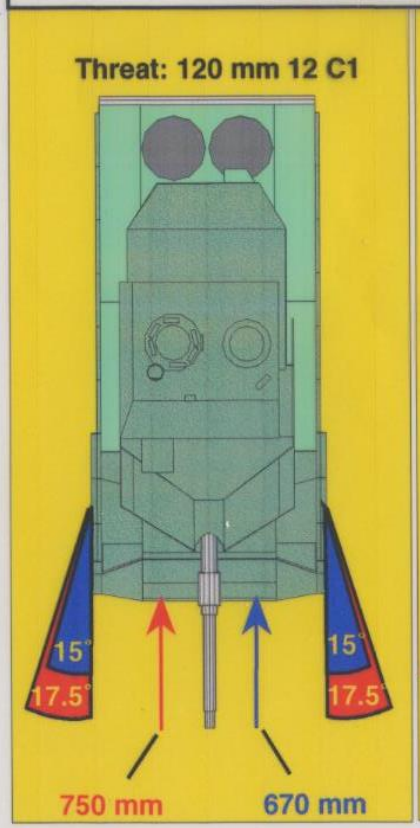
Proved Obliquities for Swedish and German Protection

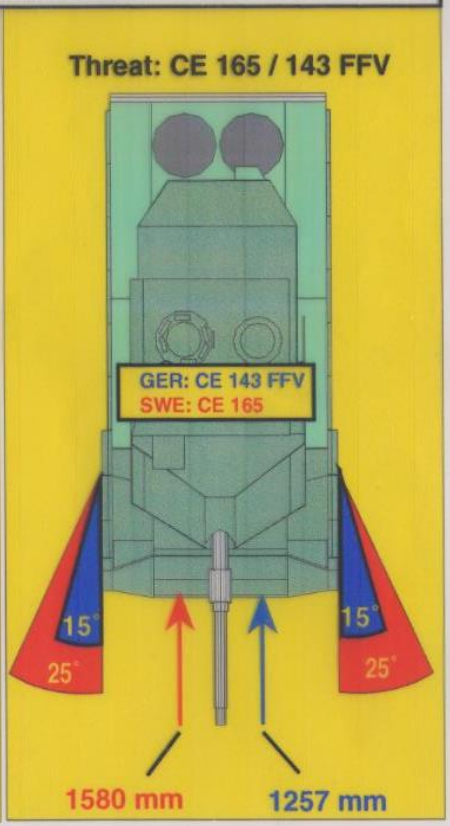
TURRET Protection





HULL Protection

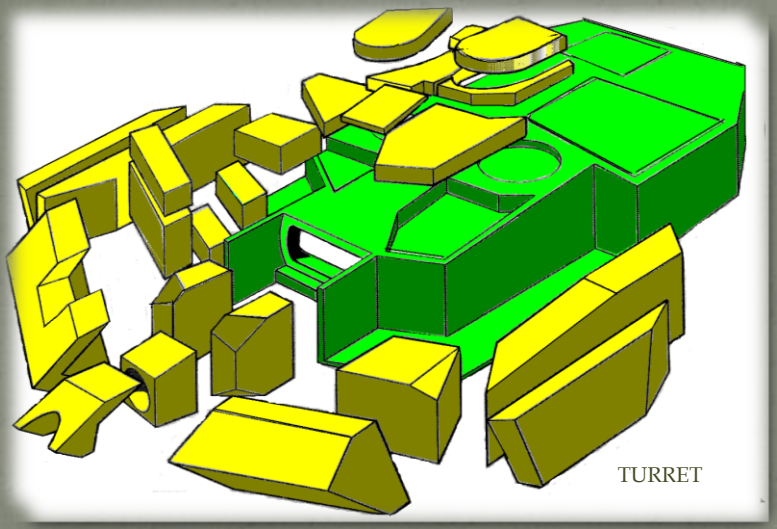


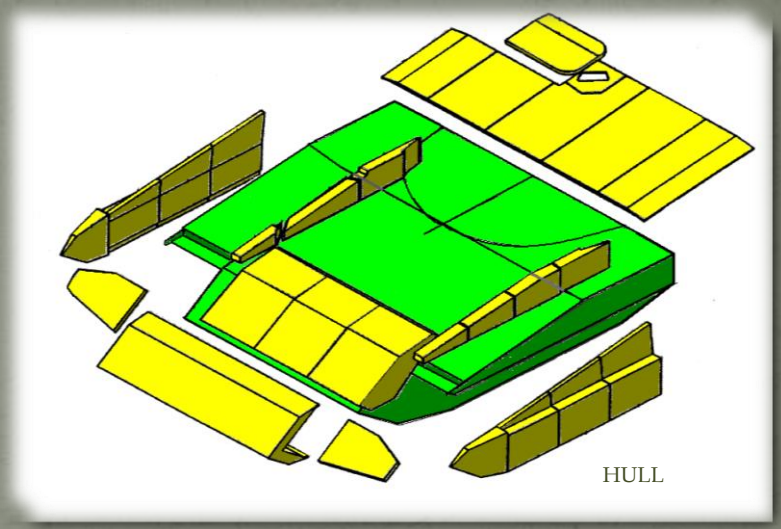


Swedish
German
Safe Areas
Ballistic Limit

SECRET

Strv 122 Ballistic Protection





- Requirement for very high protection levels for crew, both in turret (incl roof) and hull
- Requirement > 70% protection in the projected area
- Total module weight > 10 ton
- Growth potential


M1A2 Abrams

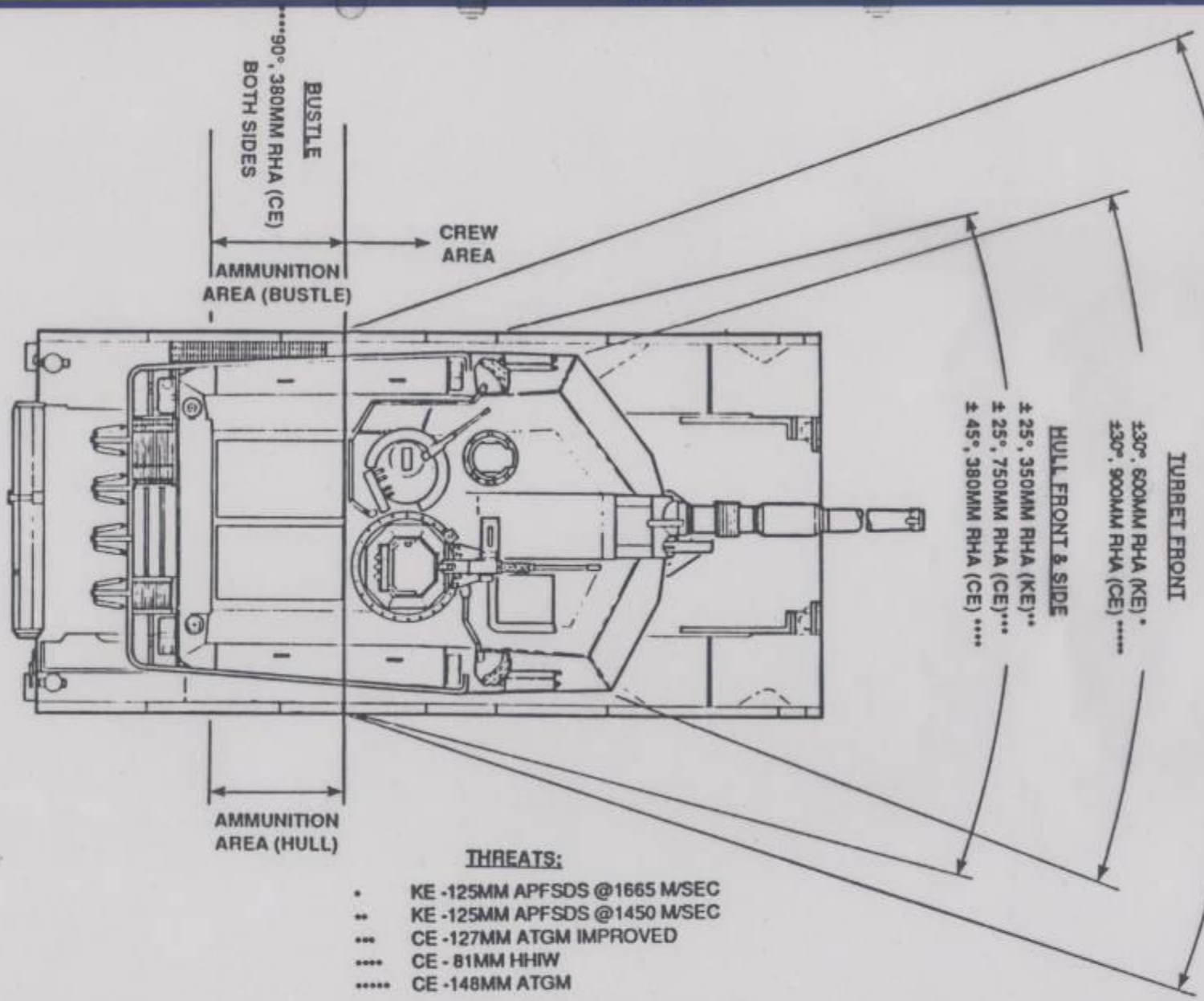
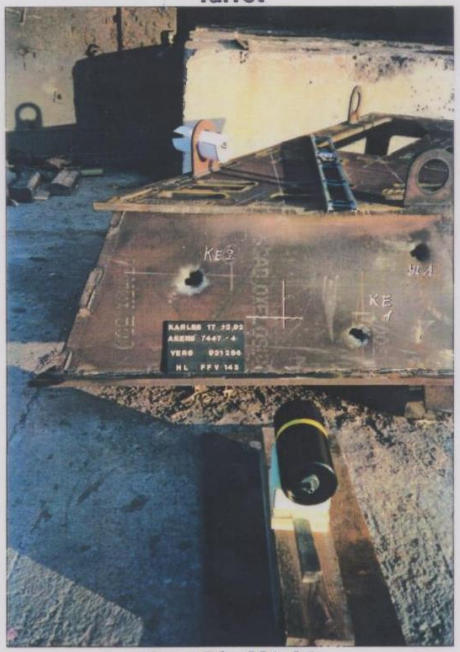


Figure 3.1.5.4.2-2. Ballistic Protection Coverage (U)

Tests with “Swedish armour” in M1A2

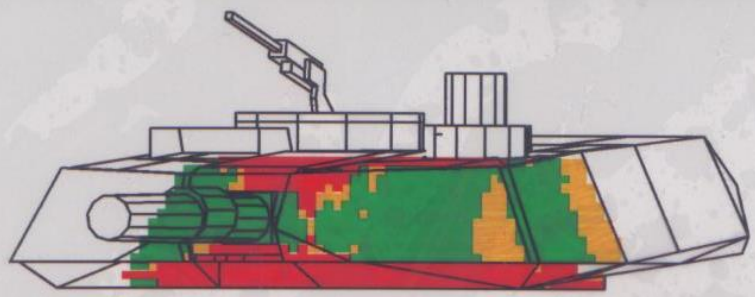
Test Rig M1 A2
Turret



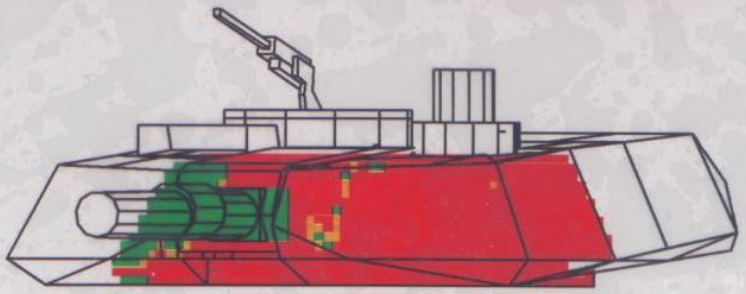
Test Rig M1 A2
Turret

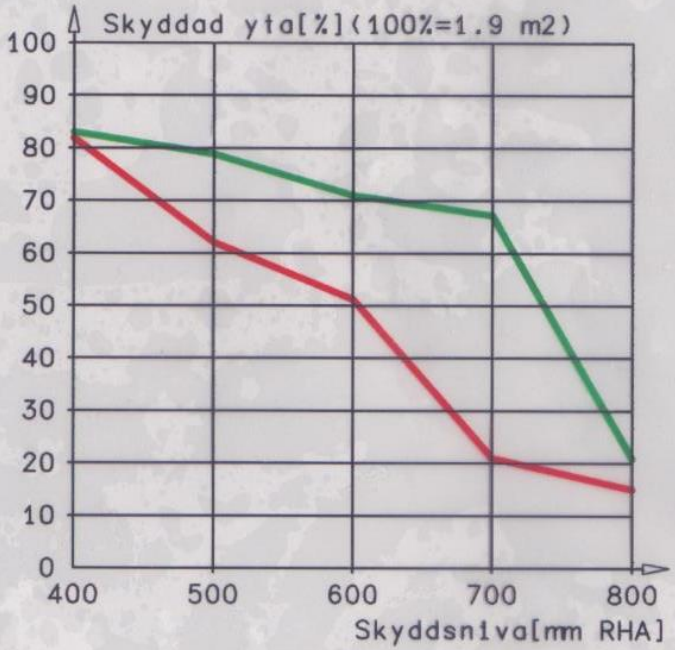
FMV

M1A2, svenskt skydd



M1A2

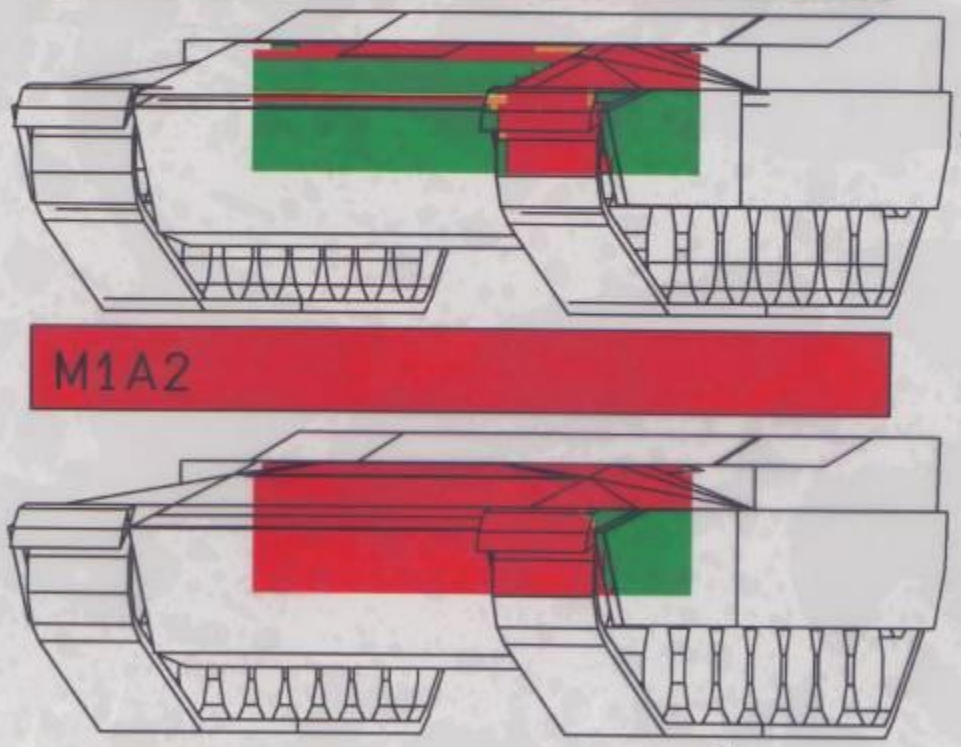




KE 700 mm RHA −20° mot torn

FMV

M1A2, svenskt skydd

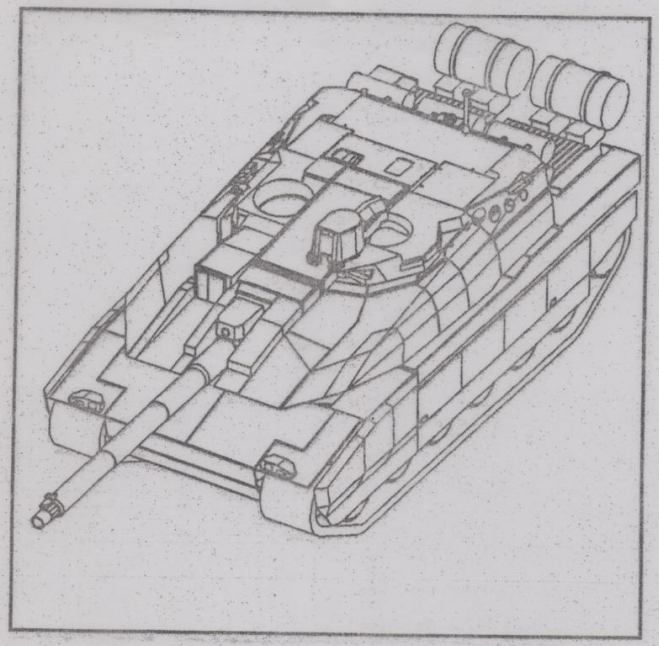


M1A2

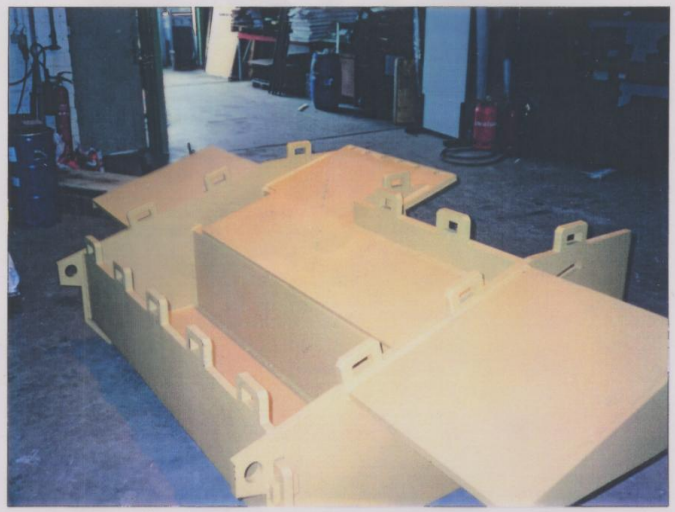
RSV 1000 mm RHA -15^{o} mot chassi

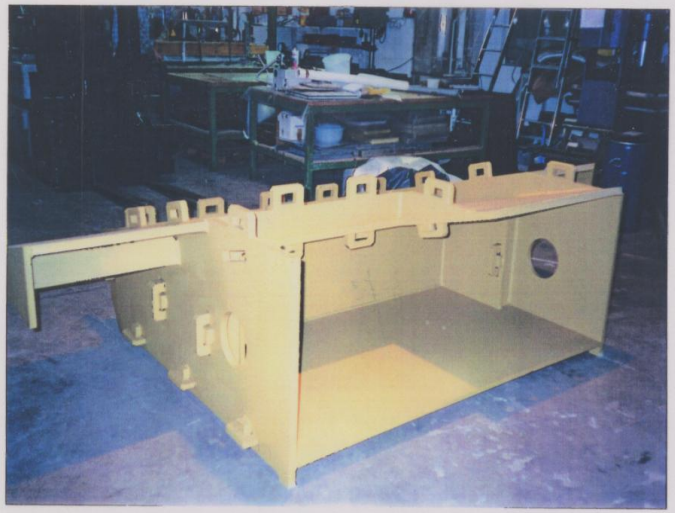

Leclerc

3 VOLUME AND SHAPE OF EACH BALLISTIC PROTECTION MODULE

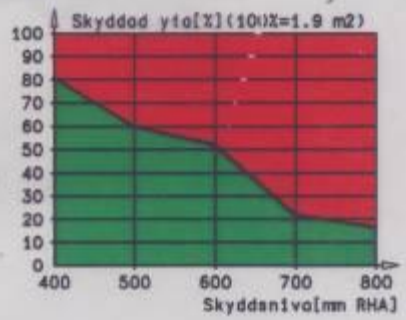


The idea was to replace all the plastic boxes with real protection modules

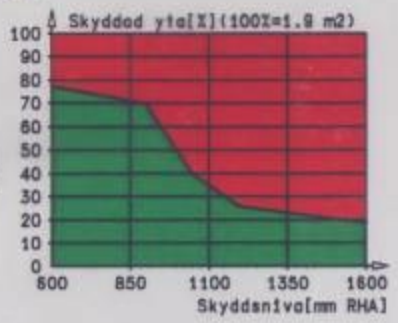




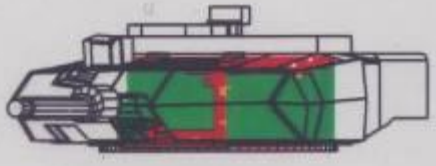
General Dynamics M1A2

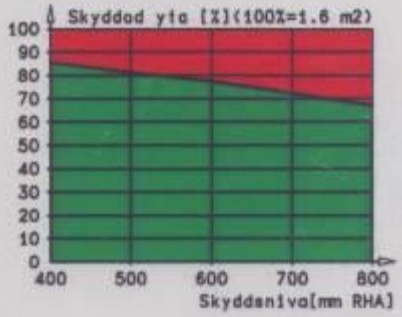


General Dynamics M1A2

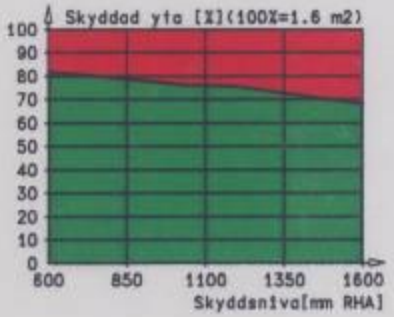


Leopard 2 Improved

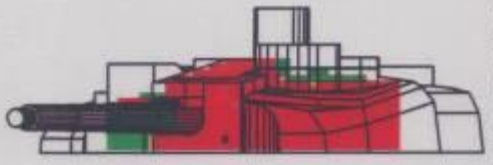


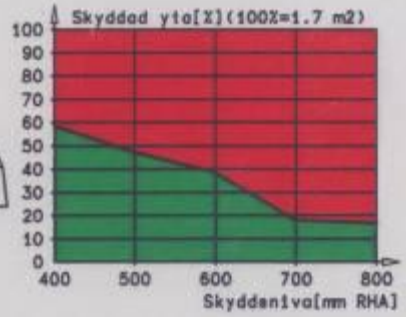


Leopard 2 Improved

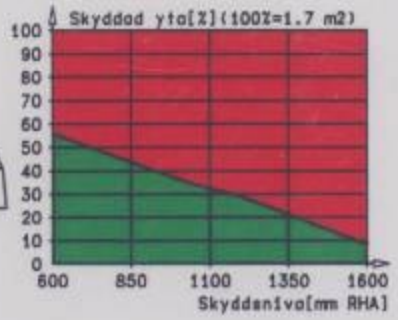


AMX Leclerc





AMX Leclerc



KE 700 mm RHA -20° mot torn

RSV 1200 mm RHA -20° mot torn

Milestones

- September 1991 – the ”MBT New” project group established
- November 1991 – RFI send out to four potential suppliers
- March 1992 – Evaluaton starts of the RFI answers
- May 1992 – Negotiation starts with the suppliers for tests in Sweden
- June 1992 – Vickers choose not to participate with Challenger 2
- August 1992 – Training of Swedish personell starts in each country
- October 1992 – Leopard 2 Improved arrives in Sweden
- November 1992 – M1A2 Abrams arrives in Sweden
- December 1992 – Swedish crew training on Leclerc in France
- January 1993 – Two Leclerc MBT arrives in Sweden, trial starts
- February 1993 – Request for Quotation send out
- June 1993 – Evaluation starts of the RFQ bids followed by negotiations
- December 1993 – Final report and proposal send to the Government

Decision and Reasons

The decison from the Swedish Government 20th of January 1994:

- Procurement of 120 new Leopard 2 ”Improved” SE
- Leasing of 160 used Leopard 2 A4 from Germany

The main reasons:

- The performance
- The cost
- The offered industrial participation

Industrial Participation for MBT New

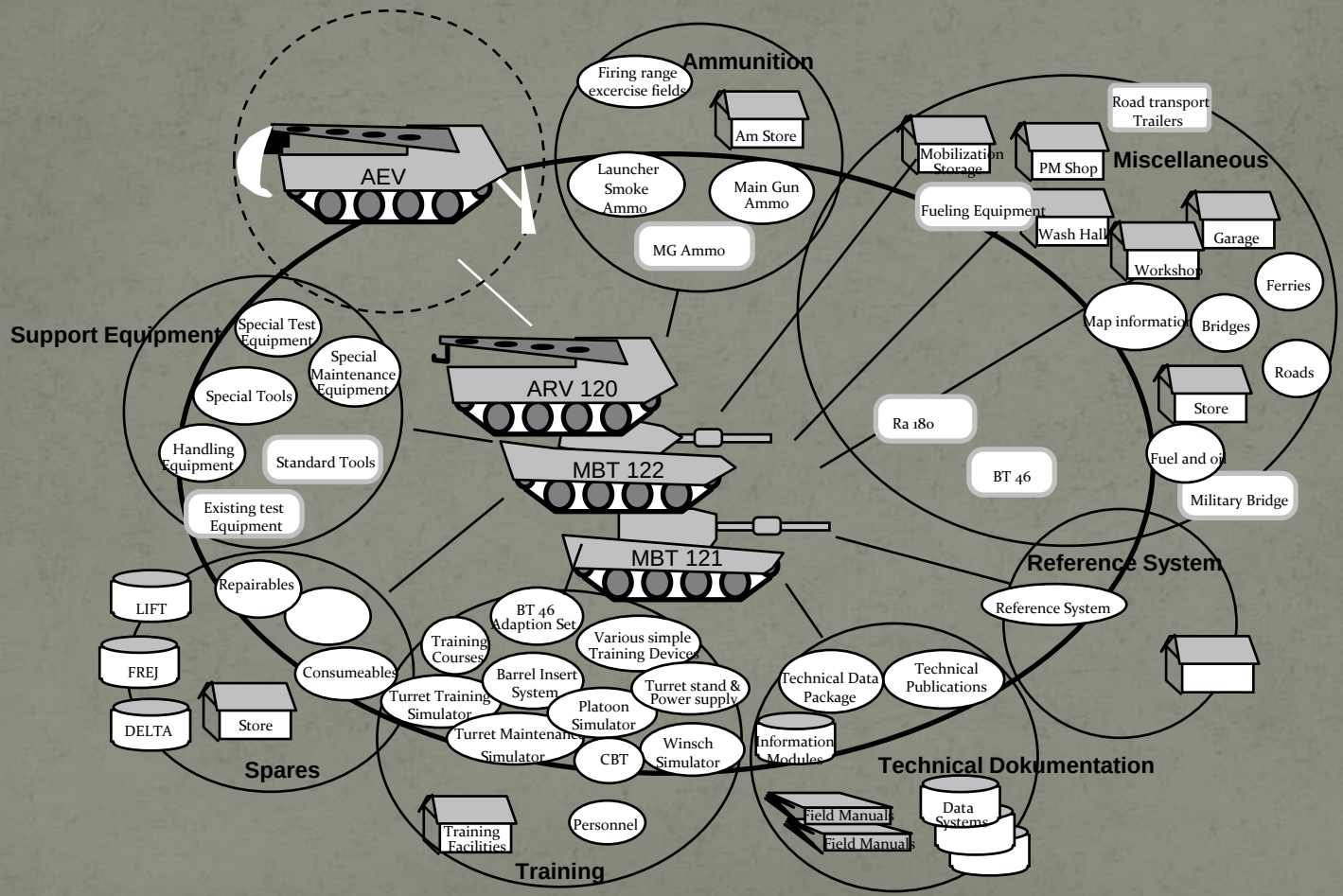
- Hägglunds Vehicle AB:
  - Systems integration
  - Chassie, manufacturing
  - Chassie, mounting
  - Turret, components
- Bofors AB:
  - Turret, manufacturing
  - Turret, integration
  - Weapon system L44
  - Stabilizing system
- SKF:
  - Stabilizing system
- Sörman Information AB:
  - Technical documentation
- Saab Instruments AB:
  - Stabilizing system
  - Commander control unit
  - Commander aiming unit
  - Gunner aiming unit
- Celsius Tech AB:
  - Mounting of optics
  - Command & Control system
- Ericsson Microwave Systems AB:
  - Gunners manouvre panel
- Åkers Krutbruk Protection AB:
  - Ballistic protection modules
- SSAB Oxelösund AB:
  - Armour steel

Strv 122 – the winner

Leopard 2 vehicle family

MBT

Leopard 2 System in Sweden



MBT 122A and MBT 122B

Strv 122A / Strv 122B

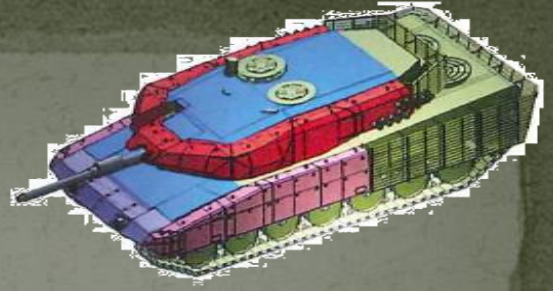
Strv 122A (MBT 122A)

- 106 MBT 122A, 30 in use for training but most of the MBTs are in storage

Strv 122B (MBT 122B INT MiP)

- 10 MBT 122B with mine protection
  - In storage waiting for deployment in international mission
- 4 more MBT 122B under production
  - Ready in May 2012
  - Will enable a complete company

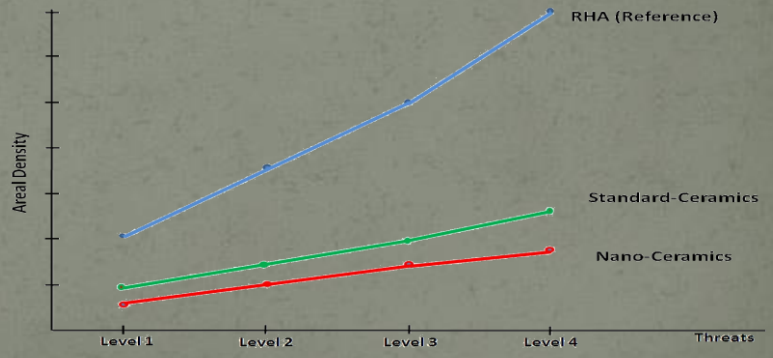
Prepared for international mission



MBT 122B+

Strv 122B+ (MBT 122B+)

- A prototype produced during 2010-2011 by IBD (Akers in Sweden)
  - Using a new type of "SLAT" armour with nano technology
- Meeting "the new" diversified threat for urban warfare (full spectrum)
  - EFP, RPG, IED, 360°
- Challenges:
  - Increase the weight as little as possible
  - Keep the width of the vehicle (4m)
- Outcome:
  - 350 kg added weight



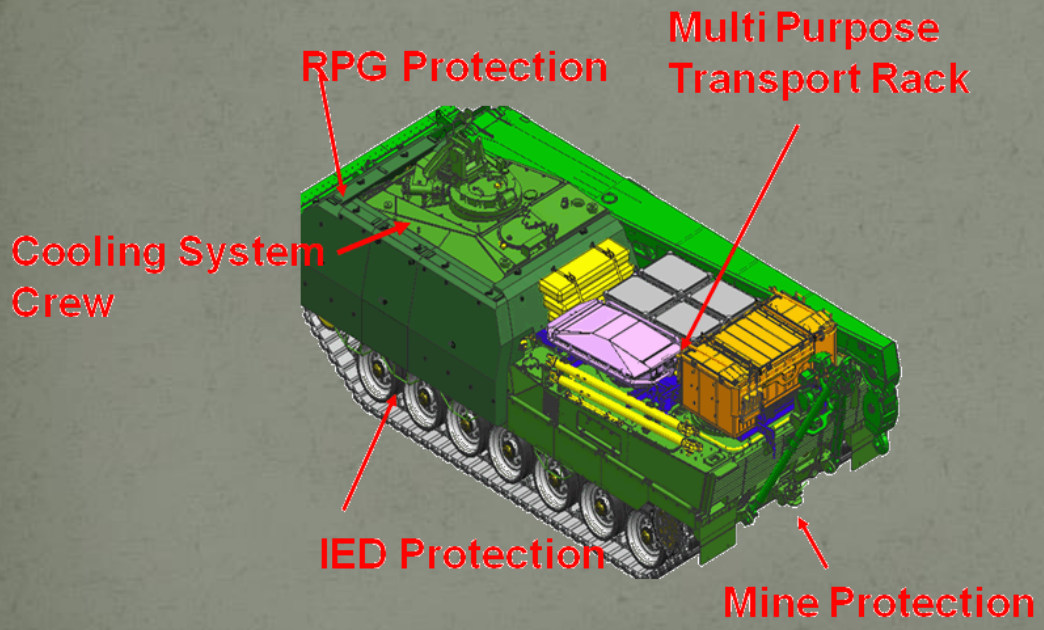
Upgrading programme

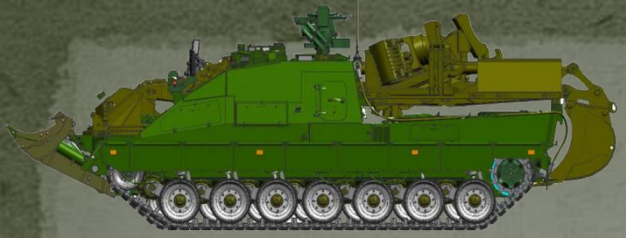
- An upgrading programme is planned from 2013
- The plan is to upgrade 74 of the 120 Strv 122 but this figure can be changed
- Total cost is ~ 5 MSEK / vehicle
- Upgrading is mostly a renovation
- Only minor modifications:
  - A new Battle Management System (separate cost for this)
- Enhanced protection not included in the upgrading package

ARV 120A

Bgbv 120A (BPz 3, ARV 120A)

- 14 ARV 120A are in use
- 2 of those are now being equipped with mine-, IED- and RPG protection
  - → ARV 120B (delivery Q4 2011)





AEV 120A

Ingbv 120A (AEV 3 "Kodiak" S)

- 6 AEV 120A - deliveries from 2011
  - All operational before the end of 2013
- Development in co-operation with The Netherlands since 2008
  - 20% savings in the procurement costs
  - Contract with RLS
- Built on Leopard 2 A4 chassis
  - 6 phased out MBT 121A are used
- Engineering subsystems
  - Hinged-arm excavator
  - Quick-release coupling for deploying additional combat engineering tools
  - Mine breaching kit (Pearson)
  - Mine and IED protected
  - RCWS from Kongsberg

Archer – Artillerisystem 08

- Mitten 90-talet testades olika beväpningar på dumperchassi
- 15,5 cm haubits mest gynnsam
- Studier, försök med olika riggar under 1995-2007 på Volvo A30D
- Samutveckling med Norge 2008

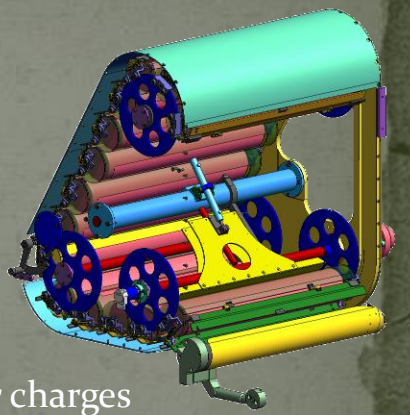
- 32 ton, 4 man, 340 hk, 70 km/h
- 15,5 cm L/52 + Protector 12.7 ksp
- Granatmagasin 21 st skjuts på 2½ min
- Skottvidd 40-50km, MRSI-förmåga, 30 sek till skott, STANAG 1
- Behov 24 pjäser


ARCHER

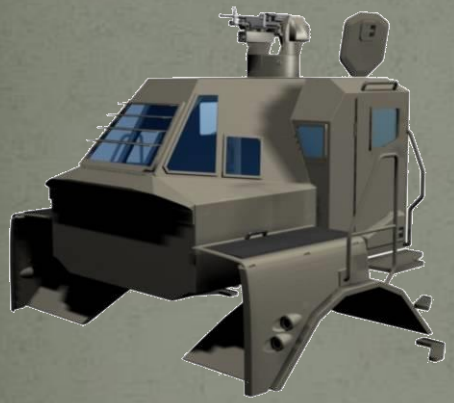
REMO haubits 77B ARCHER

Volvo A30E Dumper

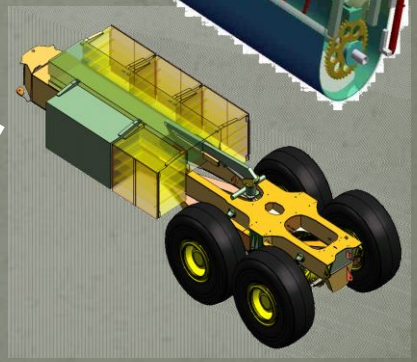
Weapon from haub 77B



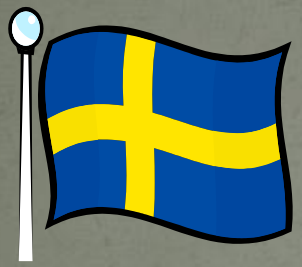
Magasine for charges and grenades

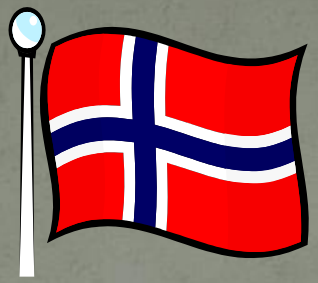


Splinter and mineprotected cabin

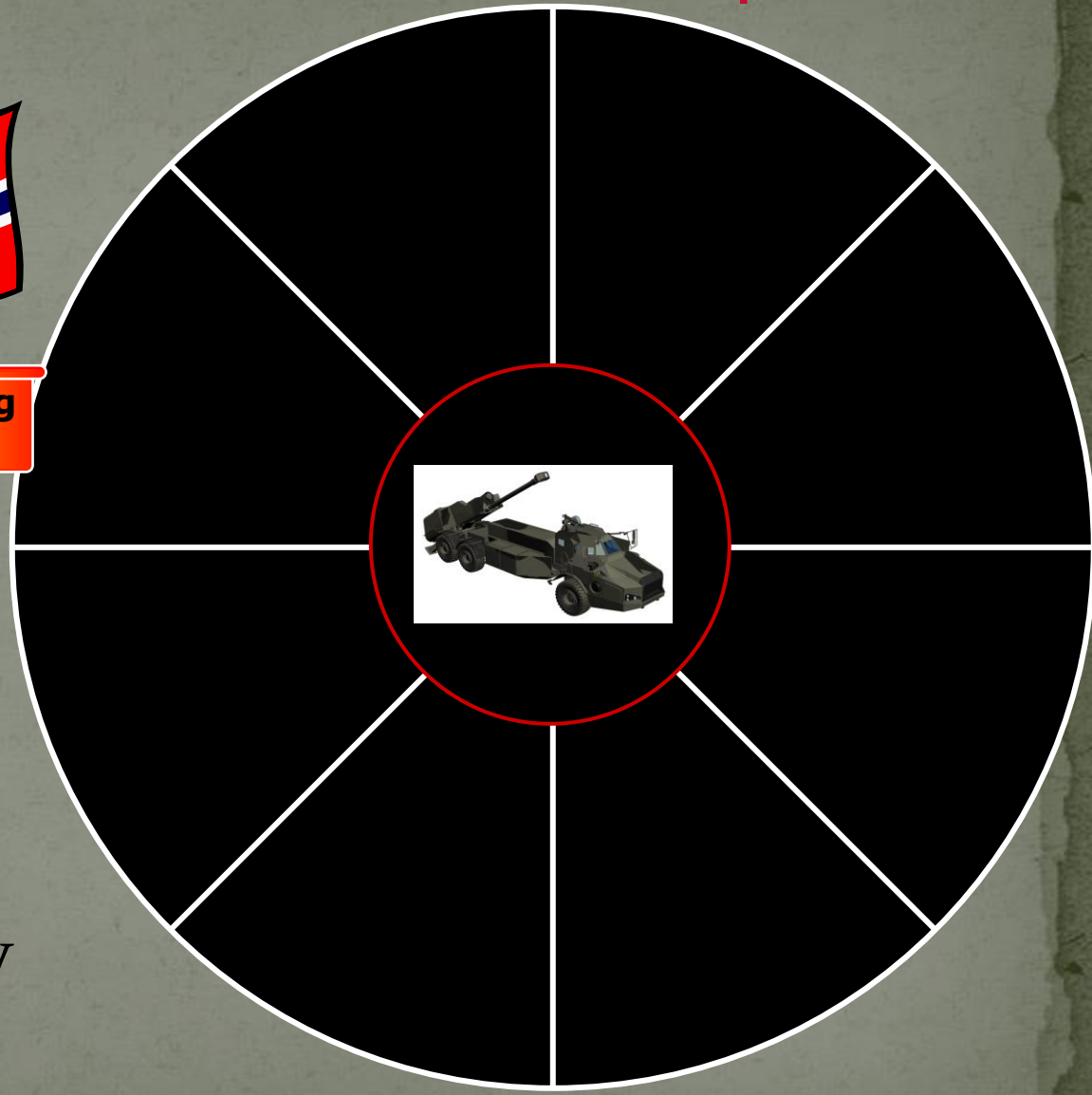


Swedish – Norwegian Indirect Fire Cooperation





Memorandum of Understanding
Indirect Fire



- ✓ Affordability
- ✓ Economies of scale
- ✓ Interoperability

The ARCHER project

- Technology studies of FH 77A MLU 1995-1998
- Technology studies of FH 77B MLU 1998-2003
- ARCHER feasibility study 2004-2006
- Product Definition Phase 2006-2007
- Design and Demonstration Phase 2006-2009
- Production Phase 2010-2014
- First delivery to the Swedish Army 2012
- First delivery to the Norwegian Army 2012
- In parallel new 155 mm ammunition has been developed - EXACALIBUR – in cooperation with USA

Transformeringen till färre stridsfordonssystem

2008

2014 - 2020

Pansarterrängbil 360

Projekt

AWV – Armoured Wheeled Vehicle

- Bakgrund:
  - ÖB:s beslut 4 februari 2008 att inte fortsätta utvecklingen av SEP
- Fortfarande fanns ett behov av hjulgående pansarfordon till två mekaniserade bataljoner
  - IOC 2014 med113 fordon (första bataljonen)
    - 79 APC
    - 16 C2
    - 7 Reparation
    - 11 Ambulans
- RFQ genomfördes i två omgångar:
  - RFQ 1 publicerad 30 oktober 2008
    - Ett överklagande inkom från BAE
  - RFQ 2 publicerad 30 december 2009
    - Ett överklagande inkom från NEXTER
- Utvärderingarna visade att AMV från finska Patria var det bästa alternativet
  - Ett kontrakt tecknades 13 augusti 2010
- De första leveranserna kommer att ske under 2013 och full operativ kapacitet förutses till 2014

De tävlande företagen och fordonen

Piranha III – GDLS

Boxer - ARTEC

AMV – Patria Vehicles

VBCI - Nexter

SEP – BAE Hägglunds

Alligator – BAE Hägglunds

Köp finskt – få fler jobb i Sverige

erige råd att skrota

BRÄNNPUNKT

Stora brister i FMV:s upphandling

NYHETER SvD GRANSKAR

Köp av pansarfordon stoppas

Härva bakom försvarsaffär

AWV – Utvärderingen av RFQ 2

- Baserad på offerterna från Nexter och Patria gjordes ett övervägande i enlighet med den publicerade utvärderingsmodellen.
- Resultatet gav en klar indikation på att endast anbudet från Patria hade potentialen att slutgiltigt vinna konkurrensupphandlingen – vilket ledde till att förhandlingar inelddes med Patria.
- Parallella förhandlingar med Nexter Systems genomfördes aldrig eftersom bedömningen var att de inte hade ett tillräckligt konkurrenskraftigt anbud.

- Sammanfattande utvärdering av parametrar (nivå 2):

	PATRIA	NEXTER
System performance (26 %)	5,20	4,43
Costs (28 %)	9,18	6,80
Through-life responsibility (8 %)	8,82	4,77
Contractual conditions (23 %)	7,14	5,48
Implementation (9 %)	8,00	7,50
Programme management (6 %)	8,00	7,80
TOTAL GRADE:	**7,47**	**5,84**

Patgb 360 (XA-360 “AMV”)

APC

C2

AMBULANS

Bandvagn 410

Projekt ”Bandvagn Ny”

- Behov förelåg av nya pansrade midjestyrda bandvagnar:
  - 15 fordon till ISAF i januari 2013
  - 33 fordon med IOC i mitten av 2014
  - optioner på ytterligare 127 fordon
- Olika rollvarianter:
  - APC (även för ISAF)
  - Ambulans (även för ISAF)
  - Ledning (C2)
  - Logistik (”flatbed”) med tilläggsmodul
    - Reparation
    - Radiolänk
    - Ingenjör
    - Granatkastare
    - ARTHUR
- Omsättning av äldre fordon:
  - Pbv 302
  - Pbv 401 (MT-LB)

- Anskaffningen skulle genomföras som en konkurrensupphandling (typ ”köp från hyllan”)
  - RFQ published in June 2011
  - Evaluation started October 2011
  - Award Decision early Jan 2012
- Tests part of the evaluation process
- Example of ”shall requirements”:
  - Oversnow capability
  - Capability to manoeuvre in mires
  - Air transportable in C-130
  - Amphibious capability
- Initial need of 15 ATVs for ISAF during 2012 solved with leasing
  - BvS10 Mk I front module (NL)
  - BvS10 ”Viking” rear module (UK)

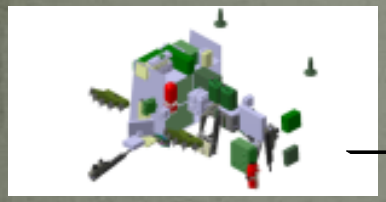
ISS-ATV-ISAF

Rear module

BvS10 Mk0 ATV-P (UK)

Front module

BvS10 Mk1 (NL)

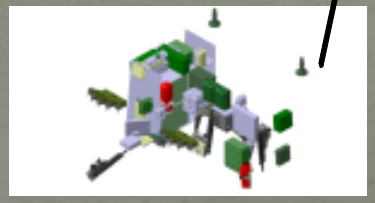


Parts from “UK UoR Kits”

- Bar-Armour
- Additional ballistic side protection
- Better mine protection

Parts from “NL UoR Kits”

- Bar-Armour
- Additional ballistic side protection
- Better mine protection
- Plat Ringmount
- Night camera



ISS-ATV-ISAF upgrading

- Command- and Communication system
- Additional mine protection front module
- Holers, fastenings, storage etc

BvNy – de tävlande kandidaterna

ATTV Bronco 2


BvS10 MkIIB

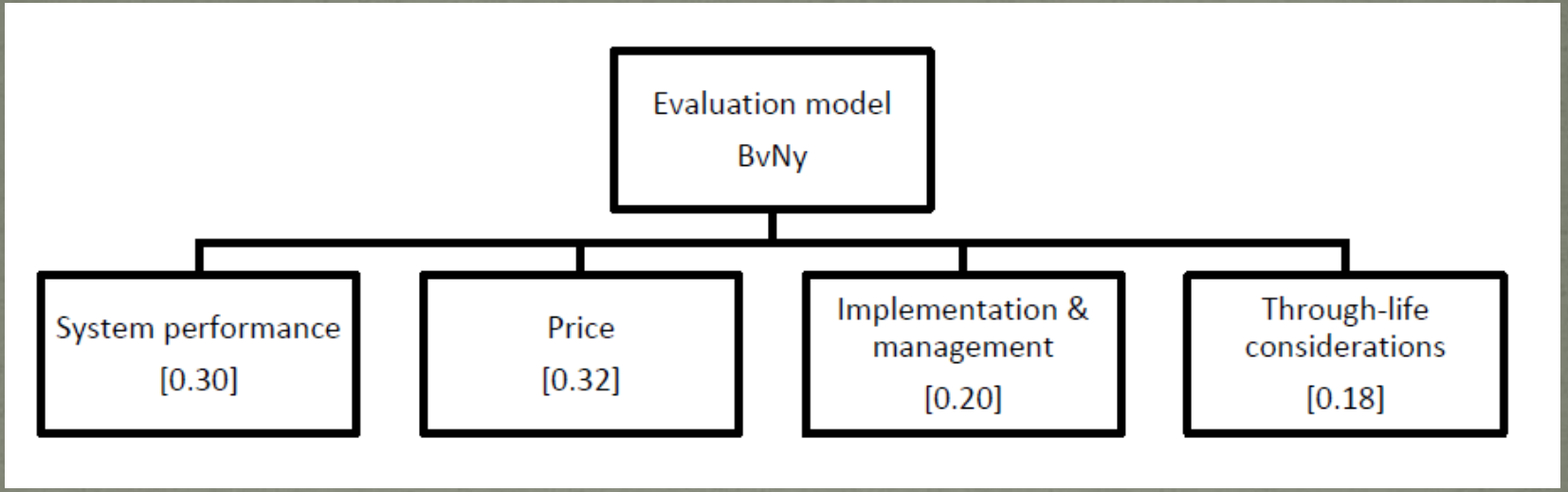
- Innan en anbudsinfordran (RFQ) publicerades genomfördes under vintern 2010-2011 s k produktdemonstrationer med de två fordon som förväntades deltaga i konkurrensupphandlingen
- När en RFQ senare publicerades i juni 2011 erhölls anbud erhölls från BAE Systems Hägglunds (med BvS10 MkIIB) och Singapore Technologies Kinetics (Bronco 2)

”Produktdemonstrationer”

Var BvS10 MkII tillräckligt stor för all last?

Hur skulle Bronco 2 klara svensk vinterterräng?

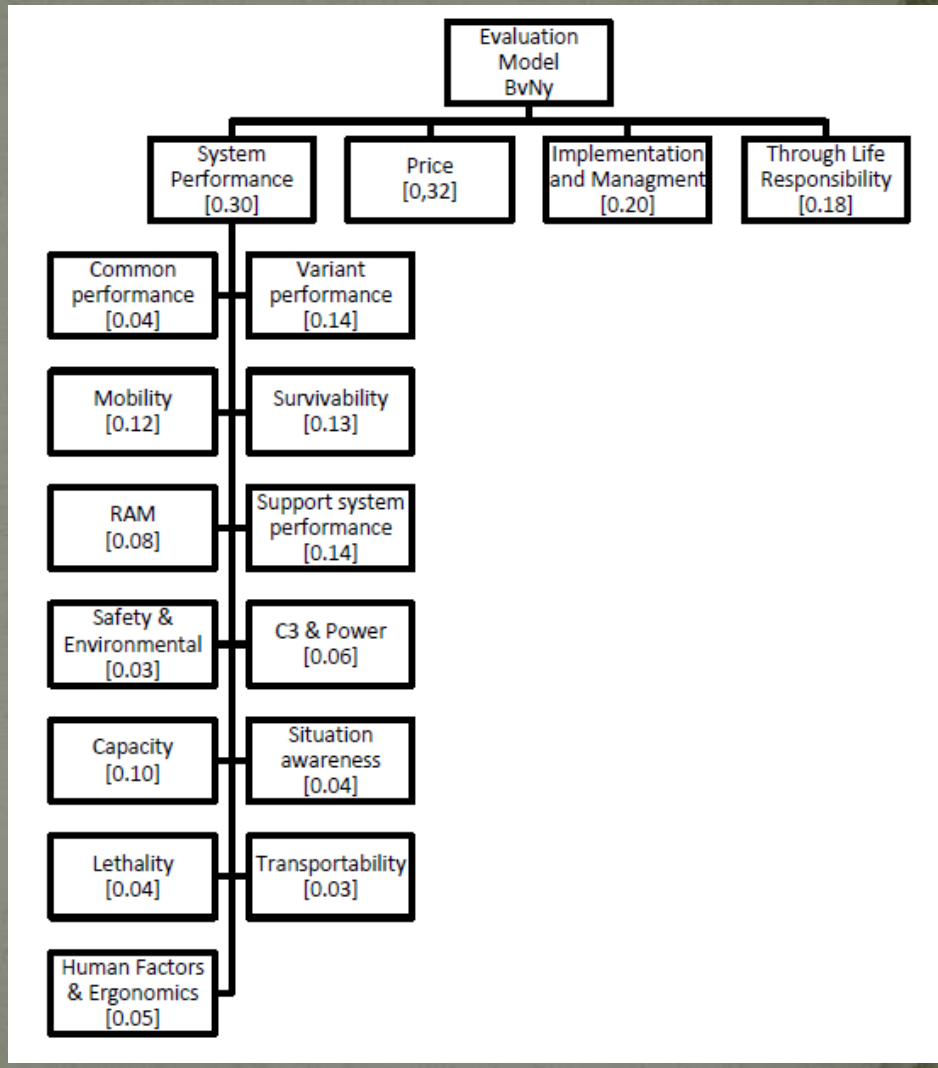
BvNy evaluation – Top level



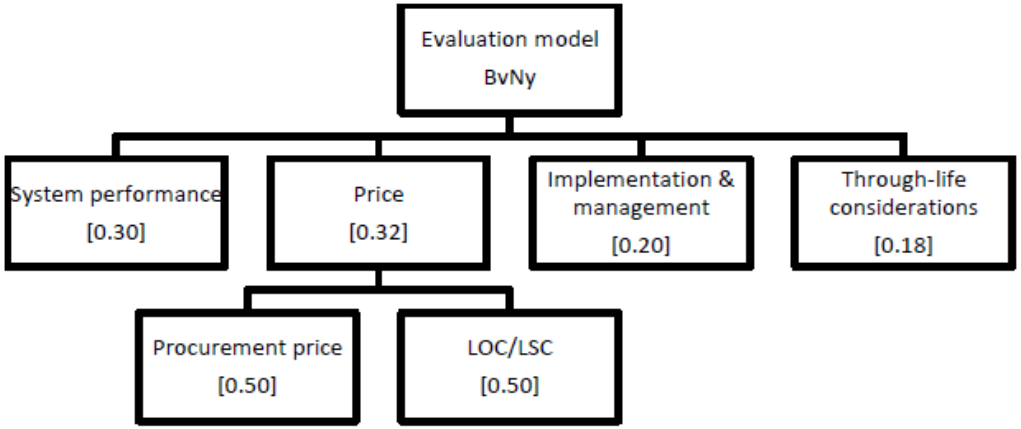
- All the ”shall requirements” are mandatory and must be fulfilled
- The compliance to the “should requirement” is evaluated
- The idea in the RFQ is to be as transparent as possible
- This gives the opportunity for the Tenderer to balance their bid
- It would hopefully also prevent a complaint to a greater extent

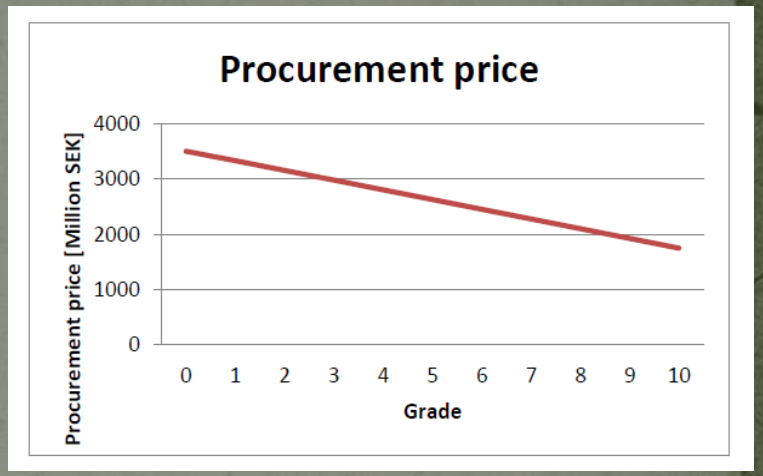
System Performance

- The basis for evaluation of System Performance was the compliance statements to system performance requirements together with the descriptions of the offered system.
- Tenderers were made aware that high grades would be given for tenders where:
  - The “should” requirement is fulfilled without any restrictions.
  - There is no conflict with other requirements in the System Specification.
  - The technical solution is well described in the documentation, clearly showing how the requested function has been integrated in the design.
  - Test reports are included that give confidence that the stated “offered performance” will be fulfilled.
- Lower grades were given for compliance without description and partial compliance

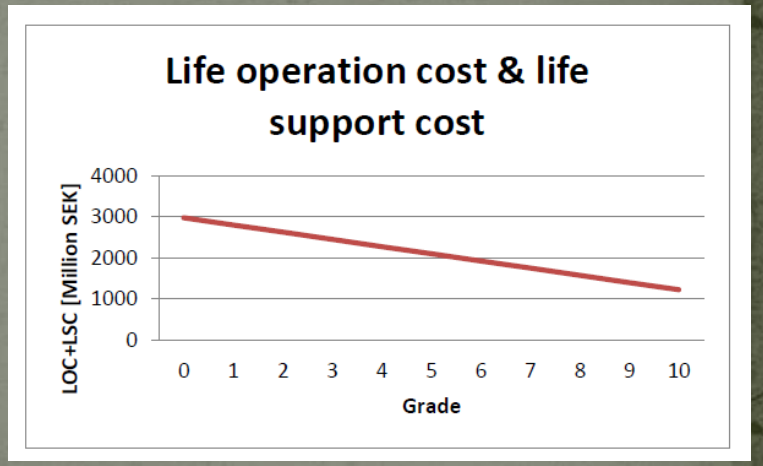


Price

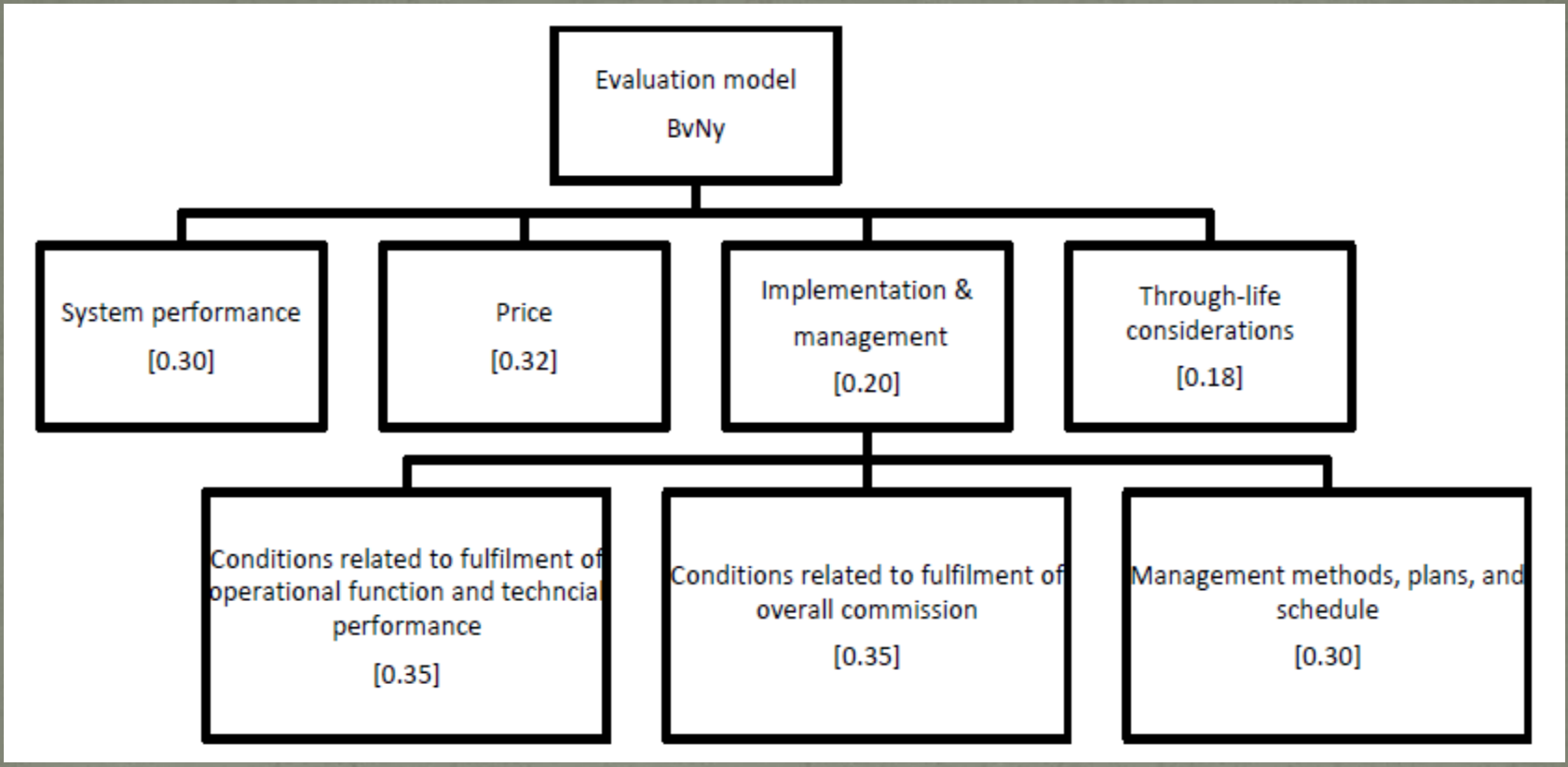




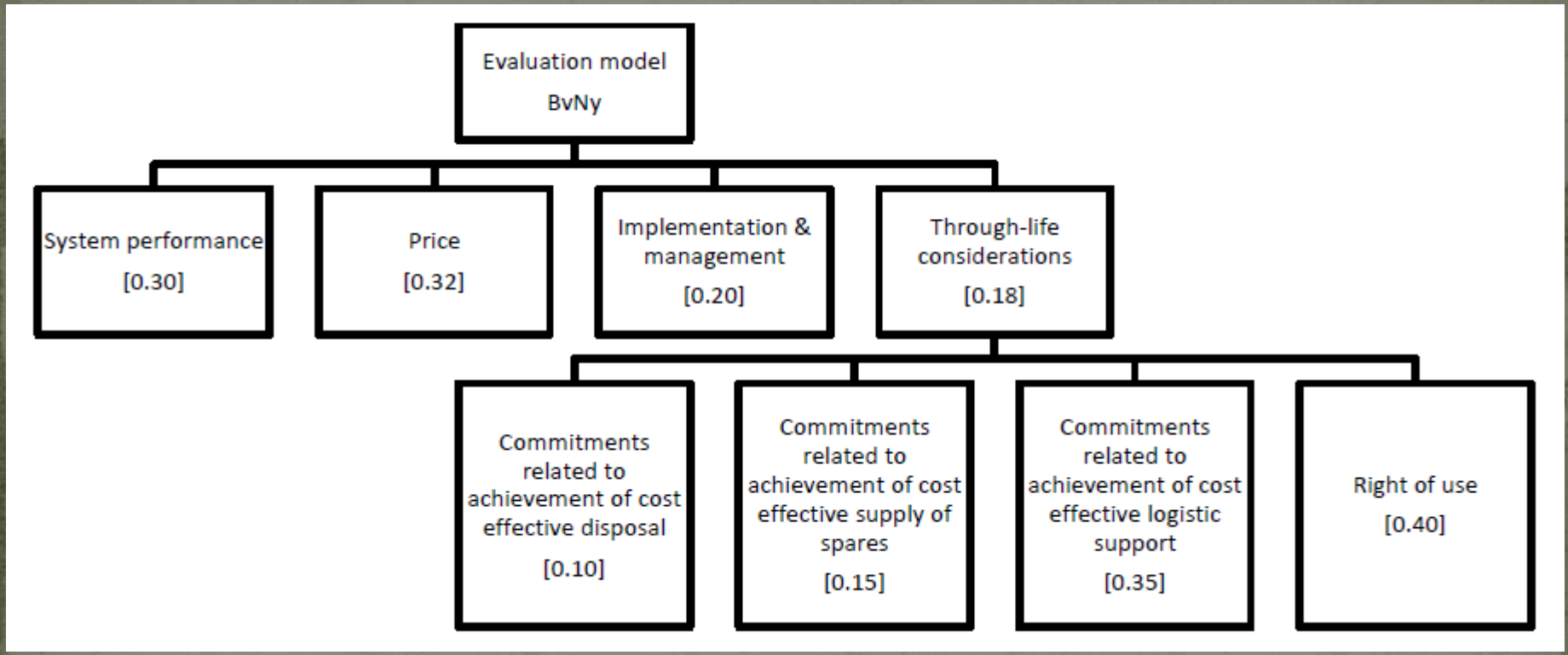
- Price given the highest weight in the evaluation model
- Extreme transparency gives the opportunity to know the exact "score"
- Each Tenderer is requested to give needed values for calculation



Implementation & Management



Through-life considerations

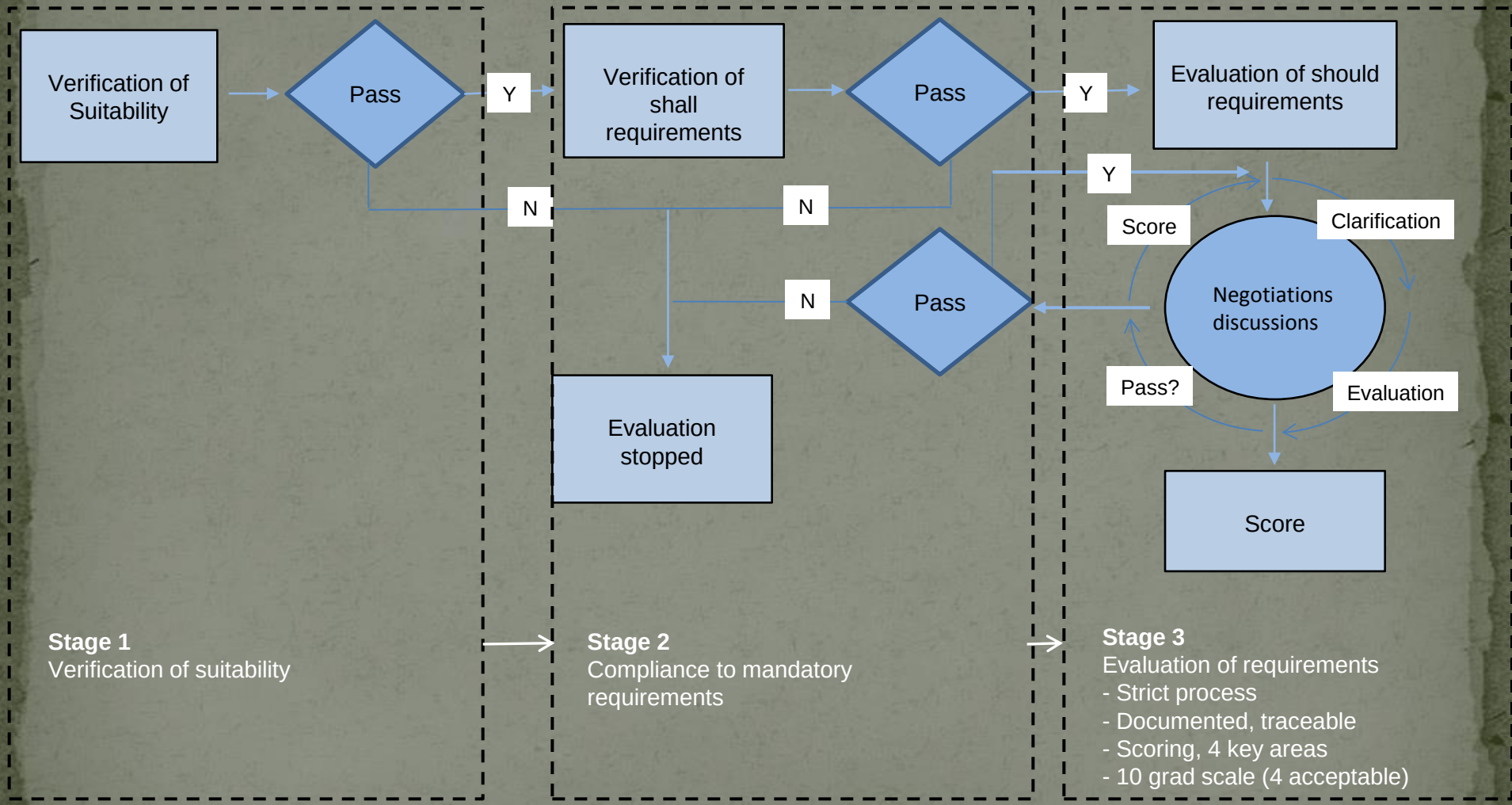


Scale for Grading

- 10 Exceptional
- 9 Excellent
- 8 Very good
- 7 Above standard
- 6 Good
- 5 Adequate
- 4 Acceptable
- 3 Weak
- 2 Marginal
- 1 Inadequate
- 0 Not compliant

Value	Rating	Criteria
10	Exceptional	• Offered performance/conditions is significantly higher/better than the requirement(s) • There is no perceived risk related to the stated compliance • The offered solution can give synergy effects to the fulfillment of other requirements • Described work method/process gives synergy effects to other parts of the work • The plan/document is comprehensive, easy to understand, fully in line with other parts of the commitment and gives opportunity for significant risk reduction and/or cost reductions • Description of offered solution is comprehensive, well described, credible and supported with high confidence evidence
9	Excellent	The offer does not fully meet the definitions for "Exceptional" but is better than "Very Good"
8	Very Good	• Offered performance/conditions is higher/better than the requirement(s) • There is very little perceived risk related to the stated compliance • The solution supports fulfillment of other requirements • Description of work method/process are comprehensive, well described, and fully in-line with guidelines/standards • The plan/document is comprehensive, easy to understand, fully in line with other parts of the commitment and gives opportunity for risk reduction and/or cost reductions • Description of offered solution is comprehensive, well described, credible and supported with evidence
7	Above Standard	The offer does not fully meet the definitions for "Very Good" but is better than "Good"
6	Good	• Offered performance/conditions is in accordance with the requirement(s) • There is little perceived risk related to the stated compliance • There are no conflicts related to fulfillment of other requirements • Description of work method/process is easy to understand and fully compliant with the guidelines/standards • The plan/document is easy to understand and is fully in line with other parts of the commitment • Description of offered solution gives a credible and clear picture of the solution
5	Adequate	The offer does not fully meet the definitions for "Good" but is better than "Acceptable". Deviations and conflicts are neglectable
4	Acceptable	• Offered performance/conditions means acceptable deviations from the requirement(s) • There is some perceived risk related to the stated compliance • There are acceptable conflicts related to fulfillment of other requirements • Description of work method/process is compliant with the guidelines with acceptable deviations • The plan/document include limited conflicts with other parts of the commitment • There is no information in the tender describing the fulfillment of the requirement
3	Weak	The offer does not fully meet the definitions for "Acceptable" but is better than "Marginal"
2	Marginal	• Offered performance/conditions is partially in accordance with the requirement(s) • There is significant doubt about the understanding or ability to meet the requirement • There are conflicts related to fulfillment of other requirements • Description of work method/process is partially compliant with the guidelines • The plan/document include contradictions or conflicts with other parts of the commitment • The information in the tender describing the fulfilment of the requirement is questionable
1	Inadequate	The offer does not fully meet the definitions for "Marginal" but is better than "Non-compliant"

Evaluation process



Evaluation process

- The tenders have been evaluated iteratively in order to:
  - Receive full understanding of the tender (enabling questions and answers)
  - Ensuring a correct evaluation (taking care of clarifications made by Tenderer)

Finally FMV (internal revision) has done a guarantee of quality on our assessment.

This to provide a high degree of confidence to the assessment.

FMV decision

- FMV decision is based on:
  - Fulfilment of all mandatory requirements
  - Consideration of firm commitments
  - Evaluation of the entire commitment
  - Clarifications and improvements
  - Score
  - Top level evaluation
- Test results have been used as supporting information

Tests

- Tests were performed as part of the procurement process.
- The test results have been considered as confidence and credibility to what is stated as commitments in the tenders.
- This means that the test results have not constituted a certain grade on their own but will be used as supporting information.
- The reason for this is that FMV does not know to what level the configuration of provided test vehicles will deviate from what is offered.
- Tests were performed with the Bv206S (Bv309B) as a reference vehicle.
- As stated in the System Specification th reference vehicle Bv309B was towing an empty trailer.
- Tests were performed for 3 weeks
  - Technical Performance
  - Amphibious capability & Mobility in mires
  - Stowing of equipment
  - Limited analysis of overhaul & repairability

Example of tests with BvS10 Mk II






Example of tests with Bronco 2


64570
ARONCO


ST Kinetics
ARONCO 2


ST Kinetics
64570
ARONCO 2


ST Kinetics

FMV evaluation

Evaluation Parameter [weight]	Grade Tender BAE	Grade Tender STK
System performance [0.30]	5.2	4.3
Price [0.32]	8.9	6.2
Implementation & management [0.20]	6.3	5.4
Through-life considerations [0.18]	6.0	5.0
Total Grade:	**6.7**	**5.3**

FMV Award Decision

- BAE Systems Hägglunds AB submitted the economically most advantageous tender
- The tenderer fulfilled all mandatory requirements
- The tenderer received the highest score after the evaluation, based on the requirements and the evaluation model stated in the Request for Quotation
- Award to BAE Hägglunds with BvS10 MkIIB

Photo shows the BvS10 Mk I test vehicle


Questions...?

COMPETITION




DIRECT PROCUREMENT



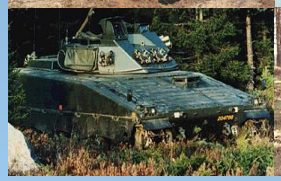





DEVELOPMENT









1990

2000

2010

Slut…

…dags för inventering….


Rast - vila!

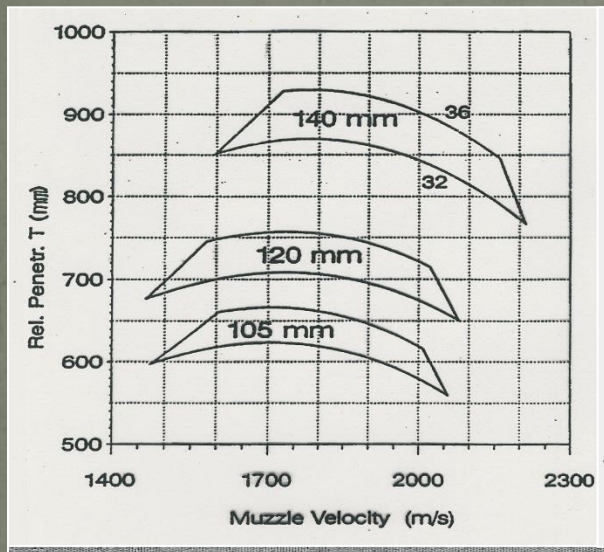
Teknikutveckling

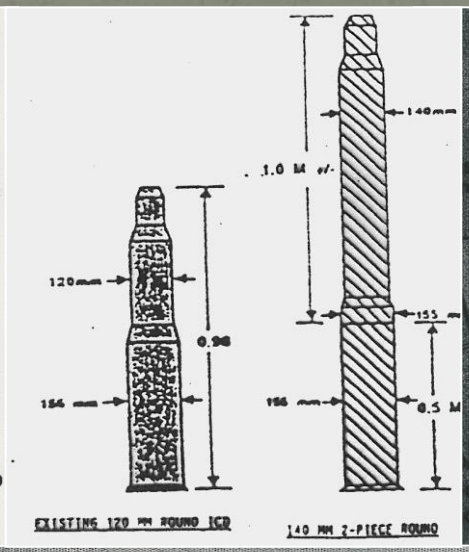
Eldkraft

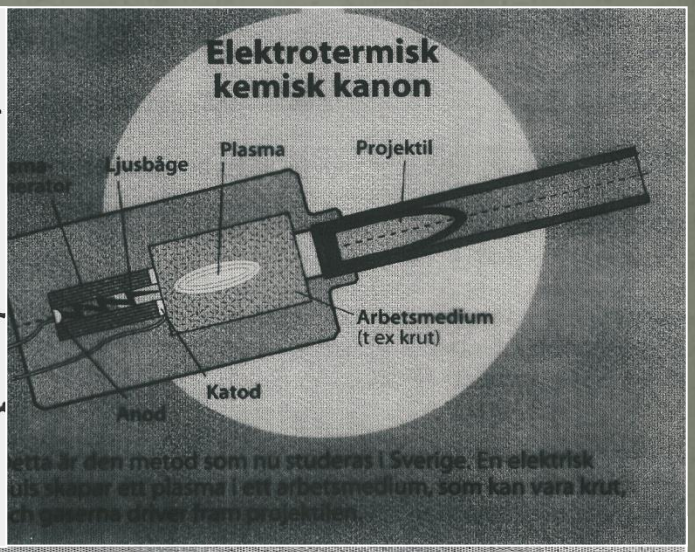
Rörlighet

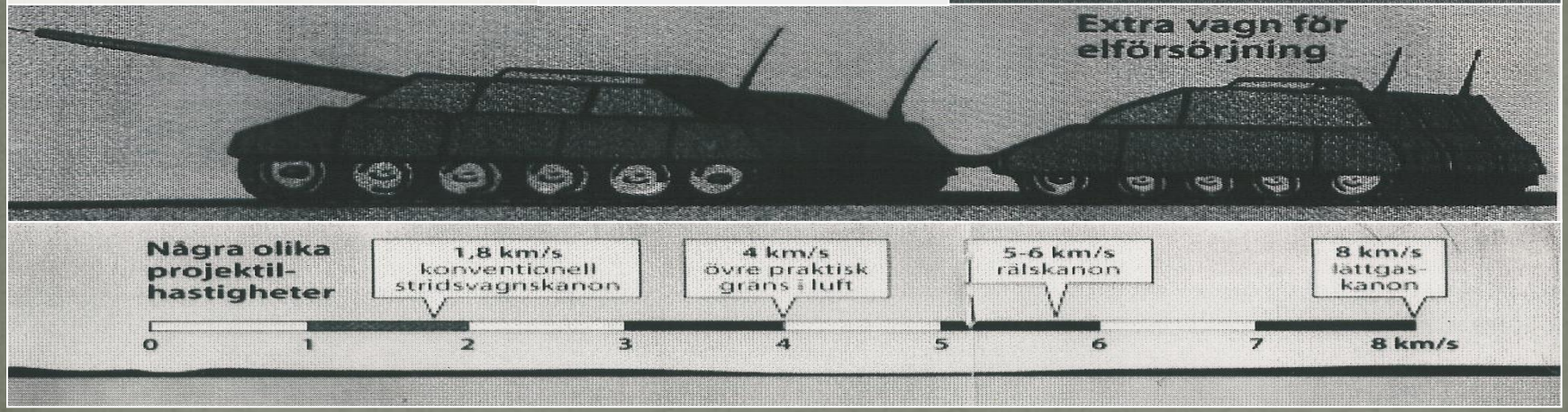
Skydd

Eldkraft?

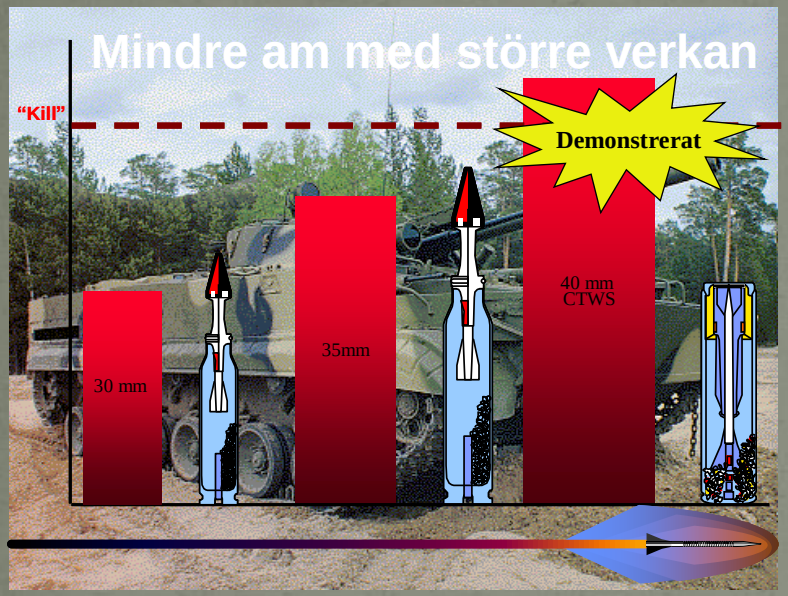

1000
900
800
700
600
500
1400
1700
2000
2300
Rel. Penetr. T (mm)
Muzzle Velocity (m/s)
140 mm
36
32
120 mm
105 mm


120mm
0.96
EXISTING 120 MM ROUND ICM
1.0 M +/-
140mm
155
0.5 M
140 MM 2-PIECE ROUND


Elektrotermisk kemisk kanon
Ljusbåge
Plasma
Projektil
Arbetsmedium
(t ex krut)
Katod
Anod


Extra vagn för elförsörjning
Några olika projektil-hastigheter
1,8 km/s konventionell stridsvagnskanon
4 km/s övre praktisk gräns i luft
5-6 km/s rälskanon
8 km/s lättgas-kanon
0
1
2
3
4
5
6
7
8 km/s

Eldkraft!


Mindre am med större verkan
"Kill"
Demonstrerat
30 mm
35mm
40 mm
CTWS


Stridsvagnsbeväpning på lätta fordon


Artilleri på lätta stridsfordon


Fjärrstyrd ovanpålagrad beväpning

Rörlighet?

- Framkomlighet i djupsnö?
- Framkomlighet i myrmark?
- Simförmåga?

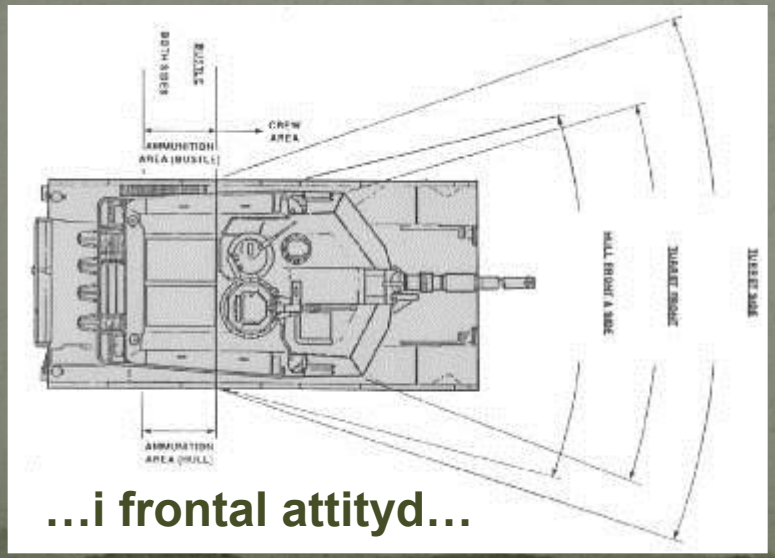
Rörlighet!

- Strid i ”alla” klimatzoner
- Strid i bebyggelse
- Strategisk rörlighet
  - C130 (max ~18 ton)
  - A400M (max ~35 ton
  - C17 (max ~50 ton)

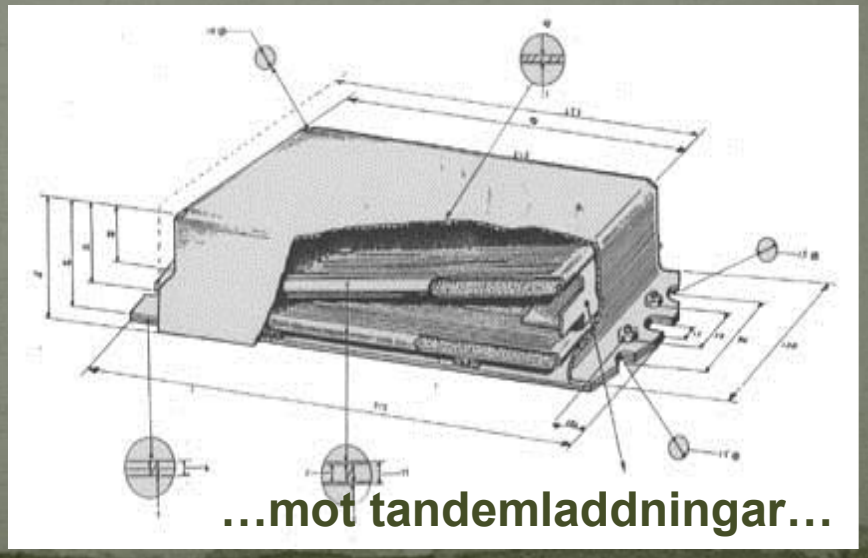
Skydd?

Mot kinetisk energi (KE)…

… mot takslående stridsdelar…



…i frontal attityd…



…mot tandemladdningar…

Skydd!

- Skydd mot IED
  - Improvised Explosive Device
- Skydd mot minor
  - T ex TRMP 6 (EFP)
- Skydd mot handburna PV-vapen
  - T ex RPG 7
- Skydd i alla attityder och våglängder