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CASE STUDY FOR PROJECT MANAGEMENT ASPECTS OF THE „S" BAND MOBILE RADAR PROCUREMENT AND LIFE CYCLE SUPPORT

The project management efficiency is the key measure of the radar procurement. This article focuses on the "S" band mobile radar management aspects and highlights the performance assessments for life cycle project supervision. This is primarily the assumptions and risks, the major problems encountered, then ratings for implementation progress by the actual actions and the likelihood of achieving implementation objectives.

***Keywords**: Project Management, risk analyses, "S" band mobile radar, twin Gaussian-monostatic radar*

INTRODUCTION

At the end of the Cold War, NATO had 22,000 staff across 33 commands. Following the 2010 Lisbon Summit, NATO Allies reformed the NATO Command Structure to create a robust, agile, and efficient command system. These changes focused on ensuring that NATO forces remained fit for purpose and improved NATO's ability to deploy forces on operations, reflecting the security environment of that time. Today, NATO maintains personnel in 6,800 posts across seven commands. The reforms also improved the NCS's operability with the NATO Force Structure (NFS). The NFS is a distinct pool of Allied national and multinational forces and headquarters placed at the Alliance's disposal on a permanent or temporary basis.

Responding to Emerging Challenges

Today, NATO faces the greatest security challenges in a generation – including terrorism, cyber and hybrid threats and a more assertive Russia and China. During the Warsaw Summit in 2016, NATO Allies agreed to review the Command Structure, so that it continues to meet the challenges of a complex and evolving security environment. In 2017, NATO Defence Ministers agreed on an outline for future work to adapt the Command Structure. Key elements include:

- a new Command for the Atlantic to ensure that sea lines of communication between Europe and North America remain free and secure;
- a new Command to improve the movement of troops and equipment within Europe;
- upgrade of the Long-Range Air Surveillance Radars of the Air Defence Systems;
- reinforcing logistics elements across the NCS in Europe;
- and a new cyber operations centre to strengthen cyber defences and integrate cyber capabilities into NATO planning and operations [1].

At the Lisbon Summit, in November 2010, NATO leaders endorsed a new Strategic Concept, which states that the Alliance will "engage in a process of continual reform, to streamline structures, improve working methods and maximise efficiency."

Additionally, NATO's International Staff is being reviewed as part of this broader package of reform being undertaken within the Organization. Similarly, to the other initiatives, it aims to streamline and adapt structures to today's environment [2].

The NATO Support and Procurement Agency (NSPA) brings together NATO's logistics and procurement support activities in a single organisation, providing integrated multinational support solutions for NATO Allies and partners. It is a fully customer-funded agency, operating on a "no profit - no loss" basis. As part of the reform process, the NSPA was established on 1 July 2012 merging three former in-service support agencies: the NATO Maintenance and Supply Agency (NAMSA), the NATO Airlift Management Agency (NAMA) and the Central Europe Pipeline Management Agency (CEPMA) [3].

One of NATO's greatest strengths is its ability to adapt to the changing security environment – something it has done again and again since its creation in 1949. In 2017, the Alliance continued to modernise and innovate to meet the challenges of a more complex security environment [4].

The aim of this document is to collect, review, analyse and put forward suggestions and proposals for the implementation of these strategic directives at the level of NATO's Nation Air Defence, and more specifically in the Acquisition and Life Cycle Logistic Technical Support of modern radars.

The observations of the author and other surveys on the subject have already pointed out:

- ✈ the logistic costs of legacy AD radars are high and increasing;
- ✈ new air defence threats are present and/or emerging that requires more investment;
- ✈ economic crisis is increasing, consequently spending is tightening.

The case study was carried out to survey the applicability of the Project Management concept [5] for merged and/or separated Radars Acquisition and Technical Support are could be required Hungary in house at NKE.

As an example, new methods to be studied and introduced with a Pilot Project to demonstrate the potential and reduced risk for military capability improvement, cost saving and accomplishment of the project on time.

Project objectives

- ✈ Find out advantages and disadvantages of the Project Management (PM) concept implementation for the newly managed Air Defence radars Acquisition and Logistic Technical Support.
- ✈ Solution required based on situation analyses. Where the biggest financial burdens are and the rationale behind them.
- ✈ Determine all key elements of the solution and propose a Pilot Project (PP) where the cost saving is significant.
- ✈ Demonstrate the PM concept applicability on the selected PP.

Project priorities

Subject	Constrains (Inflexible)	Optimize (Adaptable)	Accept (May Concede)
Cost/Resources			X
Risk		X	
Schedule		X	
Scope/Quality	X		

Table 1. Prioritizing project dimension of the study for 3×3 matrix most common, but due to complexity of the protect sometimes we use 4×3 or 5×4 (edited by the author on the basis of [6])

High level scope and excepted deliverables

- Advantages and disadvantages of the Project Management concept.
- Problem analyses related to the cost of the surveillance radar procurement, military operational importance and logistic support and maintenance.
- Determine a cost-effective procurement and logistic technical support to fulfill newly emerged AD surveillance tasks, namely:
  - new types of Stealth-Passive + Active (Plasma/Opto);
  - new capabilities of Unmanned Aerial Vehicles (UAV) – weapon systems on board;
  - new tactical ballistic missile capabilities (<1000 km);
  - advance electronic countermeasure (ECM);
  - Non-Cooperative Target Recognition (NCTR) requirements;
  - increase of Interference Resistance – jammed from Low Orbit satellites (80–500 km);
  - Cyber-attacks against radar system computers.
- technical solutions and their cost analyses for AD surveillance radar needs;
- risk analysis of the most promising technical solutions;
- suggestions for the procurement and for the life support method changes;
- recommendation for the Pilot Project, which shall be the most cost-effective technical solution.

Parameters of the Study preparation:

- schedule: The Study to be determined
- allocated Time:
  - management 200 hrs;
  - engineering 1200 hrs;
  - administrator 600 hrs;
  - instruments 10000 EUR;
- budget: 100,000 EUR (ROM);
- other: to be determined.

Assume that the Scope, Time has been determined and the Budget has been allocated.

Stakeholders (included Project Manager and staff) [5]

Assumptions:

- The Project sponsors opinion is that the currently in place Minimum Military Requirement approaches for acquisition and life logistic support are not the most cost-effective methods from a full life cycle investment point of view, but is there any better method to be implemented?
- If yes, the new method should balance the key STAKEHOLDERS INTEREST, which are:
  - in short term → maximize the income: get all available resources now;
  - in medium term → manage, reduce and/or illuminate risk factors;
  - in long term → be moderate and stay in the business.

The Project Management will be organised as in Table 2.

Sponsors	*Nations*
Project	Development of new Acquisition and Logistic Technical Support method with cost effective Pilot Project
Customers	Accepts final delivery at end of Phase 1, 2 and 3
Technical	Approves specification: for the required Studies and SOW[1] for the Prototype and for the logistic support concept [7]
Economical	Pays bills: 50,000 EUR for Phase 1; TBD[2] m EUR for Phase 2; TBD m EUR for Phase 3;
User	Represents military users need: SOW, FAT[3], SAT[4]
Project Manager	Facilitator and ultimate decision maker: XYZ
Project Team Member	Accountable for deliverables / Org chart / Team Size / Training / Background
Functional Manager	Based on newly reorganized organization structure. Provides resources

Table 4. Project Managements structure (edited by the author)

Business case

Execution plans will be developed according to the work breakdown structure (WBS) for:

- Quality Control Processes;
- Communication guidelines;
- Work standards (meetings, working times and places, hiring plan, etc.);
- Progress monitoring;
- Risk management frameworks;
- Procurement frameworks.

See WBS and Gantt charts in the enclosure [8].

[1] Scope of Work
[2] To Be Defined
[3] Factory Acceptance Test
[4] Site Acceptance Test

Study's findings and recommendations

I. Advantages and disadvantages of the Project Management concept

The Radar project Management triangle is shown in fig 1.

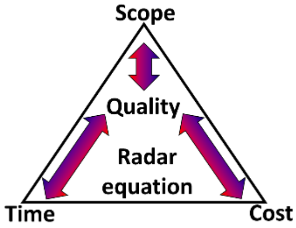

Figure 1. Radar project Management triangle (edited by the author on the basis of [9])

It depicts the main relations of the PM concept legs. What are the advantages?

- The activities shall be well structured, which:
  - could give overview of the task and responsibilities;
  - could give tools for precise monitoring of cash flow: Implementation of Earned Value Management (EVM);
- easier to point out problematic areas in scope/quality, finance and time than in the case of currently implemented methods;
- could be proper and efficient contra measures implemented on the emerging shortcomings;
- reaction time for emerging risks could be shortened;
- the quality of the final project deliverables could be increased.

What are the disadvantages?

- Its implementation costly.
- Not applicable for regularly managed activities, like services.
- If it is over managed the efficiency will suffer because the workload time cycle of the employees is extended.

The bureaucracy overhead of the project is increasing and requires additional resources [10].

The Study development Council suggested structural reorganization could save expenses in the future, but the problems regarding how "to procure and operate more equipment together" will stay open, because:

- the savings received by structural reorganization are not significant for the new equipment procurement and logistic support, due to delayed delivery and quality issues and nations could lose services and support;
- this generates risk for military operations;
- compensation for unforeseen risks requires urgent additional resources in a timely manner;
- the uncertainties regarding on new AD surveillance radar equipment's are still open.

Short look required for the problem analyses in relation to the surveillance radar procurement, military operational importance and logistic support and maintenance.

II. Problem analyses related to the cost of the surveillance radar procurement, military operational Importance and logistic support and maintenance

Comparison result of the cost of military operational importance and logistic support and maintenance shown on figure 2.

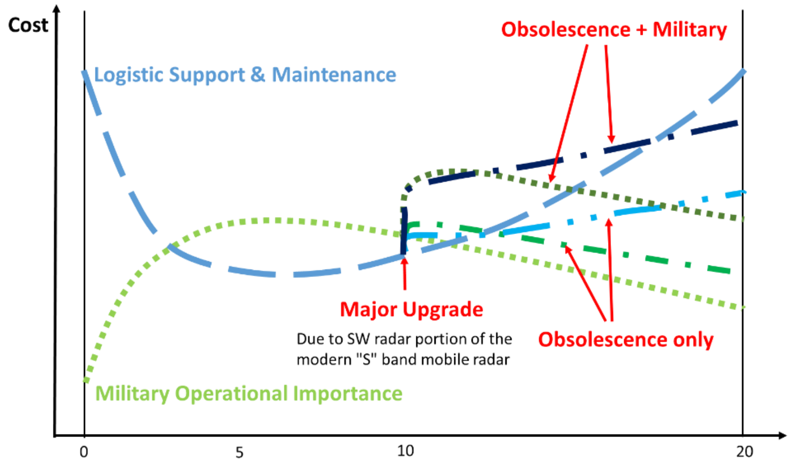

Figure 2. Cost of military operational importance and logistic support and maintenance (edited by the author)

The lifetime of the military technology is limited, has start and end points and consequently, could be handled as a project.

Close to the end of military equipment lifetime, a general upgrade or modernization of the systems are required, otherwise there is little sense, from an operational point of view, to maintain it.

Comparisons of the surveillance radar procurement cost and logistic support and maintenance cost.

Assume for simplicity that the radar acquisition time is 10 years and its service life is 20 years. The acquisition cost is X ±50%, determined by military requirements that could be minimum or maximum. It seems that we could save money if we procure radars with minimum military requirement (MMR). However, the radar and any other military equipment costs are determined by original radar manufacturers (ORM) at the project starting point and not by the customer. It could be adjusted slightly at the end of the acquisition phase. More than that, the full support for equipment life time are calculated and fixed at this point too. Surveys shows that usually it is the $X_{average}$ price, real price calculated by company and not modified for "business advertisement" point of view. Usually the full support cost of the equipment is $X_{average}$ acquisition cost multiplied by 3, to get 20 years' service life cost "Y". The margin is about Y ±20% and depends on the applied services quality. Certainly, during radar life time, the ORM wants to maximize its profit. This is manageable within the current support mechanism and frequently because the ORM has a monopoly on the logistic and technical services.

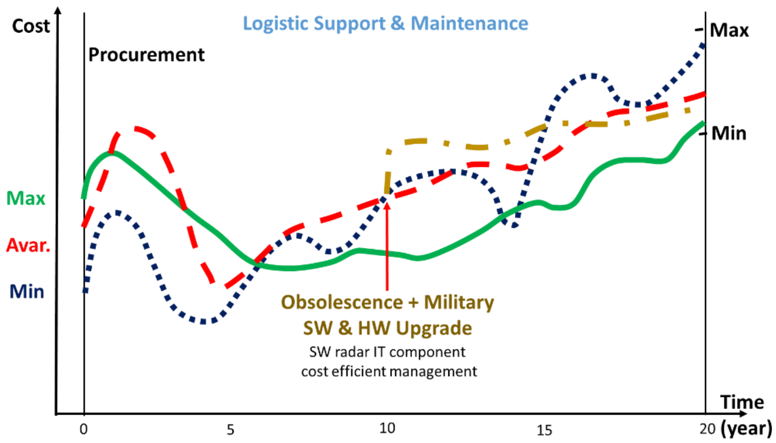

Figure 3. Procurement cost and end of life cycle cost relation (edited by the author)

Figure 3 depicts the fact that the end life cycle cost of the radar depends of the procurement cost in inverse matter. What are the reasons? First of all, radar projects with maximum required performances undergo a deeper analysis for possible:

- technical solutions;
- logistic support;
- all kind of risk;
- intensive advance and emerging techniques/technologies implementation;
- military sales marketing (could stay longer in the market with advance military operational capabilities);
- profit etc.

and need to keep experts in the project with higher professional skills than usual "low cost" projects are required.

Subject	Constrains (Inflexible)	Optimize (Adaptable)	Accept (May Concede)
Cost / Resources		*Y*	
Risk		*Y*	
Schedule		*Y*	
Scope / Quality	*Y*		

Table 3. Prioritizing new Project Dimension (edited by the author)

III. Technical solutions are available to solve air defence surveillance radar needs

What kind of technical solutions are available to solve air defence surveillance radar needs?

- Radars based on current advanced S band mobile radar technology e.g. digital beam forming
  - advantages: proven technology with low risk;
  - Disadvantages: could not fulfill required detection capacities (stealth) & they are very vulnerable targets, high risk for life cycle logistic support due to implemented newest IT SW modules;
- Multi-Purpose Multi-Function Radars (MPMFR) technology
  - advantages: proven technology for ships and airplanes with medium risk;
  - disadvantages: could not fulfill required detection & time allocation capacities (stealth) & they are extremely vulnerable targets, high risk for life cycle logistic support due to implemented newest IT SW modules.
- VHF radar technology
  - Advantages: proven technology with low risk;
  - Disadvantages: size, measurement accuracy;
- Twin (Gaussian monostatic) RF Network Centric radar technology
  - Advantages: very modern technology with medium risk;
  - Disadvantages: Need Prototype Phase with further research and strong SW support;
- Emerging technologies: Passive/Infra/Optical, etc. sensors with modern RF Networking
  - Advantages: combined RF and SW technology with low risk;
  - Disadvantages: could not fulfill required life cycle support.

Phased array radar has become the radar of choice whether for land or airborne applications: its lack of moving parts means higher performance and improved reliability. However phased array radar requires large amounts of compute power. Phased array processors have historically been built using only traditional CPU computing architectures, in which the increase in available performance over time largely follows Moore's Law [31].

Modular, Scalable

Users are increasingly demanding interoperable solutions, based on industry standards that can be deployed across different platforms and in different systems – and that are modular and scalable. The companies have a long-term roadmap for embedded computing so minimizing the potential for costly and disruptive obsolescence.

Make or Buy?

Today, the flexibility, interoperability and performance of software deliver significant advantages in terms of lower cost, lower risk, faster time to market and easier long-term support. In-house development is becoming harder to justify. Working with an experienced provider, however, is crucial. Leveraging extensive experience and hardware solutions allows you to focus on algorithm development, integration and implementation the sources of your competitive advantage.

IV. Cost analyses of the most promising technical solutions

Calculations on the required engineering hours, equipment, services, IT and consumables, travel etc. of different technical solutions and logistic support statistics, see fig. 3 depict the fact that the Procurement cost and End of life cycle cost together, $Y_{average}$, which is assumed for:

- Solution 1, It could be taken as a baseline for our calculations with the note that there are problems with stealth target detection and new Electronic Protection Measures (EPM) technology for which the solution could be extremely risky & consequently costly;
- Solution 2, due to its highest complexity, the MPMFR investment is 5 times the $Y_{average}$ and the risk on stealth target and new EPM technology has not changed, because the applied frequency band shared with solution 1;
- Solution 3, for the VHF based solution, cost is $Y_{average}/5$, but not all high-level requirement priorities are fulfilled (See table 2 for details.);
- Solution 4, The Twin RF Network radar technology compensates technical disadvantages of the VHF radar technology with significant military operational improvements but requires prototyping that contains 2 radar plus Signal Fusion Post (SFP). Rough Order of Magnitude (ROM) prices of the Twin, Gaussian-monostatic RF Network radar realization is $2 \times Y_{average}$, plus cost of the SFP, which is about $2 \times Y_{average}$. This investment is significantly less than could be offered by any other solutions.

In case of solutions based on emerging technology, the required capital strongly depends on how far the military operational requirements such as adaptation of the new EPM technologies differ from the civilian needs. However, these technologies are indispensable for the success of all other solutions as core parts of the projects.

Consequently, the Twin, Gaussian-monostatic radar technology gives the most cost-effective solution.

Suggested main milestones, deadlines and dependencies

Terminology		Military IT project
Concept	Init	Emergence of requirements
Define	Planning	Kick-off; Formal specifications
Execute/Phase-a.	Execute / Phase-a.	HW & SW procurement/ developments
Execute/Phase-b.	Execute /Phase-b.	HW & SW testing / adjustments
Finish	Close	Acceptance & delivery (SAT; PSA)

Table 4: Project Phases for prototyping and production (edited by the author)

Terminology		Type of the Logistic Concept		
		Traditional	CLS[5]	Mixture
Concept	Init	Services (GOV.) SPC[6] (GOV.) PDS[7] (GOV.)	Services (ORM[8]) SPC (GOV.) PDS (ORM)	Services (ORM) SPC (GOV.) PDS (ORM/GOV.)
Define	Planning	Resource planning, Schedule, Design,	Kick-off; Formal specification; SPC planning & preparation	Kick-off; Formal specification; *Demarcation Interfaces of Responsibilities*; SPC planning & preparation
Execute	Execute	Building, SPC/PDS execution	Building, SPC/PDS execution	Building, SPC/PDS execution
Finish	Close	Payments, Acceptance & key Delivery	Payments, Acceptance & Delivery	Payments, Acceptance & Delivery

Table 5. Project Phases for 20 years life time support (edited by the author)

Radar system development and life support subtasks are:

- feasibility study;
- analyses;
- design;
- development;
- implementation;
- infrastructure;
- project management.

Table 6 contains a few radar technical characteristics of those radar manufacturers, which could be capable for deliver Gaussian-monostatic (twin) radars

[5] Contractor Logistic Support
[6] System Performance Check
[7] Post Design Service
[8] Original Radar Manufacturer

Company	Name	Band	Range	Elevation coverage	IFF/ SSR	Cost
HENSOLDT Sensors	TRML-3D/32	C	200 km	20 km	Mode 5, Mode S	~ 12,5M EUR*
Israel Aerospace Industries Ltd.	ELM-2311 C-MMR (Compact Multi Mission Radar)	C	In Air Defence mission: 250 km	up to 50 °		-
Israel Aerospace Industries Ltd.	ELM-2084 MMR (Multi Mission Radar)	S	490 km	30 km		~ 14,25–18,67M EUR*[11][12]
Israel Aerospace Industries Ltd.	ELM-2288 MR (Medium Range)	S	300 km		Integrated antenna	-
Thales Raytheon Systems	Ground Master 400	S	470 km	up to 40° 30 km	MSSR 2000 Mode 4, Mode S	~ 16M EUR* [13]
CETC International	YLC-2V	S	500 km	25 km	Integrated antenna	-
CETC International	YLC-18 (High Mobility Medium Range Low Altitude 3D Radar)	S	250 km	12 km	-	-
Iskra	80K6M	S	400 km	up to 50°	-	-
BAE Systems	Commander SL	S	470 km	30 km	Mode 4, Mode S	-
Saab	GIRAFFE 4A	S	280 km	up to 70°	Mode 5, Mode S	-
Saab	GIRAFFE 8A	S	470 km	up to 65°	Mode 5, Mode S	-
Leonardo S.p.A.	RAT-31 DL/M	L	400 km	30 km	Mode 4, Mode S	~25M EUR* [14]
Lockheed Martin	AN/TPS-77	L	470 km	30 km	Mode 4, Mode S	-
Indra	Lanza 3D Family	L		30 km	Mode 4, Mode S	-
	Lanza MRR (Medium Range Radar)		333 km			-
	Lanza LRT (Long Range Tactical Radar)					-
	LTR-20		389 km			
	LTR-25		444 km			~ 11M EUR * [15]
LiTak-Tak	AMBER-1800	VHF	400 km	2D	-	-
Ukrspecexport	P18/2000	VHF	250 km	2D	-	-

Table 6. Possible radars for twin, Gaussian-monostatic RF Network (edited by the author) Note:* based on internet

Figure 4. TRML-3D/32 radar [16]

Figure 5. ELM-2084 MMR radar [17]

Figure 6. ELM-2311 C-MMR radar [18]

Figure 7. ELM-2288 MR radar [19]

Figure 8. YLC-2V radar [20]

Figure 9. YLC-18 radar [20]

Figure10. Ground Master 403 radar [21]

Figure 11. 80K6M radar [22]

Figure 12. Commander SL radar [23]

Figure 13. RAT 31DL/M radar [24]

Figure 14. GIRAFFE 4A radar [25]

Figure 15. GIRAFFE 8A radar [26]

Figure 16. AN/TPS-77 radar [27]

Figure 17. Lanza LTR-25 radar [28]

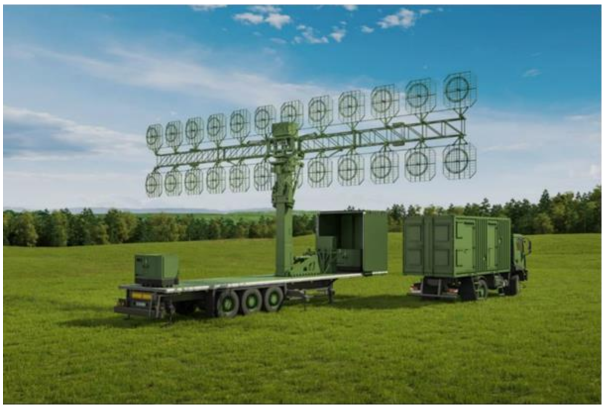

Figure 18. AMBER-1800 radar [29]

Figure 19. P18/2000 radar [30]

We could conclude that: When purchasing radars, the price is determined by the method. Furthermore, by compatible bidding, prices are 10–20% cheaper, but longer in time. By single source the prices are higher, but the time is short.

Known issues and risks for development of the life cycle support concept

Impact Risk	Low	Medium	High
Low	Feasibility Study	Development	Infrastructure
Medium	Analyses SOW	Design, Implementation	Cost overrun
High	High	Prototyping	PM; Logistic support, SW support for life cycle

Table 7: Risk in case of current method [6]

CONCLUSION IS THAT Radar system development & Life support IS VERY RISKY. New Recommendations are required.

Recommendation for the procurement and for the life cycle support concept method must be applied

The procurement method must be changed from the Minimum Military Requirement (MMR) to the Maximum Feasible Military Requirement (MFMR) concept. The risk reduction, see table 7, requires this change. Furthermore, to avoid "unrealistic" companies' suggestions, the currently in place BIT evaluation metrology shall be changed also. As experts with Nobel price suggested the minimum and maximum prices shall be excluded from the BIT by modern evaluation selection methods. To keep concurrency for the procurement and be in the safe side of the services life cycle we suggest that, the Prototyping and the servicing should be organised with newly applied principles:

- Acquisition Phase: Depending on the quantity of the required systems: if the required systems are 3 or less, 1 prototype shall be produced and tested. The required systems shall be produced and delivered with the same company. If the required systems are 4 or more, 2 prototypes shall be produced with different companies and tested. If one of the prototypes is delayed more than 6 months, all required systems will be procured from the company which delivered the prototype on time. If both companies deliver the prototype in time with very similar level of quality, the prototype with the lower predicted life time cost shall be selected as the main supplier source. This company has a right to deliver 2/3rd of the required systems while the second company responsible for the 1/3rd of the required system delivery and logistic support only.
- Logistic support phase: The procured services should be under continuous review and comparison at the systems and sub-system level. The prototypes and the final systems HW and SW must be built on modular bases where the sub-systems related LRUs are replaceable among sub-systems and are delivered by another company.

Impact Risk	Low	Medium	High
Low	Feasibility Study Analyses	Implementation Cost overrun	Infrastructure
Medium	SOW	Design, Prototyping	PM
High	Development		Concept acceptance

Table 8. Risk in case of implemented proposed methods [6]

The conclusion is that Radar system development & Life support with the implemented newly proposed methods carry a lower risk and are much cheaper than the current methods. The most problematic activity is the Concept Acceptance, but the advantages of the newly proposed methods are evident, and the investment efficiency shall be improved with the highest priority.

Certainly, all Stakeholders shall recheck, using their databases, the findings of this study and tune its criteria conclusions if required.

Bad Program Management could easily destroy the positive indications of the initiatives. However, the program management and the team selection could be extended with specialized required knowledge areas, new management training activities could be implemented, and frequent progress reviews have to be implemented for the duration of the project. The Design and Prototyping have a medium size risk that requires close project follow on activities from the Project teams and Management.

Selection of the Pilot Project as Recommendation

The "S" band mobile radar has RF and SW module interfaces for twin, Gaussian-monostatic radar operation. The Twin, Gaussian-monostatic radar technology fulfills all military operational requirements, feasible from an engineering/technical point of view. It is the most cost-effective solution with the low cost. Preliminary calculation for the expected deliverables time for Prototype and Production is in Table 9. for those nations who want to keep up momentum and motivation.

Prototype Requirements	Time	Production Requirements	Production Time (after prototyping)
Kick-off; Formal specifications	1 year	Kick-off; SOW adjustment	0.5 year
HW & SW procurement/developments	3 year	HW & SW reproduction	3 year
HW & SW testing/adjustments	2 year	Testing, Installation	1 year
Test Analyses, Final Report	0.5 year	Training; SAT	1 year

Table 9. Expected Deliverables for Twin, Gaussian-monostatic radar (1+1 Prototype system; 10+5 production) (edited by the author)

The prototype can be manufactured in 3 years and needs 2.5 years to carry out tests and evaluate the results in detail.

CONCLUSIONS

Radar systems are where the cutting-edge technology of tomorrow meets the realities of today. We need understands that the best drawing board solutions will never see deployment if they do not meet both performance and acquisition requirements. Leading edge technologies coupled with extensive experience bring the products and expertise you need for advanced radar solutions. Tools that enable you to develop fast, supported by programs that give your deployment extended longevity.

The newly proposed procurement and logistical support system based on Project Management principles is worth attention as it is more cost-effective and less risk-free than currently used solutions. It is therefore worthwhile to make further efforts to prepare for the launch of the sample project.

The main findings of the study are as follows:

- ✈ the Project Management concept is applicable, but its shortcomings shall be compensated;
- ✈ there is certain Stakeholder interest that requires precise balancing;

- ✈ cost analyses of the surveillance radar procurement, military operational importance/logistic support and maintenance for emerging military operational needs. Identify investment burden areas where modernization required and possible;
- ✈ implementations of newly required military capabilities with currently in place methods are not only very expensive and delayed but are a high risk;

The twin, Gaussian-monostatic radar system is a perspective and cost-effective alternative to any other radar offered solution, so the detailed feasibility studies should be started as soon as possible especially because the advanced planning of life time software support is the most critical issues of any newly implemented radar projects shall be characterised in advance.

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TANULMÁNY AZ „S" SÁVÚ MOBIL RADAR BESZERZÉSI ÉS ÉLETTARTAM TÁMOGATÁS MEGVALÓSÍTHATÓSÁGÁRA

A projekt menedzselés hatékonysága a radar beszerzés kulcsfontosságú mércéje. A cikk az „S" sávú mobil radar technológia menedzselésével kapcsolatos kérdéskört vizsgálja és mutatja be radar teljes életciklusán át. Ezek elsősorban a követelmények és kockázatok felmérése, a lehetséges problémák számbavétele, majd az aktuális események szerinti értékelése és a célkitűzések elérésének valószínűségének vizsgálata.

Kulcsszavak: *projekt menedzsment, kockázat elemzés, „S" sávú mobil radar, iker Gauszi.monosztatikus radar*

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