ZRÍNYI MIKLÓS NATIONAL DEFENCE UNIVERSITY
PHD COUNCIL

COLONEL ENGINEER LASZLÓ MIKULA

Quality risk management for the military configurations of the Hungarian Forces in acquisition life cycle

executive summary and critique of doctoral (Phd) dissertation

-2004-

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Science theme leader
Prof. Dr. ret. eng. col. Károly Turcsányi

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I. SUMMARY, OBJECTS AND METHODES OF MY RESEARCH' FIELD

As Hungary is a member of NATO and will join the EU, we are obliged to meet the requirements set by these organizations. We have to join these higher security cultures using our national and historical values based on our traditions and experiences. We have to pay attention to the prevent critical situations, increase effectiveness of security and to fine methods to decrease danger, prevent damages and risk (management).

NATO has worked out multilateral requirements for the military configuration in acquisition life cycle, of which the most important are the applicability and reliability. The main goals of the above requirements are to manage the quality risk of military configuration in acquisition life cycle to give suitable products for users in serving.

Quality Assurance Authority has not worked out any risk management method for Hungarian Forces for the military configuration in acquisition life cycle until now. For this reason we could not conform to multilateral requirements with respect to NATO relationships. Thus, the risk management of military configuration in acquisition life cycle is not only a need of NATO but of the Hungarian Forces as well.

According to these circumstances I have determined my research' goals:

- research, analysis and summary of definitions of quality risk for military configurations in acquisition life cycle. Analysis and study of responsibility of Quality Assurance Representative (QAR) in acquisition life cycle;
- analysis of risk management practices and their applicability of USA and NATO in acquisition life cycle for the Hungarian Forces;
- adaptation of risk management theories and practises by USA;
- working out of quality risk management model of military configuration for the Hungarian Forces in acquisition life cycle;
- demonstration of my quality risk management model.

Applied methods to achieve my research' goals in my doctoral dissertation:

1. analysis, assessment and summary of military and civilian documents made by NATO and EU organisations;
2. analysis, assessment and summary of Hungarian military and civilian documents and procedures;

3. analysis and exploration all aspects of quality risk management elements of military configurations for the Hungarian Forces in acquisition life cycle and analysis of their applicability;
4. adaptation and working out documents of military and civilian quality assurance organisations like NATO AC/250 CPG – NATO Committee of CNAD Partnership Group for National Quality Assurance Directors (I was a national representative up to July 2003) – and EOQ MNB – European Organisation for Quality Hungarian National Board etc.;
5. demonstration of my quality risk management model in practice.

Circumstances during the working out period of my doctoral dissertation

NATO members pay attention to the quality of the military configuration in the acquisition life cycle, getting the „conformity" of the product. Based on this requirement, NATO organised a special quality assurance kadre group named AC/250CPG in 1960, which has been continuing its activity under its new name AC/327 since July 2003. The NATO quality assurance committees provide directives and instructions for the Quality Assurance Organisations of the members and the participants of PfP (Partnership for Peace) having interoperabilitation among them for military configurations in relation to the acquisition. NATO quality assurance documents provide wide knowledge based on scientific principles and practises of the quality assurance for military configurations in the acquisition life cycle getting the „conformity" of the product. NATO worked out several documents regarding the principles of the quality risk management. However, all members of NATO have a separate national regulation for the acquisitions, which are influenced by different historical, social and engineering characteristics. All members of NATO have started to work out their own practises on quality risk management field. Naturally, I could apply their results in our quality risk management activities, but I have to pay attention to the regulations for acquisitions and engineering circumstances of our country.

My doctoral dissertation has been chosen to provide method for quality risk management for QAR in acquisitions based on STANAG 4107 (Mutual Acceptance of Government Quality Assurance) delegations and to provide some tools the result of which help to assess the „conformity" of the military configuration for users in the acquisition life cycle.

II. THE PURPORT OF THE MESSAGE AND SUMMARY OF CONCLUSIONS

There are the four chapters in my doctoral dissertation.

In the first chapter I have summarised the definitions of the quality risk management for military configurations in the acquisition life cycle, which helped the understanding of them. I have analysed the acquisition practises of the military configurations in the EU, in NATO and in Hungary showing the difference of the quality assurance activities and the risk area. I put emphasis to analyse the user's circumstances paying special attention to the risk area of the quality risk management of the military configurations in the acquisitions. Taking into consideration these policies, I determined the definition of user's risk. I have analysed the legal responsibilities of the contracting parties for the military configurations in the acquisitions. Extending my analysis to the parties involved in risk management, I determined the definition of legal risk, based on the legal responsibilities of both parties. I researched and analysed those mathematical methods, which are applicable to calculate the quality risk in the acquisitions life cycle.

Conclusion

I have adapted the definitions for quality risk and military configurations based on the NATO documents. According to this, I determined the definitions and their contents connected with my doctoral dissertation to analyse, to research and to interpret quality risk for military configurations in the acquisitions supplementing the procedures with their management.

I have analysed the legal elements and other relevant elements of the acquisitions of military configurations from a quality risk management point of view. I researched the acquisition practises of the EU, of the USA, of NATO and of Hungary. I determined, based on my research, that the national and international acquisition policies and their legal and administrative practises are different. However, they have some standard characteristics. The centralised acquisition systems are the most effective, as the contractors are reliable and big quantity gives a minimum level of quality risk. Centralised systems make the work of QAR more simple and cost effective determining the „conformity" of the product.

NATO countries realise the acquisitions of the military configurations in projects, which includes the activities of a risk manager and QAR. I suggest managing the above activities in Hungary the same way.

I have researched the quality assurance activities in the acquisitions in NATO, in the USA and in Hungary to show the differences between the policies and the practices. The Hungarian Forces acquires military configurations from different countries, so QAR must know all regulations about it. Since the Hungarian Forces acquires the military configurations from NATO countries as well, the Hungarian QAR has to know STANAG 4107 regulation to manage the quality risk by delegations.

I have researched and I have analysed the risk definitions in different branches of sciences. I determined that the definitions of the risk have different meanings in the different branches of sciences. NATO has determined the quality risk definitions for military configurations in the acquisition life cycle. I applied these definitions in my doctoral dissertation because civilian documents have not dealt with the quality risk issue up to now.

I have worked out the content of

- *product (configuration) risk like: scientific risk, technological risk and engineering risk*
- *contractor risk like: supply risk, business and commercial risks and quality systems risk*
- *user risk like: machine risk, media risk and man risk.*

I have researched the risks of personal-responsibility of QAR and of the contractors in the acquisitions. I analysed the decision-responsibilities of the parties in the acquisitions based on the risk-acceptation and the risk-rejection. I proved „freedom" of risk in the acquisition life cycle, which is independent from whether the manager discovers it, or not. Showing the legal content of the risk assessment, I specified the content of the responsibilities as the consequences of the decisions.

I have researched and analysed those mathematical methods, which are applicable to calculate the quality risk in the acquisitions life cycle. Based on these results, I decided to apply checklist of the risks, based on the policy of PATTERN, giving a method to identify and control the quality risks in the acquisition life cycle. I classified the risk of the data on checklist by estimation and I calculated the arising risk index by using the principle of average under some special conditions. I introduced some mathematical methods calculating the data of the checklist. However, to do these calculations lots of numerous and well-known standard deviation set are needed.

I have paid attention to "risk during use". Moreover, I evaluated some circumstances of the purchased military configurations in services as well. So in this case I applied the model 5M and AQL set by users.

In the second chapter I have demonstrated the elements and processes of NATO risk management and the tasks of the process' participants. I stressed the importance of the policies and practises of the risk management in Government Quality Assurance (GQA). Among the members of NATO I selected USA's policies and practises of risk management, as it accumulated the most practises and results. I demonstrated the policies and methods and techniques of risk management of the USA. I pointed out the inadequacies in the risk management of the USA and I put forward a proposal to improve them.

Conclusion

NATO has determined the elements of the quality risks for military configurations in the acquisition life cycle and worked out the method of the their management.

I have researched the methods of the quality risk management of the members of NATO and I pointed out that NATO, as a central organisation for procuring, and the members of NATO applied the common principle of the quality risk management based on GQA procedures. However, none of them developed common practices about it. All members of NATO delegate the tasks, involving the military configuration risks by GQA, but they do not have united stand by the terminology of their contents. On the other side, the practices of the identification for contractor risk are not unambiguous.

I have analysed the practices of quality risk management in NATO. I pointed out that the procurements of the military configurations are realised through projects. In a project team there is a risk manager and a QAR who has different responsibilities.

I have analysed the elements of quality risks management in NATO and pointed out that it means to identify, analyse and control military configuration risk and contractor risks. NATO determined the elements of quality risk as military configuration risk and as contractor risk but it did not worked out their contents.

I have analysed the principles of quality risk management of GQA in NATO and I pointed out that the principles and practices of the defence quality assurance activities in Hungary do not meet the NATO requirements.

I have studied the regulations and procedures of procuring for military configurations in the USA and I pointed out that risk management for the military configurations in acquisition are carried out in projects like in NATO. The projects involve all life cycles of the military configurations. The risk management involves a risk expert in the project team who control all type of risk not only the quality risk. All experts of the risk management should have an appropriate knowledge needed for their job in all life cycles. All

data needed for the operation of the project are in the hand of the project team. So they can carry out their activities in the project, based on these data, in all life cycles like in reinforcements and modernisation and disposals etc.

I have researched quality risk management of the military configurations in the acquisition life cycle in the USA. I pointed out that quality risk management involves planning, assessing, handing and monitoring the risk. They put stress on the reduction of the risk identified by both parties i.e. the risk manager and the contractor. The activities to reduce the risk are of great importance for them, as for example only one contractor can deliver the military configuration or there is some national economic interests with respect to the contractor and more or less it can be a Government decision in favour of the contractor. In this case the tasks of the risk manager are not only to determine the non-conformity of the contractor from a risk point of view but he has to provide some instructions for the contractor reducing risk to the conformity level.

I have analysed the practises of quality risk management for military configurations in the acquisition life cycle in the USA. I pointed out that they have some mistakes in the identification of quality risks because their risk manager assesses priority and quantity of risk. However, the quality of his activities with regard to risk depends only on his professional knowledge. Moreover, they cannot have all evidences of risk, so they can make mistakes.

The skills of the USA on the field of quality risk management is at the highest level, so I adapted their principles into my model of quality risks management for military configurations in the acquisition life cycle.

In the third chapter I worked out the model of quality risk management in the acquisition life cycle based on the principle of risk management of the USA. I determined the basic requirements of the risk management and the goals to achieve.

I have worked out the content of

- product (configuration) risk like: scientific risk, technological risk and engineering risk;
- contractor risk like: supply risk, business and commercial risk and quality systems risk;
- user risk like: machine risk, media risk and man risk

I also worked out the method of the risk management in the Hungarian public procurement. I worked out checklists to identify, analyse, handle and monitor quality risk. Based on the data

of the risk checklist, I calculated those activities of QAR which will result in a military configuration confirm with the contract.

Conclusion

The military configuration itself is one of the quality risk elements in acquisition life cycle from a quality risk management point of view. In accordance with the NATO documents I have adapted the elements of the military configuration risk. I have worked out the content of military configuration risk as follows: scientific risk, technological risk, engineering risk and requirements to manage these risk in the Hungarian public procurement procedures. I pointed out that pure military configuration risk itself relates to scientific risk only. Technological risk and engineering risk are in overlap with contractor risk.

Analysing scientific risk I pointed out that usually we take over high risk, as QAR gets new scientific knowledge lately.

Analysing technological risk I pointed out that this kind of risk includes uncertainties connected with production of the military configuration (e.g. technical, engineering, resources, infrastructures, producing procedures and so on).

Analysing the engineering risk I pointed out that this type of risk is connected not only with configuration risk but also with the contractor risk and involves planning and producing risk as well.

Acquiring the military configuration the other important quality risk element is contractor risk from a quality risk management point of view. Adapting the elements of contractor risk from the NATO documents, I have worked out the content of contractor risk like: supply risk, business and commercial risk, quality systems risk and the requirements to manage them in the Hungarian public procurement procedures.

I have pointed out that the supply risks are of the most complex type, which has several elements of uncertainty. Control of the supplier by contractor is deficient as the quality control of raw materials and the semi-finished products is in general based only on samples. The contractor accepts these materials based on "certificate of conformities" by suppliers without any further control of the producing and quality system.

Determining the content of business risk I have researched the elements of the decision-making system of the contractors, which outline the management system of the contractor. I worked out the horizontal and the vertical elements of contractor's decisions, its elements. Moreover, I analysed the connections with each other in the decision-making processes for the quality risk management of the military configurations in production.

I have worked out the elements of commercial risk and its influence on the production of the military configurations.

Analysing the quality system of the contractor from a risk perspective, I have pointed out that the fact that it has a certificate regarding the quality system of the contractor does not mean that the contractor is capable to produce "conform" military configuration. The fact that the quality system is certified means that the contractor can produce the military configuration in a certain quality level. However, this quality level may be below the level required. The accredited certification bodies issue the quality system certificate to the contractor after its audit, if the result is good. However, the certificate does not testify that the quality system of the contractor was in conformity with the requirements by submitting the tender documentation. The quality system certificate of the contractor gives confidence for the QAR. However, he should not accept it without any further audit during the tender (requirement for pre-audit).

According to the NATO quality policies, the configuration risk and the contractor risk do not represent the same risk level as user risk. In spite of this fact I have considered the management of user risk of the military configurations in acquisitions as an important factor. Having analysed the service circumstances of the military configurations in the real security area, which gives some feedback with regard to the level of the control (AQL) of the production of the military configurations. So I would like to connect the users with the management of the quality risk for the military configurations in acquisitions. With regard to the above-mentioned principle I have worked out the elements of the users risk. I put the military configuration into that security environment where the change of the defence capabilities takes place by a default of this configuration. I determined those elements of the security environment which are somehow effected by the application and the disposal of the military configurations. I worked out the impact of the human on defence capabilities i.e. the risk arising from the qualification of soldiers using the military configuration.

I have worked out configuration risk and contractor risk management adapting the elements of the risk management of the USA (e.g. planning, assessment, handling and monitoring). I paid attention to the regulations and practises of Hungarian public procurement. Moreover, I also paid attention to the structure and capacities of the Hungarian military quality assurance organisation with respect to projects or to non-project methods.

I put up the risks management of users into the level of the risk management of the configuration and the contractor.

The method of the risk management for the configurations and the contractors are the identification, the analysis, the ranking and the control of the elements of the risk. These activities include objective and subjective elements as well. The meaning of objective elements is to collect as mach data as possible during the above-mentioned activities by QAR to measure, control repeatedly, monitor and seek back on it.

The elements of user risk are in the delegation documents prepared by user. Filling in the user checklist of risk is the first step to manage user risk. The second step is to calculate risk index of the user.

I have worked out the content of the quality assurance activities to manage configuration risk and contractor risk of the military configurations in acquisitions taking into consideration the regulations regarding to the Hungarian public procurement. I have pointed out that the planning phase of the quality risk management includes gathering data regarding user risk, configuration risk and contractor risk based on the requirements set by the user. Moreover, this phase includes the calculation of the demand for human resources of the risk management in the acquisition life cycle.

The assessment phase of the quality risk management includes the analysis and the identification of the contractor and partly of the configuration risk. I paid attention to the identification and the detection of the quality risks in my dissertation, as the subjectivity of the QAR influences the results of the content of the checklist.

I have researched the identification of quality risk to identify those methods of the present state of science which are applicable for risk assessment. I decided to apply the checklists (see annex), as it is easy to fill in them. Moreover, with the means of the checklist the QAR can meet the deadline of assessment even in the case of 6 bidders in acquisition. The structure of the checklists is based on the principle of PATTERN. Following the identification of the data of the checklists (collecting data of the check-lists) I determined the risk level of the data. I tried to gather as much objective data as possible to identify risk, which helped the data to be repeatable. I aggregated the data of identified risk into one index trough homogenisation of their weight and calculation of their average supposing the relevant circumstances unchanged by time. I determined the resultant of the indexes of the configuration, the contractor and the user checklists, which prescribes the activities of the QAR in acquisition.

I have worked out the content of the handling phase of the quality risk management by the QAR to achieve requirements set by the contract, based on the Quality Plan. I have deviated from the risk management model of the USA in that content that the USA risk

manager and the contractor are together to restore the required level of risk during the production of the configuration. As Hungarian Quality Assurance Organization is not large enough to realize the above principle, the contractor realizes these activities in Hungary.

I have worked out the content of the monitoring phase of the quality risk management, which systematizes the data of the quality risk. I pointed out that these data are applicable as input data of the same procurement activity or of the scientific research to analyse and model the risk.

In the fourth chapter I have demonstrated the applicability of my quality risk management model trough an example of procurement. I realized this activity by the procurement of the 9x19 mm RARABELLUM pistol ammunition in the MFS Hungarian Ammunition-factory JSC, in Sirok. My goal was to verify the applicability of my quality risk management model and to demonstrate how the qualification of the ammunition by the user risk influences it.

Conclusion

There was a tender call for the procurement of 9x19 mm RARABELLUM pistol ammunition by Hungarian MOD. The tender was of "negotiation" type, so only one contractor was invited named the MFS Hungarian Ammunition-factory JSC, who concluded a contract for 2x1,000,000 pieces of ammunition.

A have applied my model of quality risk management in this procurement and in the delivery of the contract. I documented the applicability of my model and the significance of the user's role in the determination of the quality data in acquisition, which characterises the requirements of the ammunition in service.

I worked out the checklists of the quality risk management for the ammunitions in acquisition. I determined the configuration and the contractor risk data of the checklist at the premises of MFS Hungarian Ammunition-factory JSC, since their quality audit records was not at our disposal.

There was only one contractor invited by the tender, so I realized the configuration-audit in the factory to point out the conformity of the bidder. I determined that the technical conditions were in conformity with the technical requirements.

The user (The Arms Service Directorate of The Hungarian Forces) has provided us with the planned conditions of the usage of the ammunitions and the data needed for the checklists and the AQL. I calculated the user risk index based on above data.

I have identified and analysed the scientific risk, technological risk, engineering risk as well as supply risk, business and commercial risk and quality systems risk. I pointed out that it is no need to gather additional data regarding the risk checklists.

I calculated the configuration and the contractor risk index within the handling of the quality risk. Based on the calculation, I pointed out that the most important element of contractor risk is the supplier.

I have calculated the quality risk index in the procurement of the ammunitions, which showed that the user risks are strongly influenced by the content of the control in the production by the QAR. At the end of the calculation I had the user risk index (3,31) and the aggregated risk index of the configuration and the contractor (1,69). So I could determine the quality risk index of the procurement (3,31) that requires the content of the activities by the QAR, as follows:

The QAR is going to control and analyse all quality records made by the contractor during the production of the ammunitions. The QAR is going to repeat 80% of the control and the analysis performed by the contractor that required by the technical documentation of the production of the ammunitions. The QAR is going to do the final control using the mathematical statistical model.

Regarding the above-mentioned task I have prepared "the Quality Plan" by ISO 10005, which includes the flowchart of my quality activities according to the contract.

The content of my quality activities in the production of the ammunitions was harder than in the technical documentation of it. The reason of this difference was that the technical documentation of the production of the ammunitions did not pay attention for the users risk.

III. SUMMARY OF THE SCIENTIFIC RESULTS, RECOMMENDATIONS

Following the NATO accession of the Hungarian Republic and on the eve of the EU accession – taking into consideration our obligation to harmonize the Hungarian legal system from an economic, legal, safety etc. point of view – it is important to know the risk of the real processes and as well as the risk in the procurement of the military configuration. We can certify the military configurations and providing the "conformity" of them using the instructions of these harmonised documents in the public procurement processes.

According to my goals:

- I have researched, analysed and summarised the definitions of quality risk of military configurations in the acquisition life cycle. I analysed and studied the responsibilities of the QAR in the acquisition life cycle. I summarised several methods to calculate risks;
- I have researched the characteristics of the EU and the NATO procurements;
- I have analysed the elements and the content of the quality risk applied by the USA and NATO in the acquisition life cycle;
- I have adapted the quality risk management model of the USA;
- I have worked out the quality risk management model of the military configuration for the Hungarian Forces in the acquisition life cycle;
- I have demonstrated and validated my quality risk management model.

According to my conclusions I established:

- The quality assurance practices of the military configurations for the Hungarian Forces in the acquisition are in unsynchronised with the requirements of NATO and do not include the principles and the techniques of the quality risks management;
- NATO requires to perform quality risk management activities by the Government Quality Assurance for military configurations in acquisitions;
- NATO has determined the principle of the quality risk for military configurations in acquisitions, but its content was not worked out. All NATO members started to work out the content and the practices of the quality risk elements based on their own society, its economic and the engineering traditions;
- USA has worked out the highest level of knowledgement for the risk management in acquisitions among the NATO members, but as Hungary has special economic, engineering and administration characters it should not be adapted without any corresponding modifications. My quality risk management model provides appropriate tool for the QAR to manage the configuration risk, the contractor risk and the user risk;
- I can use my quality risk management model to determine the quality assurance activity of the military configurations in the acquisition processes by procuring of the 9x19 PARABELLUM ammunitions. The risk check lists can be applied to identification, analyse, handle and monitor the quality risk based on the required

level of marketing, engineering, financial and quality system knowledge. The result of the calculation by risk check-lists requires specific quality activities to be performed by the QAR to have "the comform" military configuration under the procuring contract at the end of the acquisition life cycle;

- My scientific achievements give possibility to certify the military configurations of the Hungarian Forces in the procurement processes as a "comform" product. According to my quality risk management model, the QAR can select the best of the bidders in the acquisition of the military configurations. My quality risk management model can be used in both acquisitions as a project or as non-project processes giving a tool for the QAR that requires special quality risk management knowledge. My proposed quality risk management principles and methods can be used as a part of the quality disciplines in the Zrínyi Miklós National Defence University giving the appreciation of the Hungarian Military Quality Assurance by the quality society.

SCIENTIFIC RESULTS

Suggested scientific results:

1. Determination of the concept of quality and acquisition from a risk perspective. Determination of the legal responsibilities of the participants of the procurement based on the risk connected with the military configurations.
2. Working out the content and the terms of configuration risk (scientific risk, technological risk and engineering risk), as well as contractor risk (supply risk, business and commercial risk and quality systems risk) and user risk (machine risk, media risk and man risk). Determining the user's role in the quality risk management activities.
3. Working out the quality risk management model of the military configurations for the Hungarian Forces in the acquisition life cycle.
4. Certifying the applicability of my quality risk management model in the procurement of the ammunitions PARABELLUM.

RECOMMENDATIONS

Based on the facts declared in my PhD dissertation I recommend:

- doing acquisition of military configurations in projects;
- separating the tasks of the risk manager and the quality assurance representative in the projects and the procurements;
- building up and operating the Hungarian Quality Assurance Military Organisation synchronised with NATO requirements and separating from other organisations responsible by life cycles;
- Working out the educational materials of the quality risk management by acquisition for the military configurations by Zrínyi Miklós National Defence University.

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CIRRICULUM VITAE

(professional)

Birth: 12. 02. 1952.

Educations: Executive engineer for aircraft engine and airframe (KGYRMF, 1974)
Dipl.engineer aircraft for engine and airframe (ZMNE, 1983)
Educated expert for quality (PE BATALAS, 1991)
Educated expert for industrial-low protecting (ELTE, 1992)

Languages: Russian, Upper intermediate (1983)
English, intermediate level (2000)
English, STANAG 2332 (2003)

Rank: colonel (2001-)

Place of work: MOD Technology Agency

Duty:

1974-1976 aircraft technician for engine and airframe (Taszár fighter wing)
1976-1978 aircraft team chief for engine and airframe (Taszár fighter wing)
1983-1988 chief of aircraft engineers, Deputy commander for engineers (Taszár)
1988-1993 deputy head of department (HDF Acceptation Centre for military product)
1993-1996 head of department (HDF Economical Agency)
1996-2000 head of department (MOD Acquisition Agency)
2000- Quality Assurance Director (MOD Acquisition Agency)
2000-2001 Quality Assurance Director (MOD Defence Technical University)
2001 deputy Director General (MOD Technology Agency)

Relationship: Founder member of Hungarian Society for Quality (1993-)
Member of EOQ MNB (2000-)
Member of Hungarian Engineer Chamber (2000-)
National representative of NATO AC/250 CPG (1997-2003)
Member of Hungarian Quality Award Committee (2003-)