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Methodology Development to Assess the Contractor Risk Tolerance from the Rocket and Space Technology Life Cycle Stage

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Abstract: ***The article proposes a universal technique, which consists in applying an assessment of the level of risk tolerance of the contractor of the State Defense Order, taking into account the stage of the life cycle of rocket and space technology; the relationship between the levels of risk tolerance of the enterprises of the rocket and space industry from the stage of the life cycle of the production process is revealed. Consideration of this pattern will allow to take preventive measures in advance. The result obtained is universal both for management, for marketing, and for the military economy and the economy of business entities as a whole.***

Specifically, at the stages of development and the birth of the production process, the level of risk is high, and the risk tolerance of the RCT enterprise is low; at the stage of development of production, when tactical and technical requirements (TTT) are achieved, risk tolerance increases; at the maturity stage of the production process, risk tolerance reaches a maximum level. Then, the hypothesis of the study is that when implementing the State Defense Order, it is necessary to introduce a plan for the continuity of control of production processes, where the SWOT analysis and risk tolerance assessment should become tools for monitoring the implementation of R&D, which will act as a tool for assessing guarantees of fulfillment and leveling the risks of not fulfilling R&D. Taking into account the revealed relationship between the levels of risk tolerance of executing enterprises and the stage of the R&D life cycle will make it possible to take preventive measures in advance during the implementation of the State Defense Order.

Keywords: Risks, stage, life cycle, rocket and space technology.

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I. INTRODUCTION

One of the most pressing strategic tasks in the Russian economy at present is to increase its economic security. When carrying out experimental design work on the development of rocket and space technology, taking into account the production or purchase of an electronic component base (hereinafter referred to as ECB), various risks arise. As practice shows, systematic disruptions in experimental design work (hereinafter referred to as OCD) began to occur due to interruptions in the supply of electronic components by domestic and foreign manufacturers. Currently, under the conditions of the sanctions policy, the level of public defense uncertainty, competition and instability are increasing, the diversity of risks is increasing, and an extremely negative environment for the functioning of the enterprises of the military-industrial complex is being formed. Due to the ban on the export to Russia of electronic component base (ECB) elements and previous failures in the Russian economy in the 1990-2000s, the level of domestic technologies in the field of electronic components does not allow the creation of full-fledged radiation-resistant electronics and some other elements at Russian enterprises. In this regard, the processes of production and supply are associated with uncertainty and risks of the internal and external environment.

The economic security of the enterprises of the military-industrial complex depends on the influence of risks and the results of their consequences. The category “risk”, the uncertainty of its consequences complicates the alternative of choice in the conditions of uncertainty of public defense and competition.

In this regard, in the work on the basis of a review analysis, a theoretical review of existing definitions in this direction is carried out, the conclusion is justified that in scientific information sources an unambiguous point of view, chosen by most scientists in terms of definitions of concepts, is risk tolerance. A corresponding analysis of the literature on this issue shows that world leaders of foreign and domestic production, for example, such as Toyota, Rosneft and others [2,3], in order to increase the likelihood of a successful completion of the production process, use proactive risk-based management in their practice approach.

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The essence of this approach includes the use of the PDCA Deming cycle (Plan-Do-Check-Act), which is a cyclically repeating decision-making process used in quality management.

II. MATERIALS AND METHODS

The risk tolerance enterprise of the military-industrial complex is an opportunity to manage internal risks and adapt to external ones, regarding the risk of competition is closely connected with its financial stability and competitiveness. In this case, it is management risks that become the initial ones.

Financial stability and competitiveness depend on the correspondence of equity and borrowed capital, liquidity of resources, organization of activity, the level of technologies used and the performance of the latest rocket and space technology, the ability to manage internal and external risks. Hence the problem of determining the content and form of expression of this concept has not been studied enough - only in a relatively small number of scientific papers do scientists pay attention to this. This problem is relevant and has not yet received a sufficiently complete and systemic reflection in the scientific literature, which has led to an increase in demand for its solution.

Therefore, the idea of the study is to improve the activities of organizations of the military-industrial complex by introducing organizational and economic mechanisms to ensure their effective functioning and development through. By assessing the risk tolerance of executing enterprises during the implementation of the state defense order to financial and production risks, it will be possible to determine the level of resistance of performers to production and financial risks. A universal approach to assessing risk tolerance, taking into account the stages of the life cycle of experimental design work (hereinafter referred to as R&D), will make it possible to assess the threshold values of the economic security of enterprises of the military-industrial complex in the course of fulfilling the state defense order when achieving tactical and technical requirements taking into account technical and economic requirements.

A universal approach is proposed, consisting in the application of assessing the level of financial and economic risk tolerance, taking into account the stage of the life cycle of the production process and the level of production and technological risk tolerance; to identify the relationship between the levels of risk tolerance of subjects from the stage of the life cycle of the production process. Consideration of this pattern will allow to take preventive measures in advance. The result obtained is universal both for management, for marketing, and for the economy of business entities as a whole.

The prospects of this study are the development of a comprehensive methodological support for assessing the risk tolerance of enterprises of performers, which allows assessing the level of risk tolerance during the development work while achieving tactical and technical requirements taking into account technical and economic requirements (TET) taking into account the evaluation criteria and threshold values of these indicators.

The authors propose a new approach to managing the progress of R&D, the essence of which is: when determining the specified levels of risk tolerance, the executing company will have the opportunity to identify deviations and determine risks and the results of their consequences that have influenced the actual change in the state of risk tolerance, as well as to monitor the interdependence of the dynamics of risk tolerance of enterprises performers from the dynamics of the life cycle of OCD for a particular analyzed period.

III. RESULT AND DISCUSSION

The heads of enterprises of the military-industrial complex in the face of uncertainty of the state defense requirements of the consequences of risks should be able to choose from a set of alternative options, evaluating them from the standpoint of economic feasibility, the necessary and acceptable levels of risk tolerance. A quantitative assessment of the level of risk tolerance in decision-making should become an indispensable means of carrying out production activities when achieving tactical and technical requirements and technical and economic requirements in the course of experimental design work (hereinafter R&D).

The quantitative value of the economic risk assessment, supplemented by qualitative assessments, in turn allows us to give an integrated assessment of the consequences of the implementation of a specific management decision. Then the hypothesis of the study is that when implementing the State Defense Order, it is necessary to introduce a plan for the continuity of control of production processes, where SWOT analysis and risk tolerance assessment should become tools for monitoring the implementation of R&D, which will act as a tool for assessing guarantees of fulfillment and leveling the risks of not fulfilling R&D. Taking into account the revealed relationship between the levels of risk tolerance of performers from the stage of the life cycle of the production process will allow to take preventive measures in advance in the course of R&D.

The result obtained is universal both for management, for marketing, and for the military economy of economic entities as a whole. Assessing the threshold values of the economic security of the enterprises of the military-industrial complex by developing organizational and methodological aspects during the implementation of the state defense order will make it possible to monitor the level of stability (risk tolerance) of the RCT enterprise to the realized, realized and forecasted production and financial risks in the form of production and financial risk tolerance. Assessing the level of risk tolerance of the RCT enterprise in conjunction with the stages of the life cycle of the state defense order implementation process will help to reduce the uncertainty of public defense orders, narrow its scope and on this basis will allow timely preventive measures to be taken in a system of multivariate choice of these decisions. The degree of relevance to the assessment of the current situation and the development of effective methods of managing economic activity in the face of uncertainty of public defense and competition has now increased dramatically.

In this regard, the need to resolve the problem of creating a methodological apparatus for assessing threshold values of the economic security of RCT enterprises in the course of their fulfillment of the State Defense Order is obvious. It is necessary to justify in the TTZ on evaluating the content of the contractor's enterprise through a risk-based approach, which does not contradict ISO 22000-2018. To start the Deming cycle, an enterprise must perform a SWEOT analysis, on the basis of which to develop policies, goals and objectives in the field of process quality, as well as formulate numerical indicators monitoring the achievement of goals; then evaluate these indicators, adjusting actions if necessary. Organizational and methodological aspects of assessing the threshold values of the economic security of enterprises of the military-industrial complex during the implementation of the state defense order will prevent (or reduce) the risks of non-performance of R&D.

Monitoring the risk tolerance of executing enterprises when achieving tactical, technical and technical and economic requirements is an urgent and promising direction, the implementation of which necessitates the development of a methodology for assessing the risk tolerance of executing enterprises in the course of development work to achieve tactical and technical requirements.

Testing the author's approach to assessing the level of risk and risk tolerance. The enterprise of RCP at the stages of the life cycle of the RCT (Q4 2018, million rubles) is proposed in Table 1.

Table- I: Risk levels and risk tolerance analysis of RCP contractor (4 quarter of 2018, million rubles.)

Steps for determining risk and risk tolerance	Stages of the life cycle of the RCT				
	Development	Implementation	Increase	Maturity	Recession
The value of fixed assets (Apost)	2050,00	2550,00	2780,00	2560,00	1780,00
The cost of the least liquid part of current assets (An.l.)	246,30	349,20	249,50	260,50	240,50
Total least liquid portion of assets	2296,30	2899,20	3029,50	2820,50	2020,50
The actual assets of the organization (A)	5840,00	6200,45	7350,28	7320,34	5630,21
The amount of equity corresponding to the liquid part of assets (SKdop = Al)	3543,70	3301,25	4320,78	4499,84	3609,71
Marginal cost of risk (SRpred)	3543,70	3301,25	4320,78	4499,84	3609,71
The condition of consistency of the marginal cost of risk (SRpred = SKdop)	3543,70	3301,25	4320,78	4499,84	3609,71
Marginal risk tolerance (Rust.pred) of the solution, %	100	100	100	100	100
Marginal level of risk (Ur.red), %	100	100	100	100	100
The actual cost of risk (the required volume of risky investments) (SR)	6200,00	4700,00	1950,00	1980,00	2100,00
Risk tolerance and verification of compliance with the conditions of equality or exceeding its maximum value, rubles / rub.	0,5	0,7	2,1	2	1,7
The level of risk and verification of the fulfillment of the condition not exceeding its maximum level, rub. / rub.	1,7	1,4	0,4	0,4	0,5

To begin with, it is necessary to identify the relationship between the risk tolerance of the business entity and the stages of the life cycle of the RCT by determining the main components of the assessment: qualitative and quantitative. Qualitative assessment involves determining the stage of the life cycle of the RCT, and quantitative - determining the level of risk tolerance of the economic entity itself.

We will perform the procedure for assessing risk tolerance at various stages of the life cycle of the RCT Enterprise RCP in 2015-2018, the results of which demonstrate the following:

The level of risk tolerance at the stage of development of RKT was 0.57, while at the stage of introduction of RKT to the market it reached 0.7; at the growth stage it began to increase sharply and reached a maximum value of 2.2. At the stage of decline in the life cycle of the RCT, the level of risk tolerance also began to decline and reached 1.7.

The result of the study was the revealed relationship between the levels of risk tolerance of the business entity with the stages of the life cycle of the RCT, which is manifested by the fact that at the stage of the birth of the RCT, when there is almost no production, the risk level is high and the risk tolerance of the business entity is low; at the stage of development of the RCT, the risk tolerance is minimal; at the stage of maturity of the RCT, risk tolerance reaches a maximum level; at the stage of decline in production, it decreases. Taking this regularity into account will make it possible to take preventive measures in advance, for example, if at the stage of maturity of the RCT the risk tolerance is low or does not exceed the level of risk tolerance of the economic entity of the previous stages of the life cycle of the RCT, it is necessary to minimize risks or insurance, if possible, to assess the degree of compliance of own funds and the total cost of risks entrepreneurial activity. Moreover, it is important to consider that the costs aimed at insurance and minimizing risks do not increase, but reduce the total cost of the production decision, since the level of risk itself decreases.

At the stage of the R&D life cycle, the "growth" of the rocket and space product - the level of risk tolerance - the RCP enterprise grows and reaches a peak at the moment of the "maturity" of the RCT and retention of market share. At the stage of the life cycle, the "decline" of the RCT while minimizing losses and withdrawing the RCT from the market - risk tolerance decreases.

Specifically, at the stages of development and birth of the RCT of the production of the RCT, the enterprise of the RCP in 2012, when there is almost no production, the level of risk is high and the risk tolerance of the production structure is low;

at the stage of development of RCT production in 2015, risk tolerance increases; at the stage of RCT maturity (2017), risk tolerance reaches a maximum level; in 2018, at the stage of production decline, risk tolerance also decreases (see "Fig. 1").

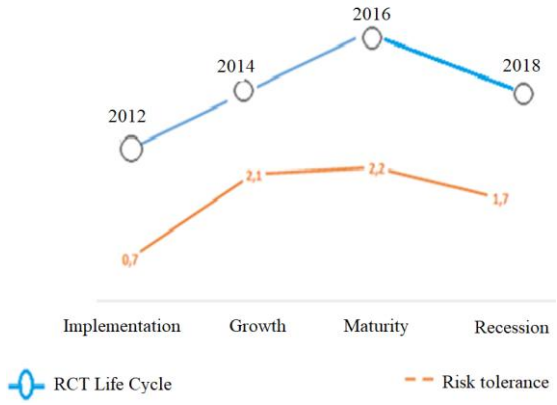

Fig. 5. The interdependence of the risk tolerance and life cycle dynamics of RCT contractor for the 2012-2018 period.

Consideration of this pattern will allow to take preventive measures in advance. The result obtained is universal both for management, for marketing, and for the economy of business entities as a whole.

In the process of assessing and analyzing levels of risk and risk tolerance, RCP Enterprise at the stages of the life cycle of the RCT showed a direct relationship between the stages of the life cycle of the RCT and the risk tolerance of the enterprise: the level of risk tolerance at the stage of development of the RCT was 0.57, whereas at the stage of introducing the RCT to the market it reached 0.7 ; at the growth stage it began to increase sharply and reached a maximum value of 2.2. At the stage of decline in the life cycle of the RCT, the level of risk tolerance also began to decline and reached 1.7.

The approaches and formalizations described above served as the basis for the development of methodological support for decision making in the face of uncertainty and competition with an integrated approach.

At the stage of development of the life cycle of the RCT, due to the total cost of risk, the risk level is also high, and the risk tolerance is low. The stage of introduction of RKT leaves the risk tolerance low, and can reduce it more; the risk tolerance limit is exceeded.

The stage of growth of the life cycle of the RCT is characterized by an increase in production volume and an increase in the level of risk tolerance; risk tolerance here does not exceed the limit value, which indicates a low level of risk and sustainable development of the industrial structure.

The stage of maturity of the life cycle of the RCT preserves the level of risk tolerance, since costs and profits also conditionally retain their volumes; risk tolerance does not exceed the limit value, which indicates a low level of risk and stable development of the business entity. The stage of decline in the life cycle of the RCT is characterized by a decrease in the risk tolerance of the enterprise; its limit value is exceeded.

Based on the results of the analysis of the risk tolerance of RCP enterprises for 2012-2018, the interdependence of the dynamics of risk tolerance and the dynamics of the life cycle of the production of RCTs is confirmed.

IV. CONCLUSION

The stages of the life cycle of production of RCTs may contain certain conditions of uncertainty with the presence of possible risks, then the higher the level of risk, the lower the level of risk tolerance of any process and vice versa. The revealed interdependence of the dynamics of risk tolerance and the dynamics of the life cycle of RCT production allowed us to develop a strategy for the sustainable development of preventive activities in the course of the fulfillment of the State Defense Order.

Thus, the goal of the study has been achieved, the prospect of the study is to develop a methodology for predicting the effectiveness of research and development based on assessing the possible risks of participants in cooperation.

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