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Development Trends of Military – Industrial Complex and its Interaction with Education and Science

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The article describes the major issues, such as shortage of qualified personnel, integration of educational and innovative processes, renovation and development of domestic military – industrial enterprises, as well as the development trends in the military – industrial complex itself.

Key words: military-industrial complex, specialist training, focused practice-oriented specialist training.

The immediate situation – shortage of qualified personnel within the military – industrial complex (MIC) – is stipulated by systemic problems. To solve these problems and overcome the existing crisis within this sector, an overall set of target actions are required which could either expand human resources or change today's personnel training system within the MIC itself.

Identifying the close interrelationship between professional education and R&D is becoming an important issue today. This fact has been considered in both research publications and the regulatory documents determining the governmental policy in this sector. Even today, the association of employers is only partially involved in implementing the national policy into the professional education domain, regulating the distribution of manpower resources and controlling the social-occupational mobility of human resources, which, in its turn, foster those problems relevant to university graduate placement.

In this respect, the Government of the Russian Federation proposed the strategies, dated December 28, 2007, in establishing n-tier continuous education system (K-12, secondary, higher and further professional education) within the military – industrial complex, including employee retention provisions in MIC organizations, development of core departments and laboratories within the framework of leading higher professional education institutions, as well as the establishment, and expansion of training professional centers for technical and engineering employees, and the generation of discipline-specific post-graduate training programs in R&D organizations for the period to 2020.

The national training academic researcher and specialist program for MIC of 2011-2015 was approved by Enactment N 421, dated June10, 2010 of the Government of the Russian Federation (stated in Corpus of Legislative Acts of the Russian Federation, 2010, N 25, clause 3180) [3]. Ministry of Education and Science promoted grants of the above-stated program for universities and defense enterprises. This could probably "close the gap" between current education programs and existing upgraded enterprises.

The updated RF Federal law of September 1, 2013 included a range of new provisions which were focused on the overall improvement in training human resources for MIC, i.e.:

- establishing on-the-spot core departments and other subdivisions within different enterprises;

- integrating sophisticated on-line program modules which would embrace the resource management of education organizations, industrial enterprises, engineering centers, etc.;
- introducing contract on employer-sponsored education involving two-sided commitment between employer and graduate. Such a contract would include full compensation of all expenses (i.e. doubled expenses) for both job placement and social benefits.

To solve the above-mentioned problems involving the shortage of qualified personnel, the President Act was signed to further the effective measures in state-financing backing of MIC organizations and project planning of state personnel training and development programs for MIC itself.

To enhance the personnel training quality for MIC organizations, the RF Ministry of Education and Science selected universities, based on competition results, and granted additional financing for employer-sponsored education, specifically focused on MIC enterprises, as well as improving academic process procurement. First and foremost, this government support is oriented on developing and initiating such courses that would provide target-focused training of employer-sponsored students for this or that specific enterprise. This involves the collaboration between different universities and military enterprises. Furthermore, this support includes purchasing training facilities and equipment (simulator systems, etc.) necessary in establishing engineering learning centers where employer-sponsored students would be able to undergo training on-site enterprises.

Due to the relatively ineffective material and technical facilities, numerous technical universities lack sophisticated license programs in product design, 3D-modeling of physical processes and other tools, which are essential in training future specialists being involved in advanced and knowledge-intensive industries. Other aggravating factors include underpayment, underqualified and ageing staff, declining social status of academic instructors, and increasing number of administrative-supporting personnel.

It should be mentioned that many universities have moved towards the so-called "strategic partnership", i.e. university-enterprise agreement. This strategy, being developed on the basis of the well-known Moscow Physico-Technical Institute (basic departments), has been implemented into St. Petersburg Electrotechnical University "LETI" in collaboration with leading radio-electronic enterprises. Another interesting innovative collaboration strategy has been developed within the framework of National Research University of Electronic Technology (Zelenograd). In co-development of academic programs, the above-mentioned universities take into account the requirements of relevant consumer-enterprises. Core departments, R&D laboratories, student technology design bureaus, different oriented centers, etc, are being established within employer-enterprises. Many leading academic instructors in the spheres of technological process automation, product design, robot (control) software programs, etc. in collaboration with students participate in the production of high-technology products [1].

To train specialists for MIC the FSBEI HPE Tambov State Technical University students of the following education programs: 11.03.03 "Design and Electronic Technology", 11.03.02 "Informcommunication Technology and Communication Systems", 11.03.01 "Radio-Electronics", as well as Master degree students of 11.04.03 "Design and Electronic Technology" and 11.04.01"Radio-Electronics" are involved in the integrated academic-production program which is based on the concept-focused practice-oriented training of specialists for MIC.

Focused practice-oriented training is an integration of theoretical and practical

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training of specialists for their professional activities within the framework of integrated science, education and production. Thus, professional specialist training corresponds to the employer requirements and the conditions for future professional activities. All in all, this is oriented on the personal development of the students via professional immersion, providing effective updating of the training content itself and based on development perspectives of different spheres and regions.

In this case, educational establishments have to reform the existing specialist training programs in response to enterprise-university interaction, which, in its turn, would further the development of relatively close-knit and sequential systems in core curriculum acquisition, corresponding to relevant enterprises and taking into account the changes in technological and social progress, innovative technology, organizations and content of the professional activities.

We have developed the concept-focused practice-oriented training of specialists for MIC within the framework of integrated science, education and production. This made it possible to consider not only the complications, but also the dynamic changes of external environment and requirements of MIC enterprises in order to further a more stable, flexible and effective professional training. The concept- focused practice-oriented training of specialists for MIC includes the following:

- ***Set of targets***c (external and internal prerequisites for designing these targets, i.e. implementing effective professional training of specialists for MIC within the framework of integrated science, education and production). It means that improving the quality of higher education, reflecting the requirements of today's society. Accordingly, there should be such educational innovations that would guarantee and further the modernization of higher education.
- ***Theoretical-methodological background*** (includes interrelated methodological principles, approaches and principles to implement the concept-focused practice-oriented training).

To implement the concept-focused practice-oriented training of specialists for MIC within the framework of integrated science, education and production, it is advisable to apply the following integrated approaches: systematic (comprehensive), synergetic, environmental, integrated, competency-based, qualimetric, process, and cybernetic.

The methodological principles include the following: consistency, occupational, relevancy, personal alignment, personal fulfillment and self reflection, synergism, and innovation.

- ***Organizational*** (includes "implementers" of set targets: transaction, functions and specific aspects of this transaction).

Within the framework of integrated science, education and production the practice-oriented environment is being developed, which, in its turn, advances the training (teaching) process towards the practical professional activities.

The "implementers" of these targets embrace the following three interrelated aspects: material-technical, social-personal and informative-tutorial having such specific features: (1) incorporating enterprise engineers and research scholars into the education process as full-fledged members; (2) engaging the material-technical and informative resources of core departments; (3) on-line updating of the training content in accordance with new regional development tendencies of MIC. All the components of practice-oriented environment are focused on the implementation of the following: educational, developmental, adaptive, informative, communicative, and technical-scientific functions.

The strategic element in the pedagogical system of focused practice-oriented training of specialists for MIC involves the integrated research-education-production structure (core departments).

- ***Project module*** (includes the organization technology focused on practice-oriented training of highly-skilled new generation specialists who should possess a wide spectrum of required competencies to effectively work in extensive upgraded enterprise sectors. This, in its turn, would be relevant to the development trends and specific features of the enterprise sector, as well as meeting the education requirements of the population of this or that region. In this case, the established practice-oriented environment is relevant to professional environment and makes it possible to advance the teaching process to actual professional activities, which, in its turn, furthers the creative self-development of students and improves the academic level of graduates for MIC via applying such methods as active learning and immersion experience in profession).
- ***Result-evaluation module*** в(includes qualitative documentation of experienced engineer-specialists to monitor the professional training effectiveness, assess the graduate professional training level, adopt flexible management decisions, and further adjustment, supplement or development of new education programs in collaboration with the employers. This could establish the foundation for Common Education Space based on the requirements of regional enterprises for human resources and implementation of educational paths in accordance with education requirements and student needs) [2].

To improve the professional training quality of human resources for MIC in Tambov State Technical University, the training process within the framework of the following areas 11.03.03 "Design and Electronic Technology", 11.03.02 "Informcommunication Technology and Communication Systems", 11.03.01 "Radio-Electronics" is conducted in compliance with developed concepts. This, in itself, incorporates the specialty and development trends of MIC enterprises in Tambov and meets the MIC requirements for highly-qualified and competitive specialists.

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