

Управління кермом, напрямки планера зазвичай здійснюють за допомогою педалей (ножного управління), а управління кермом висоти і елеронами – за допомогою ручки управління (ручного управління), проте в ряді випадків використовувалися й інші, менш традиційні способи.

Команди управління передаються на рульові поверхні за допомогою тросів, штоків або трубчастих валів. Багато винаходів було пов'язано з розробкою удосконалених швидкодіючих сполучних штуцерів і роз'ємів в системах управління, а також конструкцій крила і хвостового оперення.

Політ на планері над пересіченою місцевістю є найбільш складним видом планерного спорту. Здійснюючи політ на дальність або переліт в призначене місце, планерист використовує в польоті всі корисні для нього повітряні потоки, що зустрічаються на шляху: вітри, що виникають над схилами гір, терміки, обумовлені рельєфом місцевості або нестійкістю атмосфери, доріжки хмар, фронтальні поверхні і вітрові хвилі. Він може використовувати цей потік для підйому на велику висоту і потім планувати вниз.

Захоплюючий політ такого роду вимагає не тільки високої техніки пілотування, а й майстерності навігації і глибокого розуміння метеорологічних явищ. В даний час планеристи досягають висот порядку 18 км, використовуючи герметичні кабіни або висотні скафандри.

Отже, розглянувши історію створення планера, що насамперед являє собою планер, які моделі вітчизняних планерів були побудовані, у тому числі, і цілий авіапарк О.К. Антонова.

APPROACH TO QUALITY MANAGEMENT ASSESSMENT OF COMPLEX TECHNICAL SYSTEMS

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The problem of quality management of complex technical systems that combine elements of the life cycle of products into a single system is currently very relevant and it should be noted that in most cases it is only waiting for its solution [3, 4, 5]. Competition forces manufacturers to improve the quality of products, reduce their cost and time to market. The first element of the problem that domestic manufacturers face is the lack of a process approach and system analysis to the quality management of complex technical systems [1–6].

A feature of the synthesis of complex technical systems, among other things, presupposes the substantiation of indicators of the quality of a complex technical system and the effectiveness of its functioning, as well as criteria for evaluating the effectiveness of functioning. Efficiency is understood as a complex operational property of a purposeful process of functioning, characterizing its adaptability to the performance of the task facing the system [4, 5, 6].

The concept of efficiency is directly related to the concept of quality. Quality is a property or a set of properties of an object that determine its suitability for use as intended. The quality of a complex technical system is fully manifested only in the process of its functioning, i.e. intended use. Therefore, the most objective assessment of the quality of the system can be obtained based on the effectiveness of its intended use [4, 5]. Efficiency cannot be «observed» directly, it can only be determined by indirect methods.

Production quality management is directly related to the processes that are organized and take place at the pre-production, production and post-production (operational) stages of the product's existence [1–6]. Development of management decisions is made on the basis of comparison of information about the actual state of the process with the characteristics of the expected result. In mechanical engineering, such comparisons are made with standard quality

characteristics provided by product developers. Normative documentation regulating the values of parameters or indicators of production quality (technical specifications for its development, standards, technical conditions, drawings, delivery conditions, etc.), technical documentation establishing requirements for the development, production, or operation of engineering products should be considered *as production quality management programs*.

The production quality management system should provide for a set of interrelated organizational, technical, economic and social measures to ensure the goals of production quality management. The production quality management system covers teams of people, technical devices and material means [1–7].

A systematic approach to the management of research and design organizations, industrial (production), repair or other operational enterprises (association) requires considering the production quality management system as an integral, non-autonomous part of the management of organizations and enterprises. Therefore, management of production quality at the level of a separate enterprise cannot be carried out independently of management of the volume of production of this product. The efficiency of product use is determined by factors that are laid down at various stages of development, manufacture and operation of the product.

Ensuring a predictable and stable level of production quality at any machine-building enterprise is implemented in accordance with standard rules that describe production and management processes, ensuring internal information exchange, responsibility and authority of personnel in the field of its activity, ensuring monitoring of the operations used from the point of view of the quality of the final product on all stages of the ego's life cycle [4, 5].

The quality of the product is determined not only by the choice of the method, but also by its mandatory application in all relevant technological operations, which cannot always be realized in the conditions of large-scale mass production.

Ensuring the continuity of quality indicators and output parameters from input data means prioritizing options that are able to ensure stability of quality indicators with certain input characteristics of the processes. The use of methods that provide high quality indicators of the object of production, but in a very narrow range of input process parameters, may turn out to be unacceptable for mass production. A slight deviation from the specified range, which is very possible for serial production conditions, can lead to a sharp decrease in the output parameters of the product. Such methods are well applicable for laboratory studies or individual production. In serial production, preference is given to solutions when even some deviations of input parameters beyond the recommended interval do not lead to a sharp decrease in product quality indicators [9–12].

Without taking into account structural and functional interrelationships, which can be revealed only at the stage of system development, it is practically impossible to determine the true directions (goals) of quality improvement, and an incorrectly set goal disorients designers.

The effectiveness of the implementation of this stage depends on the adequacy of the mathematical models used in the functional description of the system, compliance with the rules of the quality management system and the theory of management of complex technical systems. Each of the presented stages can be detailed by identifying responsibility.

The detailing of the macroscopic level of the system and the transition from the general goal to the specific, and not vice versa, will allow to increase the quality of complex technical systems in the given dimensions and in the given time.

It is obvious that in this case unreasonable costs for the quality of the functioning of complex technical systems should be assigned to the initiators, and not be compensated at the expense of consumers by increasing the cost of the product [1–7].

The interaction of manufacturers should be carried out at all stages of the life cycle of the system, taking into account the system analysis and the process approach, coordinating the actions of the chain of business processes, and not separating them.

Emphasis on quality assurance at the assembly stage should be shifted to the design stage, which will allow to ensure the correct alignment of goals and eliminate the main problem of general failure - the ineffectiveness of the quality management system [10–12].

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