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**MODERNIZATION OF PERSONNEL TRAINING TECHNOLOGY FOR THE AIR TRAFFIC MANAGEMENT AND MAINTENANCE SYSTEM****МОДЕРНИЗАЦИЯ ТЕХНОЛОГИИ ОБУЧЕНИЯ ПЕРСОНАЛА ДЛЯ СИСТЕМЫ УПРАВЛЕНИЯ И ТЕХНИЧЕСКОГО ОБСЛУЖИВАНИЯ ВОЗДУШНОГО ДВИЖЕНИЯ****ӘУЕ ҚОЗҒАЛЫСЫН БАСҚАРУ ЖӘНЕ ТЕХНИКАЛЫҚ ҚЫЗМЕТ КӨРСЕТУ ЖҮЙЕСІ ҮШІН ПЕРСОНАЛДЫ ОҚЫТУ ТЕХНОЛОГИЯСЫН ЖАҢҒЫРТУ**

**Abstract.** This new study contributes to the implementation of the tasks reflected in the decree of the President of the Republic of Uzbekistan "On measures for transformation and support of civil aviation enterprises" (Decree of the President of the Republic of Uzbekistan, No. PP-5100 of April 30, 2021) and other regulatory acts related to this activity. The changes based on this decision are certainly related to the issue of training personnel for the aviation sector. The training process for new structures should be improved. In this regard, it is necessary to create and introduce new scientific-based electronic methodological manuals into the education system.

The main approaches to the systematization of aviation GA documents are also presented, data from literature sources are analyzed, and an approach that meets the goals and objectives of the electronic educational complex (EOC) "ZiNPD" is adopted.

In the aspect of systematization of aviation documents, an important role is assigned to the content of one of the main regulatory documents defining the rules for performing flights in the airspace of Uzbekistan-the Aviation Rules of the Republic of Uzbekistan – 91 document. According to Aviation Rules of the Republic of Uzbekistan -91 data, a variety of aviation documents were systematized and linked to the types of flight support. The systematization took into account 486

Doc documents and 348 Cir ICAO Cir circulars and 19 annexes to the Chicago Convention, as well as 87 regulatory documents of Civil Aviation of Uzbekistan.

**Keywords:** aviation, systematization, document, process, air traffic controllers.

**Аннотация.** Данное работа исследование в определенной степени способствует реализации задач, отраженных в постановлении Президента Республики Узбекистан «О мерах по трансформации и поддержке предприятий гражданской авиации» (Постановление Президента Республики Узбекистан, №ПП-5100 от 30 апреля 2021 года) и других нормативных актах, касающихся эту деятельность. Изменения, основанные на этом решении, безусловно, связаны с вопросом подготовки кадров для сфер авиации. Процесс обучения по новым структурам должен быть улучшен. В связи с этим необходимо создание и внедрение в систему образования новых научно-обоснованных электронных методических пособий.

А также приведены основные подходы в систематизации авиационных документов ГА, проанализированы данные литературных источников и принят подход, который отвечает цели и задачам электронно-образовательного комплекса (ЭОК) «ЗиНПД».

В аспекте систематизации авиационных документов важная роль отведена содержанию одного из основных нормативно-правовых документов, определяющих правила выполнения полетов в воздушном пространстве Узбекистане, – документу АПРУЗ-91. Согласно данным АПРУЗ-91 осуществлена систематизация многообразия авиационных документов с привязкой их к видам обеспечения полетов. При систематизации учтены 486 документов Doc и 348 циркуляров Cir ICAO и 19 приложений к Чикагской конвенции, а также 87 нормативно-правовых документов Гражданской авиации Узбекистана.

**Ключевые слова:** авиации, систематизации, документ, процесса, авиадиспетчеров.

**Андатпа.** Бұл жұмыс белгілі бір дәрежеде Өзбекстан Республикасы Президентінің «Азаматтық авиация кәсіпорындарын трансформациялау және қолдау жөніндегі шаралар туралы» қаулысында (Өзбекстан Республикасы Президентінің 2021 жылғы 30 сәуірдегі № ПП-5100 қаулысы) және осы қызметке қатысты басқа да нормативтік актілерде көрсетілген міндеттерді іске асыруға ықпал етеді. Осы шешімге негізделген өзгерістер, әрине, авиация салалары үшін кадрлар даярлау мәселесімен байланысты. Жаңа құрылымдар бойынша оқыту процесі жақсартылуы тиіс. Осыған байланысты білім беру жүйесіне жаңа ғылыми негізделген электрондық әдістемелік құралдар құру және енгізу қажет.

Сондай-ақ, АА авиациялық құжаттарын жүйелендірудегі негізгі тәсілдер келтірілді, әдеби дереккөздердің деректері талданды және «ЖНПД» электрондық-білім беру кешенінің (ЕОК) мақсаттары мен міндеттеріне жауап беретін тәсіл қабылданды.

Авиациялық құжаттарды жүйелеу аспектісінде Өзбекстанның әуе кеңістігінде ұшуды орындау ережелерін айқындайтын негізгі нормативтік-құқықтық құжаттардың бірі - АПРУЗ-91 құжатына маңызды рөл бөлінген. АПРУЗ-91 деректеріне сәйкес ұшуды қамтамасыз ету түрлеріне байланыстыра отырып, авиациялық құжаттардың алуан түрлілігін жүйелеу жүзеге асырылды. Жүйелеу кезінде 486 Doc құжаты және 348 Cir ICAO циркулярлары және Чикаго конвенциясына 19 қосымша, сондай-ақ Өзбекстан Азаматтық авиациясының 87 нормативтік-құқықтық құжаттары ескерілді.

**Түйін сөздер:** Авиация, жүйелеу, құжат, процесс, авиадиспетчерлер.

**Introduction.** The International Civil Aviation Organization (ICAO) at the United Nations pays great attention to the problems of training personnel for the aviation system on a global scale. One of the main requirements of the time is that staff training should be based on advanced technologies. In this regard, digitalization of educational and methodological support is of great importance. In connection with this problem, teaching methods of some leading universities were studied. The analysis showed that the work on improving and developing the educational process in

aviation higher educational institutions of the USA, Russia, the Czech Republic and the Republic of Belarus is carried out on the basis of extensive use of simulators. However, it turned out that there are no special electronic training manuals for training aviation dispatchers in the necessary legislative and regulatory documents. Although knowledge in the context of aviation documents is subject to strict requirements. In this regard, the development and implementation in the educational process of a special electronic educational complex (EOC) for training students, future air traffic controllers, in the legislative and regulatory documents necessary for their future professional activities was recognized as an urgent scientific and technical task.

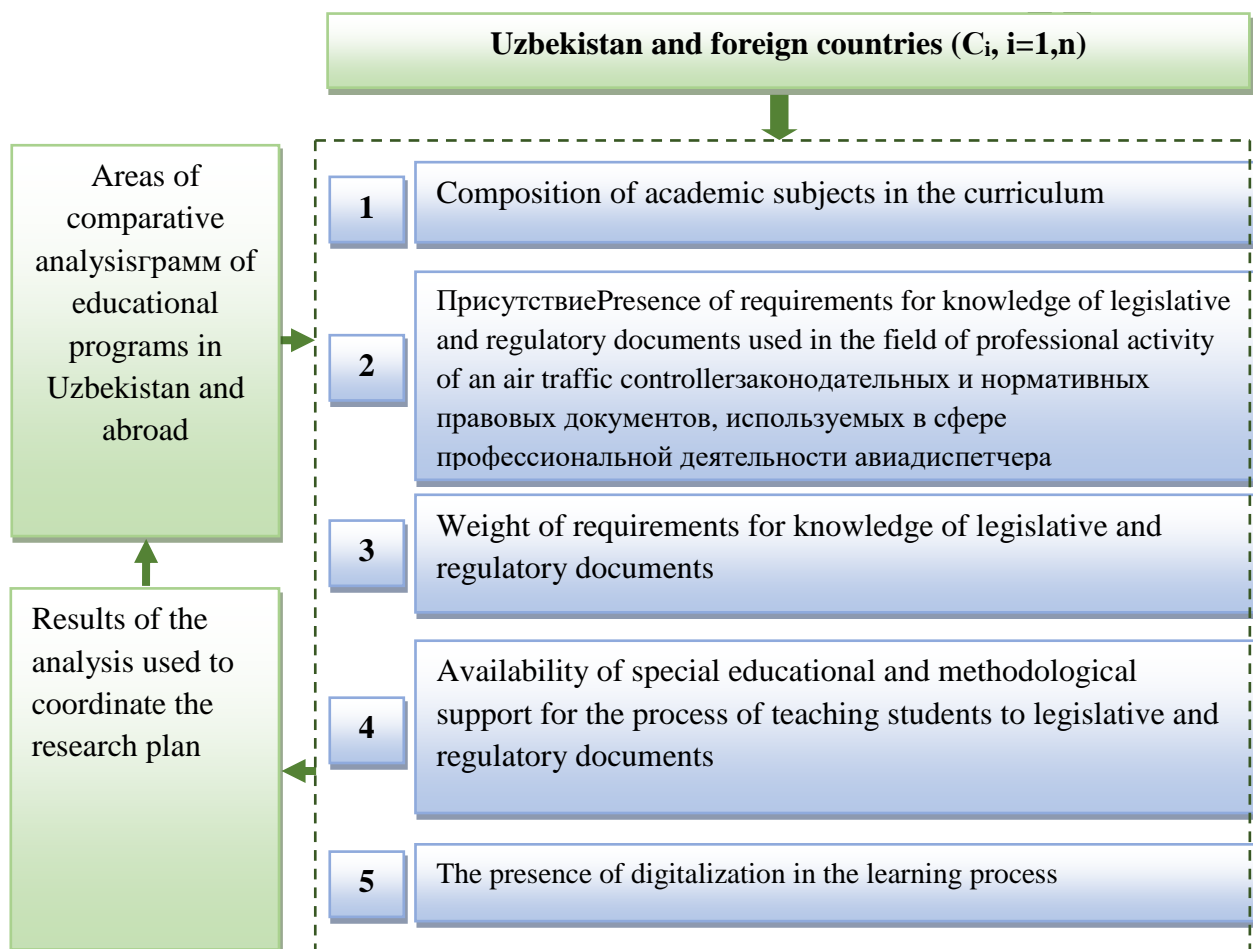
**The main part.** One of the most effective measures to improve the educational process is the digitalization of its most significant and complex components, which are associated with the study of a large volume of materials. Such components in the training programs for air traffic controllers include studying and mastering a large number of different legislative and regulatory documents that have domestic or international application. For example, regional laws and aviation regulations related to various types of flight support, as well as ICAO standards and documents ICAO that deal with the regulation of international air transport.

To substantiate the relevance of improving the educational process within the framework of the purpose and objectives of the study based on the digitalization of the educational and methodological base of regulatory legal documents, an analysis of the curricula of a number of countries was carried out in order to establish the weight of the chosen aspect of digitalization and the formulation of its tasks.

Within the framework of the study, the emphasis was placed on the analysis of educational programs in order to identify the dominant requirements for the student's knowledge, the fulfillment of which determines the level of his / her readiness. Based on the purpose and objectives of the study, the comparative analysis was performed according to the scheme shown in Figure 1.

Quite a large number of works are devoted to improving the educational process of training aviation specialists, including air traffic controllers. They relate to various aspects of the educational process, directly or indirectly related to the subject area of research.

The modern educational system at the global level is being transformed towards the widespread use of digital technologies. Expediency of widespread introduction of electronic educational complexes (EE) into the educational process) discussed in forums. On at the Gaidar Forum " Russia and the World: Goals and Values "[1], an open dialogue "Trends in education: challenges, expectations, reality" was held about the digital revolution as a new trend in education. Forum participants, including heads of higher education institutions, noted that the digital revolution creates new challenges, it affects education from the perspective of the labor market and the need for internal restructuring. At the same time, it is emphasized that society needs new digital competencies, creative elements, training in decision-making, communication and cooperation. It further concludes that "The education market by 2030 is more of an online, private and global market" and that "The new digital System has already begun to provide online courses and models."



**Fig. 1.** Scheme of conducting a comparative analysis of educational processes in Uzbekistan and abroad for training air traffic controllers

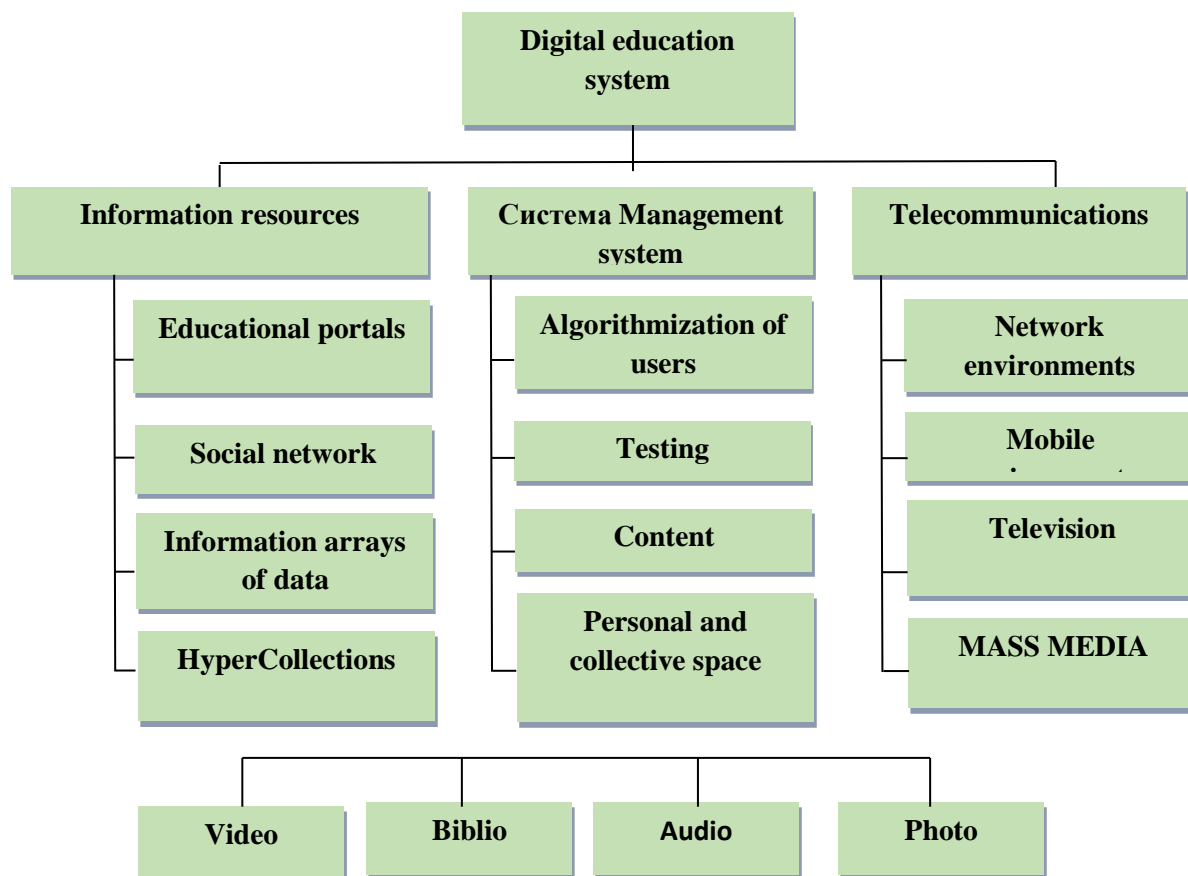
The article [2] provides information on the work of the EdCrunch-2019 conference, dedicated to the modern digital educational environment in the Russian Federation and training personnel for the digital economy, and creating conditions for improving the quality and accessibility of education. It notes that the transition to the digital economy requires a transformation of the usual approaches to education. Attention is drawn to the National Open Education Platforms established by leading universities, where online courses are hosted and on the portal online.edu.ru. At the same time, digital transformation is being updated, which makes it possible not only to widely use the potential of educational platforms, communication and multimedia tools in training, but also to automate many processes that take up considerable time for teachers and administrators, to provide employees and students with a whole range of services and services to improve the quality and convenience of learning.

The article [3; p.108] substantiates the expediency of a confident transition of the education system to the digital era, aimed at increasing productivity and new types of labor, which is seen through the inclusion of all segments of the population in the educational process. As part of this, it is proposed to build individual training routes and manage your own learning outcomes. It is noted that the main areas of application of information technologies in education should be::

- development of pedagogical software tools for various purposes;
- development web of educational websites;
- development of methodological and didactic materials;
- managing real objects.

– organization and execution of computer experiments with virtual models.

Further in the article, the relevance of digitalization is justified by the federal project "Modern digital educational environment in the Russian Federation", launched in 2016. A schematic representation of the digital education system is given (Figure 4), which is of interest in the framework of the development of EOCs of legislative and regulatory documents, provided for in the dissertation work as a practical application of scientific results.



**Pic. 4.** Digital education system [39; p. 108]

There are quite a lot of publications devoted to the issues of electronic education systems, including [4-5]. All of them update the EOS, reveal the areas of their effective application and development. As effective measures, it is recommended to reorient the system of higher professional education to innovative activities based on EOS, as the most important tool for achieving the competitiveness of graduates in the labor market. It is emphasized that the investment attractiveness of a university often depends on the innovative nature of the development of scientific, educational and practical activities of subjects of the educational process, their involvement in the national innovation system.

In relation to the educational process of training air traffic controllers, it is advisable to consider [6-16].

The paper [6], which is a guide developed by employees of the CAASD Center of the International Aviation Corporation MITER and the US Federal Aviation Agency (FAA), provides recommendations for improving the technology of training air traffic controllers based on training them on the route, on terminal equipment, using high-precision intelligent training systems and implementing intelligent training. The recommendations are valuable in developing the methodology for training air traffic controllers. However, it does not address the issues of automation of educational and methodological support.

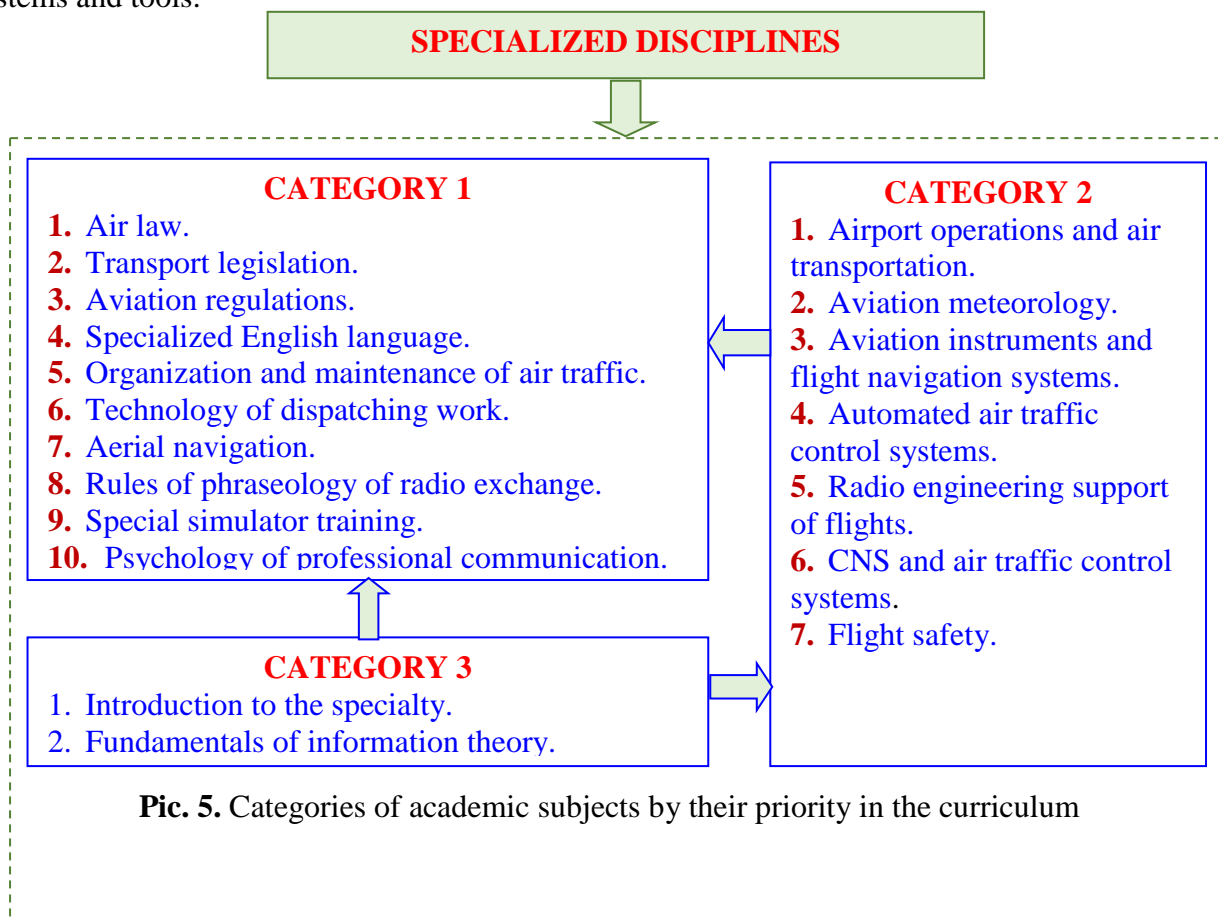
In the paper [17], the methodology of conducting practical classes on studying legislative and regulatory documents of the State Duma using computer tools is considered. It provides specific procedures for creating training tasks.

In the Republic of Uzbekistan, the functions of the aviation administration for ensuring the safety of aircraft flights in civil and experimental aviation, and protecting the GA from acts of illegal interference are performed by the GA Agency [18]. It is part of the structure of the Ministry of Transport of the Republic of Uzbekistan [19]. The functions of the GA Agency include inspection of compliance by aviation structures with recommendations, instructions and provisions of legislative, regulatory and legal acts, etc. types of documents regulating the production activities of aviation structures [20], as well as the development of regulatory documents, the need for which is associated with the development of aviation areas, as well as current ICAO documents [21]. The Agency has a sufficient database of legislative and regulatory documents with national and international status, information about which can be obtained from the Internet, within the framework of Uzbekistan in the source [18], and in the context of ICAO –in the annually published ICAO Catalog "Products and Services", for example, for 2019 [22].

To systematize the legislative and regulatory documents of the GA, first of all, it is necessary to study the issues related to their application in the framework of the studied academic disciplines.

The analysis and evaluation of the priority of the above-mentioned academic subjects gives grounds to divide them into three categories in (Fig. 5).

The priority category includes the concept of the direct relation of knowledge obtained in a particular profile discipline to the performance of professional duties. It is not difficult to notice that category 1 includes disciplines that directly determine the professional functions of an air traffic controller, while category 2 and 3 disciplines provide knowledge in the field of flight support systems and tools.



**Pic. 5.** Categories of academic subjects by their priority in the curriculum

In view of the above, it is important to refer to the content of one of the main regulatory documents defining the rules for performing flights in the airspace of Uzbekistan-document Aviation Rules of the Republic of Uzbekistan – 91 (Rules for Civil and Experimental Aviation Flights in the Airspace of the Republic of Uzbekistan) [23]. According to Aviation Rules of the Republic of Uzbekistan -91 data, a variety of regulatory documents were systematized and linked to the types of flight support [23; p. 44-45].

According to the form of systematization of legislative and regulatory documents, an important conclusion can be drawn about the choice of an algorithm for finding the necessary information.

The systematization took into account 486 Doc documents and 348 Cir ICAO Cir Circulars [22] and 19 annexes to the Chicago Convention [24], as well as 87 regulatory documents of Civil aviation of Uzbekistan [18].

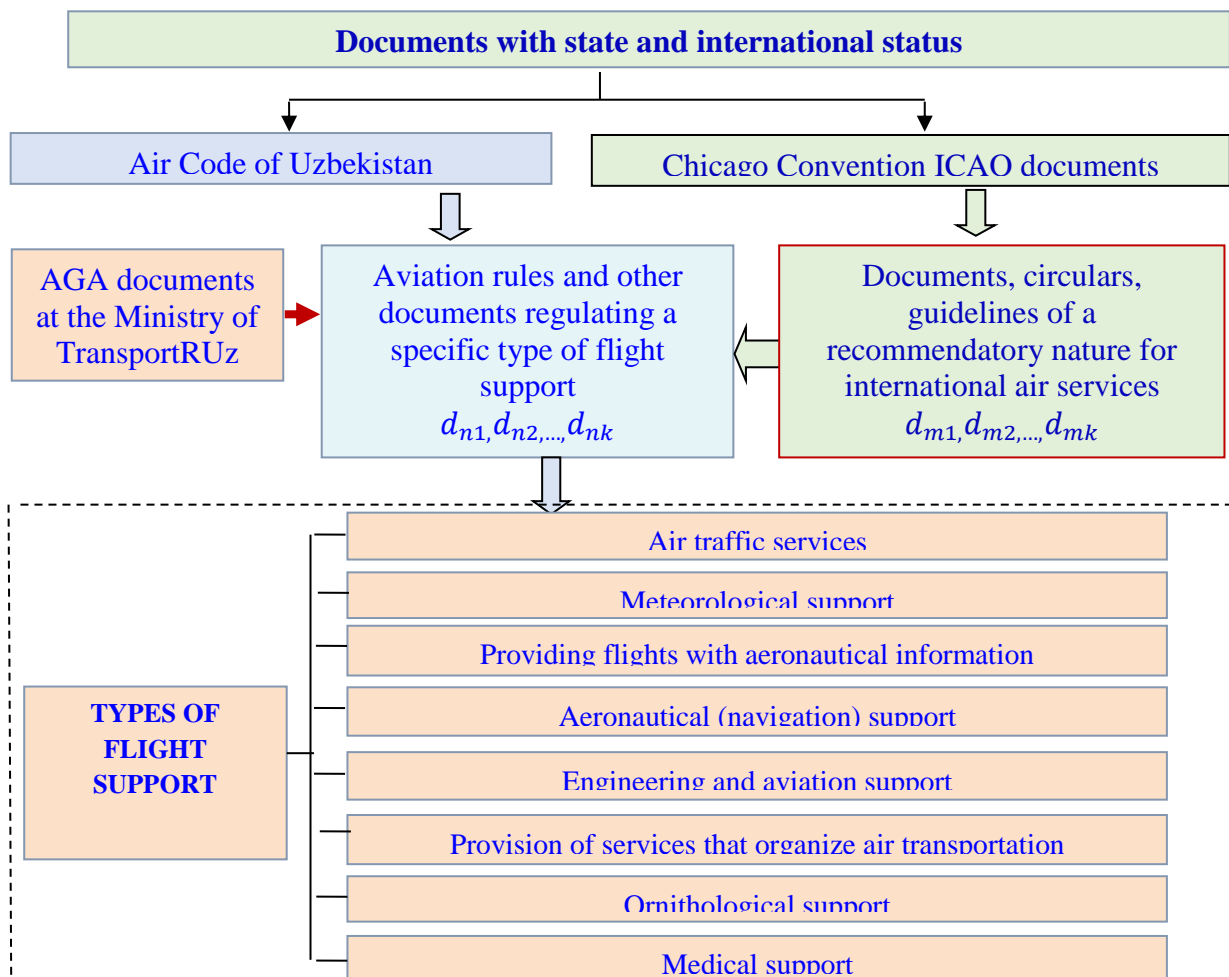
Fig. 6. shows a schematic diagram of the systematization of legislative and regulatory documents of the CA of the Republic of Uzbekistan.

The first defining step is to log in to the database via their status. If the practical training is conducted within the framework of national documents, then you must enter the database through the "Air Code" RUz, if within the framework of international documents-through the "Chicago Convention" and "ICAO Documents".

Conceptually, the information field can be organized in two ways:

**Option 1:** based on the types of flight support, as reflected in the document [90; p. 44-45].

**Option 2:** based on the list of academic subjects according to the curriculum.



**Pic. 6.** Organizational system of legislative and regulatory documents of Uzbekistan and ICAO, regulating flights of civil and experimental aviation in the airspace of Uzbekistan and abroad

These options should be used as a platform for organizing the menu for working with the EOC "ZiNPD" software package. A formal description of these variants of the organization of the information field can be performed on the basis of a set-theoretic representation of complex objects.

**Conclusions and Suggestions.** Based on the results of the study of the issues of systematization of legislative and regulatory documents, mathematical structural and functional formalization of the information field of these documents, the following conclusions can be drawn:

1. The existing approaches to the systematization of legislative and regulatory documents of the GA used for educational purposes sufficiently reflect their status, purpose and boundaries of use, have commonality in taking into account the priority and areas of use in the GA, which gives grounds to take them as the basis for building the concept of the information field of EOC.

2. The structural and functional modeling of the EOC information field and educational tasks solved within this field can be based on the IDEF0 methodology with the use of a set-theoretic method to describe functional relationships between system components and the use of mathematical logic to form the necessary information structures in the form of variants of educational tasks, their implementation and verification for correctness.

3. Establishing the possibility of using the IDEF0 methodology for modeling EOC "ZiNPD" allowed to develop a co-text and child structural and functional models of this educational complex.

4. Contextual and child structural and functional models are used as the basis for software and algorithmic support.

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