

## PEDAGOGICAL CONDITIONS FOR DEVELOPING PROFESSIONAL RELIABILITY OF FUTURE PILOTS UNDER BLENDED LEARNING

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*The article explores the organizational and didactic approaches to developing professional reliability in future pilots within the framework of blended learning. It examines the requirements of the International Civil Aviation Organization (ICAO) regarding language proficiency, emphasizing their critical role in ensuring flight safety and effective crew resource management. Professional reliability is interpreted as an integrative competency that encompasses cognitive, communicative, operational, and psychophysiological components, which collectively determine a pilot's ability to perform tasks under both standard and emergency flight conditions. The study analyzes the pedagogical potential of various training methods, including the case study method, simulator-based exercises, and the Google Classroom learning management system, demonstrating their effectiveness in promoting communicative stability, critical thinking, situational awareness, and decision-making skills. The article presents a structured model for aviation English training, which integrates theoretical knowledge with practical application, allowing cadets to simulate real-life flight scenarios and emergency situations. Emphasis is placed on the stepwise organization of case studies, including preparatory thematic cases and executive cases during online sessions, designed to develop independent analysis, problem-solving, and adaptive decision-making. The research includes pedagogical approbation of the proposed model with pilot-cadets, highlighting measurable improvements in reliability, responsiveness, and confidence in executing flight tasks in the condition of conducting radiotelephony in English. Findings indicate that the blended learning approach, combining classroom instruction, simulator training, and distance learning technologies, provides a comprehensive environment for fostering professional reliability. The study concludes that structured, scenario-based training methods not only enhance aviation English proficiency but also cultivate critical competencies necessary for safe and efficient flight operations, making the proposed model a valuable contribution to modern aviation education.*

**Keywords:** professional reliability, Aviation English, blended learning, case method, simulator training, pilot education.

### Півень В. В., Півень М. І. Педагогічні умови формування професійної надійності майбутніх пілотів у контексті змішаного навчання

*У статті розглядаються організаційні та дидактичні підходи до формування професійної надійності майбутніх пілотів у рамках змішаного навчання. Проаналізовано вимоги Міжнародної організації цивільної авіації (ICAO) щодо мовної компетенції та їхню критичну роль у забезпеченні безпеки польотів і ефективного управління ресурсами екіпажу. Професійна надійність розглядається як інтегративна компетентність, що включає когнітивні, комунікативні, операційні та психофізіологічні компоненти, які спільно визначають здатність пілота виконувати завдання як за стандартних, так і за надзвичайних умов. Досліджено педагогічний потенціал різних методів підготовки, зокрема кейс-методу, тренувань на симуляторах та системи управління навчанням Google Classroom, і показано їх ефективність у формуванні комунікативної стабільності, критичного мислення, ситуаційної обізнаності та навичок прийняття рішень. Стаття пропонує структуровану модель навчання, яка інтегрує теоретичні знання з практичним застосуванням, даючи змогу курсантам моделювати реальні польотні та надзвичайні ситуації. Особливу увагу приділено поетапній організації кейсів, включаючи*

*тематичні та виконавчі кейси під час онлайн-занять, спрямовані на розвиток самостійного аналізу, вирішення проблем і адаптивного прийняття рішень. Проведено педагогічну апробацію запропонованої моделі серед курсантів-пілотів, що продемонструвала покращення рівня надійності, швидкості реагування та впевненості у виконанні льотних завдань. Результати показують, що змішаний підхід, який поєднує аудиторне навчання, тренування на симуляторах та дистанційні технології, створює комплексне середовище для розвитку професійної надійності. Висновки свідчать, що структуроване навчання на основі сценаріїв не лише покращує володіння англійською мовою у професійній сфері, а й формує критично важливі компетенції для безпечного та ефективного виконання польотних операцій, роблячи запроповану модель цінним внеском у сучасну авіаційну освіту.*

**Ключові слова:** професійна надійність, авіаційна англійська мова, змішане навчання, кейс-метод, тренажерна підготовка, підготовка пілотів.

**Introduction.** Modern aviation operates in a highly dynamic, technologically advanced, and safetycritical environment. In such conditions, the professional competence of flight personnel directly influences operational reliability and flight safety. Among the numerous components of pilot competence, English language proficiency occupies a central position, as it ensures standardized communication in international airspace. The language proficiency requirements established by the International Civil Aviation Organization (ICAO) define clear descriptors for pronunciation, grammatical structure, vocabulary, fluency, comprehension, and interaction. Achieving at least Operational Level 4 is mandatory for international flight operations. However, language competence in aviation should not be limited solely to grammatical accuracy or lexical knowledge. It must ensure clarity, speed, precision, and psychological stability in communication under stress.

Recent analyses of aviation incidents demonstrate that communication failures remain a contributing factor in unsafe situations. Misinterpretation of instructions, delayed responses, and improper use of phraseology can lead to operational risks. Therefore, Aviation English training must focus on forming professional reliability rather than on developing isolated linguistic skills. Ukrainian researchers Petrashchuk and Vasiukovych have investigated the phonological and functional aspects of Aviation English, identifying specific language requirements for pilot-controller communication in accordance with ICAO standards. Their research emphasizes the necessity of aligning language training with real operational tasks, recognizing that protocol compliance and proficiency in phraseology directly affect communication accuracy and safety outcomes [5].

The transition to blended learning models in higher aviation education institutions has created new opportunities for integrating classroom instruction, simulator practice, and digital platforms. This transformation requires a scientifically grounded organizational and didactic framework capable of ensuring the systematic development of professional reliability. Blended learning is widely discussed in modern educational theory as a combination of face-to-face and digital instruction. In aviation education, this approach allows the integration of theoretical preparation with professional simulation training.

In the field of distance and blended learning, the Denisova's study provides insights into how remote technologies influence professional language acquisition among aviation students. Denisova argues that digital platforms, when combined with structured pedagogical design, can enhance learner autonomy and reinforce repeated practice of aviation-specific phraseology [3].

Ukrainian scholars Aleysenko and Mudrenko analyze methodological approaches to remote training in professional English, highlighting technological and cognitive challenges, such as reduced immediate feedback and diminished interactivity. They propose a blended approach, in which online modules are interwoven with synchronous practice and instructor-led discussions to maintain communicative engagement [1].

Distance education theorists such as Holmberg, Anderson & Elloumi describe the potential of blended models that combine online and face-to-face instruction to create flexible yet structured learning environments. These hybrid models have been shown to increase learner engagement, facilitate incremental skill development, and provide continuous feedback loops – features essential for complex professional training [14; 10].

Despite existing studies on Aviation English and blended learning, the problem of forming professional reliability through their integration remains insufficiently explored.

**The purpose** of this study is to theoretically substantiate and experimentally verify the effectiveness of a blended model of Aviation English training aimed at developing the professional reliability of future pilots. Despite growing interest in these areas, few studies have directly analyzed how blended learning models influence the formation of professional reliability among future pilots. This gap highlights the need for integrated empirical research that combines linguistic pedagogy, aviation safety, and instructional technologies.

**Methods of the Research.** To address the issue of developing professional reliability in future pilots, a special research model was designed by the academic and teaching staff of Professional and Aviation Language Training Department at the Ukrainian State Flight Academy. This model was focused on fostering cadets' professional reliability through Aviation English training. It involved the integration of classroom, simulator, and distance learning components, the use of the case method, and digital platforms to develop communicative, cognitive, and psychological stability in cadets. The model also ensured systematic assessment of professional reliability levels throughout the experiment.

**Results of the Research.** The study employed a quasi-experimental design and involved two groups of cadets specializing in flight operations:

Experimental Group (EG) – 42 cadets

Control Group (CG) – 40 cadets

A total of six credits were allocated to the experiment. There were three stages of the experiment:

*Diagnostic Stage* – assessment of initial language proficiency and indicators of professional reliability.

*Formative Stage* – implementation of the blended Aviation English training model.

*Control Stage* – evaluation of learning outcomes and comparative analysis.

The blended model included some components such as: classroom theoretical instructions, case-based communicative training, simulator-based radiotelephony practice, online modules

via Google Classroom, formative and summative assessment. The control group followed the traditional classroom-based program.

Assessment criteria of the future pilots' professional reliability was evaluated according to different components. These components are:

- Accuracy of radiotelephony communication.
- Speed of response in simulated scenarios.
- Decision-making adequacy.
- Resistance to stress during simulator sessions.
- Language proficiency level according to ICAO descriptors.

Quantitative data were processed using comparative statistical analysis.

The results of pedagogical approbation showed reasonable data. At the diagnostic stage, both groups demonstrated comparable results. The majority of cadets were at pre-operational or borderline operational levels of communicative performance. After implementing the blended model in the experimental group, significant positive dynamics were observed.

First, the proportion of cadets reaching Operational Level 4 of Aviation English increased by 32% in the EG compared to 14% in the CG.

Second, the average response time in simulator-based emergency scenarios decreased by 18% in the EG.

Third, communication accuracy during radiotelephony simulations improved by 27% in the EG, compared to 11% in the CG.

And finally, stress resistance indicators, measured through performance stability under simulated abnormal conditions, increased significantly in the experimental group.

Qualitative analysis revealed that cadets involved in systematic case discussions demonstrated more structured reasoning and clearer communicative strategies. The integration of online modules facilitated independent preparation and allowed repeated practice of phraseology and listening exercises. Simulator sessions provided realistic communicative pressure, enhancing psychological readiness.

**Discussion.** The findings confirm that professional reliability cannot be formed solely through traditional classroom instruction. It requires the integration of linguistic, operational, and psychological training components.

The case method proved particularly effective in developing analytical and communicative flexibility. By analyzing aviation incidents, cadets learned to identify communication breakdowns and construct alternative strategies.

The use of *digital learning* environments ensured continuity of training beyond classroom limits. Modular structuring of content enhanced systematic knowledge acquisition.

*Simulator-based communication* played a decisive role in developing stress tolerance and operational accuracy. Under time pressure and realistic cockpit conditions, language became a functional instrument of safety rather than an academic subject. Thus, the blended model created a comprehensive educational environment that integrates theoretical knowledge, practical application, and reflective analysis.

The proposed model is based on the following principles:

1. *Professional Orientation* – alignment with real aviation communication.
2. *Systematic Integration* – combining linguistic and operational components.
3. *Modularity* – structured content progression.
4. *Interactivity* – active student engagement.
5. *Feedback and Monitoring* – continuous assessment.

The model includes:

- Input module (terminology and phraseology)
- Communicative simulation module
- Case analysis module
- Simulator communication module
- Reflective evaluation module

This structure ensures gradual development from theoretical awareness to operational reliability of future pilots.

**Conclusions.** The study substantiates that forming professional reliability of future pilots requires an integrated organizational and didactic approach within Aviation English training. Blended learning, combining classroom instruction, case-based analysis, digital modules, case method and simulator practice, significantly enhances communicative competence, decision-making skills, and stress resistance. The results of pedagogical approbation confirm the effectiveness of the proposed model. The experimental group demonstrated statistically and qualitatively higher indicators of language proficiency and professional reliability compared to the control group.

Therefore, the integration of blended Aviation English training into pilot education curricula can be considered a pedagogically justified and practically effective approach to ensuring flight safety and operational stability.

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