Written review of the official Reviewer
on Raziyam Kurvanzhanovna Anayatova's thesis "The methodology for reducing the impact of the human factor on flight safety" to fulfill requirements for the Doctor of Philosophy (PhD) degree in the specialty Aviation Engineering and Technology (6D071400)

No	Criteria	Compliance criteria (one of the answer options should be checked)	Science-based positions of the official Reviewer
1	2	3	4
1.	The topic of the thesis (as of the date of its approval) corresponds to the areas of scientific development and/or state programs	1.1 Consistency with priority areas of scientific development or state programmes	
		1) The thesis was carried out within the framework of a project or target program funded from the state budget (specify the name and number of the project or program) 2) Dissertation completed as a part of another state program (specify program name) 3) The thesis corresponds to the priority direction of science development, approved by the Higher Scientific-Technical Commission under the Government of the Republic of Kazakhstan (specify direction)	1) The thesis was executed within the grant funding of the Ministry of Education and Science of the Republic of Kazakhstan on "AP08857126 - Development of interactive training programs complex on technological repair processes of aircraft equipment"; 2) The thesis corresponds to the priority direction of science development "Information, communication and space technologies".
2.	Importance to Science	The work does/does not make a significant contribution to science, and its importance is well disclosed/not disclosed	The work makes a significant contribution to science and its importance is well discovered as it proposes a new methodological approach to improving flight safety based on recognising the psycho-emotional states on a scale of seven archetypal classes: joy, surprise fear, calm, sadness, disgust, anger by speech signals of phraseology of aviation personnel
3.	Principle of autonomy	Level of independence: 1) High; 2) Medium; 3) Low; 4) No independence	The level of independence of the work is high as evidenced by the absence of borrowing and sufficient justification of scientific statements.
4.	The principle of internal unity	4.1 Rationale for the relevance of the thesis: 1) Justified; 2) Partially justified; 3) Not substantiated.	The topic of the thesis is relevant and justified by the need to reduce the impact of human factor on flight safety and aviation accidents through the development and implementation

			of intelligent methods and technologies of analysis and automatic recognition of psycho-emotional states on the speech signal of phraseology.
		4.2 The content of the thesis reflects the theme of the thesis: 1) <u>Reflects</u>; 2) Partially reflects; 3) Does not reflect	The content of the thesis reflects the theme of the thesis and fully reveals the essence of the problem under study.
		4.3 The aim and objectives are in line with the thesis topic: 1) <u>correspond to</u>; 2) partially correspond; 3) do not correspond; 3) do not correspond	The aims and objectives are in line with the thesis theme, which involves the development of a methodology that includes a theoretically justified approach, scientific methods and practical recommendations to improve flight safety based on reducing the influence of the human factor by recognizing psycho-emotional states based on the results of digital processing and intelligent analysis of speech signals of phraseology. All sections are presented in strict accordance with the solutions of the tasks set.
		4.4 All sections and provisions of the thesis are logically interlinked: 1) <u>are fully interconnected</u>; 2) interrelation is partial; 3) there is no interrelation.	All the sections and provisions of the thesis are logically and completely interconnected and consistent in the presentation of the material.
		4.5 The author's proposed new solutions (principles, methods) are argued and evaluated compared to known solutions: 1) <u>there is a critical analysis</u>; 2) the analysis is partial; 3) the analysis is not the author's own opinions, and the quotes from other authors	The new solutions proposed by the author (principles, methods, algorithms, mathematical model) are argued and critically analyzed, characterized by the application of a fairly extensive toolkit of analytical research, computer and mathematical modelling.
5.	The principle of scientific novelty	5.1 Are the scientific results and provisions new? 1) <u>Completely new</u>; 2) partly new (25-75% are new); 3) not new (less than 25% are new)	The scientific results and statements are completely new, in particular, a new approach and a mathematical classifier model for determining the speaker's psycho-emotional state from his speech signal based on synthesised deep convolutional neural networks trained on informative features can be noted.

		5.2 Are the conclusions of the thesis new? 1) <u>Completely new;</u> 2) partly new (25-75% are new); 3) not new (less than 25% are new)	The conclusions of the thesis are entirely new, among which we can mention the development of rules for the formation of phraseology for digital processing of spoken language with a variety of utterances used and aviation English with the rules regulated by the ICAO Guidelines.
		5.3 Technical, technological, economic or managerial solutions are new and sound: 1) <u>completely new;</u> 2) partially new (25-75% are new); 3) not new (less than 25% are new)	Technical, technological, economic or managerial solutions are entirely new and feasible, among which we can mention the proposal of an intelligent system for recognising the psycho-emotional state of aviation personnel, which allows for noise-resistant digital processing of complex speech signals, building up databases of states and informative attributes, deriving quantitative and qualitative characteristics.
6.	Validity of main findings	All main findings <u>are based</u>/ are not based on scientifically solid evidence or are sufficiently well founded (for qualitative research and training areas in the arts and humanities)	All main conclusions are based on scientifically credible evidence using appropriate tools of analytical and experimental research, computer and mathematical modelling, as well as tools for automation of mathematical calculations and visualisation of results based on Python 3 language. As a result a methodology has been proposed to reduce the impact of the human factor on flight safety by controlling the behavioural activities of aviation personnel by assessing the psycho-emotional state.
7.	Key points defended	The following questions need to be answered for each provision individually: 7.1 Is the provision proven? 1) <u>proven;</u> 2) rather proven;; 3) rather not proven; 4) not proven; 7.2 Is it trivial? 1) yes; 2) <u>no</u> 7.3 Is it new?	All of the main points presented in the thesis and defended - are proven; - are not trivial; - are new; - the level of application is broad; - proven in the author's articles.

		1) yes; 2) no. 7.4 Level for application: 1) narrow; 2) medium; 3) <u>broad</u> 7.5 Does the article prove it? 1) <u>yes;</u> 2) no;	
8.	The principle of credibility. Credibility of sources and information provided	8.1 Choice of methodology is justified or methodology described in sufficient detail 1) <u>yes</u> 2) no	The choice of methodology is justified by the current recognised scientific theories on psychological safety at work, human factor reduction in civil aviation and digital signal processing, as well as by the rules of aviation and plain English phraseology formation.
		8.2 The results of the thesis work are obtained using modern scientific research methods and techniques of data processing and interpretation with the use of computer technology: 1) <u>yes;</u> 2) no	The results of the thesis work were obtained using modern scientific research methods and techniques of data processing and interpretation with the use of computer technology.
		8.3 Theoretical conclusions, models, identified correlations and regularities are proved and confirmed by experimental research (for teacher training areas the results are proved on the basis of pedagogical experiment): 1) <u>yes;</u> 2) no.	The theoretical conclusions, models, identified relationships and patterns are proved and confirmed by computer modelling and experimental research.
		8.4 Important statements <u>are corroborated</u>/partially corroborated/not supported by references to relevant and reliable scientific literature	Important statements are supported by references to relevant and reliable scientific literature.
		8.5 Literature sources used <u>are sufficient</u>/insufficient for the literature review	The literature sources used are sufficient for a literature review of the problem under study.
9.	The principle of practical value	9.1 The thesis has theoretical significance: 1) <u>yes;</u> 2) no	The thesis is of theoretical significance.
		9.2 The thesis has practical relevance and there is a high probability of the results being applied in practice: 1) <u>yes;</u>	The thesis has practical value, and there are certificates of implementation.

		2) no.	
		9.3 Are the proposals for practice new? 1) <u>completely new;</u> 2) partly new (25-75% are new); 3) not new (less than 25% are new).	The dissertator's proposals and recommendations for practice are entirely new.
10.	Quality of academic writing and design	Quality of academic writing: 1) <u>high;</u> 2) medium; 3) below average; 4) low.	The quality of the academic writing and layout of the thesis is quite high.

Official reviewer decision:

1) to apply for awarding the degree of Doctor of Philosophy (PhD) to a doctoral student Raziyam Kurvanzhanovna Anayatova in the specialty 6D071400 - Aviation Engineering and Technology to the Committee.

Official Reviewer,
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