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Original Research Article

Analysis of Factors Affecting the Safety of C-130 Guidance and Control

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Abstract

Safety risks are always an integral part of aircraft design. In the C-130 Hercules aircraft, due to its high service age, it is essential to carry out life expectancy plans and discuss flight safety, especially in the field of guidance and control, In such a way that every four years or every 5000 flight hours, overhaul and life extension operations for this plane are done, and the control surfaces are evaluated by X-RAY device. In this paper, the main parameters that lead to the creation of flight safety risks and the reduction of the plane's safety level, especially in the topic of guidance and control, were evaluated, as well as the valuable aspects that lead to the safe flight of this plane was analyzed. The type of paper is applied research, and the descriptive-analytical research method is used. The time domain of the study is from 2000 until now. This paper investigates the effect of avionics and navigation upgrades on flight risks. The data collection tools are questionnaires and flight records of the Hercules plane. In the discussion of gathering information through interviews, the researcher, after asking the question and receiving its validity from the expert community, conducted interviews with pilots and navigators. The reliability of the questionnaire was also calculated through Cronbach's alpha formula, and descriptive-inferential statistics and SPSS software (chi-square test) were used for data analysis.

Keyword: C-130; Guidance and Control; Overhaul; Safety; Reliability; Validity.

1. Introduction

Risk and safety are always considered the most critical operational characteristics of civil and military aircraft. Typically, they relate to the possible occurrence of air traffic collisions that could result in loss of life, infrastructure damage, and property by third parties. Consequently, they were deemed externalities in addition to other adverse effects such as noise and air pollution. Due to their high importance, risk and protection became topics of continuous study, ranging from purely technical/technological aspects to explicitly administrative ones. Such concerns require the establishment of appropriate regulations regarding the designs and operations of device technology. To assess the risk, several methods include identifying safety concerns, analysis of the risk factors' likelihood, analysis of the risk factors' severity, and assessment and the admissibility of risk factors. Finally, risk reduction should be reduced by three general strategies: avoidance of the risk, reduction of risk, and isolation of the exposure. These strategies are implemented based on efficiency, technical measures, controlled measures, staffing measures, cost/benefit, practicality, acceptability of each party, durability, residual risk factors for flight safety, and new challenges. With the advancement of technology, new methods of risk reduction and safety concerns are being developed to ensure safe and risk-free flight operations [1].

The C-130 Hercules primarily performs the tactical portion of the airlift mission. The aircraft can operate from rough dirt strips and is the prime transport for airdropping troops and equipment into hostile areas. Basic and specialized versions of the aircraft airframe perform diverse roles, including airlift support, Antarctic ice resupply, aeromedical missions, weather

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reconnaissance, aerial spray missions, firefighting duties for the U.S. Forest Service, and natural disaster relief missions.

Using its aft loading ramp and door, the C-130 can accommodate a wide variety of oversized cargo, including utility helicopters and six-wheeled armoured vehicles to standard palletized cargo and military personnel. In an aerial delivery role, it can airdrop loads up to 42,000 pounds or use its high-flotation landing gear to land and deliver cargo on rough dirt strips.

The flexible design of the Hercules enables it to be configured for many different missions, allowing one aircraft to perform the role of many. Much of the special mission equipment added to the Hercules is removable, allowing the aircraft to return to its cargo delivery role if desired. Additionally, the C-130 can be rapidly reconfigured for various types of cargo, such as palletized equipment, floor-loaded material, airdrop platforms, container delivery system bundles, vehicles and personnel, or aeromedical evacuation [2].

As the C-130 fleet ages, management issues arise with reduced reliability, obsolescence, reduced parts availability, and changing aviation rules that impact the C-130's ability to operate worldwide. A common strategy to extend the life of an aircraft fleet is to modernize the current airframes with new components. This strategy attempts to combat issues that plague an ageing fleet, such as diminishing reliability, antiquated avionics, and capabilities that no longer meet current requirements. The cost of modernization is commonly the driving factor behind these efforts. Analyzing the return on investment of modernizing components on ageing aircraft versus recapitalizing the fleet to gain new capabilities will inform these decisions [3]. Figure 1 shows a C-130 in flight, three view drawings, and a cockpit.

Sarphie et al. evaluated a probabilistic analysis approach to predicting aircraft structural fatigue endurance using C-130 structural integrity program data. Using test results from C-130 B and E wing full-scale fatigue tests, three fatigue-sensitive areas of the C-130 centre wing were investigated [4]. Torregosa and Hu performed a risk analysis for the C130H Hercules centre wing structure. A standard crack scenario using a phase-by-phase approach was assumed. The probability of failure was based on the residual strength criterion for the given crack size distribution at the accumulated flight hours [5]. Qattan predicted the failure rate by employing more than thirty years of local operational field data of Lockheed C-130 engine turbines. The Weibull regression model and the Artificial Neural Network model included feed-forward back-propagation, radial basis neural network, and multilayer perceptron neural network model [6].

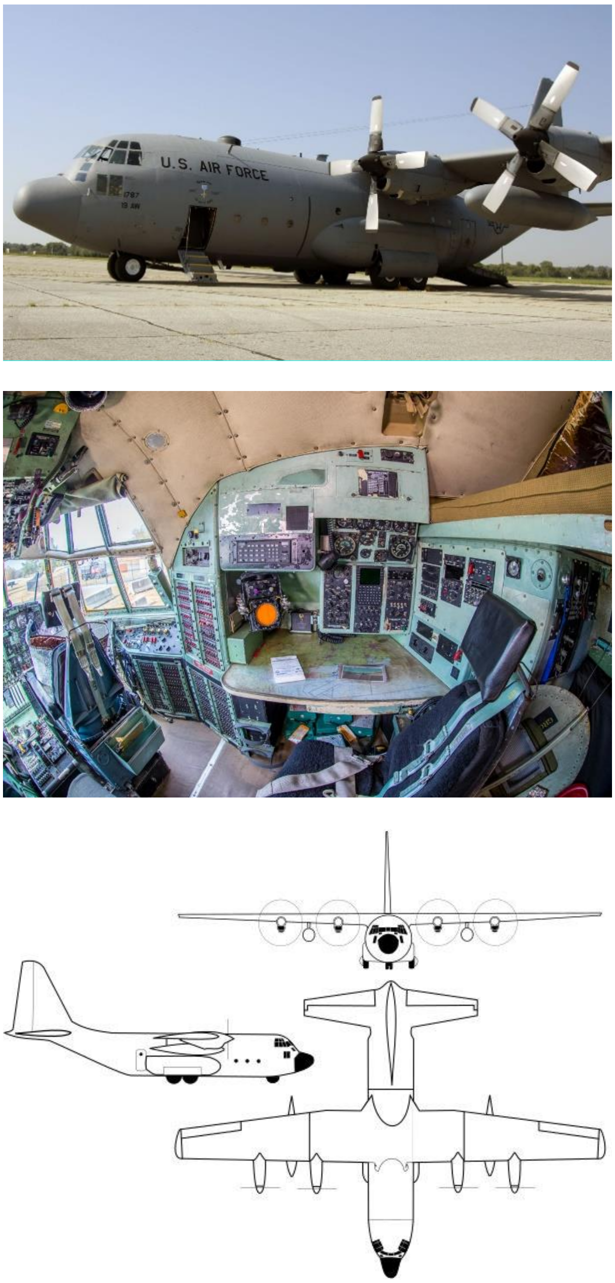

Figure 1. C-130 Hercules

Alikhani et al. studied fault tolerant guidance of under-actuated satellite formation flying using inter-vehicle coulomb force. Also, they designed a fault-tolerant control law to maintain the formation's shape and dimension [7]. Guzanek and Borucka characterized and analyzed factors that affect the number of safety incidents in civil aviation. The statistical analysis of historical data on aviation incidents was employed. The data provided in Poland's National Security Plan 2020-2023 were used to distinguish the factors associated with the threats present and synthetically evaluate their impact. The analyses identified areas of particular safety risks and formed the basis for further detailed research [8]. Khanlo and

Mahmodi Kohan investigated the risk priority number of the Ilyushin-76 aircraft hydraulic system, and its critical parts were identified by using the FMEA method [9]. Using second-order sliding mode control, Yazdannik et al. investigated the safety and reliability of quadrotor UAVs based on machine learning and AI [10]. Wang et al. performed a new method of aircraft flight safety boundaries in icing situations based on a case study of icing [11]. Moghimi Esfandabadi and Djavareshkian studied the risk analysis in flight safety, the performance evaluation index of safety, security, and flight to save from plane crashes [12]. Using the FMEA method and RPN formula, Livani et al. investigated the reliability of the equipment related to the PC-7 aircrew. They determined the severity, occurrence, and detection of failures using the opinions of technical experts and pilots of the PC-7 aircraft [13].

The topic discussed in this article is improving the safety level of the C-130 aircraft that was designed and built in the 60s and has left an excellent performance in the safety category. The technology of the 60s is very different from today's knowledge after half a century**.** Therefore, there are always many concerns about this aircraft's supply of parts and maintenance for safe operation and performance. The first case is the supply of parts based on internal technical knowledge, and the second is the improvement of the safety systems of this plane, which was not included in the plane's initial design. Therefore, with today's knowledge and technology, it is possible to use this type of aircraft for at least two decades by making changes in the design and adding safety equipment.

In the reviewed studies, the C-130 aircraft is mentioned as the most used military transport aircraft, and the improvement of safety equipment is noted. Among the remaining systems, we can say the category of guidance and control of C-130. This research aims to evaluate how to increase the flight safety level of C-130 guidance and control systems. The type of paper is applied research, and the descriptive-analytical research method is used. The time domain of the study is from 2000 until now. The effect of avionics and navigation upgrades on flight risks is investigated. The data collection tools are questionnaires and flight records of the Hercules plane. In the discussion of gathering information through interviews, the researcher, after asking the question and receiving its validity from the expert community, conducted interviews with pilots and navigators.

The current research aims to answer the following questions:

A- main question:

1. Is the use of guidance and control systems according to the latest world standards effective in increasing the flight safety of the C-130 plane?

B- Subquestions:

1. Is the C-130 plane's overhaul effective in its flight safety?
2. Is this plane's navigation system old and needs to be upgraded?
3. Is it necessary to upgrade the plane's autopilot system now?
4. Does this plane's weather radar still have the previous performance?
5. Can training this plane's crew regarding safety risks effectively reduce air accidents and incidents?
6. What factors affect the safety risks of C-130 aircraft guidance and control, and how can they be controlled?

The statistical society of this research consists of several pilots, navigators, flight engineers, and technical experts. The statistical society of this research consists of several pilots, navigators, flight engineers, and technical experts. The Cochran's formula is used to calculate the sample size. According to the statistical population under study, this research uses a proportional stratified sampling method. A researcher-made questionnaire is used to collect data. Cronbach's alpha test is applied to test the consistency and stability of the questionnaires. Also, the reliability assessment is assessed by Composite Reliability, and the Average Variance Extracted determines validity. The study considered absolute and incremental fit indices to ascertain that the model adequately fits the data. The Kaiser- Meyer- Olkin test is used to determine sampling adequacy for each variable in the model and for the complete model. The Kolmogorov-Smirnov test is used to show the non-normality of the data distribution. Path analysis in this research is done using Smart-PLS software.

2. Research Methodology

The current descriptive research uses a quantitative research method by collecting quantifiable information for statistical analysis of the population sample, in which it examines and analyzes the safety factors in the C-130 aeroplane.

The research independent variable is C-130 aircraft safety. Also, research-dependent variables are overhauling C-130 aircraft, guidance, control systems, and upgrading avionics systems.

The research hypotheses are as follows:

1. Upgrading the avionic equipment effectively reduces the flight safety risks of the C-130 aircraft.
2. The overhaul of this plane can be effective in reducing air accidents.
3. This plane's guidance and navigation systems must be upgraded urgently.
4. The installation of new equipment should accompany the service life of this aircraft.

5. Standard training of flight crews regarding safety risks is essential.

6. The life, overhaul, and installation of the avionics equipment of this aircraft is cost-effective.

7. Upgrading and installing safety equipment increases the reliability of aeroplane flight.

2.1 Statistical Society

One of the goals of scientific research is to describe the state of society. Society is a group or class of people, objects, variables, concepts, or phenomena that share at least one characteristic, and the usual method is to select samples from society.

The statistical society of this research consists of several pilots, navigators, flight engineers, and technical experts, whose total number is 382.

2.2 Sample Size

A sample is a percentage of the total population in statistics. You can use the data from a sample to make inferences about a population as a whole. Finding a sample size can be one of the most challenging tasks in statistics and depends upon many factors, including the size of your original population. You can use many different formulas, depending on what you know or do not know about your population [14].

This article uses the Cochran's formula to calculate the sample size. The Cochran formula allows you to calculate an ideal sample size given a desired level of precision, desired confidence level, and the estimated proportion of the attribute present in the population. Cochran’s formula is considered especially appropriate in situations with large people. A sample of any given size provides more information about a smaller population than a larger one, so there’s a correction through which the number given by Cochran’s formula can be reduced if the population is relatively small [14].

The Cochran formula is [15]:

$$n = \frac{\frac{z^2pq}{d^2}}{1+\frac{1}{N}\left(\frac{z^2pq}{d^2}-1\right)} \tag{1}$$

Where:

n = Sample size,

N= Population size,

z = Level of confidence according to the standard normal distribution (for a level of confidence of 95%: $z = 1.96$ and a level of confidence of 99%: $z = 2.575$),

p = Estimated proportion of the population that presents the characteristic (when unknown, we use $p = 0.5$),

q = denotes the proportion of the population not having this characteristic ($q = 1 - p$),

d = Tolerated margin of error (for example, we want to know the real proportion within 5%).

By substitution of the value of 382 for N, the value of 0.05 for d, the value of 1.96 for z, the value of 0.5 for p, and the value of 0.5 for q into the equation (1), the sample size can be obtained:

$$n = \frac{\frac{1.96^2\times0.5\times0.5}{0.05^2}}{1+\frac{1}{382}\left(\frac{1.96^2\times0.5\times0.5}{0.05^2}-1\right)} = 192.44 \tag{2}$$

Then, the sample size of 192 people is obtained.

2.3 Demographic Characteristics of the Respondents

There were a total of 192 responses. After data screening, which involved the removal of incomplete or unengaged responses, 168 valid responses remained. Table 1 shows the characteristics of the respondents.

Table 1. Respondents demographic data.

Age Range	**Frequency (n)**	**Percentage (%)**
20-30	13	7
31-40	69	36
41-50	100	52
51-60	10	5
Total	192	100
Sex		
Male	192	100
Female	0	0
Total	192	100
Highest Educational Attainment		
Bachelor’s Degree	132	69
Master’s Degree	56	29
PhD	4	2
Total	192	100
Working Experiences		
0-10	6	3
10-20	50	26
20-30	128	67
30-40	8	4
Total	192	100

2.4 Sampling Method

According to the statistical population under study, this research uses a proportional stratified sampling method. Stratified sampling determines the number of data items in each subgroup, requiring a secondary sampling method to select the individual data items. This is usually through a simple random sampling technique[1]. This is why a stratified sample can also be called a stratified random sample.

1. a random number generator

Therefore, 200 people were randomly selected from the four mentioned categories based on the statistical population's population ratio and the questionnaire distributed among them.

2.5 Data Collection Tool

In this research, a questionnaire is used as a data collection tool. A questionnaire is a list of questions or items used to gather respondent data about their attitudes, experiences, or opinions. A researcher-made questionnaire is used to collect data, and this questionnaire includes two sections: general and specific questions.

General questions include age, educational qualification, and years of professional experience, and specific research questions are based on the purpose of the research. The number of particular questions in the questionnaire includes 38 questions with 5-point answers based on a 5-point Likert scale from 1 for very little to 5 for very much. Safety of C-130 guidance and control is measured with the following items:

- Upgrade of avionics equipment: 4 questions,
- Extending the service life of the aircraft: 3 questions,
- The moral of the flight crew: 4 questions,
- Flight crew training based on military standards: 6 questions,
- Installing flight safety equipment and increasing aircraft reliability: 7 questions,
- Installation of guidance and navigation equipment: 6 questions,
- Upgrade of flight control system: 8 questions.

2.6 Reliability and Validity

Reliability and validity are concepts used to evaluate the quality of research. They indicate how good a method technique is. Or test measures something. Reliability is about the consistency of a measure, and validity is about the accuracy of a measure. It’s important to consider reliability and validity when creating your research design, planning your methods, and writing up your results, especially in quantitative research. Reliability and validity are closely related, but they mean different things. A measurement can be reliable without being valid. However, if a measurement is accurate, it is usually also reliable [16].

Reliability refers to how consistently a method measures something. The measurement is considered reliable if the same result can be achieved using the same techniques under the same circumstances [16]. Reliability studies are commonly used in questionnaire development studies and questionnaire validation studies. Different types of reliability can be estimated through various statistical methods. Cronbach's alpha test is usually applied to test the consistency and stability of the questionnaires that measure latent variables. Cronbach's Alpha is calculated using the following formula:

$$\alpha = \frac{K}{K-1}\left[1 - \frac{\sum_{i=1}^{K} S_i^2}{S^2}\right] \quad (3)$$

Where:

α = Cronbach’s Alpha,

K = The number of subsets of questionnaire or test questions,

S_i^2 = The variance associated with each item i,

S^2 = The variance associated with the total scores.

A rule of thumb for interpreting alpha for Likert scale questions is given in Table 2. In general, a score of more than 0.7 is usually okay. However, some authors suggest higher values of 0.90 to 0.95.

Also, The reliability assessment is assessed by Composite Reliability (CR), and validity is determined by Average Variance Extracted (AVE).

Validity refers to how accurately a method measures what it is intended to measure. Research with high validity produces results corresponding to real properties, characteristics, and variations in the physical or social world [16]. The main types of validity are face validity, content validity, construct validity, and criterion validity.

In this research, the questionnaire was referred to experts in several stages for the face validity test. Its defects were corrected, the questionnaire was finalized, and the desired validity was confirmed. Also, the questionnaire was given to twelve expert pilots, and they were asked to solve the ambiguities and problems in the questionnaire. For more validity, the questionnaire was given to ten experts, and they were asked to comment on the clarity and correctness of the questions and approve the questionnaire.

Table 2. Range of reliability and its coefficient of Cronbach's alpha [17]

Cronbach’s Alpha	Reliability Level
$0.9 \leq \alpha$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

Therefore, the final questionnaire of the research was prepared based on the opinions of the people mentioned above, and this questionnaire was given to the respondents in the same way to collect the information needed for the research.

2.7 Factor Analysis

The Kaiser-Meyer-Olkin (KMO) test measures how suited your data is for Factor Analysis. The test measures sampling adequacy for each variable in the model and for the complete model. The statistic measures the proportion of variance among variables that might be common variance. KMO returns values between 0 and 1. A rule of thumb for interpreting the statistic:

- KMO values between 0.8 and 1 indicate the sampling is adequate.
- KMO values less than 0.6 indicate inadequate sampling and that remedial action should be taken. Some authors put this value at 0.5, so use your judgment for values between 0.5 and 0.6.
- KMO values close to zero mean significant partial correlations compared to the sum of correlations. In other words, widespread correlations are a considerable problem for factor analysis [18].

2.8 Parametric or Non-Parametric Tests

When choosing a statistical test for research, one must decide whether to use parametric or non-parametric tests. One of the main criteria for this selection is the Kolmogorov-Smirnov test. The Kolmogorov-Smirnov test shows the non-normality of the data distribution. It means that it compares the distribution of a trait in a sample with the distribution assumed for the society. If the Kolmogorov-Smirnov test is rejected, the data have a normal distribution, and it is possible to use parametric statistical tests for research. Conversely, if the Kolmogorov-Smirnov test is confirmed, the data do not have a normal distribution, so the study should use non-parametric tests.

In SPSS software, on the Kolmogorov-Smirnov test result page, if this test was significant [2] it means that the data distribution is not normal and non-parametric tests can be used, and vice versa because the confirmation of this test is a sign of non-parametric data.

3. Results and Discussions

3.1 Results Regarding the Reliability

After distributing 30 questionnaires as a preliminary test, Cronbach's alpha is calculated using SPSS software, and the computed alpha value for each variable and the total alpha are given in Table 3.

Table 3. Cronbach's alpha value of C-130 guidance and control evaluation indicators

Variable	**Number of Items**	**Reliability Cronbach's Alpha**	**Comment**
Upgrade of avionics equipment	4	0.87	Accepted
Extending the service life of the aircraft	3	0.88	Accepted
The moral of the flight crew	4	0.88	Accepted
Flight crew training based on military standards	6	0.87	Accepted
Installing flight safety equipment and increasing aircraft reliability	7	0.88	Accepted
Installation of guidance and navigation equipment	6	0.88	Accepted
Upgrade of flight control system	8	0.89	Accepted

According to the results from Table 3 and Table 2, since Cronbach's alpha value of all variables is more than 87%, with 95% confidence, it can be said that all variables have good reliability and are approved.

CR assesses the reliability of the assessment, and AVE determines validity. Table 4 presents the results for CR and AVE, which would be necessary for consideration in confirmatory factor analysis. The acceptable values for CR and AVE should be 0.70 and 0.50, respectively [19]. The higher the value of CR and AVE, the more reliable and valid the construct to be tested. In this study, all variables satisfactorily fulfilled the requirements since the values of CR and AVE are more significant than the recommended values. Specifically, the range value for CR is between 0.790 and 0.930, and the value of AVE for each variable is between 0.519 and 0.822.

The study considered absolute and incremental fit indices to ascertain that the model adequately fits the data. The appropriate index was used to verify that the models used to test the hypothesis were adequate. All the Model Fit indices are given in Table 5. The value of RMSEA

2. i.e., p was smaller than 5 percent

(0.071) indicates the appropriateness of the fit of the structural model. The values of GFI and CFI above 91% are calculated, meaning the model's high fit.

Table 4. CR and AVE for all components

Variable	CR	AVE	Comment
Upgrade of avionics equipment	0.930	0.822	Accepted
Extending the service life of the aircraft	0.898	0.689	Accepted
The moral of the flight crew	0.853	0.660	Accepted
Flight crew training based on military standards	0.811	0.519	Accepted
Installing flight safety equipment and increasing aircraft reliability	0.874	0.623	Accepted
Installation of guidance and navigation equipment	0.821	0.641	Accepted
Upgrade of flight control system	0.790	0.622	Accepted

Table 5. Model Fit Statistics

FIT INDEX	Measurement Model	Recommended Value	Comment
GFI	0.91	>0.90	Accepted
CFI	0.95	>0.90	Accepted
RMSEA	0.071	<0.08	Accepted

3.2 Kaiser-Meyer-Olkin Test Results

Table **6** shows the results of calculations related to the KMO value for each of the components of the research model. As it is evident in Table **6**, the KMO values for the studied variables are higher than 0.6, so it can be said that the criterion of sampling adequacy has been estimated.

3.3 Kolmogorov-Smirnov Test Results

The results of the Kolmogorov-Smirnov test are presented in Table 7. As seen in Table 7, the significance level in each of the research variables is more than 5%; therefore, with a 95% confidence interval, it can be said that the above variables have a normal distribution.

3.4 Path Analysis Results

Path analysis is a form of multiple regression statistical analysis used to evaluate causal models by examining the relationships between dependent and independent variables. Path analysis in this research is done using Smart-PLS software. Table 8 shows the results of Smart-PLS software in brief. According to the results shown in Table 8, guidance and control systems, overhaul, navigation system upgrade, autopilot system upgrade, weather radar update, and crew training according to world standards are significantly effective in the safety of the C-130 aircraft.

Table 6. KMO values for each of the variables of the research model

Variable	KMO value
Upgrade of avionics equipment	0.850
Extending the service life of the aircraft	0.800
The moral of the flight crew	0.650
Flight crew training based on military standards	0.630
Installing flight safety equipment and increasing aircraft reliability	0.800
Installation of guidance and navigation equipment	0.751
Upgrade of flight control system	0.725

Table 7. The results of the Kolmogorov-Smirnov test of the variables

Variable	Kolmogorov Smirnov Statistic	Significance Level
Upgrade of avionics equipment	3.43	0.802
Extending the service life of the aircraft	3.07	0.704
The moral of the flight crew	4.01	0.952
Flight crew training based on military standards	4.46	0.799
Installing flight safety equipment and increasing aircraft reliability	2.39	0.629
Installation of guidance and navigation equipment	4.01	0.815
Upgrade of flight control system	3.71	0.799

Table 8. The standard coefficient and significance level of the questions

Questions	Standard Coefficient	Significance Level	Comment
Is the use of guidance and control systems according to the latest world standards effective in increasing the flight safety of the C-130 plane?	1.03	0.000	Accepted
Is the C-130 plane's overhaul effective in its flight safety?	1.18	0.000	Accepted
Is the navigation system of this plane old and needs to be upgraded?	0.98	0.000	Accepted
Is it necessary to upgrade the autopilot system of the plane now?	0.89	0.000	Accepted
Does this plane's weather radar still have the previous performance?	1.24	0.000	Accepted
Can the training of the crew of this plane regarding safety risks be effective in reducing air accidents and incidents?	0.79	0.000	Accepted
What factors affect the safety risks of C-130 aircraft guidance and control, and how can they be controlled?	0.95	0.025	Accepted

According to Table 8, obtained from the conceptual model and software analysis of the questionnaire, all research hypotheses are confirmed.

3.5 Rating of Components Affecting the Flight Safety of C-130 Aircraft

According to the obtained standard coefficients, the components affecting C-130 flight safety are shown in Table 9.

As shown in Table 9, according to the participants in the survey, updating the avionics equipment and updating the guidance and navigation system have a higher rank and are more important than other items.

Table 9. Rating of components affecting the flight safety of C-130 aircraft

Components	Rank
Upgrade of avionics equipment	1
Installation of guidance and navigation equipment	2
Extending the service life of the aircraft	3
Flight crew training based on military standards	4
Installing flight safety equipment and increasing aircraft reliability	5
The moral of the flight crew	6
Upgrade of flight control system	7

4. Conclusion

In this research, the safety issue of the C-130 plane was discussed, and the cases and patterns affecting the flight safety of this plane were tried to express. The hypotheses should be confirmed by considering hypotheses, preparing a questionnaire, and distributing it to experts in the aviation industry who usually deal with these aircraft. According to the participants in the survey, the upgrade of avionics equipment and the upgrade of guidance and navigation system have a higher rank and are more important than other items. Therefore, according to the study, the following points are suggested.

Considering that the effect of the avionics upgrading on the concept of C-130 flight safety is the highest among the considered components, it is suggested that the commanders and managers improve the avionics equipment of this plane. Also, many of the aircraft's analogue indicators have been digitized. It is recommended that the Glass Cockpit of this plane be seriously pursued. Also, other suggestions are to upgrade the avionics system, install an upgraded TACAN navigation system, and VHF and UHF radios on the C-130.

Considering that the effect of upgrading guidance and navigation systems on the concept of C-130 flight safety is the second rank, it is suggested that the commanders and managers of the organization take necessary measures to install an up-to-date navigation system on this aircraft. It is recommended that the class 2 electronic flight bag (EFB) be used in this plane, which can be charged with its electrical system and has a high standard.

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