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Research on Prevention Strategies of General Aviation Flight Accidents Based on Regression Analysis Method

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Abstract. Flight safety is important for the development of general aviation; this paper first analyzed the main accident types of general aviation, obtained various factors that cause general aviation flight accidents, regression analysis method was used to analyze factors data, prevention strategies of general aviation flight accidents were proposed in accordance with the analysis results.

Key words: List the, keywords covered, in your paper.

OVERVIEW OF REGRESSION ANALYSIS METHOD

Regression analysis method is analytical method by using data statistics principle, mass statistical data are processed by mathematics, and determine the correlation between the dependent variable and some independent variables and build a regression equation with better correlation (function expression), and try to extrapolate, and used to predict the change of the dependent variable in future. The steps of regression analysis method are as follows:

1. The regression equation is set according to the existing data and relationship between the independent variable and the dependent variable.
2. Find reasonable regression coefficient.
3. Carry out the correlation test and determine the related coefficient.
4, After meet the requirements of correlation, we can determine the future status of things based on obtained regression equation and the specific conditions and calculate the confidence interval of predictive value.

ANALYSIS OF CAUSES OF GENERAL AVIATION ACCIDENTS BASED ON REGRESSION ANALYSIS METHOD

In this paper, the specific reasons that cause the general aviation flight accidents are taken as the independent variable, and the results of general aviation accidents are taken as the dependent variable. The relationship among various factors and the influence degree of various reasons on general aviation accidents are explored. According to the regression analysis method, the following steps are used to analyze.

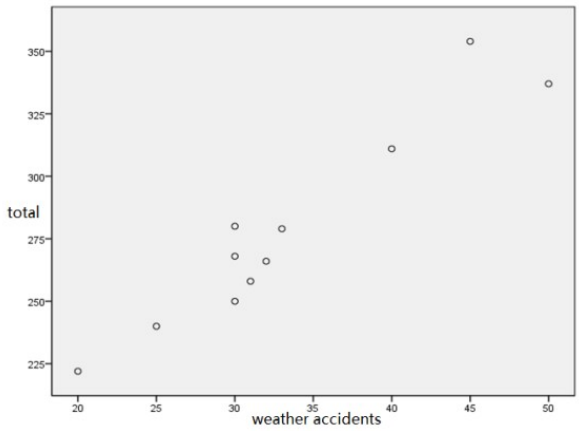
Determine variable and build scatter diagram

Determine variable

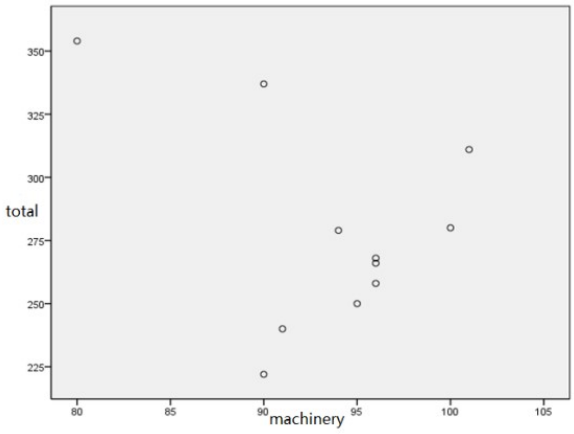
By analyzing the causes of general aviation flight accidents in the last decade, we can get the main reasons for general aviation flight accidents as follows: bad weather, mechanical failure, unit arrangement, ground support, management negligence, and navigational matters and so on. In this research, the weather accidents, machinery, unit, maintenance, ground support, management, navigational matters, air traffic control, others, responsibility undetermined these factors as independent variables, the accident results as the dependent variable.

Build scatter diagram

Each kind of reason represent one figure, such as Figure 2-1 to Figure 2-8 in scatter diagram, The abscissa corresponding to each points is, in this year, the number of events caused by this reason, and the ordinate corresponding to each point is, in this year, the total number of events.



(a)



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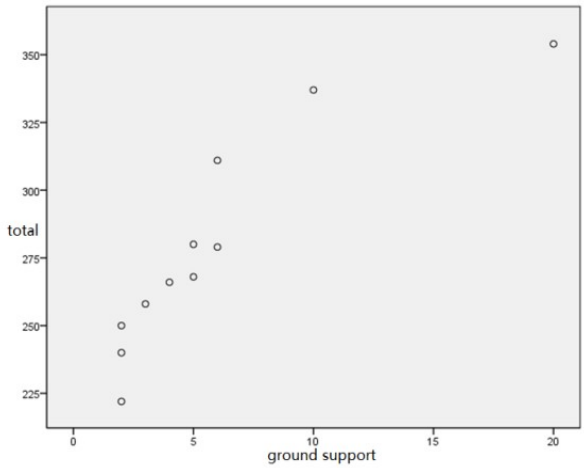

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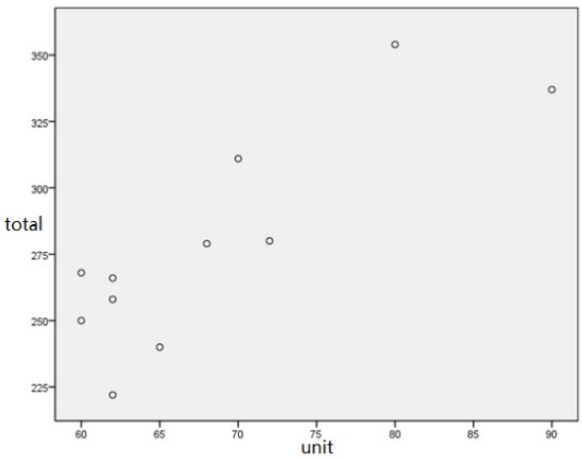

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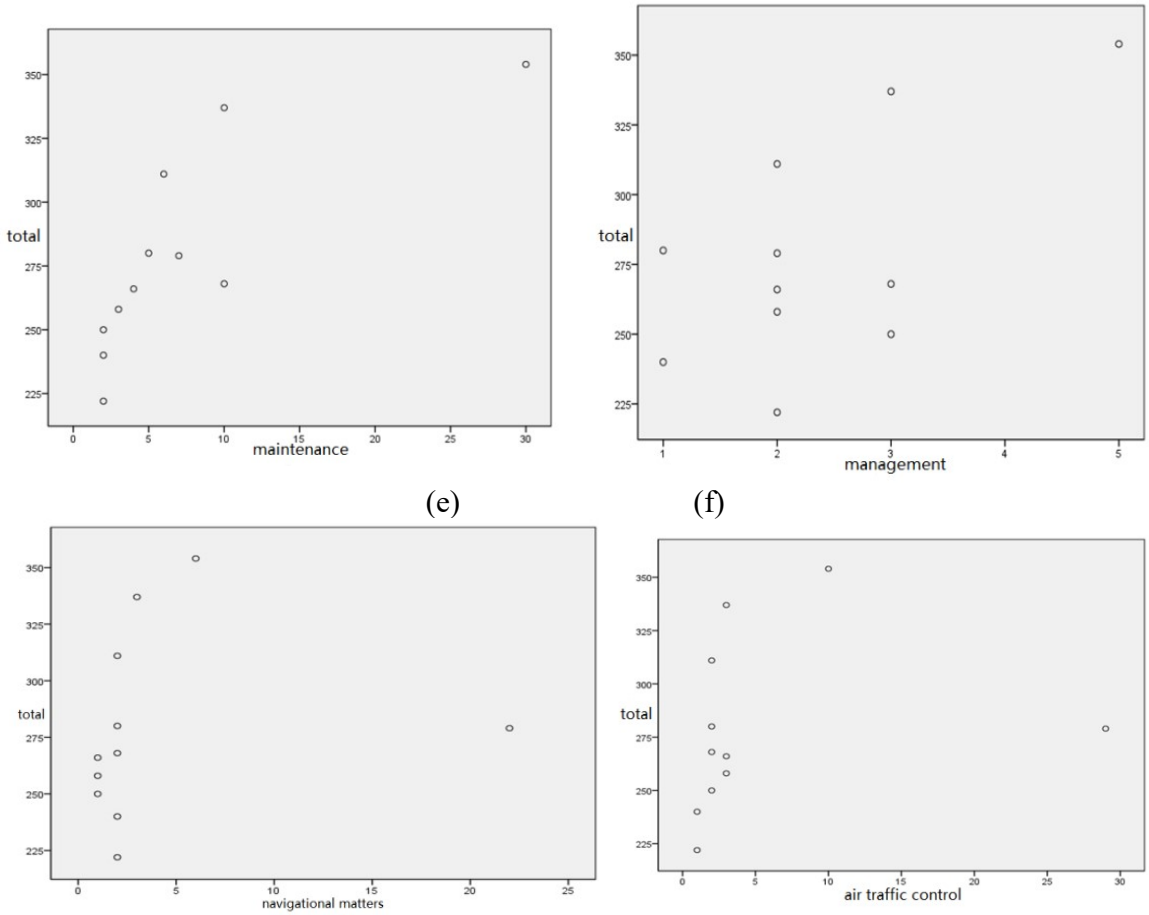

FIGURE 1. The total number of events.

As can be seen from the analysis of the scatter diagram, the ground support, maintenance, navigational matters and air traffic control these four factors are highly correlated with accident, other factors such weather accidents, machinery, unit, management these several factors are not highly correlated with accidents, but they are important analysis objects as well and cannot be neglected, however, comparatively speaking, the above four factors are major considerations.

Carry out correlation analysis

Correlation analysis is to analyze two or more variable elements with correlation, so as to measure the relatively close extent of the two variable elements [2]. The elements of correlation need to have a certain connection or probability to be able to carry out the correlation analysis. Correlation is not equal to causality, nor is it simple personalization. The above reasons for the general aviation flight accidents are carried out correlation analysis of, as shown in Table 1.

TABLE 1. Reason correlation of general aviation flight accidents

		weather accident	machinery	unit	manage	ground support	maintenance	navigational matters	air traffic control	responsibility undetermined	others	total
weather accident	Pearson correlation	1	-.286	.842**	.588*	.765**	.641*	.123	.170	.164	.899**	.955**
	significance (one side)		.197	.001	.028	.003	.017	.360	.309	.315	.000	.000
	N	11	11	11	11	11	11	11	11	11	11	11
machinery	Pearson correlation	-.286	1	-.425	-.684*	-.683*	-.708**	-.155	-.186	.210	-.109	-.355
	significance (one side)	.197		.096	.010	.010	.007	.324	.292	.268	.374	.142
	N	11	11	11	11	11	11	11	11	11	11	11
unit	Pearson correlation	. 842**	-.425	1	.377	.723**	.570*	.145	.135	-.279	.806**	.845**
	significance (one side)	.001	.096		.126	.006	.034	.335	.346	.203	.001	.001
	N	11	11	11	11	11	11	11	11	11	11	11
manage	Pearson correlation	.588*	-.684*	.377	1	.789**	.836**	.058	.140	.111	.419	.624*
	significance (one side)	.028	.010	.126		.002	.001	.432	.341	.373	.100	.020
	N	11	11	11	11	11	11	11	11	11	11	11
ground support	Pearson correlation	.765**	-.683*	.723**	.789**	1	.973**	.221	.283	-.122	.750**	.887**
	significance (one side)	.003	.010	.006	.002		.000	.257	.200	.361	.004	.000
	N	11	11	11	11	11	11	11	11	11	11	11
maintenance	Pearson correlation	.641*	-.708**	.570*	.836**	.973**	1	.200	.266	-.116	.638*	.791**
	significance (one side)	.017	.007	.034	.001	.000		.278	.215	.367	.017	.002
	N	11	11	11	11	11	11	11	11	11	11	11
navigational matters	Pearson correlation	.123	-.155	.145	.058	.221	.200	1	.987**	-.105	.152	.173
	significance (one side)	.360	.324	.335	.432	.257	.278		.000	.379	.327	.305
	N	11	11	11	11	11	11	11	11	11	11	11
air traffic control	Pearson correlation	.170	-.186	.135	.140	.283	.266	.987**	1	-.012	.175	.220
	significance (one side)	.309	.292	.346	.341	.200	.215	.000		.486	.304	.258
	N	11	11	11	11	11	11	11	11	11	11	11
responsibility undetermined	Pearson correlation	.164	.210	-.279	.111	-.122	-.116	-.105	-.012	1	-.082	.003
	significance (one side)	.315	.268	.203	.373	.361	.367	.379	.486		.406	.496
	N	11	11	11	11	11	11	11	11	11	11	11
others	Pearson correlation	.899**	-.109	.806**	.419	.750**	.638*	.152	.175	-.082	1	.953**
	significance (one side)	.000	.374	.001	.100	.004	.017	.327	.304	.406		.000
	N	11	11	11	11	11	11	11	11	11	11	11
total	Pearson correlation	.955**	-.355	.845**	.624*	.887**	.791**	.173	.220	.003	.953**	1
	significance (one side)	.000	.142	.001	.020	.000	.002	.305	.258	.496	.000	
	N	11	11	11	11	11	11	11	11	11	11	11

**. There is a significant correlation at the.01 level. (one side).
*. There is a significant correlation at the 0.05 level (one side).

Each value in the table is the P value as well; it shows the relationship between the two factors corresponding to the value, that is, and it is the significant level. Generally, less than 0.05 is significant; if less than 0.01 is more significant; for example, the P value =0.001, it is a very high significant level. As can be seen from the data in the table, correlation coefficient between machinery and maintenance, between unit and ground support, between management and machinery, between ground support and maintenance, between navigational matters and air traffic control are all below 0.5, it shows that there are higher significant levels among these factors, that is to say, the relationship among several reasons is the greatest.

Specifically, between machinery and maintenance, maintenance work is responsible for the machinery work of the aircraft, so the two have a very high correlation, between the unit and the ground support; when the aircraft is taking off and landing, the crew must communicate with the ground support personnel, the two cannot be separated, so the two have high correlation; among management and machinery, ground support, maintenance three kinds of factors, there are management factors in three kinds of factors, so the correlation between them and management are relatively high; between the ground support and maintenance, maintenance work must need ground support and assistance, so there is a high correlation between the two; between navigational matters and air traffic control, air traffic controllers and flight crew in order to flight safety, they need close communication, so the correlation between the two is high.

The correlation coefficients among other combinations are not very obvious, it shows that they are not related, or have little relationship, so ignore the situation which is not significant for the moment, and mainly analyze the situation with high significant degree. So, according to the analysis results, when the prevention measures are

proposed, mainly from the following aspects: machinery, units, maintenance, ground support, management, navigational matters and air traffic control flight.

Analysis of Model Results

TABLE 2. Model summary

model	R	R-squared	adjust R-squared	standard	estimation error
1	0.900a	0.800			

a. predictive variable: (constant), responsibility undetermined, air traffic control, management, others, machinery, unit, maintenance, navigational matters, weather accidents, ground support.

The model summary is shown in Table 2-2, determine coefficient R-squared=0.800, the goodness of fit is high, it shows that the independent variable has a high influence degree on the dependent variable, the main independent variables adopted are, machinery, unit, maintenance, security, ground support, management and air traffic control. The results of the regression analysis, under the factors listed, some factors such as unexpected weather, the impact on flight accidents is not strong, when precautionary measure are taken, it cannot be ignored, and some factors, such as machinery, unit, maintenance, etc., they are must be taken into account, because such factors have the highest impact on flight accidents.

PREVENTIVE MEASURES AND STRATEGIES FOR CHINA'S NAVIGATION FLIGHT ACCIDENTS

Through the above analysis and calculation, when the accident prevention measures of general aviation are carried out, they can be mainly carried out from these aspects.

Mechanical factors include mechanical assembly and mechanical maintenance, mechanical assembly is to assemble aircraft in accordance with the designed technical requirements, mechanical assembly is an important part of mechanical maintenance, the quality of the assembly work plays an important role in efficiency, maintenance workload of aircraft, which requires the practitioner to master the structure and working principle of the aircraft, and master the principle of engine. If the staffs have a little carelessness, whether in the assembly or maintenance aspect, they will have a serious impact on the safety of the aircraft. This needs to strengthen the requirements and training of professionals.

The management factors include the air traffic control, the airport and the airline three parts. Because the time of aircraft in the flight process is longer, the air traffic control factors are ranked first in the sorting process. During air traffic control, a little mistake of controllers will cause flight accidents, and they need to maintain high pressure for a long time, it is unavoidable to be careless, at this time, the probability of plane accident will be very high. And the work of the airport is ground management, if there are mistakes in this link; it is because the communication among the ground staffs is not in place. The airline's keep in a close contact with the airport in serving customers, and the impact on flight safety cannot be ignored. So it is necessary to strengthen management and communication.

The factors of navigational matters include communication with AOC and confirmation before flight two parts. These two parts is reflected, before the plane takeoff, navigational matters should confirm maintenance work of aircraft with the AOC department, and the confirmation of the aircraft's load and the nature of the goods, if there is wrong in this link, it will have a great relationship with workers' working attitude, the consequences will be serious. This requires a correct working attitude.

The unit factors include the pilot, the safety officer and the crew three parts. As the controller of the aircraft, the pilot is undoubtedly the most important to the safety of the flight, if the pilot has a little wrong manipulation, there will be a flight accident. And the safety officer is mainly responsible for the safety of the cabin, the crew is mainly responsible for the service on the plane, and the impact on the flight safety is not so great. Here, the requirements for the engineering level are higher.

Maintenance factors include maintenance field staffs and maintenance office staffs two parts. The job done by the maintenance crew is the aircraft maintenance; this point is almost the same as the mechanical factors. The maintenance field staffs are responsible for work outside the station, they are mainly engaged in maintenance work of flight line; maintenance field staffs are mainly responsible for the maintenance work of the internal parts of the aircraft. It is also a job requiring technology. Of course, if there is a problem in this part, then the safety of flight will not be guaranteed, so it is necessary to strengthen the training of technical personnel.

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