

Analysis for the Indicator Light Indicating Abnormality of the Electronic Programmable Controller

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Abstract— During installing the seat on fighter, the electronic programmable controller of the seat can receive the atmosphere data, but the indicator light indicates abnormally. The phenomenon is considered, the atmosphere data signal from the electronic programmable controller is analyzed and the cause is gotten by going deep into the mechanism of the problem.

Keywords- Atmosphere data; RS429 signal; RS422 signal

I. SOURCE OF PROBLEMS

During joint debugging of seat, it has been found seats program-receives exception signal programmable led display for atmospheric data (irregular flashing) and program-receive LED indicate abnormal failure when air data signals, LED indicate status, fault status indicator is not clear, is not easy to identify the problem. These issues directly affect the aircraft's flight safety, such as unable to locate and solve the problem in a timely manner will result in the aircraft fully grounded, impact research training and the work of a successful test flight.

II. WORKING PRINCIPLES OF ELECTRONIC PROGRAMMABLE CONTROLLER ON SEATS

When the aircraft is during normal flight, program automatically receives air data system parameters from the aircraft, and can feel the speed from the airplane's airspeed, height parameters and to determine whether the ejection seat pull off the true signal and the start signal. After ejection seat emergency start, programmable thermal battery receives a start signal and a seat pull off the start signal, will feel instantly catapult spacewalk from the airplane's pitot speed, altitude parameters and ejection posterity - which seat systems height argument and ejection from the environment

from the atmosphere before the machine system on the aircraft system parameters are compared, the arithmetic processing, in accordance with a predetermined speed control box - height - delay state, the delay time depends on the launch of the aircraft speed and altitude given shot umbrella separation time. Date of Receiving: May 27, 2014

Introduction to the Author: Deng Guopeng (1977-), male, undergraduate, engineer, mainly engaged in flight organization and management

Program-RS429 signal processing modules running and monitoring module consists of two parts. Monitor running module main reception on board, pitot signals and seat signals and handling, speed, highly effective value, delayed control, and other functions. RS429 receives air, bus RS429 signal receiving and processing modules (including barometric altitude, barometric altitude, Mach number, the correct airspeed, true airspeed, stable temperature, total pressure and static pressure), converted to a RS422 data for RS422 after data processing, sent to monitor running module.

Send atmospheric air data parameters, electronic programmable device receives atmospheric systems RS429 data, determine, packaging them into a RS422 signal data formats, and then sends the data to run program-monitoring module, electronic controlled atmospheric data receiving and processing signal process as shown in Fig. 1.

Monitoring run the module initialization after the self test to enter the system monitoring program, are in a wait state (seat no ejection seat), press the cycle signal on the query in the order received, State inspection and testing have no start/start signal, collecting the airspeed pitot/static pressure. Monitor idle time to determine inorganic signal if

signal on organic, receive RS422 signal indicates the data if that data is processed; otherwise an error signal/alarm indication. If there is no signal on, the monitor order status checking, testing has no start/start signal, collection storage total static pressure from the pitot tube system signals.

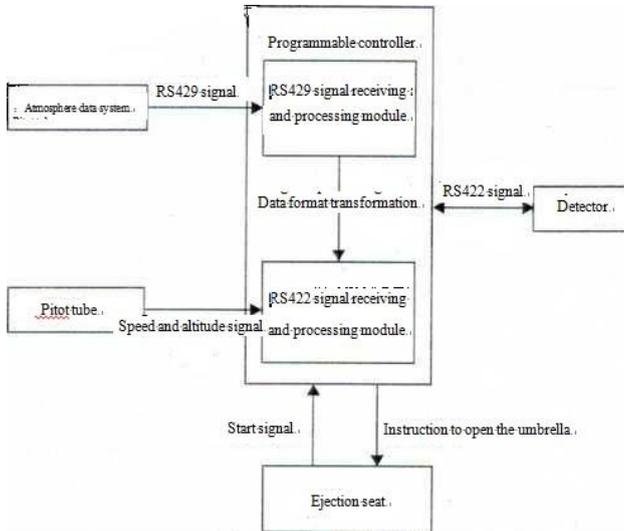


Figure 1. Diagram of Processing Atmosphere Data and Signals

When the ejection seat starts, monitor running module detects starting / start signal into the delay control module, the received signal is parsed machine, select the ejection start signal the last valid calibration and true airspeed static atmospheric parameters as RMS signal on board, pitot speed before starting the acquisition of catapult, height signal value is determined according to a predetermined decision logic speed, altitude RMS, to delay control.

System is in a power-on self test, or while waiting for a State, control module self test results in a different state of the system display output status led, indicates work State separately. When there are organic signals, each receives a set of atmospheric monitoring module RS422 data, if it is normal, 7K light flashes once.

III. PRELIMINARY ANALYSIS

The seat was taken by the electronic program-receives work principle analysis of atmospheric data signal, programmable status indicator to indicate that the exception from two aspects;

(1) When seat electronic control device is not connected to atmosphere signal, the status of electronic control

electronic control device status LED indicates normal judging program-control system works properly (from the status indicator light flashes only).

(2) Seat electronic program-air signals, electronic programmable device status is: electronic programmable device status LED indicate does not comply with the technical documentation requirements, determine the program-control system is not working properly. Preliminary analysis of this fault is the atmospheric systems and seat electronic control device caused by cross-linking, cross-linking relationships analyzed on two systems

① Both atmosphere data system and seat electronic programmable controller are powered on, and judge whether they are normal through self test;

② If both of the two systems are working properly, make further test into the technical indexes of atmosphere data computer and seat electronic programmable controller according to technical protocol to find out where the problem lies.

After processing the problem, air data computer electronic programmable device and seat of cross-linking checks, protection systems in accordance with the technical agreement is cross-linked properly curing technology.

IV. POSITIONING OF FAULTS

Through preliminary analysis, both seat electronic programmable controller and atmosphere data system are powered on with their respective systems running normally.

The electronic program-control system and air data computers removed from the plane, and check the specification of each system separately.

To detect the air data computer sends a signal, signal is properly formatted, the signal cycle of instability, sent under cycle requirements are not met, leading to run program-monitoring procedures for receiving and processing data drop-frame air data signals, status LED indicates the fault exception.

Program-receive send order data order and air data computer is inconsistent. Program-format according to RS422 signal receiving and processing of air data computer

RS429 signal format of the data that is sent when press RS429 the air data computer signal format when sending data, program will show audio data format does not match the data received is not complete, calculate error results, the status LED indicates abnormal trouble.

V. TREATMENT OF PROBLEMS

A. *Improvement of Receiving Processing Module of Programmable Controller RS429*

Atmosphere computer sends 8 RS429 data in each cycle. Program-RS429 signal processing modules by address then judged the last data from low to high end format, signal receiving and processing lead program-receives the air data computer signal error solution. By changing the program-RS429 signal processing modules receive several ways to solve this problem.

Programmable controller RS429 signal receiving and processing module improvements received. Data register individually to determine whether the received data full 8, if the eight RS422 is packaged as a frame data signal upload, avoiding the sequence change because air data computer to send data incomplete problem programmable controller receives the data to solve the program-controlled air data received abnormal results at fault solvers. Using RS429 signal receiving improved treatment, even if the air data computer change any order of sending data, it would not have received the results of atmospheric data at understanding count the abnormality.

Improved RS429 signal receiving and processing way enable the order for computer to send atmosphere data changeable without abnormal results in receiving and processing atmosphere data.

B. *Change Atmosphere Data through Computer*

Atmosphere data transmitted through computer do not have stable cycle, which is also the reason for abnormal status indicator of the programmable controller. Change the cycle of transmitting atmosphere data through computer to

make atmosphere data transmitted through computer and give programmable controller signal cycle to meet the requirements of technical agreement.

VI. CONCLUSIONS

When programmable controller receives atmosphere data, the status indicator is abnormal, which is caused by the cross-linking of two systems: one is that cycle to transfer atmosphere data does not meet the technical agreement, and another is that programmable controller has a misunderstanding of the format of RS429 signal.

Coordinated atmospheric data signal cycle strictly technical agreements to ensure consistent atmosphere data computer technology products.

Improve the signal receiving and processing module of programmable controller RS429, solving the problem of abnormal programmable controller's status indicator because data of RS429 format are sent to atmosphere system according to the RS422 format.

After the signal receiving and processing module of programmable controller RS429 is improved, it receives 8 data sent by atmosphere parameter, and the solution of programmable controller's receiving data is normal. Using analog signals sent by the source data cycle of atmospheric parameters data, program-control led indicates normal, normal data are received, and data calculation results are normal.

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