Advances in Integrated Avionic Systems

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Abstract
With the development of flying quality and need, the functions of avionic systems is increasing. Information organization and environmental constitution is becoming more complicated. How to improve the performance of avionics system and consider the development of avionics system, this paper puts forward some ideals, hoping to be beneficial to the development of avionics system.

Keywords: *Integrated Avionic Systems, Optimization and synthesis for Avionic Systems*

1 INTRODUCTION

With the development of flying quality and need, the functions of avionic systems is increasing. Information organization and environmental constitution is becoming more complicated. Avionic system is a flying application organization and is used for complicated system functional organization, is also based on complicated equipment organizations, and is typical system based on applications, dispositions and capabilities.

There are several characters of avionic systems as shown below. Avionic system lies in a background which is complicated environment, concurrent assignments and several kinds of targets. Different kinds of elements, complicated relations, and different kind's organizations with varied impact factors are in avionic system. Using different disposition methods with multi-discipline, avionic system is becoming an organization with different capabilities. Single systematic organization, disposition and management cannot comply with the efficiency demand of systematic organization. Thus, comprehensive technology of system is the most important developing direction of coming avionic system.

New generation avionic system can be divided into different parts shown in below, flying-oriented comprehension, including flying-capability efficiency improvement; system-functional integration-oriented, including system function efficiency and quality; system equipment integration-oriented, including equipment using efficiency etc. the basic and specific architecture of highly synthesis avionics system is shown in Figure1 and Figure 2 below.

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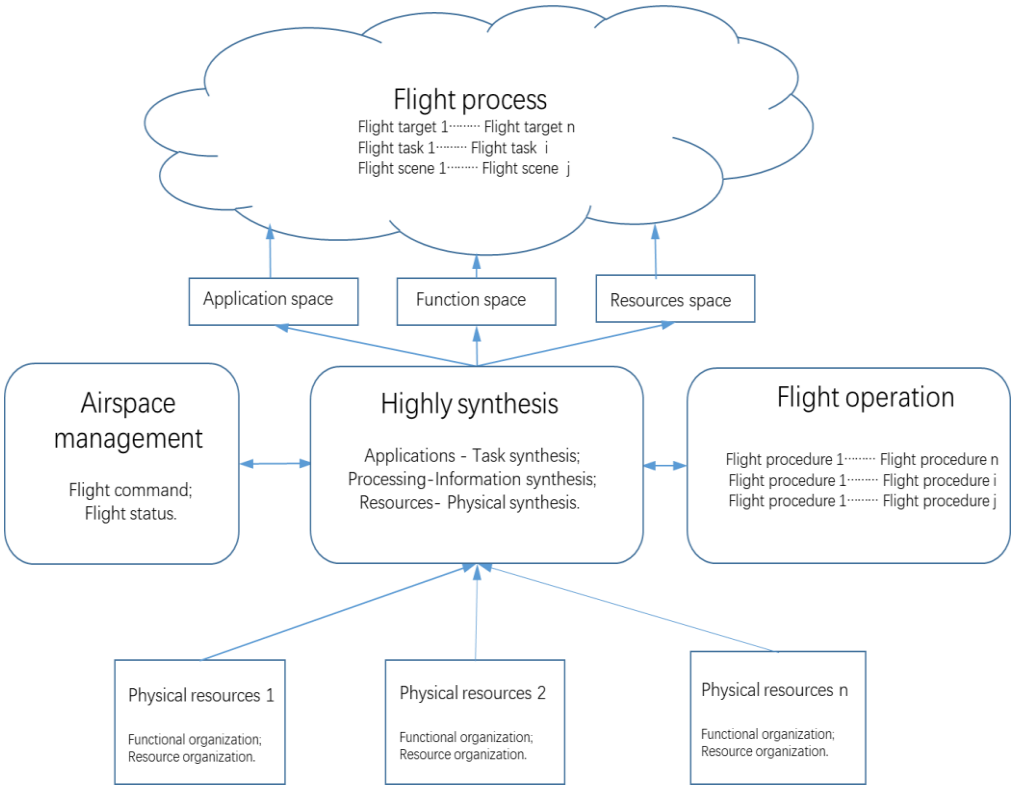

Figure 1 Basic architecture of highly synthesis avionics system

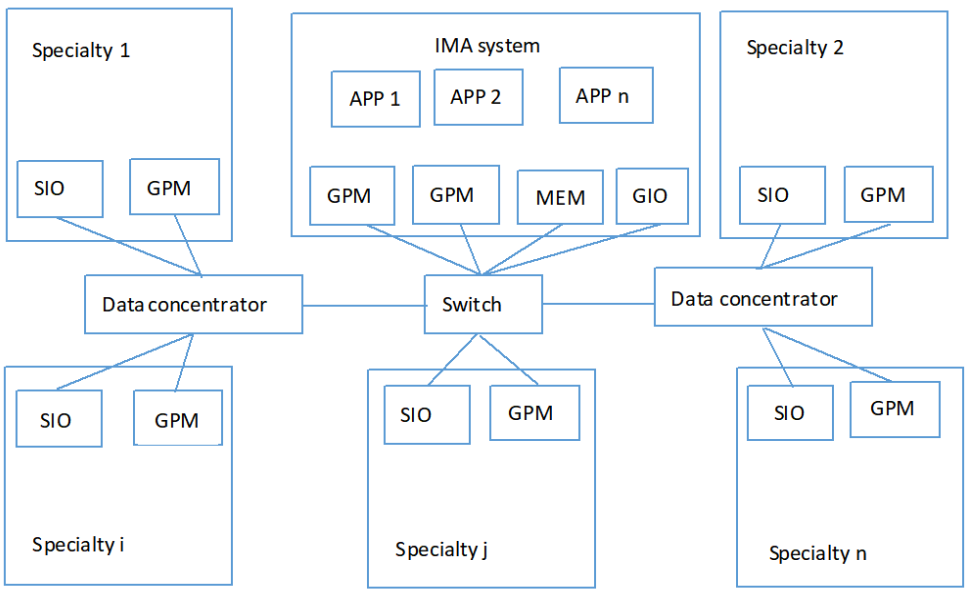

Figure 2 Specific architecture of integrated avionics system

2 OPTIMIZATION AND SYNTHESIS FOR FLIGHT APPLICATION ORGANIZATION

The core object of avionic system is improving the capabilities of flying, fly qualities and fly efficiency. Thus, according to flying application processes, the main task of avionic system integration is the identification of the demand of the flying capability, establishment of flying organization and the improvement of flying processes.

The technology of organization improvement used in avionic system is assignment comprehension and is task-oriented, process-oriented and capability-oriented. Characteristics of task-oriented technology are, firstly, according to flying phase flying scene, establishing traffic-oriented environment synthesizing, qualifying task-oriented capability synthesizing, forming the flying-oriented synthesizing and improving the perceptional

capability of aircraft; secondly, according to flying phase flying scene, establishing traffic-oriented environment synthesizing, qualifying task-oriented capability synthesizing, forming the flying-oriented synthesizing and improving the perception capability of aircraft. thirdly, according to the management of task, establishing the comprehension of task, domain and function domain, assuring to the capability, process and result, forming comprehension of environment, target and capability of decision enhancing the ability of task

3 OPTIMIZATION AND SYNTHESIS FOR SYSTEM FUNCTION ORGANIZATION

The core object of avionic system is improving the capabilities of system function, enhancing disposition efficiency of system function. Thus, target on the demand of system task organization, avionic system shall be accomplishing flying processing function organization and optimization of disposition.

The technology of the optimization of function component used in avionic system is function comprehension and is task-oriented, process-oriented and capability-oriented. Characteristics of system function comprehension are shown in below, firstly, according to capability demand of system task, target on capability class. based on classification of function and running model, establishing synthesis of system function target, quality and effect based on classification of system function disciple; secondly, according to capability demand of system function element operations, target on the disciple of system task processes, establishing logic element target, quality and scope based on capability of system function disposition, thirdly, according to the in-put capability of system sensors, target on the in-put demand of system task, establishing the comprehension based on system sensor target, performance and effectiveness; fourthly, incorporation of system information is a kind of comprehensive technology based on the ability of system information, constitutes and importance, it can greatly enhance the capability of disposition of system, quality and effectiveness, achieving the target of avionic system information capability, quality improvement and effectiveness of results.

4 OPTIMIZATION AND SYNTHESIS FOR EQUIPMENT RESOURCE ORGANIZATION

System equipment resource is a platform for applied task of flying processes, running and disposition of system function. It has several features shown in below.

Firstly, management, control and sharing of system resources; secondly, establishing the ability of re-using the resource maneuver. Based on the capability demand and efficiency of system disposition, target on the model of system task and functional disposition, establishing the function comprehension based on functional parts, re-using and sharing of system disposing model. Thirdly, according to system reliability and capability demand, target on applied task of system and function disposition results, establishing the comprehension based on the task/failure, function/fault, resource/defect management of system management model System equipment resource comprehension is a kind of management based on self-ability of system, it enhances the capability, effectiveness and efficiency and is a guarantee of system capability, disposing efficiency and structural effectiveness.

5 CONCLUSION

With the continuous improvement of flight application capability, quality and efficiency requirements, the function expansion, information organization and environment composition of avionics system are becoming more and more complex. Avionic system is a complex system which is faced with complex flight application organization and complex functional organization. It is based on complex equipment resource organization. It is a typical complex system with application, processing and capability. In terms of flight application, avionics system is responsible for the organization of application, which has the organizational characteristics of different objectives, different environments, different spaces and different scopes. In terms of system capability, avionics system is responsible for the functional organization of the system, which has the composition characteristics of different fields, different disciplines, different functions and different qualities. In terms of equipment organization, avionics system is responsible for the organization of system resources, which has the organizational characteristics of different resources, different capabilities, different operations and different roles; In terms of operation management, avionics system is responsible for the operation organization of the system, which has the process characteristics of different tasks, different processes, different processing and different states; In terms of technical composition, avionics system is responsible for the organization of system technical capability, and has the operation characteristics of different knowledge, different methods, different tools and different results. Therefore, for this complex system, current avionics system must adopt an integrated system with application as the goal, function as the ability, equipment as the basis, process as the object and operation as the practice.

Integrated system is based on the organization of system application, capability and overall capability of equipment and the integration of system application, function and equipment. Avionics system integration is

to improve the flight process capability and efficiency through the integration of flight process objectives, environment and tasks according to the overall operation efficiency, efficiency and performance improvement requirements of the system; Improve the quality and efficiency of system function processing through the integration of the ability, condition and performance of system function organization; Through the type, operation and state synthesis of equipment resources, the sharing and effectiveness of system equipment resources are enhanced.

Avionics system integration technology aims at the application task, system function and equipment resource composition, and adopts the integrated technology of system activity synthesis, process integration, information fusion and resource sharing to realize the goal of avionics system integration according to the optimization requirements of system application goal, system capability and equipment operation.

Avionic system with the feature of comprehensive is based on demand of improvement of the whole efficiency, according to comprehension of target, environment and task, improving the capability and efficiency of flying processing, according to the comprehension of capability, performance, condition of system functions, improving the quality and efficiency of system functional disposition; according to class, control and configuration of equipment resources, enhancing the share and effectiveness of system resources. Thus, to accomplish the flying target and task, achieving the target of optimization of flying environment and condition, flying processes and management, flying system and function which is the main task of avionic system, avionic system using the technology of comprehension is a must.

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