

Study on Military Equipment Support Modeling and Simulation

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Abstract: In order to estimate the readiness, sustainability and support capability of the operational unit, an support simulation concept model of the military equipment is given as viewed from the system engineering modeling and simulation. Simulation test of military aircraft is analyzed in detail, it is composed of the operational mission, function maintenance process and resource modeling.

Key words: military equipment support; modeling; simulation

装备保障建模仿真研究. 章文晋, 康锐, 郭霖翰, 李瑞莹. 中国航空学报(英文版), 2005, 18(2): 142-146.

摘要: 为了评价作战单元的战备完好性、持续作战能力和保障能力, 根据系统工程的建模仿真思想提出了装备保障建模研究的仿真概念模型, 并以军用飞机为例对装备保障仿真试验进行了分析, 包括任务、功能、维修过程和资源利用建模过程等。

关键词: 装备保障; 建模; 仿真

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1 Integrated Support Simulation Model

The integrated support simulation model is comprised of support objects and supporting system model, and the model framework can be seen in Fig. 1. The support objective model mainly consists of operational mission model, function model, maintenance mission model (which comprises of preventive maintenance mission and estimation maintenance mission) and estimation model of op-

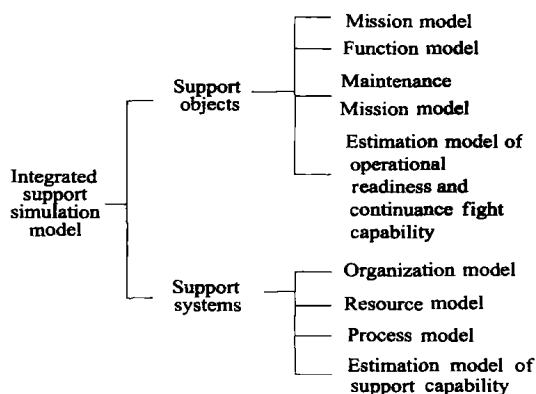


Fig. 1 Concept model framework

erational readiness and continuance fighting capability. Support system model comprises of organization model, resource model, support process model (which consists of operational mission support model and maintenance mission model) and the estimation model of support capability^[1].

The system function flow of integrated support simulation model can be seen in Fig. 2. The

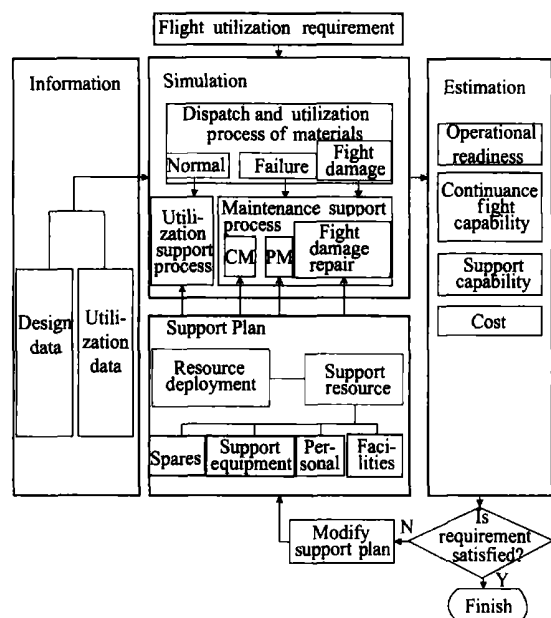


Fig. 2 Simulation flow chart

fighting function requirement is the process of changing the fighting or training plan to make the integrated support simulation model run, such as the detailed plans of everyday during the fighting and training periods, including the quantity of material needed, effect distance, start time and finish time of the mission, and the type and quantity of loading weaponry (ammunitions).

The left block deals with the information, which includes the input data used in integrated support model simulation and the data used to estimate the objects such as operational readiness of fighting units. These data are classified as follows:

1) Classified by source

a. Design data: design and analysis data of RMSTL CAD, and data from integrated support work flat;

b. Operation data: data from integrated support information system and data gather and exchange interface tools;

2) Classified by simulation model needs

a. Reliability data of material (such as MTBF of material, system, and units);

b. Maintainability data (such as MTTR of material, system, and units);

c. The law data of fighting damage;

d. Maintenance support process data (such as preventive maintenance cycle).

The upper part of the middle block is the simulation logic process, including dispatch operation process, operational support process and maintenance support process. The lower part is the support plan, concerning with the establishment of resource and resources (such as spares, personal, support equipments and facilities) of different levels.

The right block describes the estimating process of the integrated support model simulation test results, including operational readiness, continuance fighting capability, support capability and costs. If these requirements could not be satisfied, the support plan can be modified or the quantity of material under a certain cost restriction can be adjusted, and the simulation and estimation are per-

formed again.

2 Integrated Support Simulation Tests

(1) Mission simulation^[2,3]

Military equipment support simulation is a practical example which uses the simulation engine driven by dispersed event to execute every activity such as material utilization or maintenance support process and drive mission automatically. A series of statistics data on the running of integrated support model, such as failure time, maintenance time, maintenance cost and recourse utilization rate, can be get by a number of simulations for many times.

Let the cruise mission tasks of 24 aircrafts be chosen as mission objects of the simulation system. The mission model can be set up through simulating the dispatching process of this mission. The mission case is seen in Table1.

Table 1 Mission list

Mission time	5 days
Plane quantity	24
Plane quantity taking off per time	two per time
Starting time of fight per day	8 30
Finishing time of fight per day	18 30
Flight time per plane	2 hours
Minimum rounds of a plane per day	twice per day
Maximum rounds of a plane per day	3 times per day

The dispatch method of the plane fleet mission mainly simulates the dispatch work of support object assembly to justify whether the minimum plane quantity requirement could be meet under the defined mission profile. After the dispatch activity begins, the dispatcher would check the plane state to find the plane in available state, find the plane which could be dispatched according to the dispatch rule, and assign flying mission according to the mission profile, then record the dispatch process. After the flying command assigned, the plane which waits to take off will go to the parking apron to wait for the orders, and take off at the starting time.

The simulation flow of the plane flee mission model can be seen in Fig. 3. When dispatch activity begins, the dispatcher check the plane state to find available planes, confirm a serial number of planes

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