The fundamentals of multirole aircraft engine parameters optimization.

Dr. I.Bashkirov, TsAGI
Dr. Y.Ezrokhi, CIAM
aerobig@mail.ru

One of the main components of a multirole aircraft, determining it's flight performance characteristics, is the propulsion system.

At selection of aerodynamic arrangement parameters and jet engine working process parameters there are complexities stipulated by an inconsistency of sub- and supersonic flight regimes. Direct method of aerodynamic calculation - from geometry to the flight performance and maneuvering characteristics is characterized by search of large number of versions and requires large costs of time.

The essential simplification of the problem is provided by use of return way of aerodynamic calculation - from the point flight-performance (PFP) to required parameters of arrangement and engine. Therefore the method of simultaneous aerodynamic arrangement parameters (size, geometry) and engine parameters (size, bypass ratio etc) selection under design requirements to the aircraft is actual.

To solve the problem the Method of aircraft arrangement and engine parameter selection under flight performance requirements to combat aircraft is offered and realized in a computer program "FAKS-Eng".

The Method is based on arrangement formation procedure, [1], including the solution of non-linear equation system expressing analytical and statistical relations between mass and geometry, parameters of an aerodynamic polar, flight-performance together with gas turbine engine mathematical model computational results. The main relations of arrangement formation were derived from analysis of a general case asymmetrical non-parabolic (the influence of break away effects on aerodynamic polar is taken into account) “g-load” polar.

The used mathematical model of gas-turbine engine is based on formalized algorithm. The main parameters of each engine component are independent variables. The conditions of joint work – equation system. The approach makes it possible to determine the main engine parameters and characteristics at design range as function of design parameters.

It is presented the methodological peculiarities of the Method and examples of jet engine ando multirole aircraft arrangement interaction.

References.

1. I.G.Bashkirov and R.D.Irodov, Calculation of Jet Aircraft Parameters Under Design Requirements, Paper No 975598, 1997, World Aviation Congress, October 13-16, Anaheim, CA