Modeling methods of thermal action from energy fluxes onto constructions

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The thermal action of radiation and particle fluxes (RPF) is one of the main reason leading to a loss of strength for the composite constructions of modern aircraft [1]. Thermal ablation of material from irradiated surface and unsteady temperature profile formed inside construction are referred to effects of thermal action of RPF. Thermal ablation and spallation destructions (effects of mechanical action [1]) are simulated in experiment by reducing the thickness from the outside (facial spallation and/or ablation) and from the inside (rear spallation) of the construction. Various methods of supplying heat are performed in reproducing the temperature profile in composite structures. In particular, contact conductive plates, EHF radiation and sheet pyrotechnic compositions (PTC) are used. Sheet PTC appear to be more convenient for testing large-scale constructions. The use of flexible PTC sheets allows making contact pyrotechnic devices (CPTD) that is suitable for heating structures with curved surfaces. Preset energy flow on tested object surface and its temperature are reproduced by selection for compounding and thickness of sheet. Compounding determines the combustion rate and sheet thickness sets the total heat input time. Multilayer CPTD consisting of layers with different combustion rates allow to vary the operating time of the device. An important variable value is also the specific thermal PTC effect (50–1000 cal/g).
Experiments with multilayer CPTD give: heating times 1–10 s; surface temperature 100–3000 ^{o}C; heating rate 10–3000 ^{o}C/s.

[1] Bakulin V and Ostrik A 2015 *Complex action of radiations and particles on the thin-walled constructions having heterogeneous coverings* (M: FML)