

# **CONTROL OF SONIC BOOM PARAMETERS AND AERODYNAMIC DRAG BY CRYOGENIC ACTION ON THE FLOW-AROUND PROCESS**

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The investigation of the sonic boom (SB) level reduction are discussed. This paper presents the results of a series of experimental and numerical investigations of the control of SB parameters and aircraft aerodynamic characteristics via the cryogenic action on the flow-around process. To solve this problem, a complex method is proposed, which involves the active formation of a disturbed flow near the aerodynamically effective to provide the acceptable SB level on the ground.

The extension of the middle SB field depends on the distance at which the bow SW interacts with the intermediate hanging SW forming when the blunt area is flowed. Due to the dependences of velocity disturbances propagation from the temperature a cryogenic technologies of active control of the intermediate SW parameters (intensity, position on the body) have been developed on the base of experimental investigations in the supersonic wind tunnel T-313 ( $M = 2$ ,  $Re_1 = 25 \cdot 10^6 / m$ ), by using a combination of experimental calculation method. In order to increase the cryogenic effect in the region of SW origin, the convective heat exchange is organized via the distributed coolant injection from the body surface. It was founded that the process of hanging SW formation is highly influenced by the layer of the over-cooled gas forming near the body because of coolant evaporation as it passes into the free stream flow. The shape of this layer depends on the scheme of perforation organization and mode of coolant flow-out, and it influences significantly on the disturbed pressure re-distribution to big distances from the body, which defines the SB parameters and aircraft aerodynamic drag.

The distributed coolant injection behind the spherical bluntness with the variable perforation degree has provided the considerable downstream shift of the region of hanging SW formation due to the creation of an extended expansion region. As a result, the decreasing intensity of the bow SW (up to 40%) was realized at the distance up to 7000 calibers, which is very important for supersonic aircraft.

Supersonic aircraft, sonic boom , coolant injection, cryogen action, evaporation/