

# EXPERIMENTAL INVESTIGATION OF A DYNAMIC LAYER AT THE RAMP FOR SUPERSONIC SEPARATED FLOW

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The new results of an experimental and numerical study of the 3D laminar separated flow at a ramp are reported. Existence of a think dynamic layer which located over boundary layer at the ramp downstream from reattachment line is registered at the experiment. This work is the continuation of the investigation which has presented at EUCASS-2011.

The model was a plate with a sharp leading edge on which a 30° ramp was mounted. The model width is equal of the plate length before the sharp bend.

The experiment was carried out in the T-326 wind tunnel of the Khristianovich Institute of Theoretical and Applied Mechanics of the Siberian Branch of the Russian Academy of Sciences (ITAM SB RAS). The parameter flow measuring over model surface was made with using of Pitot pressure probe. Results of flow measuring are corresponded with visualization data were obtained with using of the shadow device IAB-451.

Wind tunnel gas-dynamic parameters were: free-stream Mach number  $M_\infty=6.01$ , free-stream total pressure  $p_{0\infty}=9.73\cdot 10^5$  Pa, and free-stream total temperature  $T_{0\infty}=380$  K. The Reynolds number based on the model length was  $Re_L=6\cdot 10^5$  ( $L$  is the length of the horizontal surface of the model,  $L=50$  mm).

Also a numerical calculations were performed using the Fluent software. Three-dimensional laminar Navier-Stokes equations were solved. The heat flux between the model wall and the flow was accepted to be equal to zero (adiabatic wall condition). The calculation data are well correspond to the experiment data.

The existence of a dynamic layer is confirmed by experiment data. Streamwise vortices are formed near the reattachment line and are located in the downstream direction and inside the reverse flow region. A probable cause for the formation of such vortices could be the baroclinic effect due to the existence of a density gradient in the dynamic layer and a transversal pressure gradient.