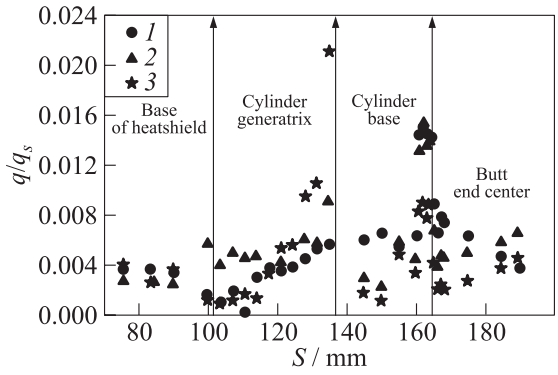

Figure 8 Heat flux distribution over the base mode surface at $M_\infty = 8$ at three angles of attack (*1* — $\alpha = 0°$; *2* — 7.5°; and *3* — $\alpha = 15°$) and turbulent flow

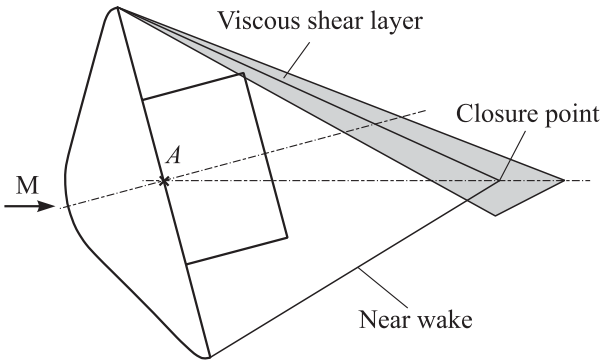

Figure 9 Viscous sheer layer ($\alpha = 15°$)

Relative heat flux distribution over base model surface at $M_\infty = 8$ and turbulent flow is shown in Fig. 7. On all the base surfaces, heat flux is minimal at $\alpha = 15°$. Maximal relative heat flux value takes place at $\alpha = 7.5°$ ($q/q_s = 0.055$) and exceeds corresponding value at laminar flow more than in 2 times.

Heat flux distribution in the base model region in carbon dioxide at $M_\infty = 12$ and laminar flow is presented in Fig. 8. At $\alpha = 15°$, viscous shear layer reattaches to the container surface or touches with it (Fig. 9). Relative heat flux at reattachment point is maximal in the whole of the base region and reaches to 2.1%, and exceeds heat flux on the opposite cylinder end in 15 times. This effect did not take place at $M_\infty = 8$.

ACKNOWLEDGMENTS

The work was performed under financial support of INTAS (Project # 03-51-5204) and Russian Foundation for Basic Research (Project # 08-08-00565).

REFERENCES

1. Hollis, B. R., and J. N. Perkins. 1995. Hypervelocity measurements in wake of Mars mission entry vehicle. AIAA Paper No. 95-2314. 12 p.
2. Hollis, B. R., and J. N. Perkins. 1996. Hypervelocity heat-transfer measurements in an expansion tube. AIAA Paper No. 96-2240. 12 p.
3. Holden, M., J. Harvey, I. Boyd, J. George, and T. Horvath. 1997. Experimental and computational studies of the flow over a sting mounted planetary probe configuration. AIAA Paper No. 97-0768. 22 p.
4. Horvath, T., and K. Hannemann. 1997. Blunt body near-wake flow field at Mach 10. AIAA Paper No. 97-0986. 23 p.
5. Hollis, B. R., and J. N. Perkins. 1997. Transition effects on heating in the wake of a blunt body. AIAA Paper No. 97-2569. 16 p.
6. Wright, M., M. Lomis, and P. Papadopouls. 2001. Aerothermal analysis of the Project Fire II afterbody flow. AIAA Paper No. 2001-3065. 15 p.
7. Horvath, T. J., N. C. Heiner, D. M. Olgium, F. M. Cheatwood, and P. A. Gnoffo. 2001. Afterbody heating characteristics of a proposed Mars Sample Return Orbiter. AIAA Paper No. 2001-3068. 16 p.
8. Egorov, I. V., V. G. Sudakov, and A. V. Fedorov. 2006. Direct numerical simulation of disturbances generated by periodic suction-blowing in a hypersonic boundary layer. *Theor. Comput. Fluid Dynamics* 20(1):41–54.
9. Egorov, I. V., A. V. Novikov, and A. V. Fedorov. 2006. Numerical modeling of the separated flow in a rounded compression corner. *Fluid Dynamics* 41(4):521–30.
10. Korst, H., and R. Page, and M. Childs. 1956. A theory for base pressures in transonic and supersonic flow. *J. Appl. Mech.* 23(4):593–600.
11. Chapman, D., D. Kuehn, and H. Larson. 1958. Investigation of separated flows in supersonic and subsonic streams with emphasis on the effect of transition. NACA Report # 1356. 40 p.