The deposition of an energy in a undisturbed flow upstream a body can appear as effective mode of drag reduction under super- and hypersonic speeds of flight. It has been shown by numerous theoretical and experimental examinations. Such an energy supply can be implemented by different tools: the laser radiation is one of those. Last, having a number of indisputable advantages, has one essential shortage: high value of power of laser radiation, required for breakdown and steady-stage localization of place of energy deposition in a stream.

The possibility of decreasing of required power was considered in a series of works. So in [1-3] the pulse-repetitive energy supply ensuring under certain conditions a quasistationary flow regime was explored. Thus mean on time of power value appear on some orders below required for a
continuous application. In [4] the energy deposition by means of combination of two Nd-laser beams was explored: one laser (initiating) worked in giant pulse regime, and other (main) in a condition free generation. It has allowed holding up the plasma formation, initiated by the first laser, by radiation of the main laser, which had the power density much less than threshold for maintaining of light-detonation regime of optical discharge. The scheme of such application and some outcomes are reduced in a Fig.1. Here it is necessary to mark increase of relative sizes of plasma formation and time of its existence, which was determined by pulse duration of the main laser working in a condition of free generation. In activity [5] the method of hypersonic flow control with the help of ablating mini-bodies and following combustion of ablation yields in approaching airflow is explained (Fig.2). The preliminary approximated estimations had show, that at definite sizes of mini-bodies and level of energy release the decrease of drag on 25% for a cone with half-angle 20° is possible.

The essence of a mode, considered in the report, consists of substitution of the initiating laser by a solid mini-body (target). The target is shooting out to area of main laser beam focus (Fig.3). The positioning of the transparent or opaque target in laser beam can reduce a threshold of an optical breakdown of gas on 2-3 order, that was revealed [6-8] just in 1972 - 1973. This phenomenon has been named as a low threshold of an optical breakdown of gas (LOB). Later there was number of efforts devoted to LOB. The full enough view of these activities is adduced in [9]. In these activities the influence of the different factors (material of the target, state of its surface, grade of ambient gas, pressure in gas, duration of a laser pulse, frequency of radiation, sizes of the target and area, etc.) on value of a threshold LOB was detected. The even greater decrease of a threshold LOB was detected in aerosols [10]. However it is possible, that for a considered case the deviations from the detected regularities can take place. It can be stipulated by difference of physical processes (gasdynamic, thermal, optical, etc.). Main ones of them are following to be referred:

- Aerodynamic heating at large Mach numbers (M > 4-5);
- Presence of hot vapor of target material and their intermixing with gas in a wake;
- Essential gasdynamic and optical non-uniformity of a medium (in a neighbourhood of the target and in a track behind it);
- Possible presence of charged particles in case of application of target material having a low potential of ionization.

Within the framework of model of inviscid, not heat-conducting perfect gas the approximated estimates(estimations) of influence of ablating mini-body (sphera) on drag of a cone with lengthening equal 1.5 were executed.

Fig. 2. The distribution of density (a-energy supply off; b-energy supply on)

Fig. 3.
а) Распределение давления
б) распределение относительной плотности
в) распределение чисел Маха
г) распределение концентрации

Fig.4.

а) Распределение давления
б) распределение относительной плотности
в) распределение чисел Маха
г) распределение концентрации

Fig.5.
The real processes of vaporization were not considered and were modeled by uniformly distributed on all surface of a sphere blowing of model gas distinguished from gas of approaching flow. The velocities of blowing varied. The decrease of a drag coefficient of a cone approximately on 25% was marked. The flow pictures and allocations of gasdynamic parameters and concentration of blown gas are shown in a Fig.4-5. In activity [11] the estimation of effectiveness energy expenditure was executed at a concentrated and distributed application of an energy in a undisturbed flow (Fig.6-7). The analysis of allocation of concentration of blown gas allows to make a conclusion about a possibility of embodying of these two schemes of an application of an energy with the help one or several laser beams with under-threshold values of a power density (Fig.8). The scheme 8a corresponds to a concentrated application of an energy (trajectory of a mini-body lies outside of a laser beam), and the scheme 8b implements a distributed application on all trajectory of a mini-body, which goes all time of the existence in a laser beam.

The tentative estimations and analysis display, that...
the listed above singularities can promote decreasing of required values of power ensuring maintaining of plasma formation, localized in a undisturbed flow. The final conclusion about embodying and effectiveness of an offered mode of an application of an energy of laser radiation will be possible to made after realization of experimental and theoretical examinations which are taking into account such actual physical processes as vaporization, diffusion, heat conduction, viscous mixing, absorption of laser radiation etc.

References