1. INTRODUCTION

The “Plasma Aerodynamics” (PA) is a modern science aimed for an application of plasma technologies to solve the fundamental and applied problems concomitant the fluid mechanics, aerodynamics, combustion in flow, etc. The most objectives of PA can be related with two independent but genetically bounded domains: (1) Advanced Flow/Flight Control; and (2) Plasma Assisted Ignition, Mixing and Combustion.

A rich experience has been accumulated up to moment in using electrical discharges to control gas flows, especially a wealth of data has been received in model experiments and by way of numerical calculations. Several aerodynamic problems stimulate efforts in this field: drag reduction, control of the inlet/diffuser performance, surface discharge effect on viscous friction, the improvement of the supersonic combustion efficiency, etc. An idea of the method can be formulated on the most simple manner as following: modification of flow-field structure and, consequently, changing a pressure and shear stress near surfaces by means bulk forces excitation in EM fields and heat release into predefined location with predefined parameters’ distribution and at predefined tempering. Among known methods for flow characteristics control the plasma generation is the newest and, probably, the most prospective. This lecture is focused on problems of supersonic/hypersonic flows. The diagram in Fig.1.1 illustrates (not comprehensively, of course) a field of potential applications.

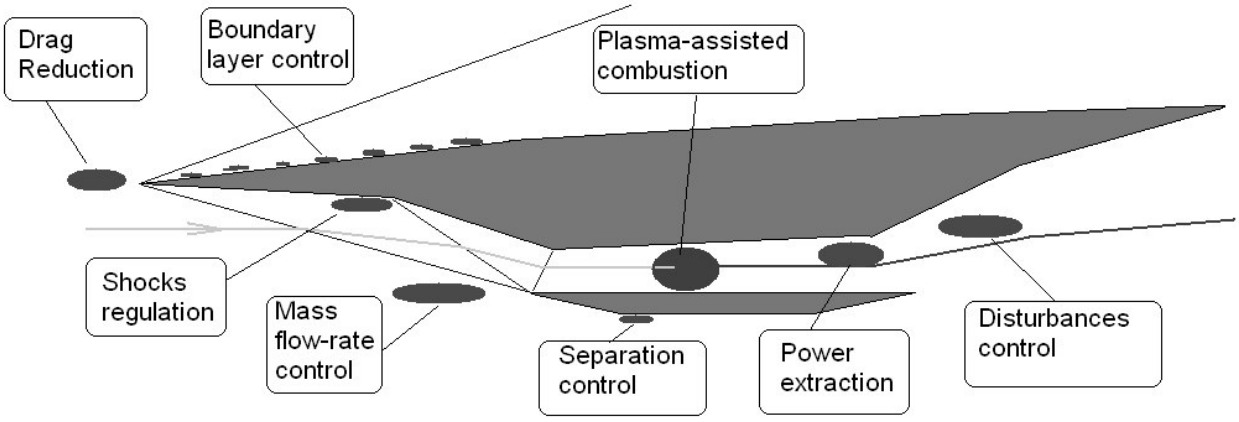

Fig.1.1. Field of potential plasma applications.

Several reviews regarding flow and combustion control by low-temperature plasma of electrical discharges were published, namely by Cherny (1998), Garscadden *et al* (2005), Leonov and Bityurin (2002), Fomin *et al* (2004), Levin *et al* (1997), C. Carter *et al* (2008), Starikovskaya (2006), some others [1-10]. As it was considered the practical utilization is the most prospective for steering forces/momentums generation, BL control, flow separation control, and high-speed combustion intensification.

Last time an idea of flow actuation by near-surface discharges became very popular. Among a number of papers several ones are quite comprehensive, for example by Corke *et al* (2005-10), Choi *et al* (2004), Roth *et al* (2000), Moreau *et al* (2002-07), Opaits *et al*