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Abstract :

Six component measurements were carried out on a slender body model with lifting surfaces (Kalla Model) under the collaborative program between DFVLR-NAL(CSIR)-MBB to study the vortex flow of slender bodies with lifting surfaces at various Reynolds numbers upto very high incidences. The test configuration consists of a 105 mm (3D) long tangent ogive nose and a 420 mm (12D) long circular cylinder afterbody of D = 35 mm diameter having cruciform lifting surfaces of 105 mm (3D) and 140 mm (4D) span and a constant chord of 35 mm. The tests have been carried out in the 0.75 m x 0.75 m free jet suck-down type high speed wind tunnel of the DFVLR in Goettingen. The test Mach numbers were 0.4, 0.6 and 0.8 and the test Reynolds number, based on the body diameter, varied from 0.28 million to 0.48 million. The incidence range was from 30° to 70°. The normal (in-plane) and side (out-of-plane) force characteristics of the basic model (body alone) was studied by rolling the model from an arbitrarily defined 0° over 360° in steps of 60°. To study the influence of body vortices on the wing and tail, tests have been performed on the model with the lifting surfaces fixed at a position of 140 mm (4D) from the nose tip (BODY + WING), at a position of 490 mm (14D) from the nose tip (BODY + TAIL) and by arranging them at both positions as BODY + WING + TAIL combinations. Tests were also carried out by rolling the lifting surfaces with respect to the body from 0° to 22°, 45° and 67°. The complete test results are documented in this report in the form of tables and plots together with a limited analysis.