



Air-Spacecraft of the Third Millennium Traveling on the Hyperbolic Trajectory (ASTM 786-H)

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Abstract – This work is an extension of *Air-Spacecraft of the Third Millennium* (ASTM 786-E), which travels, partly, in space on the elliptical trajectory. ASTM 786-H, traveling on the hyperbolic trajectory, initially, faced dilemma of traveling with extremely-high speeds through the atmosphere (hyperbolic trajectory being flatter than parabolic/elliptical trajectories), producing shock waves causing infrastructure destruction. This is resolved by taking this spacecraft on a linear trajectory above the atmosphere and then put into the hyperbolic trajectory using the extended-Q system (position and velocity vectors managed, simultaneously, through the normal-component-cross-product steering expressed in the hyperbolic-astrodynamical-coördinate mesh). Further check is performed through the normal-component-dot-product steering expressed in the hyperbolic-astrodynamical-coördinate mesh, accomplishing vanishing of the down-range/the cross-range errors. Fuel economy in both the civilian, ASTM 786-H-C, and the military, ASTM 786-H-M, versions, should allow them to travel halfway through globe, completing their missions and coming back without refueling. This should, also, reduce ticket prices in the civilian flights and operating costs in the military flights. Other benefits include decrease in travel time (*comfort* in ASTM 786-H-C and *operational efficiency* in ASTM 786-H-M, no drag, no drift in ballistic phase), fuel-consumption minimization as most of the flight is in the ballistic phase (*environmentally friendly*), average-engine-noise reduction, as engines are shut down during free-space trajectory (*comfort*), absence of turbulence, as most of the flight is in vacuum (*comfort*) and, finally, reduction of engine-failure risk, as engines are not running in the ballistic phase (*safety*). ASTM 786-H-C should have its payload as passengers and cargo. These products satisfy most of the requirements of *green engineering*.

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