FUTURE ULTRA-SPEED TUBE-FLIGHT

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ABSTRACT

Future long-link ultra-speed surface transport systems will require electromagnetically (EM) driven and restrained vehicles operating under reduced-atmosphere in very straight tubes. Such tube-flight trains will be safe, energy conservative, pollution-free, and in a protected environment. Hypersonic (and even hyperballistic) speeds are theoretically achievable.

Ultimate system choices will represent tradeoffs between amortized capital costs (ACC) and operating costs. For example, long coasting links might employ aerodynamic lift coupled with EM restraint and drag make-up. Optimized, combined EM lift and thrust vectors could reduce energy costs but at increased ACC. (Repulsive levitation can produce lift-over-drag 1/d ratios a decade greater than aerodynamic). Alternatively, vehicle-emanated, induced-mirror fields in a conducting (aluminum sheet) road bed (a la Magneplane) could reduce ACC but at substantial energy costs.

Ultra-speed tube flight will demand fast-acting, high-precision sensors and computerized magnetic shimming. This same control system can maintain a magnetic "guide way" invariant in inertial space with inertial detectors imbedded in tube structures to sense and correct for earth tremors.

Ultra-speed tube flight can compete with aircraft for transit time and can provide even greater passenger convenience by single-model connections with local subways and feeder lines.

Although cargo transport generally will not need to be performed at ultra speeds, such speeds may well be desirable for high throughput to optimize channel costs. Thus, a large and expensive pipeline might be replaced with small EM-driven pallets at high speeds.

Various suspension approaches will be reviewed including servo-stabilized permanent magnet levitation.

Ultimate long-link tube trains may utilize more than one levitation scheme as it transcends stationary, acceleration, and coasting phases.