AisplaneLinearized simulates the Linearized longitudinal dynamics of an aircraft

AirplaneLinearized uses the linearized longitudinal equations (4.9, 18) from Etkin (1996) to simulate the longitudinal dynamics of an aircraft which, in the case of Homework 7, is a Boeing 747-100, whose dimensional stability derivatives are given in Appendix E, Table E.3. The case that is simulated is in cruise, at an altitude of 20,000 feet and Mach number = 0.5 as given in Table E.1.

State is the current state vector consisting of Δu, Δw, Δq, $\Delta \theta$, Δx_E, and Δz_E.

```
function dState = AirplaneLinearized(t, State, A)
    global theta0 E1 K1 K2 B
    U = [-K2 * State(4) - K1 * State(3); 0];
    dState(1:4,1)   = A * State(1:4) + B * U;
    dState(5,1)     = E1.Velocity + State(1)  * cos(theta0) + State(2) * sin(theta0) ...
        - E1.Velocity * State(4) * sin(theta0);
    dState(6,1)     = -State(1) * sin(theta0) + State(2) * cos(theta0) - E1.Velocity ...
        * State(4) * cos(theta0);
end
```