

```
function [LtoD,maxLtoD,vmaxLtoD] = LtoD_ratio(aircraft,h,v)
% LtoD_RATIO Lift to Drag ratio and maximum L/D with velocity
% Inputs are:
% aircraft :a struct aircraft data in SI
% h         :a numeric array of Mx1 aircraft altitude in m
% v         :an optional numeric array of Mx1 aircraft velocity in m/s
%
% Outputs are:
% LtoD      :a numeric array of Mx1 lift to drag ratio
% maxLtoD   :a scalar maximum lift to drag ratio for given
% vmaxLtoD  :a numeric array of Mx1 velocity at maximum lift to drag ratio
%           in m/s
%
% When no v is passed to the function LtoD is set to NaN, with the
% presumption that the argument will be ignored in the output call.
```

arguments

```
aircraft {mustBeA(aircraft,"struct")}
h (:,1) {mustBeNumeric, mustBeReal}
v (:,1) {mustBeNumeric, mustBeReal} = NaN
```

end

```
W = aircraft.W;
S = aircraft.S;
Cd_0 = aircraft.Cd_0;
K = aircraft.K;
```

```
[~,~,rho] = stdatm(h); % atmospheric density at altitude (kg/m^3)
```

switch nargin

```
case 5
    LtoD = NaN;
case 6
    Q = 0.5.*rho*v.^2; % dynamic pressure (N/m^2)
    Cl = W./(Q.*S); % lift coefficient
    Cd = Cd_0+K.*Cl.^2; % drag coefficient
    LtoD = Cl./Cd;
```

end

```
maxLtoD = 1./sqrt(4.*Cd0.*K);
vmaxLtoD = sqrt((2./rho).*(W./S).*sqrt(K./Cd0));
```

end