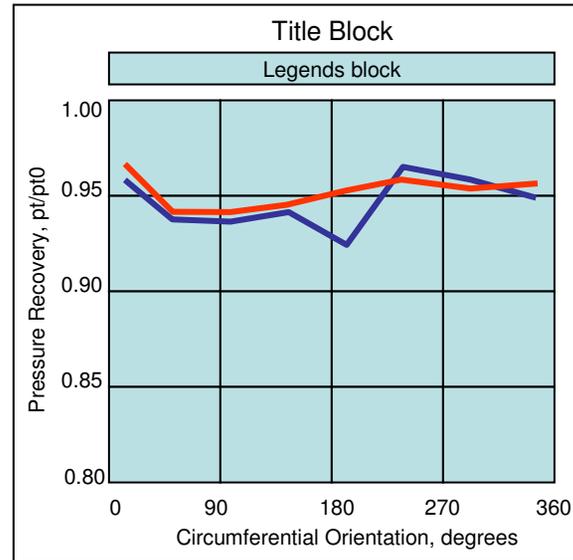


Real world use: Tracking intake distortion limits established by inlet-engine compatibility. Radial and circumferential distortion values calculated from 40 pressures at engine face rake, plus Mach number, airflow, freestream pressure. This value would have a tail showing previous results. Blue and red clipped boxes show the requirements for the engine. Lower limit would be for engine internal geometry changes without major thrust loss, upper limit box would be max distortion engine can tolerate by reconfiguring with thrust loss. This is a prime contractual requirement for most fighter aircraft. Limit envelopes are functions of Mach number and airflow.

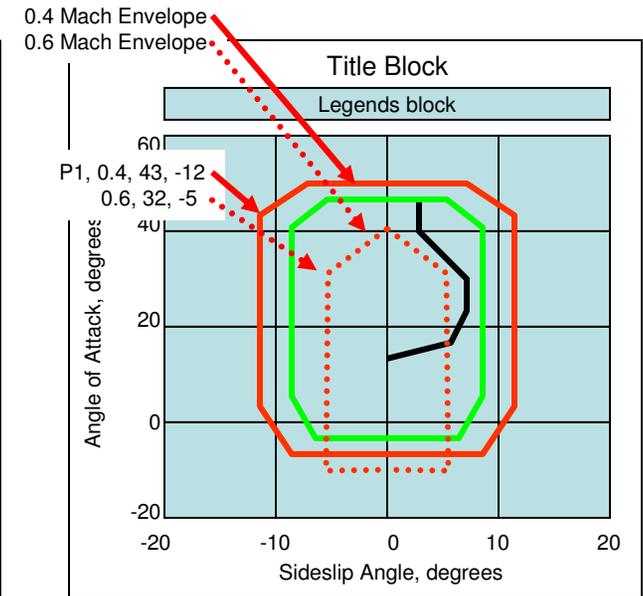


Real world use: Tracking engine face pressures from flight test rake. There are 40 pressures at engine face, arranged 5 pressures on a radial rake, 8 rakes somewhat evenly space circumferentially. Blue line shows the pressures on 8 rakes at the same radial distance from centerline, different orientations. Five such plots would be used to describe the engine face. The red line shows the predicted pressure profile based on wind tunnel results. Prediction is based on simplified Mach number and airflow functions. Purpose is to track if pressure profiles are as expected and to verify valid instrumentation for future flights. This plot would indicate one pressure is responding below expected and needs to be checked prior to propulsion critical flights.

The displayed data is a line connecting, in this case 8 points, (max should be X) data points. Each of the point's vertical (Y axis) location is a function of a measured or derived parameter, a different parameter for each point on the line. It's X location, in this case, is a fixed location, but the capability to tie the X location to a parameter should be provided. Thus, as the parameter tied to the Y location changes the point on the line moves. The capability to display up to 5 (?) lines on one axis should be provided.

Note that there would be no tails on this data. Also note that all the pressures (points) are at the same instant in time and are connected. Connecting points makes trends easier to notice.

This cartoon could also be a plot of wing deflection v. span, actual and predicted at an instant in time.



Real world use: Tracking alpha / beta relative to limits. Limits are imposed by structural, controls, propulsion, etc. and are typically functions of Mach number (and altitude). This plot would show the controls limit (green) and the propulsion engine running limit (red). Both limit boxes would slowly change as the a/c freestream conditions changed, enlarging for lower altitudes and Mach numbers. The black line represents a measured data with a tail.

The user defines the location of each corner point of the envelope as a function of independent variables. In the example, each point would move as a function of Mach number. One difficulty is the appearing and disappearing of corner points of the envelope. These could be moved into one of the remaining points so it becomes "hidden", but is really there. This could be done similar to the current envelope definition by defining a set of points of Mach number, AOA, Beta for each point in the envelope box. IADS would need to interpolate on Mach number between the points in the curve. For example, point 1 is defined as: 0.4, 43, -12; 0.6, 32, -5. When flight Mach is 0.5, the point location should be half way between the points provided as 0.5, 37.5, -8.5.

This example comes from regions (alpha and beta) where the engine is "allowed" to stall and regions where it should not stall. The envelope and data trail clearly define where the aircraft is/was during a stall event.