

# 1 Data Normalization

These numbers were obtained by generating 100 flights with varying flight conditions—different altitudes, mach numbers, and turbulences—in the FLTz flight simulator. The turbulence levels vary from none to mild. The empirical maximum and minimum were computed and rounded before picking the normalization ranges.

- Parameters 1-19 are inputs; 20-25 are outputs. Parameter 26 is the mass used in our varying mass model.
- Comments give justification for range values. These range values were used for data normalization.

	<b>Parameter</b>	<b>Range</b>	<b>Units</b>	<b>Comments</b>
1.	Aileron	$[-0.5, 0.0]$	degrees	from mild turbulence data
2.	Differential Aileron	$[-5.0, 5.0]$	degrees	from mild turbulence data
3.	Elevator	$[-2.0, 2.0]$	degrees	from mild turbulence data
4.	Rudder	$[-5.0, 5.0]$	degrees	from mild turbulence data
5.	Stabilizer	$[-2.0, -1.0]$	degrees	from mild turbulence data
6.	Roll Angle	$[-0.1, 0.1]$	radians	about $5^\circ$ ; more in strong turb.
7.	Yaw Angle	$[-3.0, 3.0]$	radians	relative to earth-axis, between $[-\pi, \pi]$
8.	Pitch Angle	$[0.0, 0.05]$	radians	plane doesn't pitch much in cruise
9.	Angle-of-Attack	$[0.0, 0.05]$	radians	greater than 0; steady in cruise
10.	Sideslip Angle	$[-0.02, 0.02]$	radians	about $1^\circ$ ; more in strong turb.
11.	Mach Number	$[0.7, 0.9]$	—	less than 1; range from simulation
12.	Dynamic Pressure	$[200, 300]$	pascals	approx. from min, max mach
13.	Engine Thrust	$[20000, 33000]$	lbs	from mild turbulence data
14.	Long. Velocity	$[700, 900]$	ft / s	from mild turbulence data
15.	Lat. Velocity	$[-10, 10]$	ft / s	from mild turbulence data
16.	Vertical Velocity	$[0.0, 40]$	ft / s	from mild turbulence data
17.	Roll Rate	$[-0.1, 0.1]$	rad / s	from mild turbulence data
18.	Pitch Rate	$[-0.005, 0.005]$	rad / s	from mild turbulence data
19.	Yaw Rate	$[-0.01, 0.01]$	rad / s	from mild turbulence data
20.	Forward Accel	$[-0.5, 0.5]$	ft / s <sup>2</sup>	from mild turbulence data
21.	Lateral Accel	$[-10, 10]$	ft / s <sup>2</sup>	from mild turbulence data
22.	Vertical Accel	$[-10, 10]$	ft / s <sup>2</sup>	from mild turbulence data
23.	Roll Accel	$[-0.25, 0.25]$	rad / s <sup>2</sup>	from mild turbulence data
24.	Pitch Accel	$[-0.05, 0.05]$	rad / s <sup>2</sup>	from mild turbulence data
25.	Yaw Accel	$[-0.05, 0.05]$	rad / s <sup>2</sup>	from mild turbulence data
26.	Mass	$[4680, 5800]$	slugs	from simulation setup