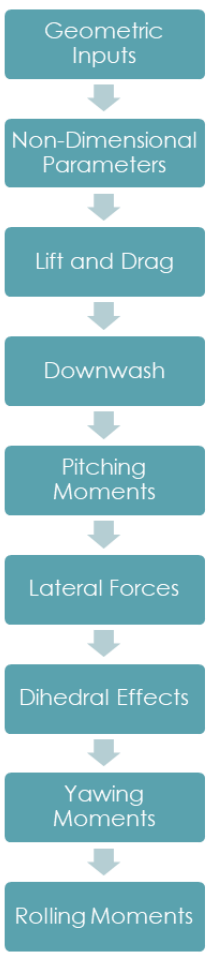
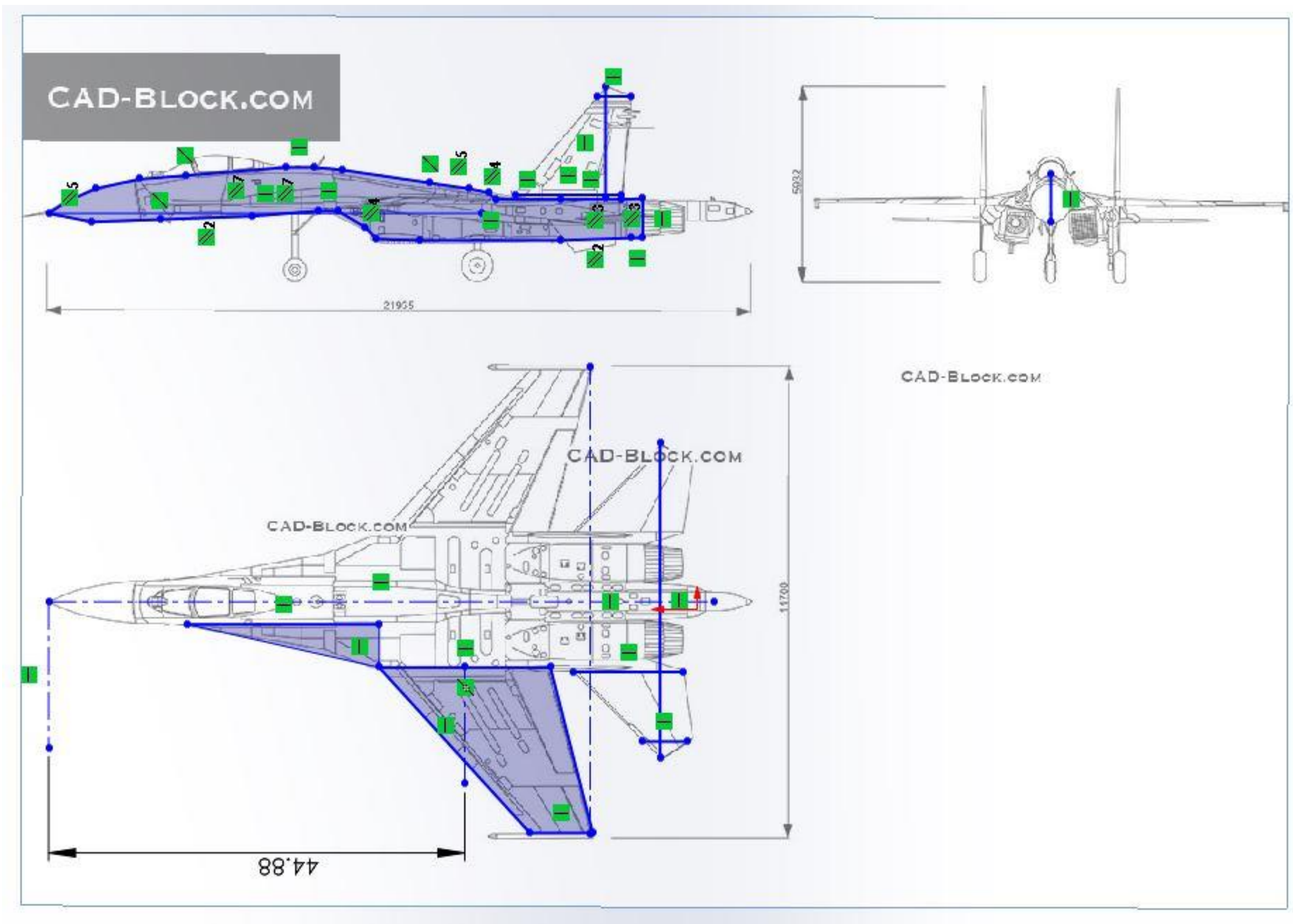
The purpose of this project was to develop a MATLAB code which could calculate aircraft control and stability derivatives based solely off a planform view of an aircraft. This would allow the user to predict key aerodynamic characteristics and properties of the aircraft being analyzed such as maneuverability, and aircraft performance and stability. The MATLAB code developed took aircraft geometry and dimensions as inputs and used empirical modeling equations to calculate a range of control and stability derivatives. Over 150 user defined functions were created to accomplish this, and they were all compiled into a master code which calculated the desired control and stability derivatives.

The relationships and equations used for the project were validated for the F-4 Phantom II, F-104 Starfighter, Marchetti S-211, and Cessna T-37; and the code was used to calculate experimental results for the F-15 Eagle and Su-35 Flanker allowing for basic predictions of their fight characteristics. The results from the project accurately calculated the control and stability derivatives of the four aircraft used to validate it, and successfully calculated experimental values for the two aircraft which did not have openly available control and stability derivative data (F-15 Eagle and Su-35 Flanker)

Future development of this project could include using it for preliminary design analysis of small drones, integration between MATLAB and Solid Works to assist in inputting the dimensions of the aircraft being analyzed and predicting flight characteristics for new and unknown aircraft.





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F-4 Phantom					
Predicted		Actual		% Difference	Sign
CLα	3.93	CLα	3.75	4.77	1.00
CLα(dot)	0.61	CLα(dot)	0.86	29.52	1.00
CDα	0.33	CDα	0.30	10.62	1.00
Cmα	-0.49	Cmα	-0.40	22.14	1.00
Cmα(dot)	-1.06	Cmα(dot)	-1.30	18.31	1.00
Cy$\boldsymbol{\beta}$	-0.52	Cy$\boldsymbol{\beta}$	-0.68	22.99	1.00
CL$\boldsymbol{\beta}$	-0.26	CL$\boldsymbol{\beta}$	-0.08	222.41	1.00
Cn$\boldsymbol{\beta}$	0.04	Cn$\boldsymbol{\beta}$	0.13	70.08	1.00
C_lqW	2.10	C_lqw	1.80	16.85	1.00

Table 5: Predicted Values for the F-15

Predicted **M = 0.75, Alt = 37,000ft, AOA = 2.6 deg**			
C_{L1}	0.4602	C_{Lq}	3.2257
$C_{L\alpha}$	4.155	C_{mq}	-5.066
$C_{D\alpha}$	0.5538	C_{miH}	-1.522
$C_{m\alpha}$	0.4152	$C_{y\beta}$	-0.7107
$C_{L\dot{\alpha}}$	1.375	$C_{l\beta}$	-0.6203
$C_{m\dot{\alpha}}$	-2.014	$C_{n\beta}$	0.2331

Table 6: Predicted Values for the Su-35

Predicted **M = 0.75, Alt = 37,000ft, AOA = 2.6 deg**			
C_{L1}	0.4885	C_{Lq}	2.345
$C_{L\alpha}$	5.132	C_{mq}	-6.556
$C_{D\alpha}$	0.5492	C_{miH}	-2.176
$C_{m\alpha}$	-0.7226	$C_{y\beta}$	-0.985
$C_{L\dot{\alpha}}$	1.611	$C_{l\beta}$	-0.7188
$C_{m\dot{\alpha}}$	-2.189	$C_{n\beta}$	0.3496