Supersonic Configuration at Low Speeds

SCALOS: Wind Tunnel Data Analysis

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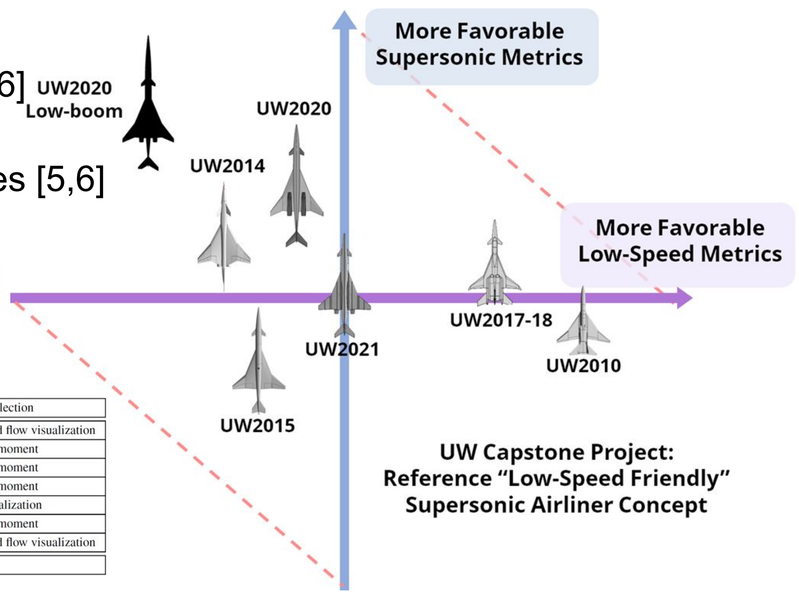
1. Project Background and Motivation

Supersonic airliners/SSBJs are optimized at cruise speed and often neglect low-speed impact at takeoff, approach, and landing. Studies on how the shapes and configurations affect handling qualities, dynamic, stability and control of the aircraft. Tests are conducted at the Kirsten Wind Tunnel at UW [1-7].

- Data reduction [1,4]
- Configuration study [2,5,6]
- Test Correlation [3]
- Control surface authorities [5,6]
- Incremental Effect [6]
- Design Space Survey [7]
- Model Regression
- Stability and Control

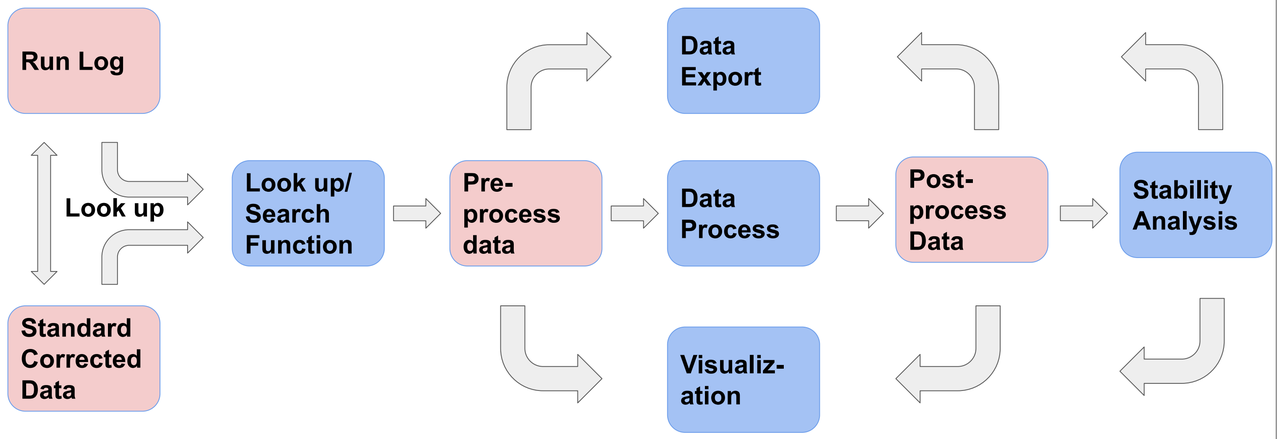


Year	Month	Test period (days)	Total Runs (#)	Data collection
2020	July	5	152	Force & moment and flow visualization
2020	August	3	23	Force & moment
2020	September	6	133	Force & moment
2021	June	7.5	148	Force & moment
2021	August	4	54	Flow visualization
2021	September	6	225	Force & moment
2021	November	5	150	Force & moment and flow visualization
Total		36.5	885	

2. Project Goal and Structure

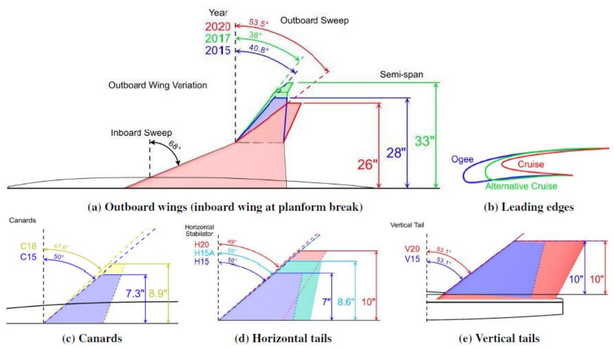
This project aims to analyze the experimental wind tunnel data for design space and trade-off study of supersonic airliner/ business jet at low speeds. The goal is to extract the commercial wind tunnel standard corrected data for look-up, search, process, and visualization.

01	Data Look-up:	Pandas
02	Data Extraction:	Pandas
03	Data Process:	Numpy, Scipy
04	Data Visualization:	Altair



3-I. Data Look-up & Extraction

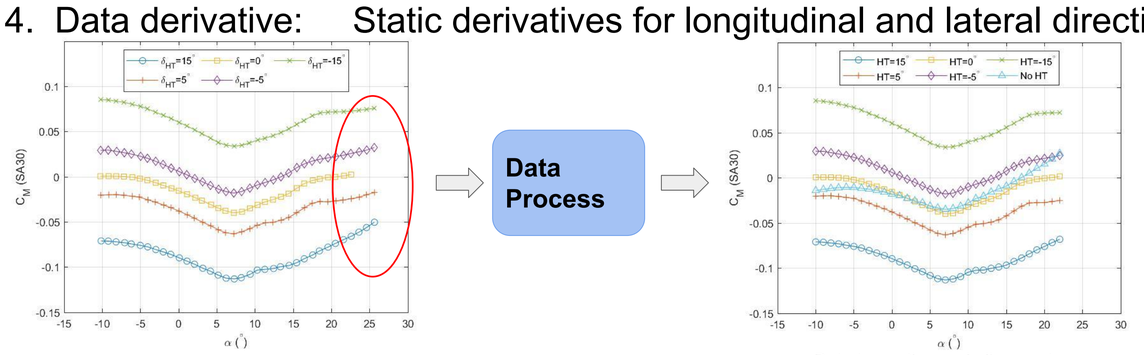
With a valid configuration, the tool will search in the run log dataset, get the run numbers under this specific configuration, and then extract the corresponding data from the standard corrected dataset.

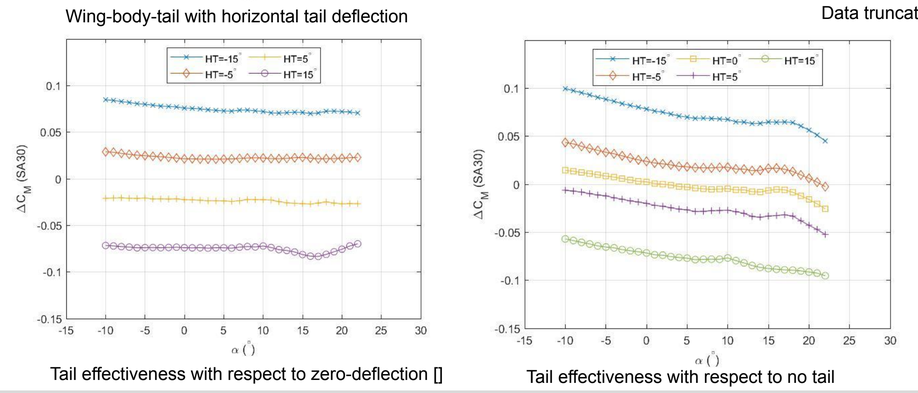


Users can enter the configurations they are interested in. Then the tool will tell them whether the configuration is in our dataset.

3-II. Data Process

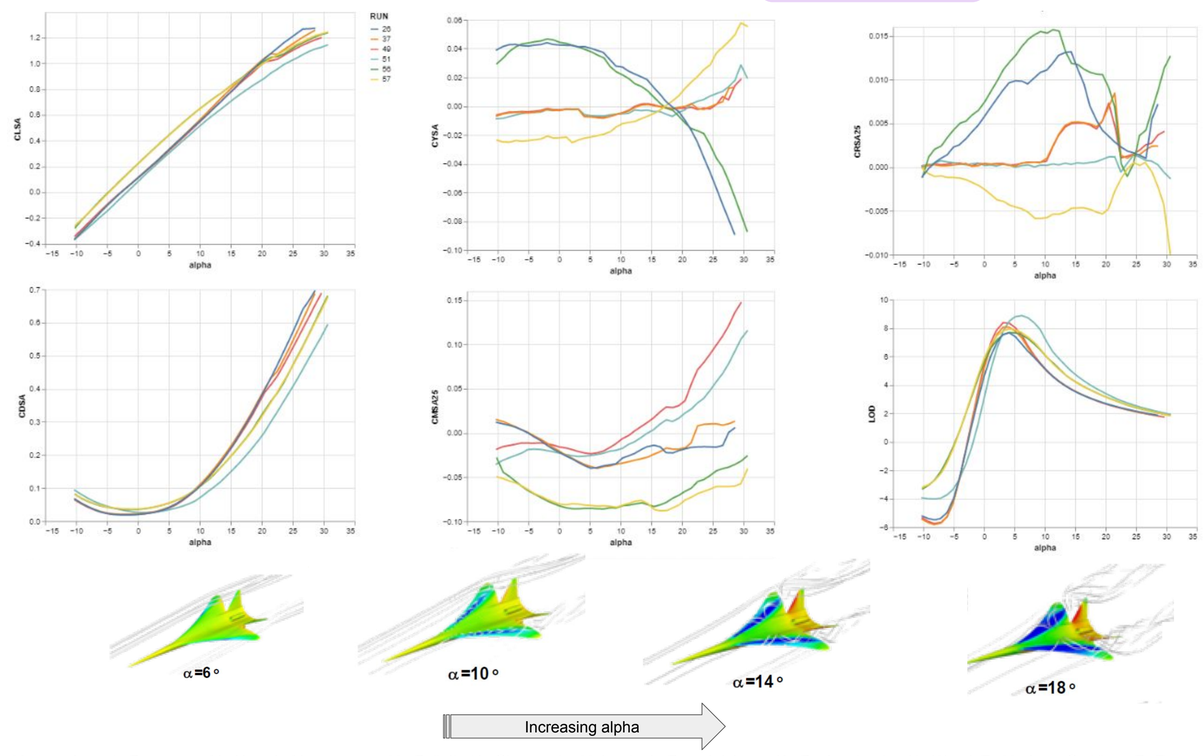
1. Data alignment: Align different sets of data at max and min data pt,
2. Data truncation: Truncate pts beyond max, min, and hysteresis data
3. Data interpolation: Interpolate data points for addition and subtraction (delta increments for configurational built up)
4. Data derivative: Static derivatives for longitudinal and lateral directions





4.Data Visualization: Moment Coefficients vs Pitch Yawing Angle

user friendly **interativable** chart



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