

Aerospace Vehicle Design And System Integration 3: Design Methods AENG30016 (AVDASI3: Design Methods)

Introduction to FWAC Performance tool
Code structure

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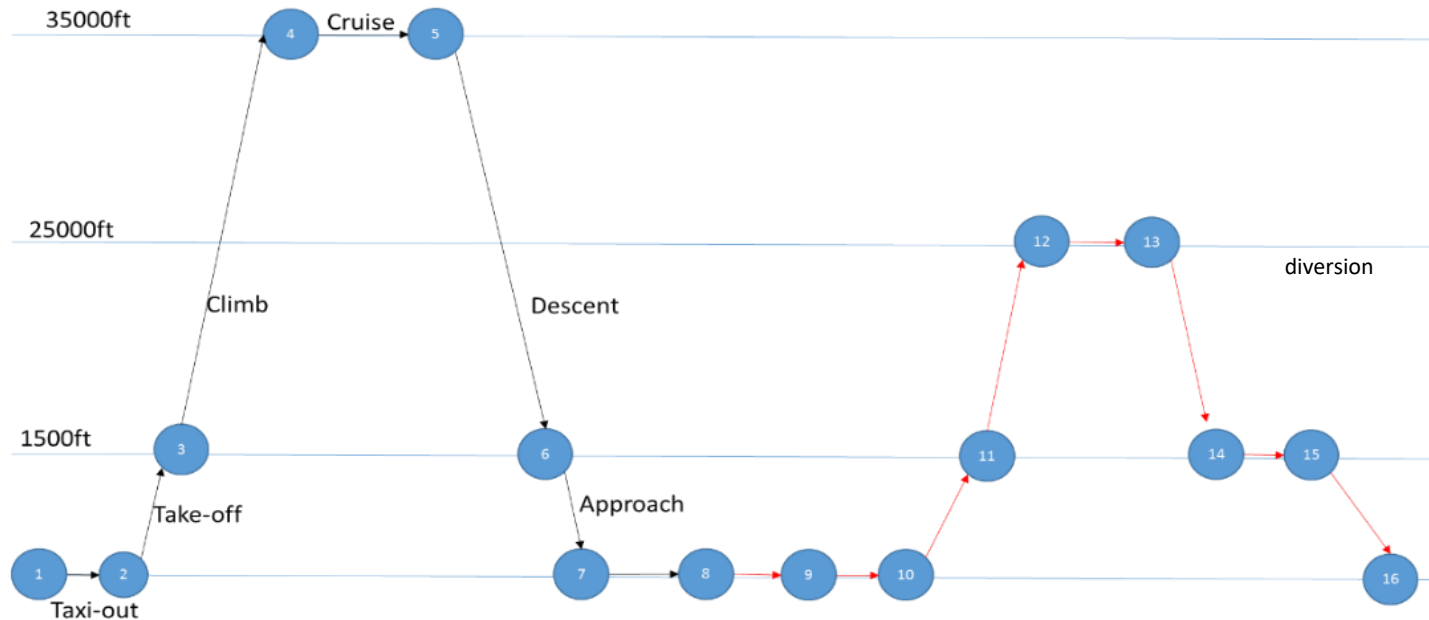
Fixed Wing Performance Tool

- In-house **MATLAB** tool created by **Rezgui, Mitchell and Gibbons**.
- Based largely on the reference aircraft in Chapter 10 of **Civil Aircraft Design** by Jenkinson, Simpkin & Rhodes, with a few modification from the Airbus design guides
- To tool generates the aircraft **Payload-Range Diagram** and calculate the **operational performance** for:
 - Given aircraft parameters (configuration, e.g. wing span, engine data, MTOM, empty mass, drag polar, ...)
 - Given aircraft mission (Mach number, altitude, required range, payload, ...)
- The tool is simple to use and allows flexibility to customise the run files and plotting functions
- Quick start guide available in the form of html and pdf demo files.

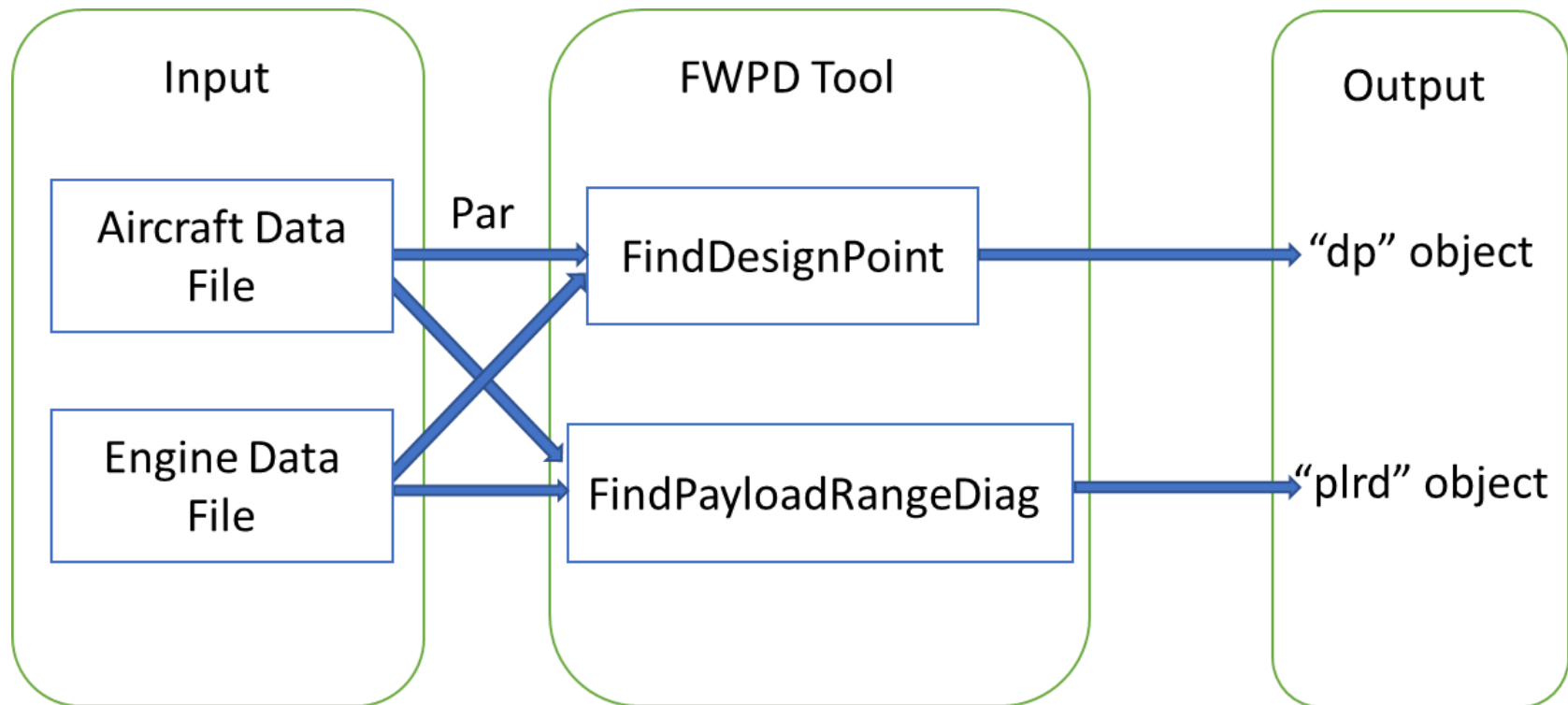
Mat Lab Mission Phases

1 - 2	Taxi out	Allowance
2 - 3	Take-off to 1500ft	Allowance
3 - 4	Climb 1500ft to Initial Cruise Altitude	Calculation
4 - 5	Cruise	Calculation
5 - 6	Descent final cruise altitude to 1500 ft.	Calculation
6 - 7	Approach	Allowance
7 - 8	Taxi in	Allowance
9 - 10	Overshoot	Allowance
10 - 11	Diversion Climb	Calculation
11 - 12	Diversion Cruise	Calculation
12 - 13	Diversion Descent	Calculation
13 - 14	Diversion Approach	Allowance
15 - 16	En route allowance /Extended Cruise	Calculation

Fixed Wing Performance Tool



Code Structure



Function Calls

dp = FindDesignPoint(Par, EngineData, TOM_0)

Input:

Par: Object of aircraft parameters

EngineData: Structure of aircraft engine data [optional]

TOM_0: Initial value for TOM [optional]

Output:

dp: object contains design point (dp) results

plrd = FindPayloadRangeDiag(Par, EngineData, Payload_0)

Par: Object of aircraft parameters

EngineData: Structure of aircraft engine data [optional]

Payload_0: Initial value for payload [optional]

Output:

plrd: object contains design point (dp) results

Plotting

Plot mission:

PlotMission(dp.Mission)

Plot payload range diagram:

PlotPLRD(plrd, marker)

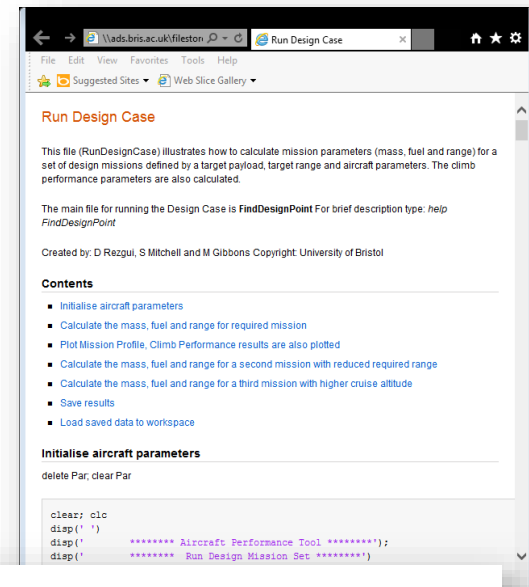
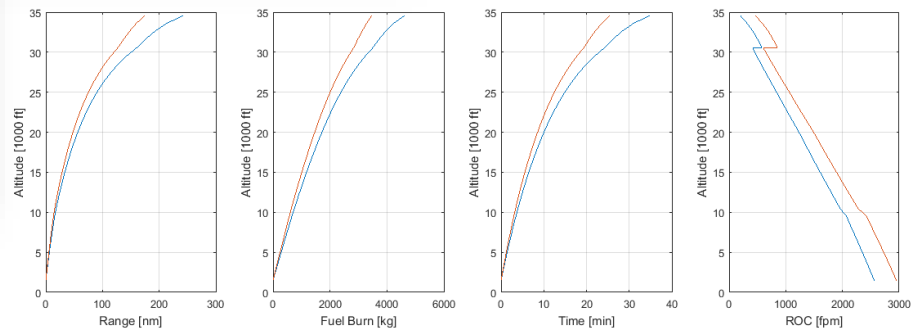
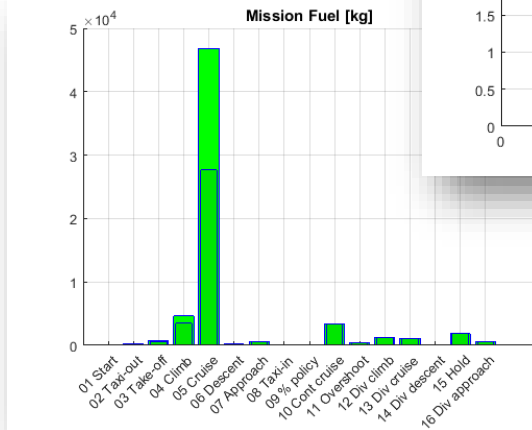
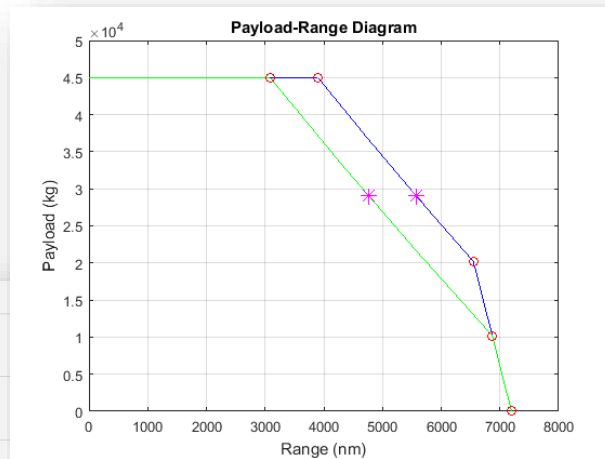
Marker: line colour and shape [optional]

Run files

- RunDesignCase
- RunDesignSet
- RunPayloadRange



Fixed Wing Performance Tool



Getting Started with FW Performance Tool

- Download tool from Blackboard
- Go through Quick Start-up Guide (run files and help documents)
- Attempt the tutorial tasks
- Attend lab for the FW Performance design exercise

