Fuel burn calculations and PM CDO routes generation (MATLAB)

'1-Route_Generation' folder

1) Open 'Fuel_and_CDO_profiles_Calculator_v2.m', to start the MATLAB script.
2) Set up the correct path names by replacing the letter 'x'. Note that it is required to insert your own BADA files into the BADA directory.

```
% --------------------------- DIRECTORIES ----------------------------- %

BADA_dir = 'x\ESGG_PM_opt\Data\BADA\BADA_4.2\';
opensky_dir = 'X\ESGG_PM_opt\Data\Trajectory\Opensky\';
fr24_dir = '';
LFV_dir = '';
DDR_dir = 'x\ESGG_PM_opt\Data\Trajectory\DDR\';
nc_dir = 'x\ESGG_PM_opt\Data\Weather\';
export_dir = 'x\ESGG_PM_opt\Export\OS\';
export_dir_CDO = 'x\ESGG_PM_opt\Export\CDO\';
export_dir_figures = 'x\ESGG_PM_opt\Export\Figures\';
airframe_data_dir = 'x\ESGG_PM_opt\Data\Airframe\';
function_dir = 'x\ESGG_PM_opt\Functions\';
```

3) Run the code and make the following selections:
   - [6] Fuel calculation and PM CDO generation for ESGG
   - 'S', for single mode
   - Accept input data by typing 'Y'
   - Enter callsign 'RYR4AR'
   - 'Y', for 'Match CAS'
   - 'Y', for 'Match a/c type to database'
   - 'Y', for 'Find cruise alt'
   - Accept the selected BADA model by 'Y'
   - Accept the selected cruise altitude by 'Y'

4) The code will now calculate the fuel consumption of the actual trajectory from the OpenSky database, and generate a corresponding CDO trajectory along the point merge system. Exported data can be found in the 'Export' folder, both for OpenSky (OS) and CDO trajectories.

Optimization (AMPL)

'2-Optimization' folder

1) Run the 'esgg_opt_2024.run' file with AMPL.
2) The results can be found in the 'esgg_opt_2024.out' file, stating the arrival profile selected for each arrival, as well as the total fuel burn for all aircraft.

Performance Evaluation (MATLAB)

'3-Evaluation' folder

1) Open 'esgg_opt_evaluation_2024.m', to start the MATLAB script.
2) Set up the correct path names by replacing the letter 'x'.

```
c1_data = readtable('x\ESGG_PM_opt\3-Evaluation\Data\Clusters\osn_ESGG_states_TMA_rwy03_2019_04_cluster1.csv');
c2_data = readtable('x\ESGG_PM_opt\3-Evaluation\Data\Clusters\osn_ESGG_states_TMA_rwy03_2019_04_cluster2.csv');
c3_data = readtable('x\ESGG_PM_opt\3-Evaluation\Data\Clusters\osn_ESGG_states_TMA_rwy03_2019_04_cluster3.csv');
c4_data = readtable('x\ESGG_PM_opt\3-Evaluation\Data\Clusters\osn_ESGG_states_TMA_rwy03_2019_04_cluster4.csv');
c5_data = readtable('x\ESGG_PM_opt\3-Evaluation\Data\Clusters\osn_ESGG_states_TMA_rwy03_2019_04_cluster5.csv');
c6_data = readtable('x\ESGG_PM_opt\3-Evaluation\Data\Clusters\osn_ESGG_states_TMA_rwy03_2019_04_cluster6.csv');

files_OPT = dir(['x\ESGG_PM_opt\3-Evaluation\Data\CDO_full\*CDO*.csv']);
files_OS = dir(['x\ESGG_PM_opt\3-Evaluation\Data\OS_full\*.csv']);

files_ALL = dir(['x\ESGG_PM_opt\3-Evaluation\Data\CDO_all_trajectories\*.csv']);
```

3) Run the 'esgg_opt_evaluation_2024.m' file.