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KC-30A SLEP Detailed Mission Definitions

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Why detailed mission definitions?

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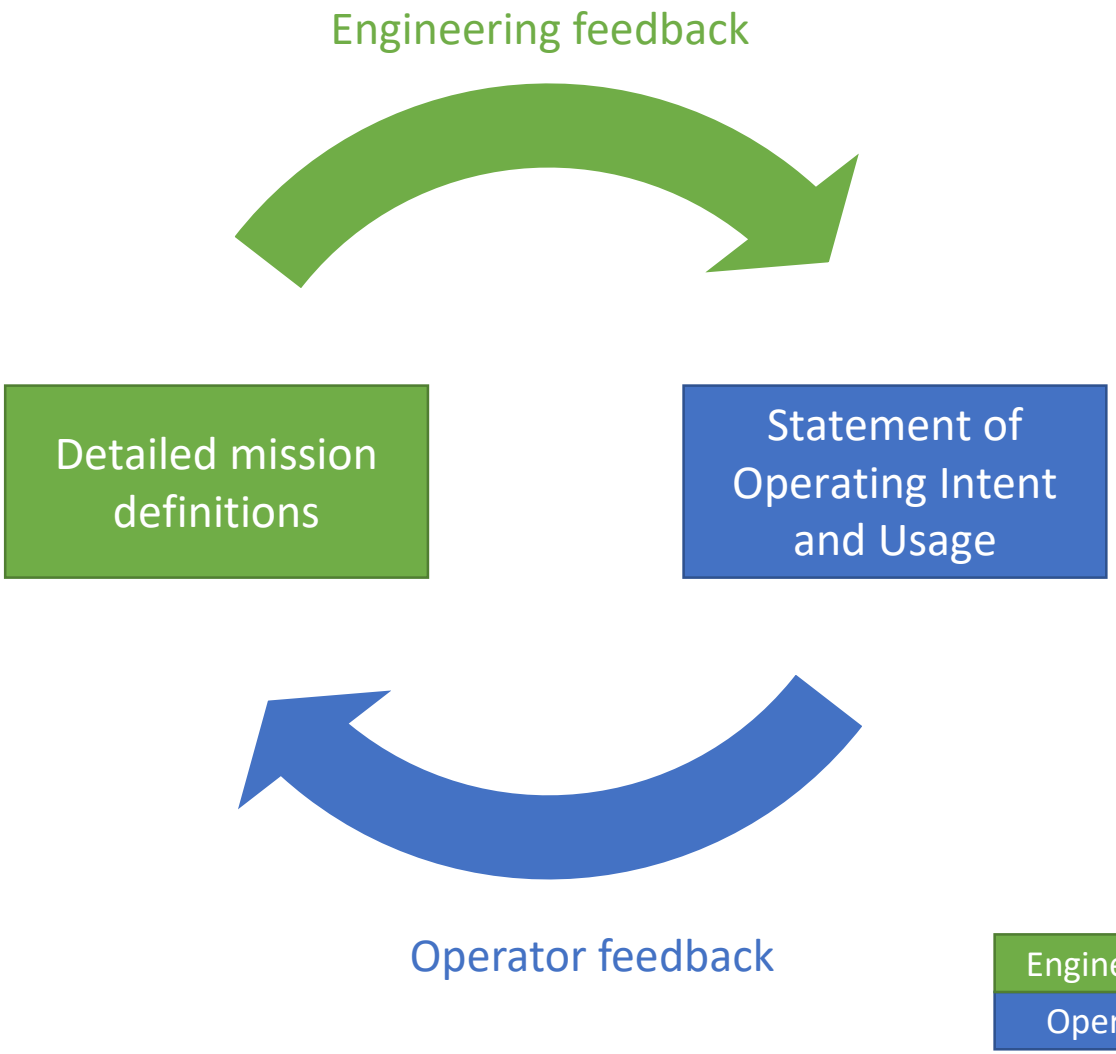
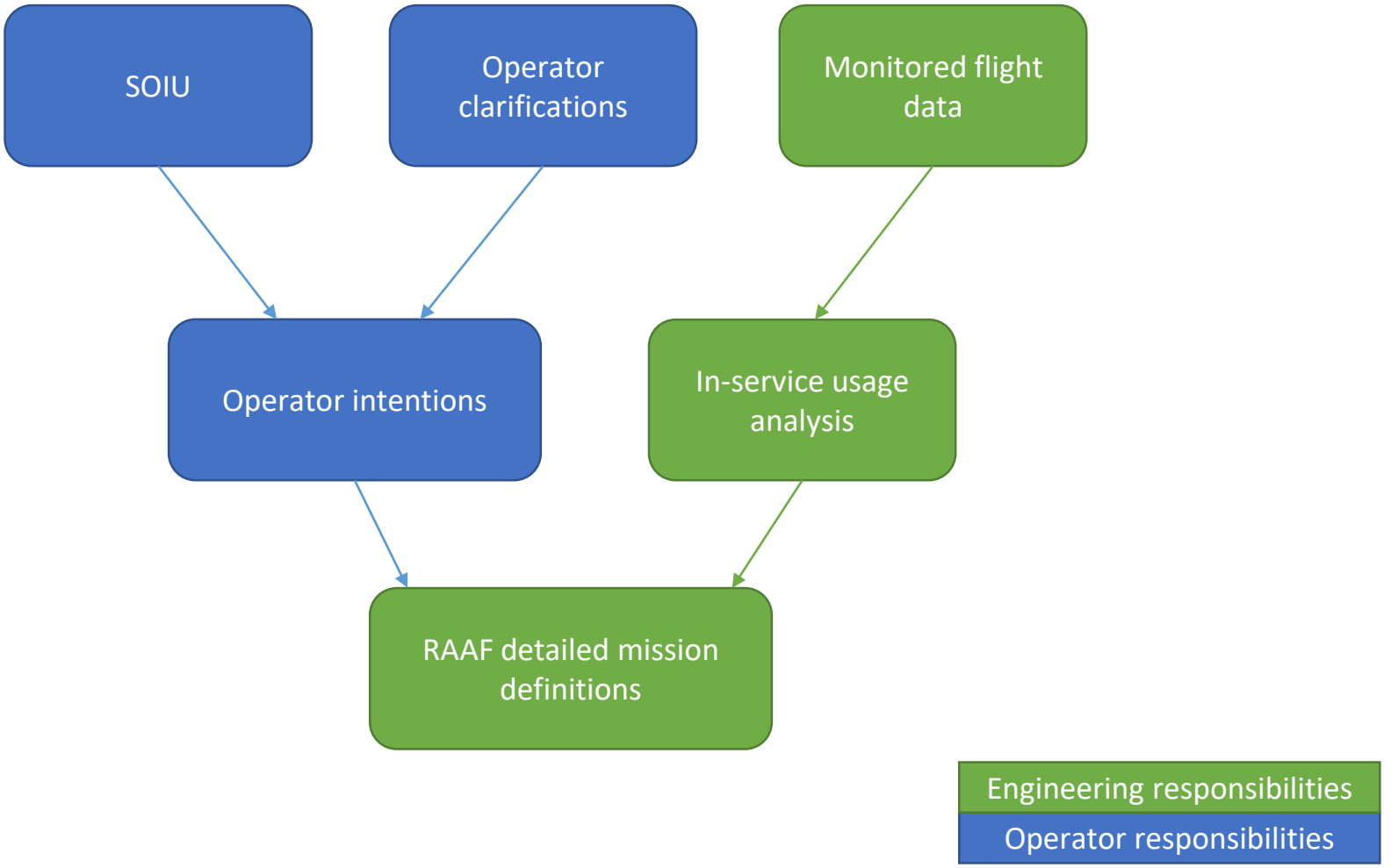
- Common SLEP between fleets does not establish what RAAF requirements are
- Translation of Operator intentions required to support engineering activity (certification)
- RAAF baseline with significant detail needs to be established for comparison to certification baseline

Detailed mission definitions



Inputs to mission definitions



In-service analysis

- Benefited from the through life support usage monitoring system.
  - Data was well organised
  - Initial data quality checks had been performed
- Automated processing of large amount of flight data downloaded from the aircraft.
- For SLEP, Engineering investigated key parameters of interest to the OEM as well as current in-service issues.
- Analysis of previous usage supported detailing Operator intentions.

Methodology

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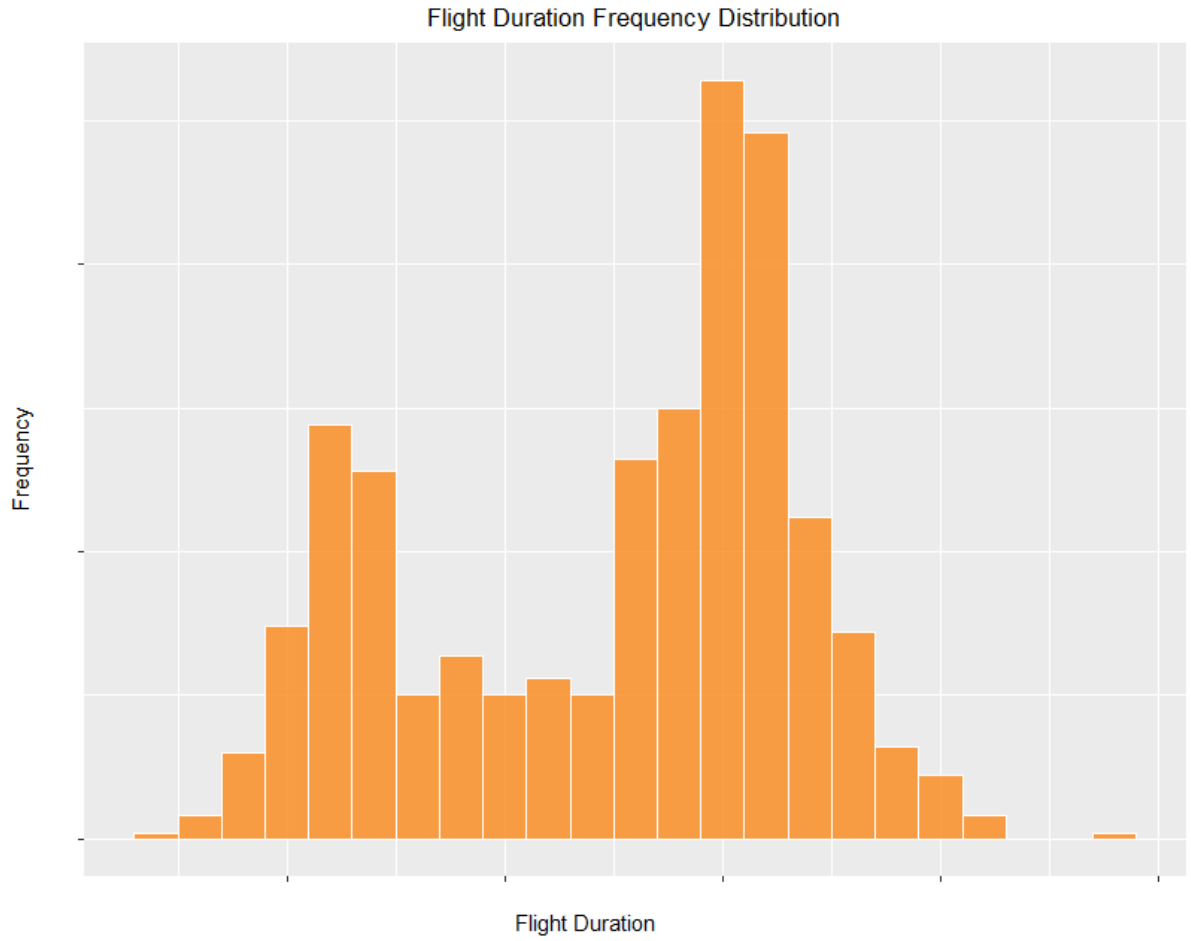
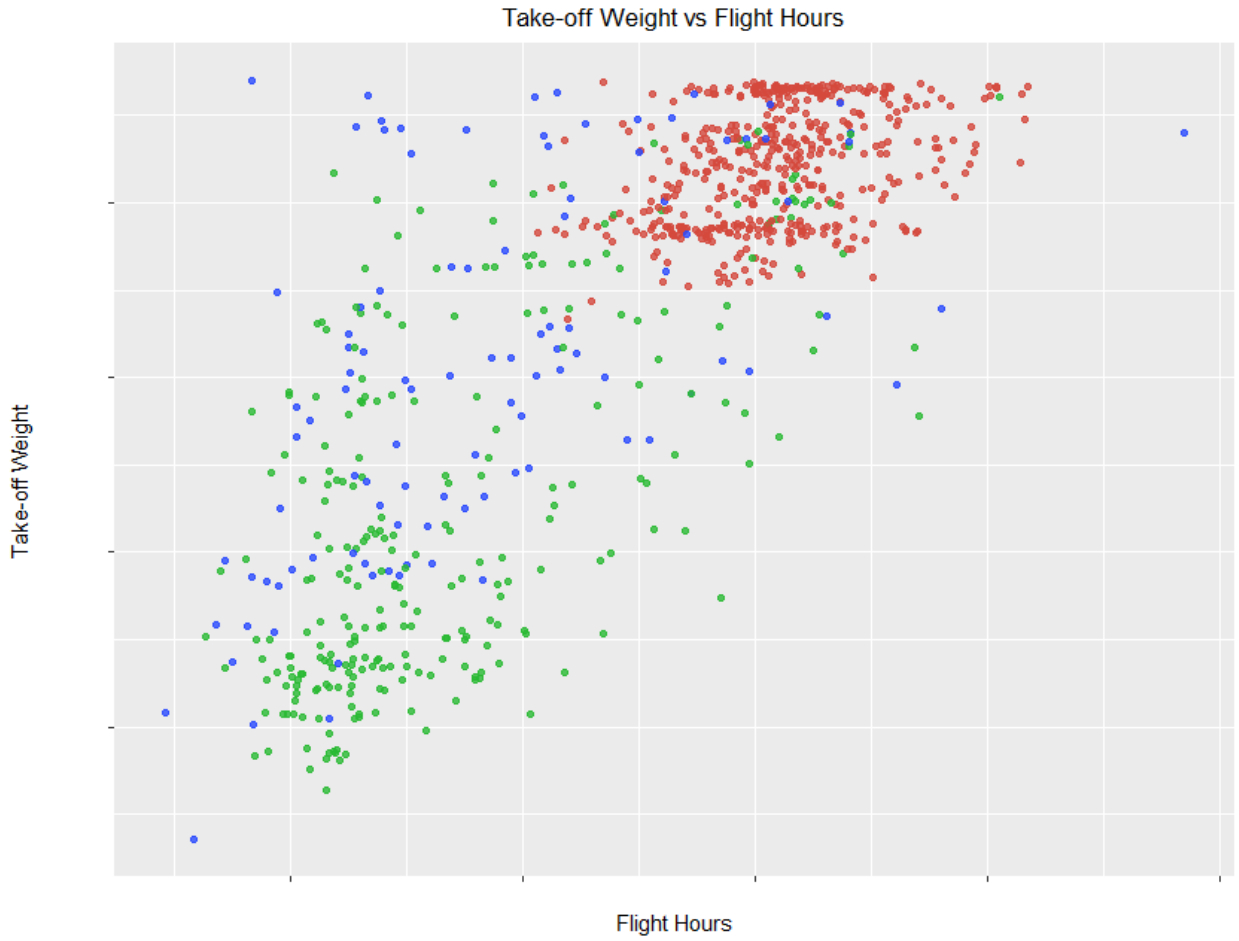
1. Use SOIU and basic statistical information to prompt discussion between stakeholders.
2. Perform detailed analysis to identify operational characteristics.
3. Confirm results of analysis and clarify unexpected observations with the Operator.
4. Discuss expected changes for future operations.
5. Provide detailed mission profiles, mission mix and rate of effort.
6. Confirm proposed definitions represent best understanding with stakeholders.
7. Release report to OEM to support certification.

Example of analysis



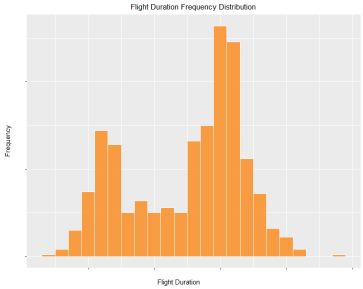
Bimodal distribution from basic statistical analysis of fleet

Example of analysis (cont'd)



Detailed analysis based on categorical variables

Example of analysis (cont'd)



Detailed analysis based on categorical variables

Example of analysis (cont'd)

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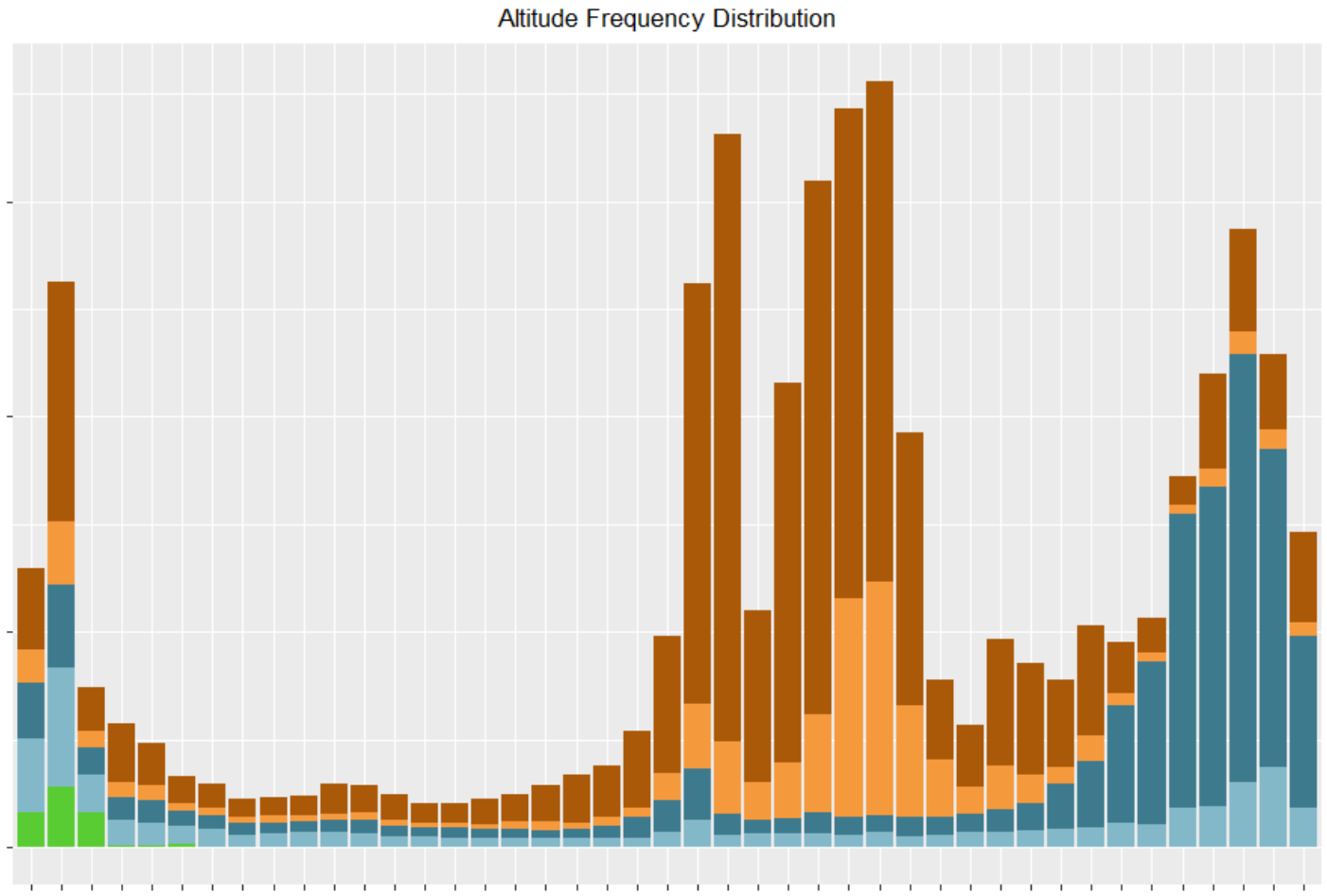
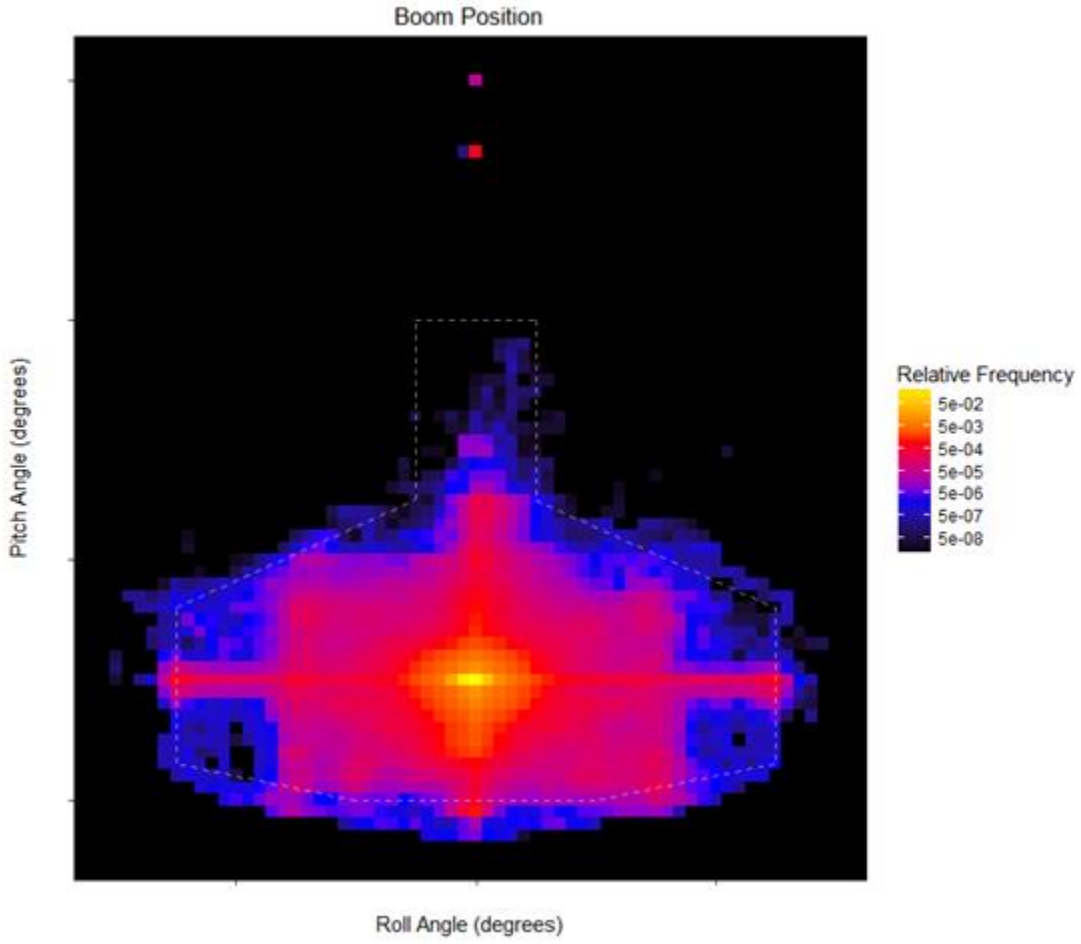
- Compared other key variables, identifying significant differences
- Confirmed results with Operator
- Mission types were further differentiated as a result

Other example charts – altitude distribution



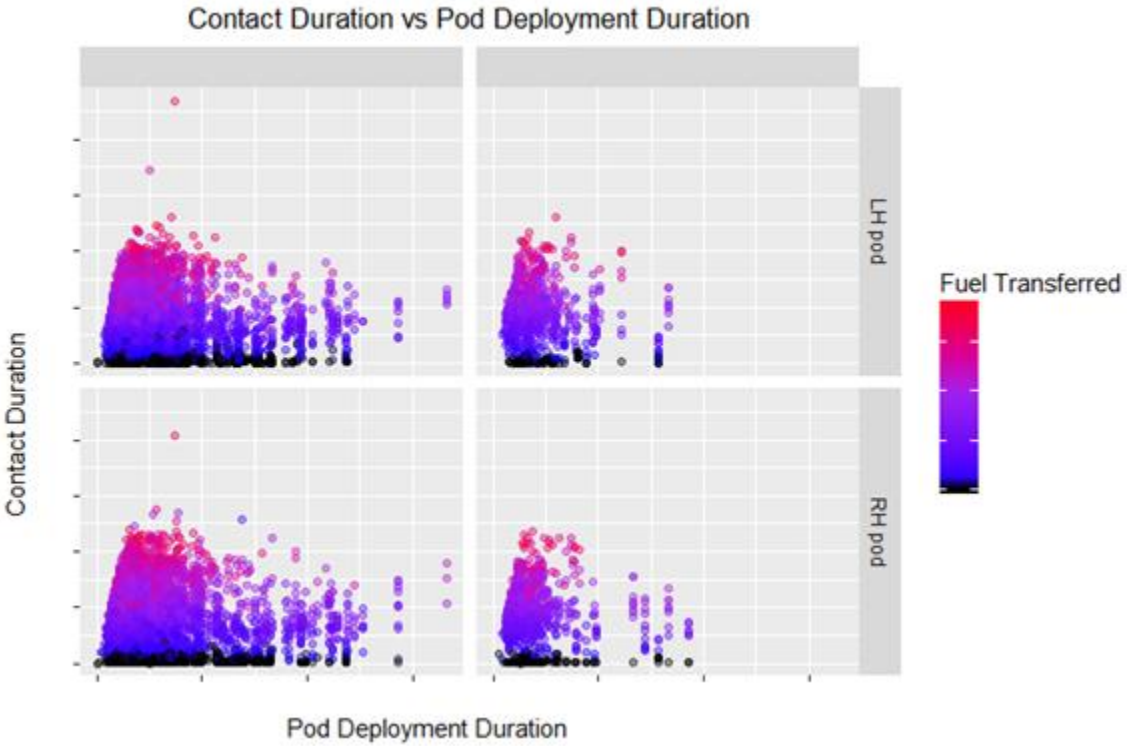
Altitude distribution with categorisation

Other example charts – boom envelope



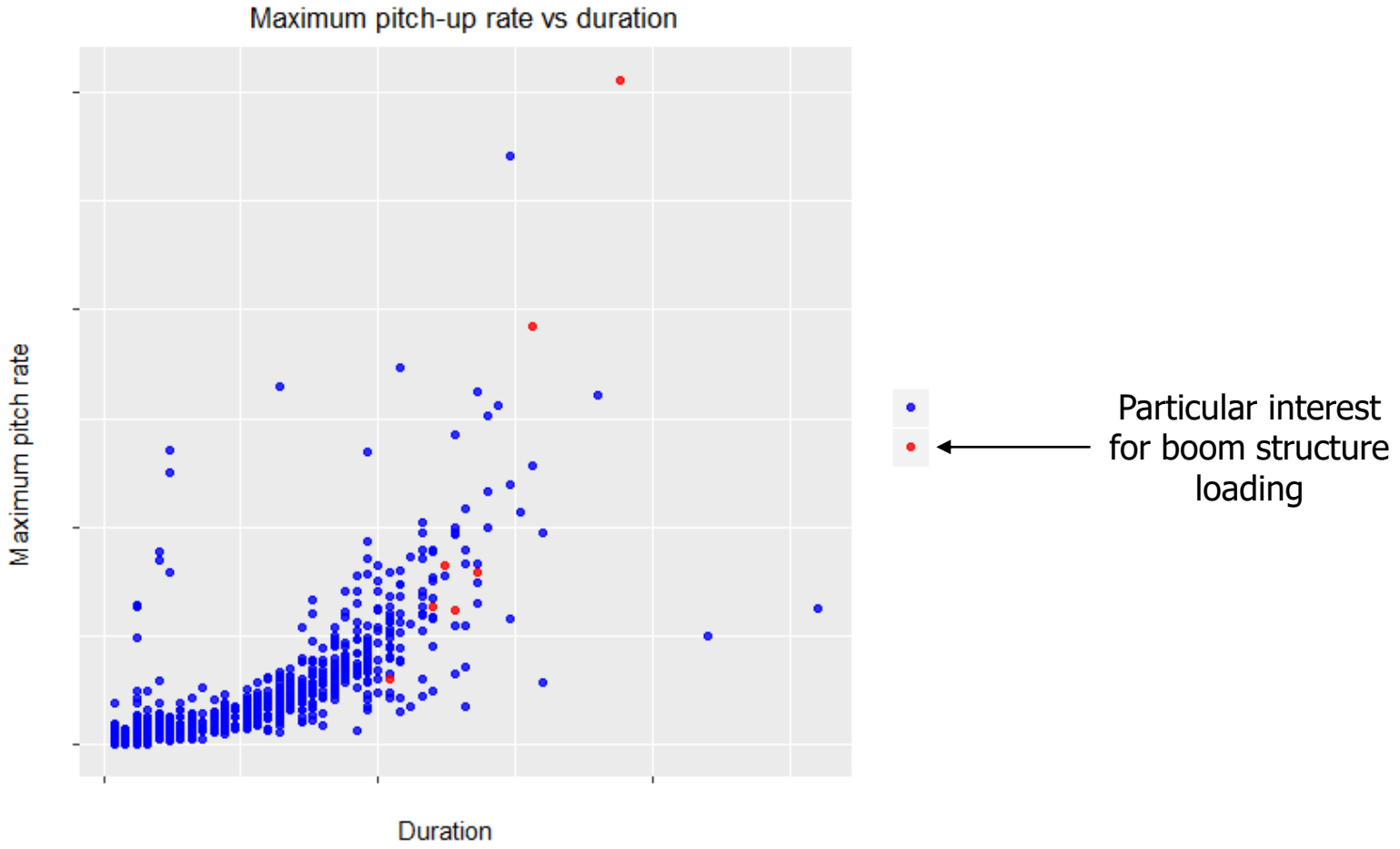
Boom position relative frequency

Other example charts – pod contacts



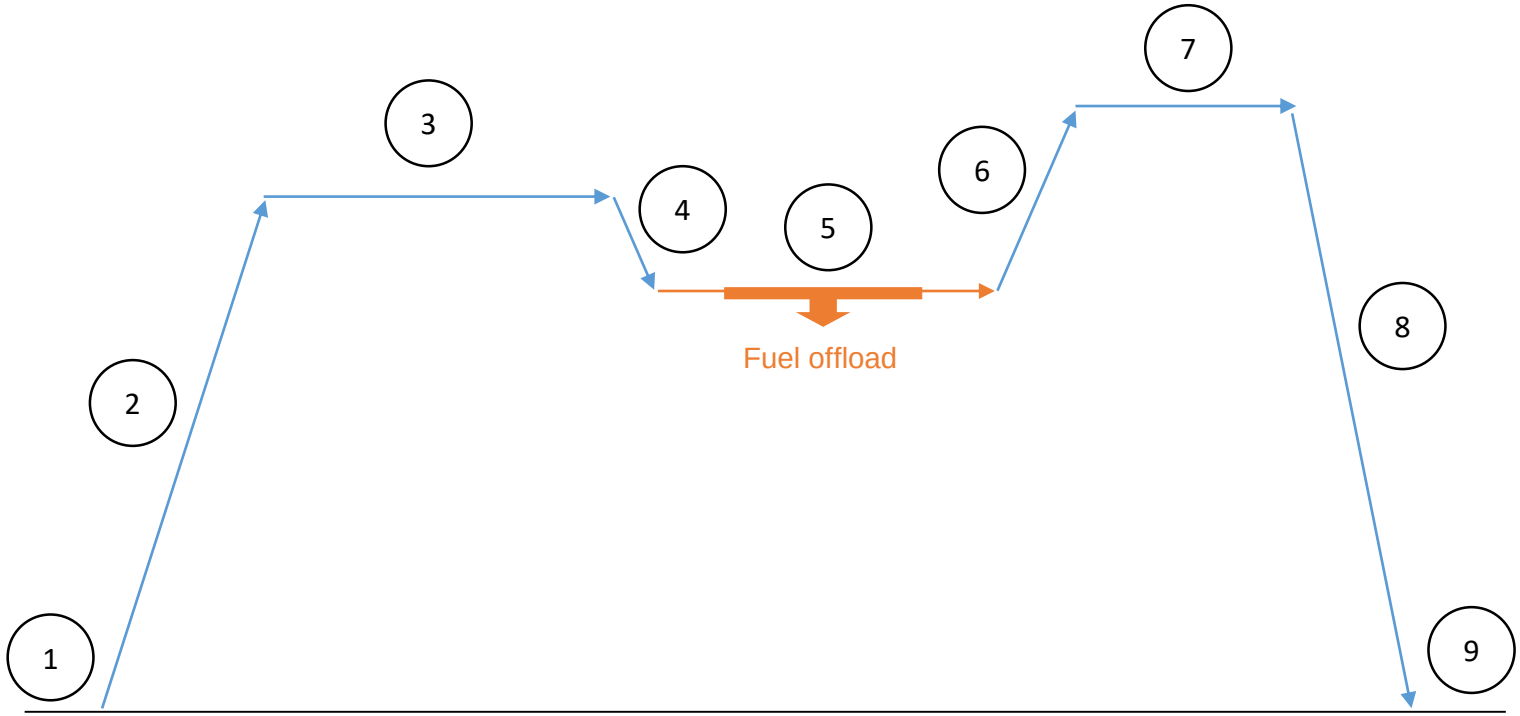
Pod contact durations – used to select appropriate values for profiles

Other example charts – Boom conditional events



Boom usage conditional events highlighted

Example flight profile



Individual phases of flight were detailed (not shown)

Issues encountered

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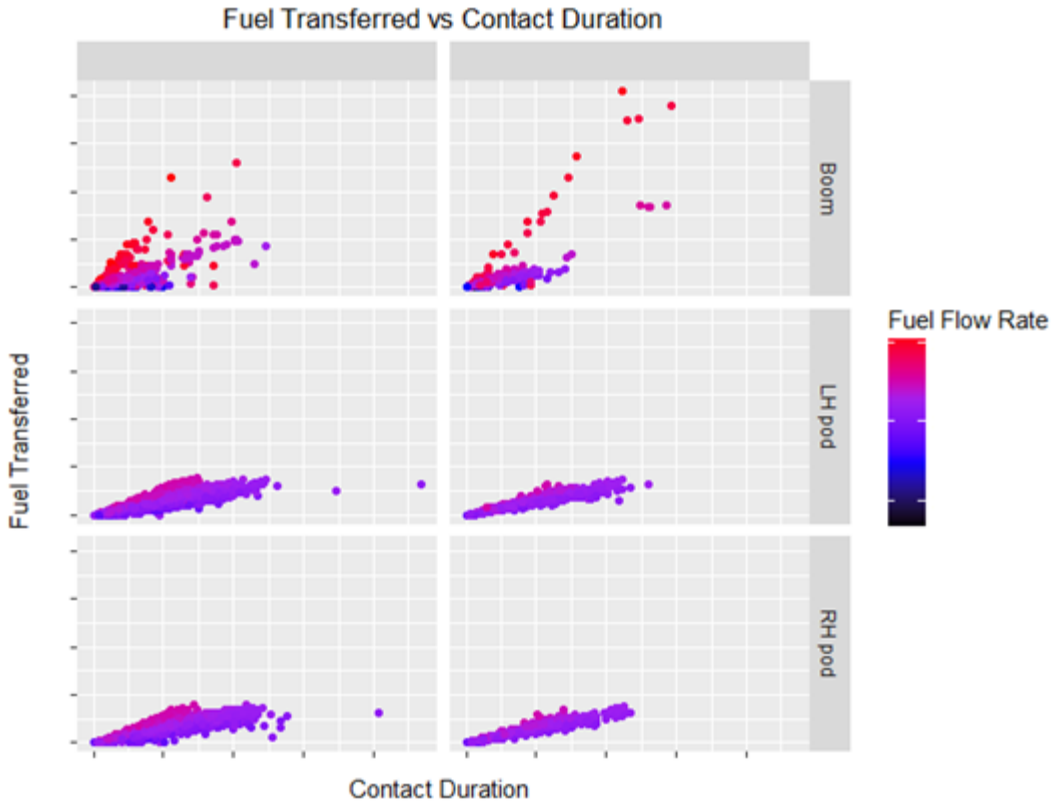
- Network infrastructure and computational time.
  - Code iteratively developed
  - Significant processing time limited the amount of “passes”.
  - Network reliability was an issue
  - Code optimisation was required
- Machine learning explored, but validation did not support schedule.
- Difficult to make decisions on intended usage without supporting in-service data – especially when a change to operations is expected in the future.
- Terminology used between different disciplines.
- Time available to explore data, investigate findings and develop consensus.

Issues encountered (cont'd)

Are terms consistent across disciplines?



Light receiver vs heavy receiver?
Are we able to successfully determine this in the data?

Benefits of approach taken

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- In-service analysis independently verified that flight characteristics were found to be consistent with SOIU.
- Updates to the SOIU and Engineering detailed mission definitions were developed iteratively further improving both documents.
- A shared understanding was developed across multiple stakeholders.
- Engineering benefited from knowledge about operational practices and constraints to explain observations in data.
- The Operator were able to fine tune details in the SOIU.

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