

Hawk HUMS - Strain Gauge Health

Software Assisted Hawk Mk127 Strain Gauge Serviceability Assessment

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Hawk Strain Gauge Health

Overview

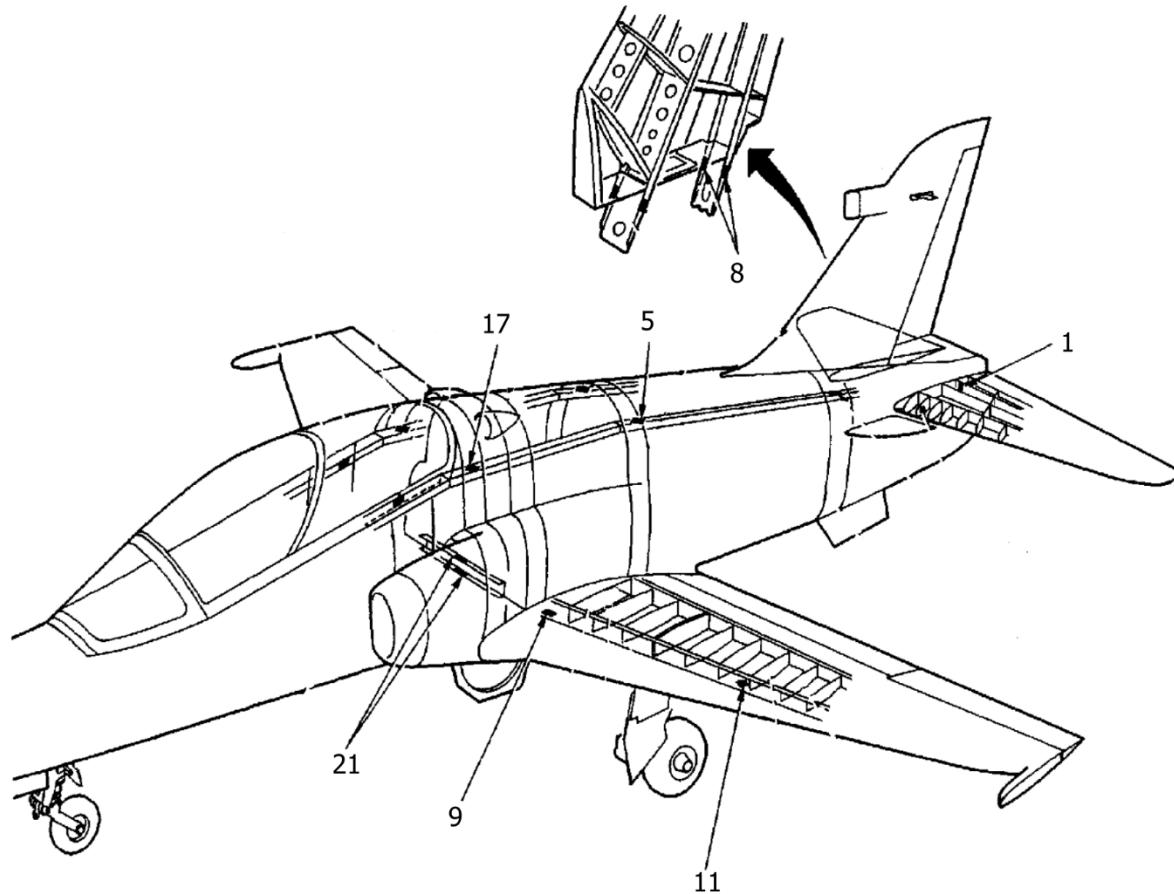
- Background
- Strain gauge failure modes
- Manual gauge serviceability assessment
- The process of automating gauge serviceability assessment
- Specific examples of checks performed
- Results and future improvements



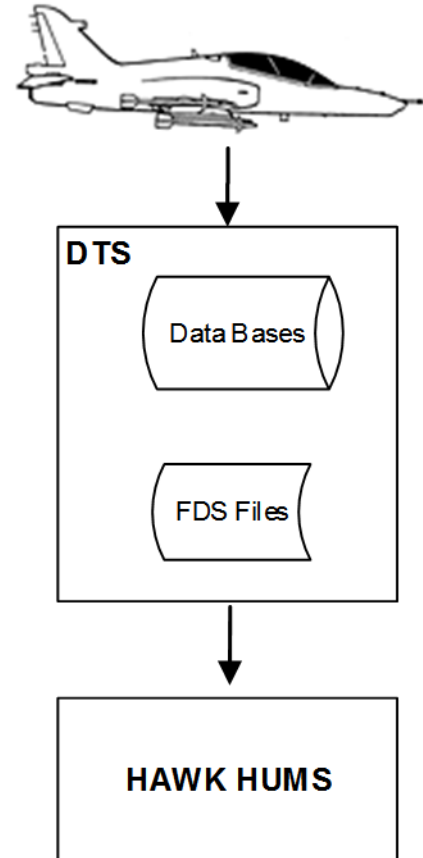
(Source: <https://images.defence.gov.au>)

Hawk Strain Gauge Health Background

Strain Gauge Locations



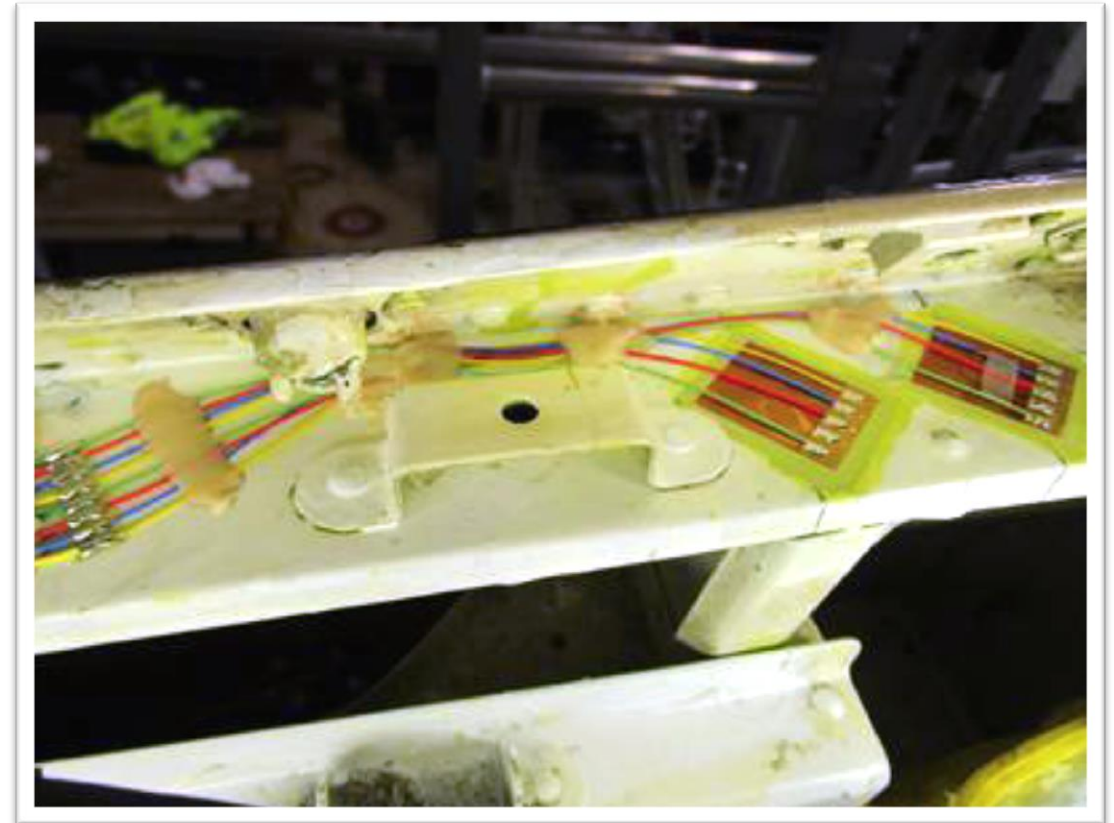
Hawk HUMS Data Flow



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Strain Gauge Failure Modes

- Open Circuit
- Short Circuit
- Corrosion of substrate
- Corrosion of connector
- Delamination of gauges

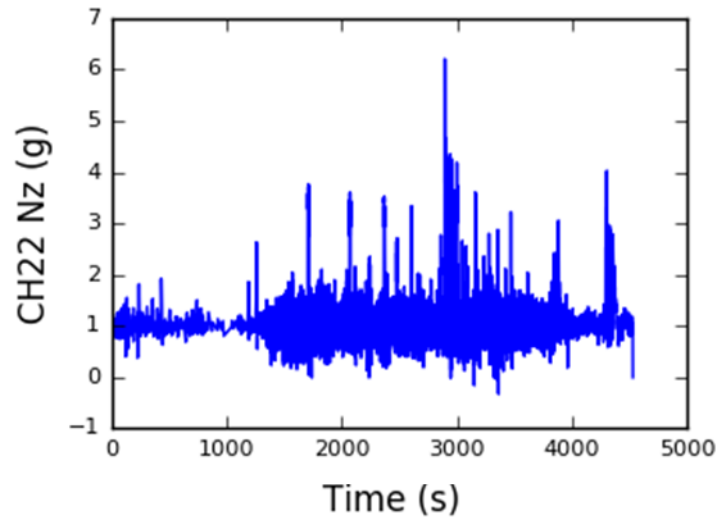
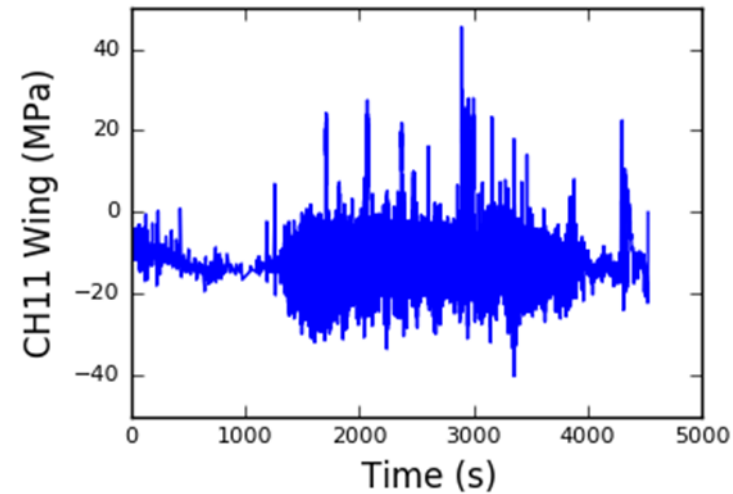
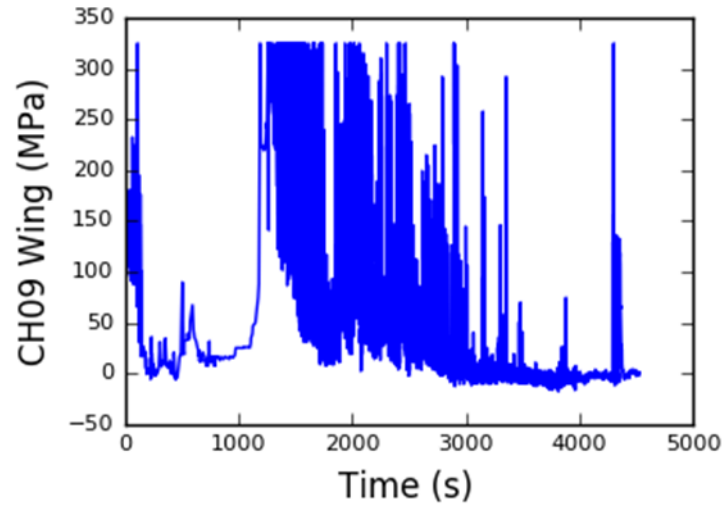


Wiring and Gauges

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Manual Strain Gauge Assessment

- Compare gauge response with other gauges
- Check for any anomalous strain recording such as spikes and lack of response



Plots of gauges used in manual strain gauge assessment

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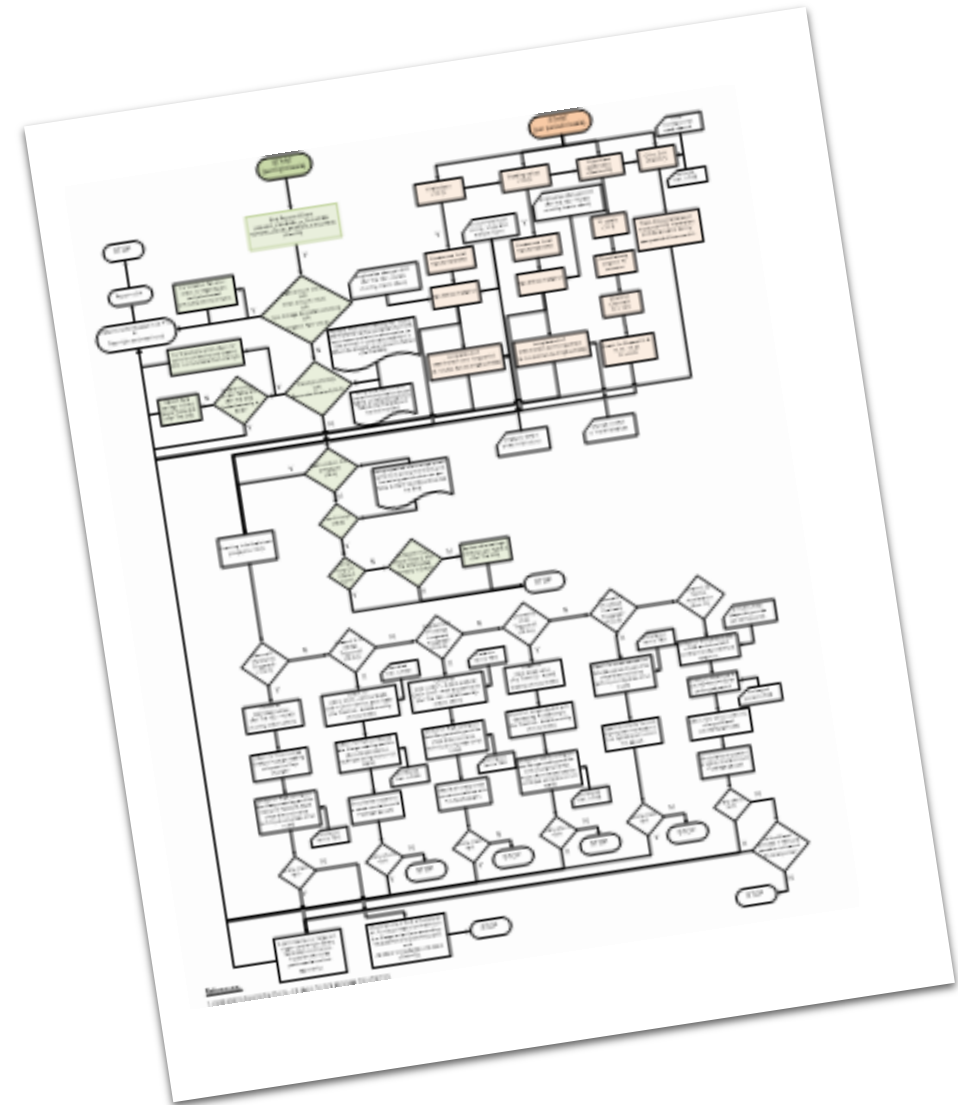
Manual Strain Gauge Assessment



- Thorough – each flight is looked at
- Analysts becomes very skilled at identifying issues
- Requires highly trained personnel
- Human judgment – human error

Hawk Strain Gauge Health Automating Strain Gauge Checks

- Authored a report
- Produced a flowchart
- Developed software



Complex logic for determining strain gauge serviceability

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Automating Strain Gauge Checks

Wired In Reverse (WIR) Checks

- Check for negative correlations

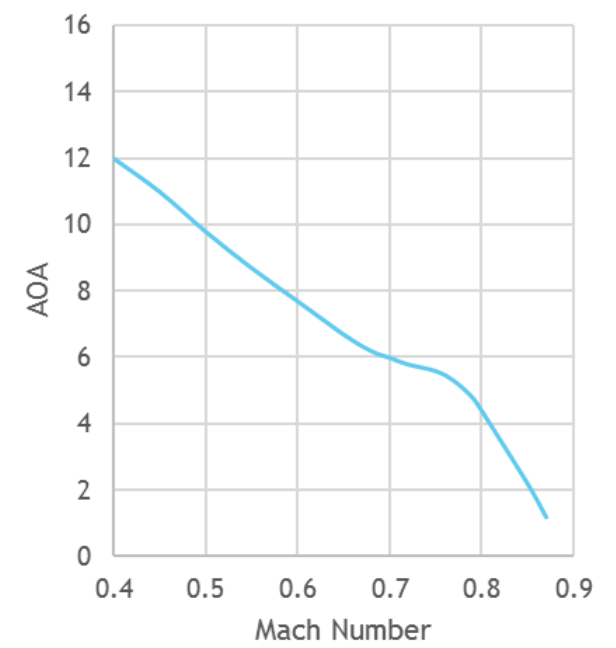
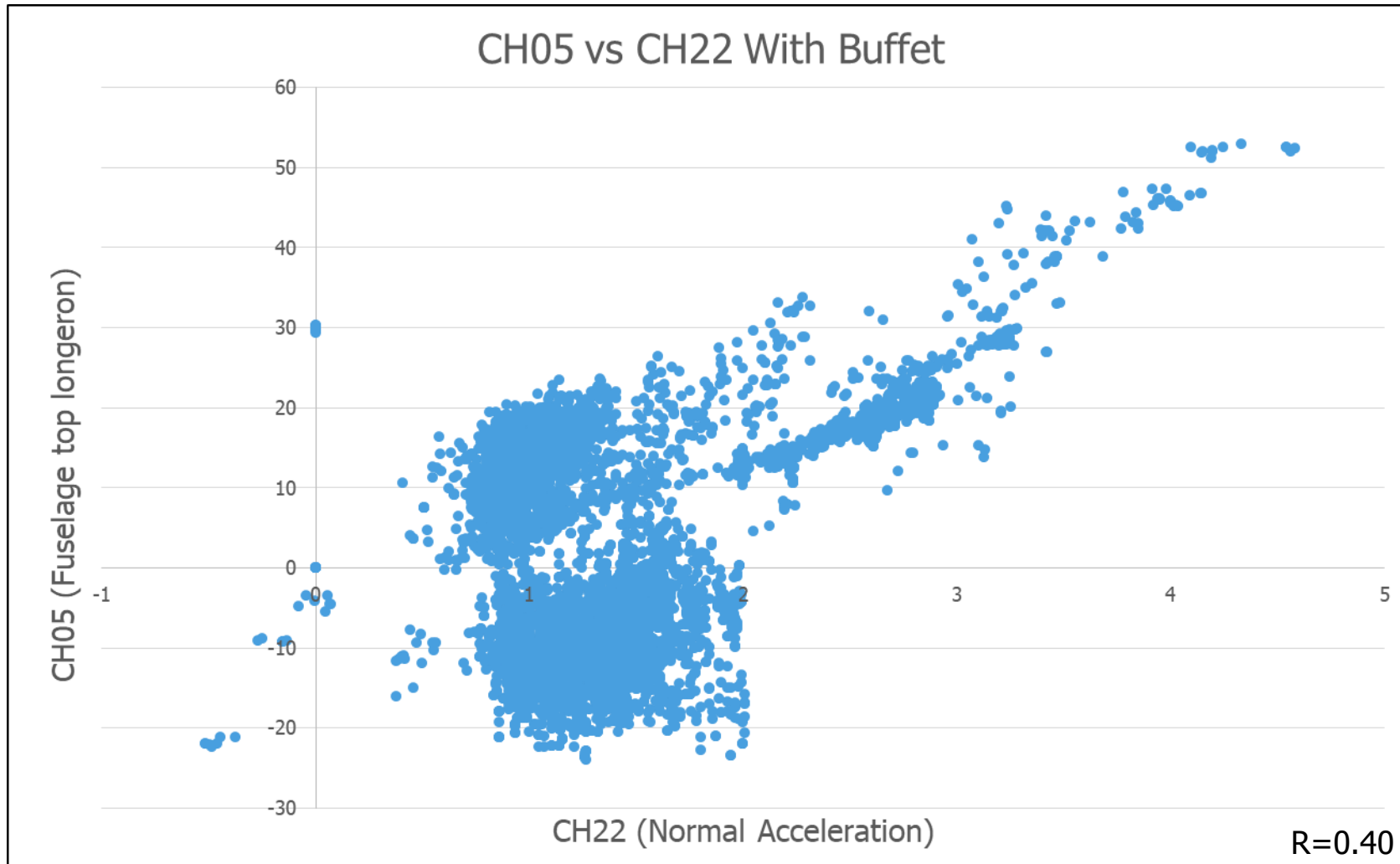
Periodic Checks

- Check for degradation over time

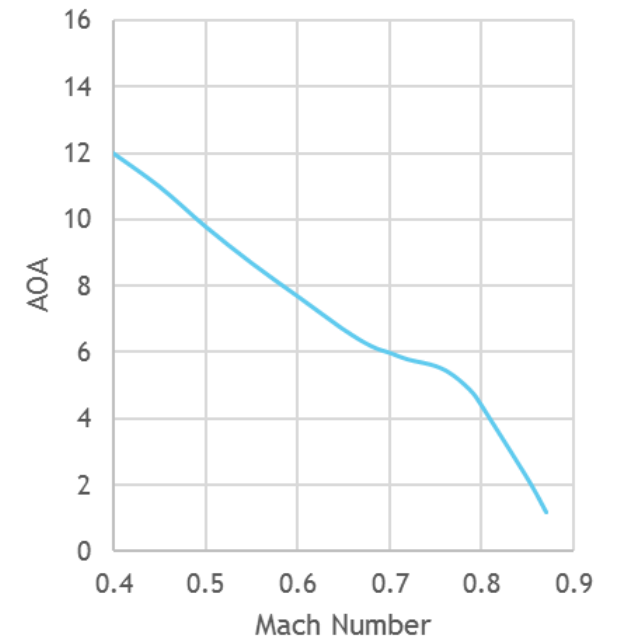
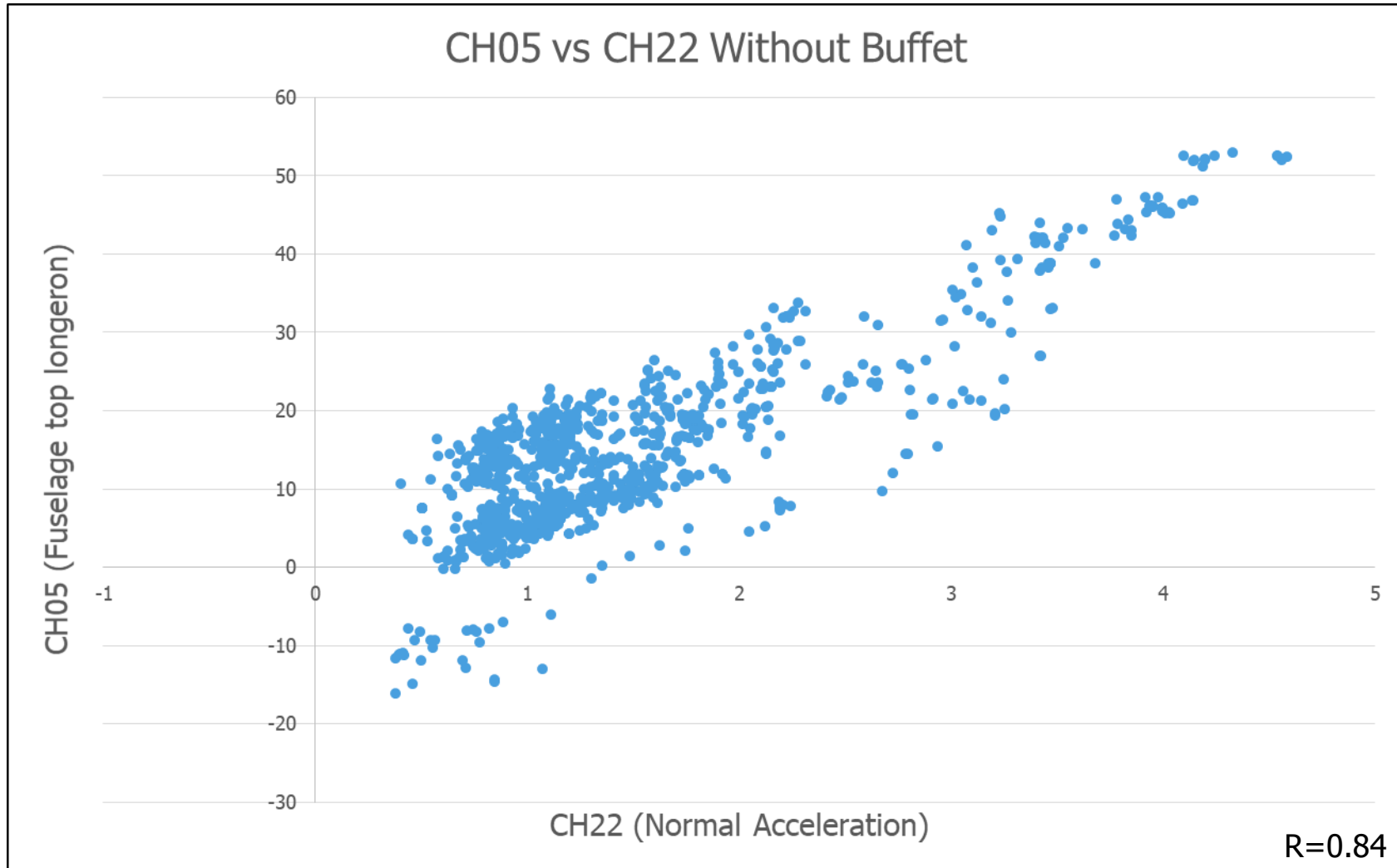
Flight Checks

- Built In Test (BIT) failures
- Anomalous fatigue outputs
- Cross checking flight parameters

Hawk Strain Gauge Health Flight Check – Channel Correlation Check



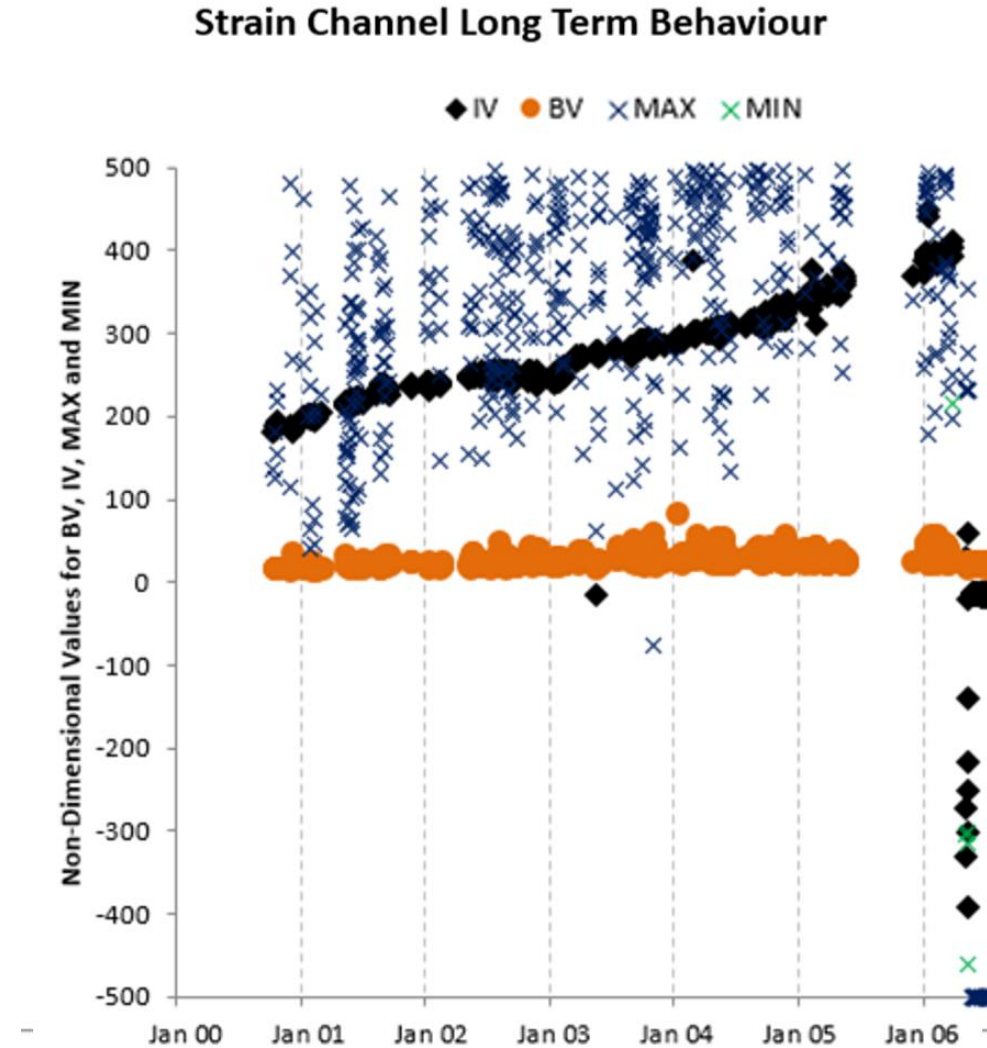
Hawk Strain Gauge Health Flight Check – Channel Correlation Check



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Periodic Checks

- Observe trends in bonding and initial values



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Results and Future Improvements

Results

- Processed 16 years of flight data
- Reduced time taken to perform gauge assessment
- Software was validated

Future Improvements

- Fine tune thresholds for checks performed
- Develop additional checks



(Source: <https://images.defence.gov.au>)

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Acknowledgements

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