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Searching for Hidden FDM Events

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Searching for Hidden FDM events

Outline of this presentation

- Common industry practice
- The Limitations of FDM
- Quality Checks as mitigating actions
- Development of FDM systems

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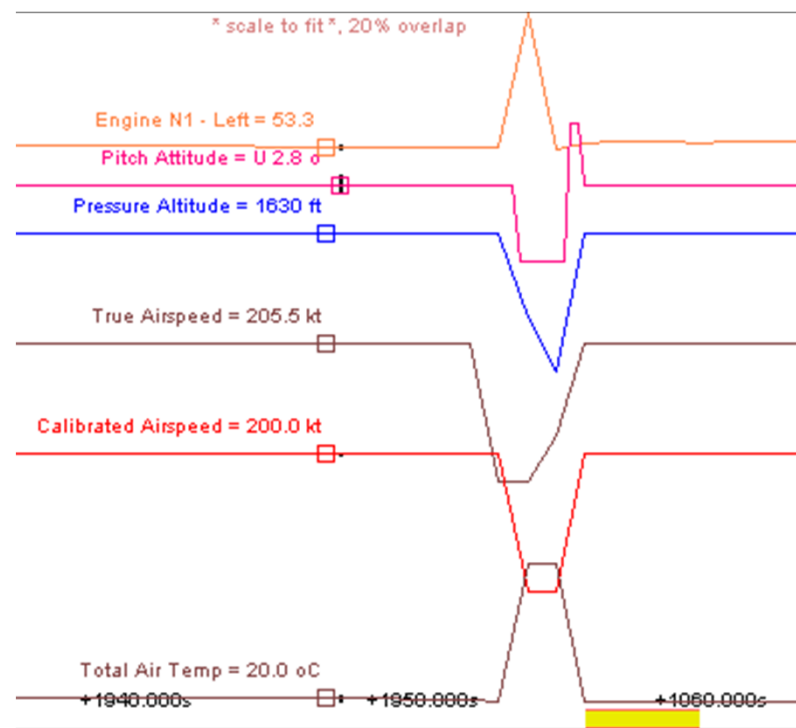
Common industry practice

Most FDM systems highlight “events” when routine measurements exceed predefined thresholds

Events may be invalid for multiple reasons: “false positives” are easy to discard

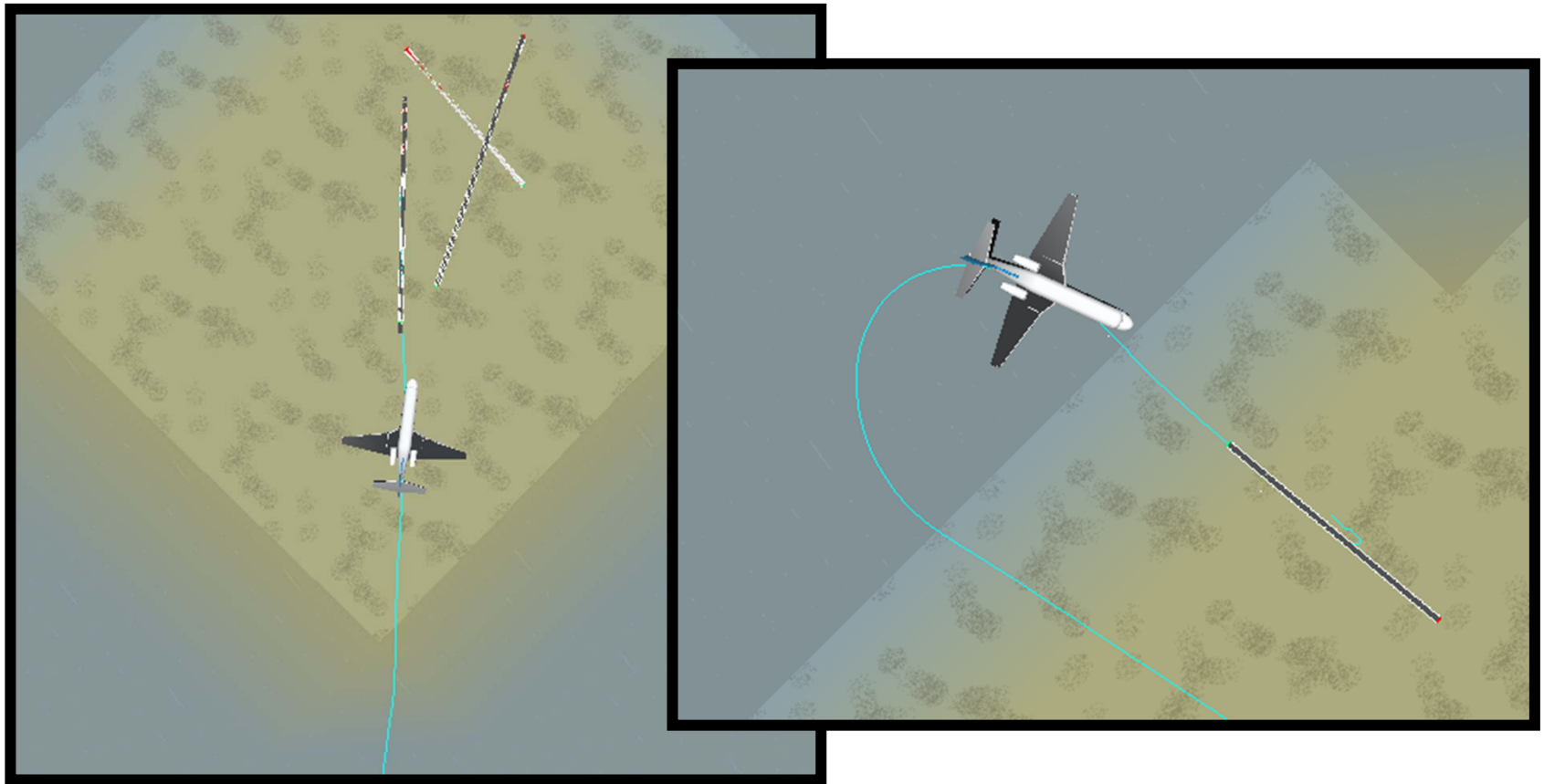
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Invalid data may trigger invalid events



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Crosswind may trigger invalid “Unstabilized Approach” events



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Common industry practice

Most FDM systems highlight “events” when routine measurements exceed predefined thresholds

Events may be invalid for multiple reasons: “false positives” are easy to discard

- Invalid Data
- Crosswind on short final
- etc

Flights without events are assumed to be “compliant”

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The Limitations of FDM systems

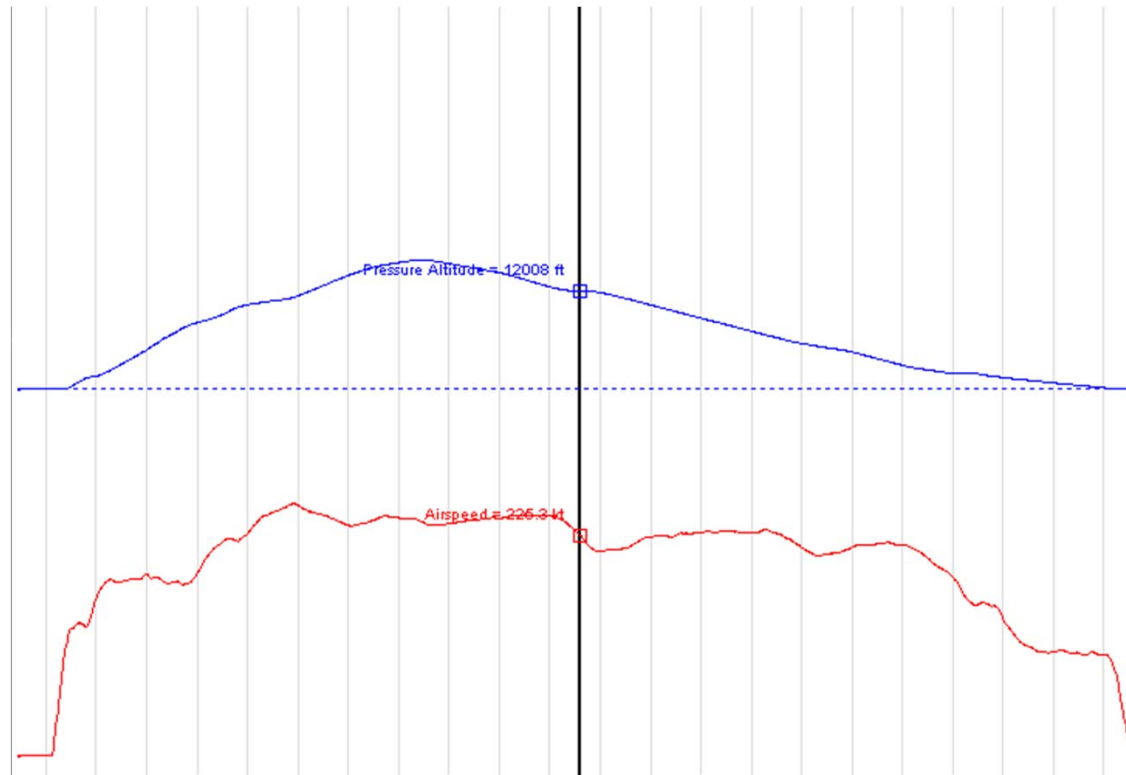
FDM systems are not perfect: real events may not be flagged due to many reasons

- Event is not set or a parameter is not recorded
- Unusual flights

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Unusual flights may cause algorithms to fail

Short “parabolic” flights may not have a distinct cruise phase.
This may prevent further events to be generated



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The Limitations of FDM systems

FDM systems are not perfect: real events may not be flagged due to many reasons

- Event is not set or a parameter is not recorded
- Unusual flights
- Incorrect definitions (SOP & aircraft limitations, conversion factors)
- Bugs in the software

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The Limitations of FDM systems

FDM systems are not perfect: real events may not be flagged due to many reasons

- Event is not set or a parameter is not recorded
- Unusual flights
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- Bugs in the software

“False Negatives” are difficult to identify and often overlooked

How reliable are our statistics and trends?

“Garbage in – garbage out”

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How can we minimize the problem of Hidden events?

Two useful techniques

1. *Count of missing flight measurements*
2. *Visualization of flight measurements*

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1. Count of missing flight measurements

In our FDM system there is a hierarchy of “objects”

Flights – Phases – Measurements – Events

Events will not be flagged if any of the parent objects are missing

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1. Count of missing flight measurements

We run a report for the most important measurements for each flight

ReplayID : 4166

Flights to be checked: 6

Flight 101709 passed all tests!

Flight 101710 passed all tests!

Flight 101711 has the following errors:

- Found 0 instances of State: Climb(Min: 1)

- Found 0 instances of State: Descent(Min: 1)

- Found 0 instances of SV: Fuel Monitoring - Weight - Top of Climb(Min: 1)

- Found 0 instances of SV: Fuel Monitoring - Weight - Top of Descent(Min: 1)

- Found 0 instances of SV: NJEAirborne2 - Max Airspeed Below 10000ft - Climbing(Min: 1)

- Found 0 instances of SV: NJEAirborne2 - Max Airspeed Below 10000ft - Descending(Min: 1)

- Found 0 instances of Pt: Top of Climb(Min: 1)

- Found 0 instances of Pt: Top of Descent(Min: 1)

- Found 0 instances of Pt: 10000ft Climbing(Min: 1)

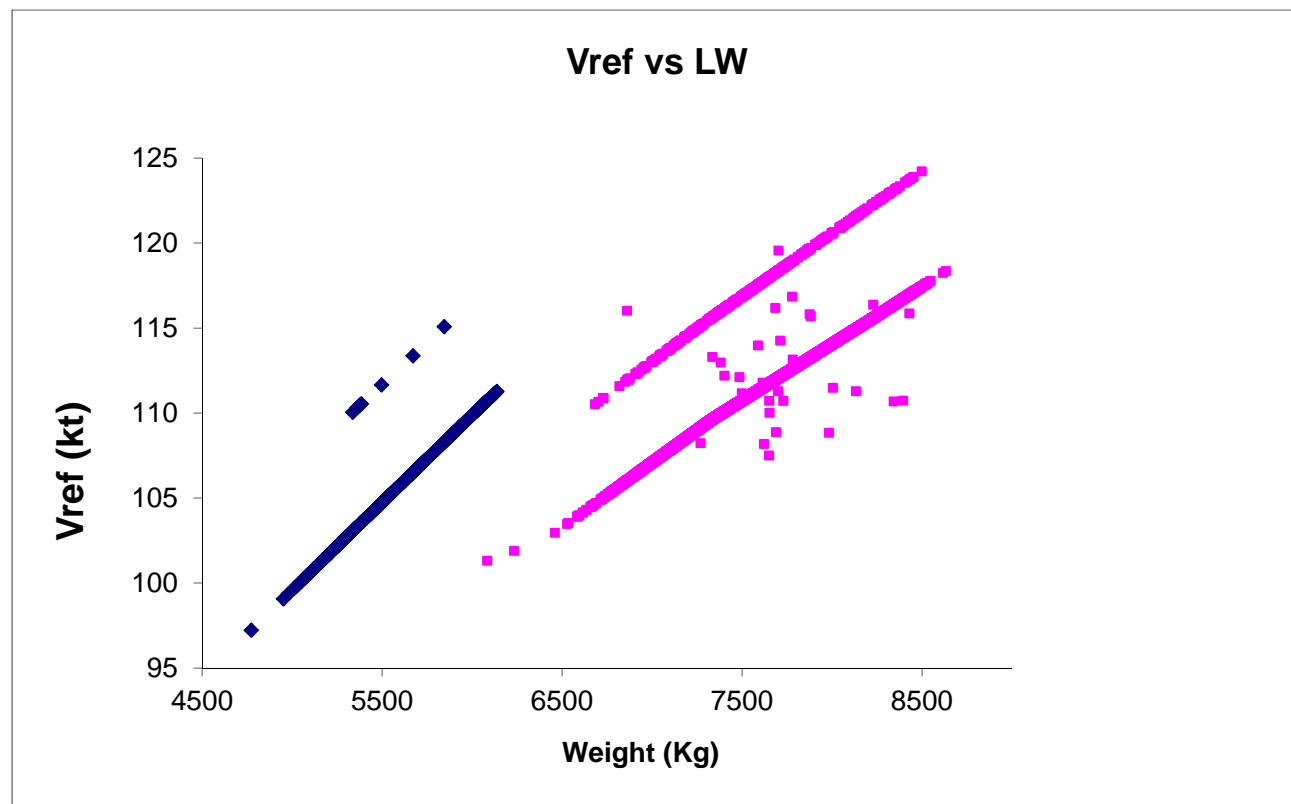
- Found 0 instances of Pt: 10000ft Descending(Min: 1)

Flight 101712 passed all tests!

Flight 101713 passed all tests!

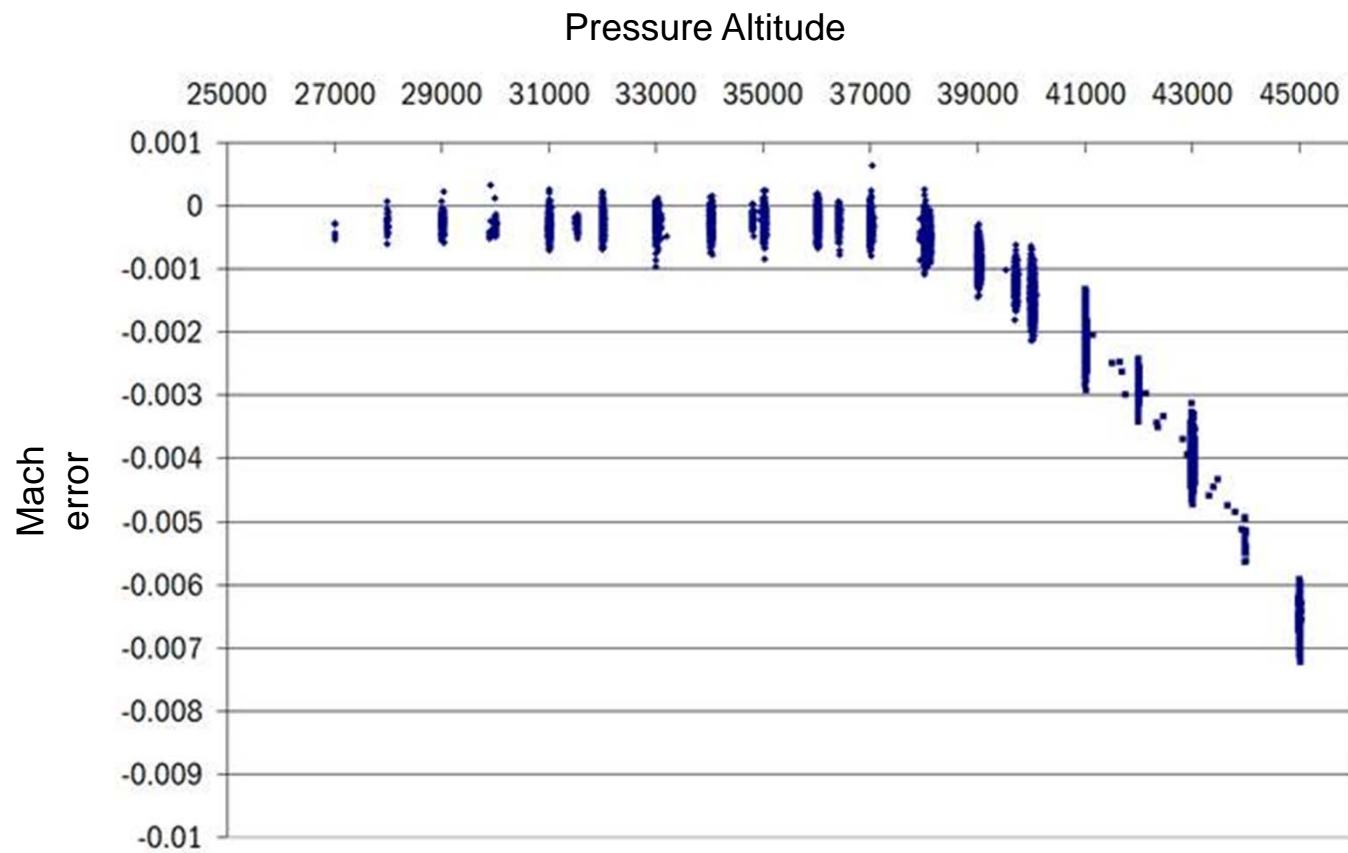
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2. *Visualization of flight measurements*



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2. *Visualization of flight measurements*

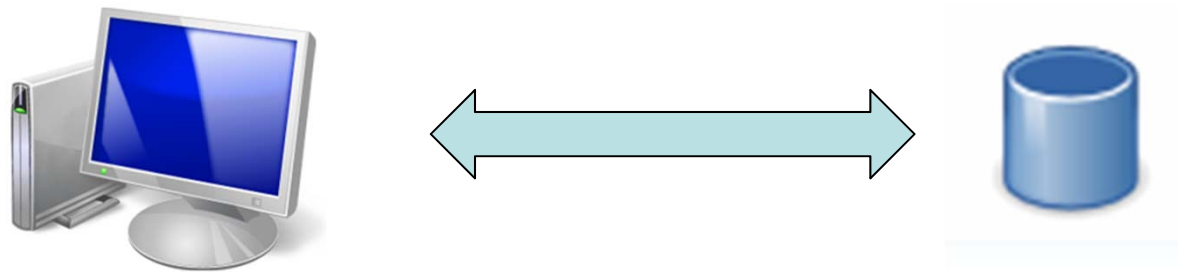


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Most FDM systems include reporting features, but often these are not sufficiently flexible or efficient.

The solution:

Bypass the User Interface and get to the data source!



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Bypass the User Interface and get to the data source!

```
SELECT
dbo_vRecordedFlights.flight_id,
dbo_vRecordedFlights.ac_type_name,
[SV-Vref].state_value ,
dbo_vFlownFlights.ff_td_weight_kgs,
dbo_vRecordedFlights.aircraft_reg
FROM
dbo_vRecordedFlights LEFT JOIN
dbo_vFlownFlights ON
dbo_vRecordedFlights.flown_flight_id =
dbo_vFlownFlights.flown_flight_id
LEFT JOIN
[SV-Vref] ON dbo_vRecordedFlights.flight_id =
[SV-Vref].flight_id
LEFT JOIN
[Flights wo Vref] ON dbo_vRecordedFlights.flight_id =
[Flights wo Vref].flight_id
WHERE
dbo_vFlownFlights.ff_td_weight_kgs Is Not Null
AND
[Flights wo Vref].flight_id Is Null AND [SV-Vref].[state_value] Is Null
ORDER BY dbo_vRecordedFlights.flight_id;
```

Requires:

- Deep knowledge of FDM system extra IT skills
- powerful tools
- critical judgement

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FDM systems need to evolve over time:

- Changes in SOP
- New fleets
- New safety issues to be investigated
- More reliable algorithms

Suggestions for development of FDM systems

- Double-check the default setup provided by your FDM vendor
- Build a separate FDM installation for testing & development
- “Mass-test” your new events before deployment

Beware of database performance!

- Create a checklist for phase-in of new fleets

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Summary:

- FDM systems are not perfect
- Hidden events may be important
- Two techniques to identify hidden events
 - ✓ Counting of flight measurements
 - ✓ Visualization of flight measurements
- FDM systems need to evolve over time
 - ✓ Be methodical and test before deployment

Thank you



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