BCA Aviation Safety

High Bandwidth Event Briefings - Google Earth Visualizations

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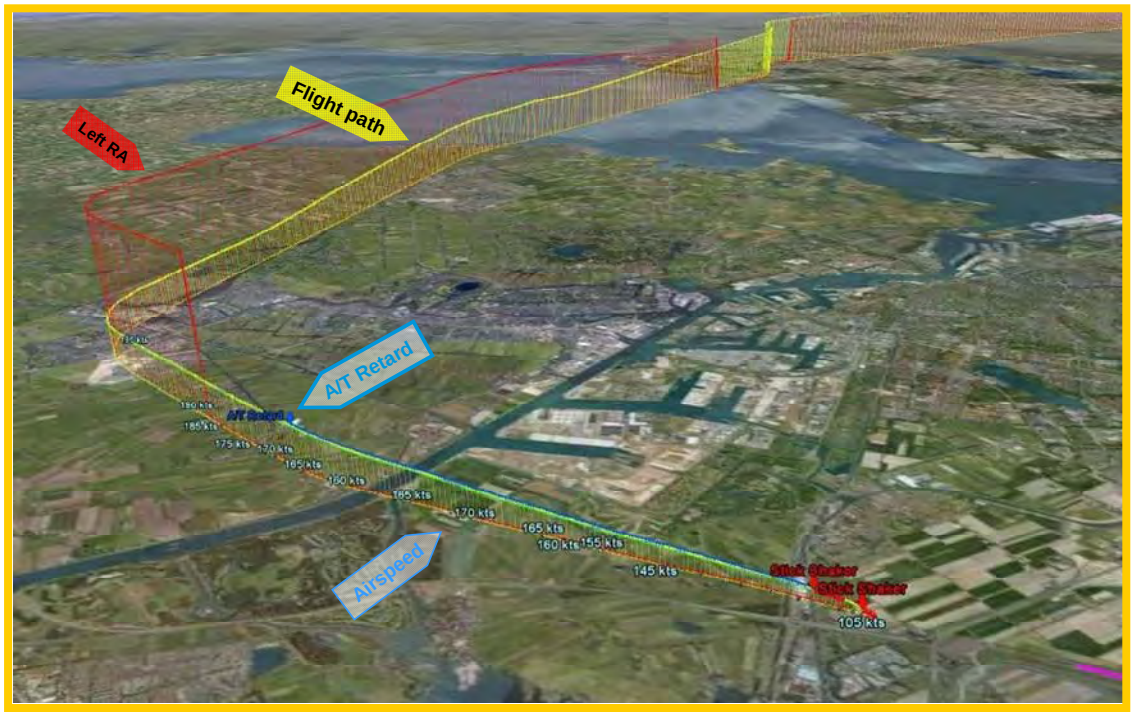
Event Visualizations

Visual Analytics - Different ways of communicating information

Traditional Plot

Animation

Google Earth Visualization

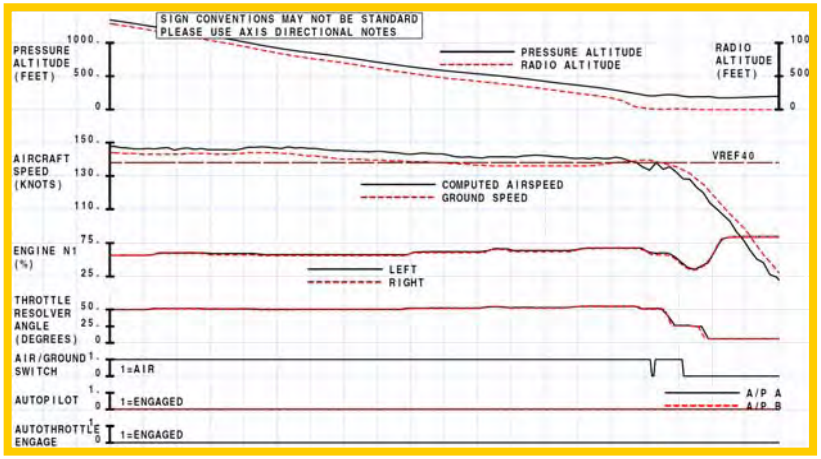


Google Earth Visualizations combines advantages of plots and animations

Traditional Plots

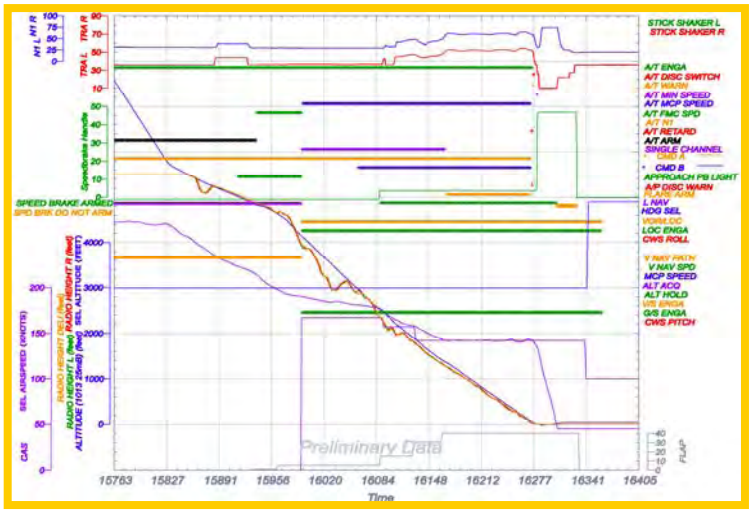
Pros

- Good for detailed study of parameter values
- Good for initial data exploration, especially on-screen
- Shows changes over time in a single image



Cons

- Often requires a learning curve or experience to quickly interpret data
  - *"What am I looking at?"*
- Low information density
- Hard to optimize for both on-screen and paper formats



Good at showing changes over time, poor at showing spatial relationships

Animations

Pros

- **Good communication tool**
- **Good exploration tool**
- **Intuitive presentation**

Cons

- **Shows only one instant in time**
- **Heavily dependent on**
  - Aircraft models
  - Instrument models
  - Generated data
- **Can result in misleading visuals**

Good at showing spatial relationships, poor at showing changes over time

Google Earth Visualization

Pros

- Good “high band-width” communication tool
- Effective at showing relationships between recorded data and events
- Good for data exploration
- Can combine data from nearly any source
- Shows progression over time

Cons

- Difficult to get precise value of parameters
- Requires access to Google Earth

Good at showing changes over time and spatial relationships

KML | The Language of Google Earth

Keyhole Markup Language

```
<Placemark>
  <name>Sample Point</name>
  <Point>
    <coordinates>
      50.9581, 6.9204, 0
    </coordinates>
    <TimeStamp>
      <when>
        2012-01-12T13:00:00Z
      </when>
    </TimeStamp>
  </Point>
</Placemark>
```

Longitude, Latitude, Altitude

Time

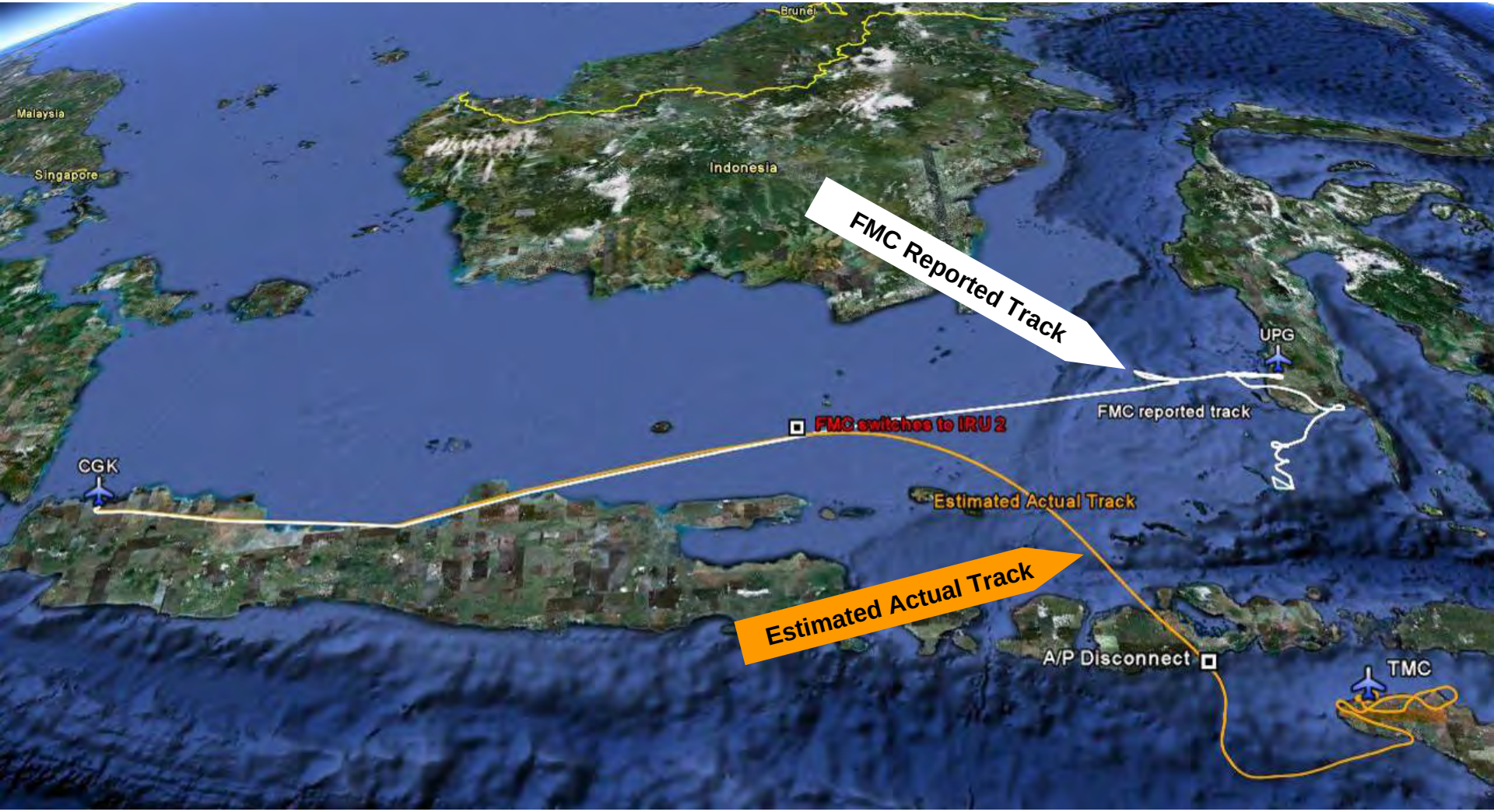
```
<Placemark>
  <name>Sample Path</name>
  <LineString>
    <coordinates>
      -112.2550, 36.0795, 2357
      -112.2549, 36.0811, 2357
      -112.2552, 36.0826, 2357
    </coordinate>
  </LineString>
</Placemark>
```

Longitude, Latitude, Altitude

Everything is reduced to Longitude, Latitude, Altitude – and Time

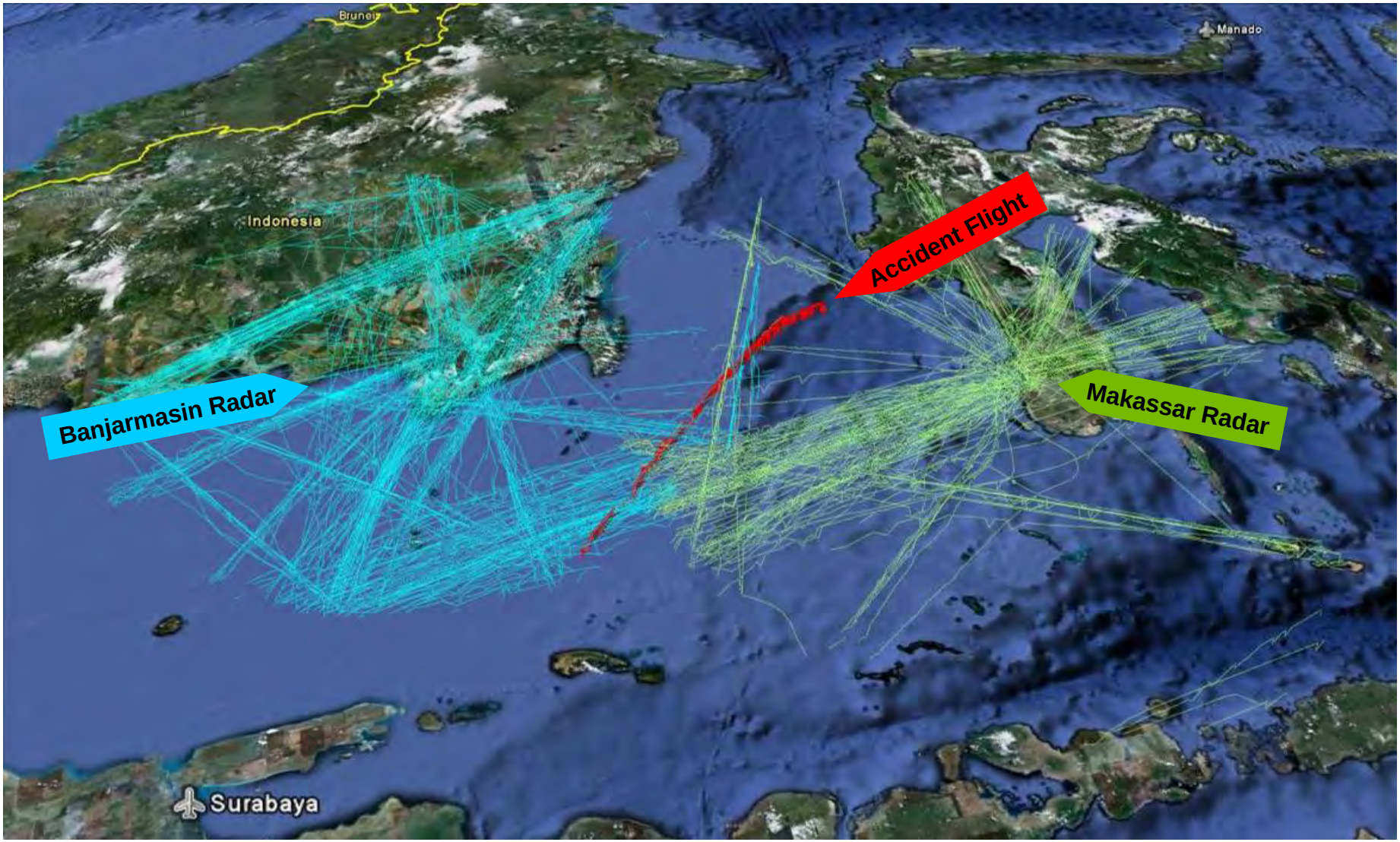
Flight Path Depiction

2006-02-11 737-300 IRS Fault Indonesia



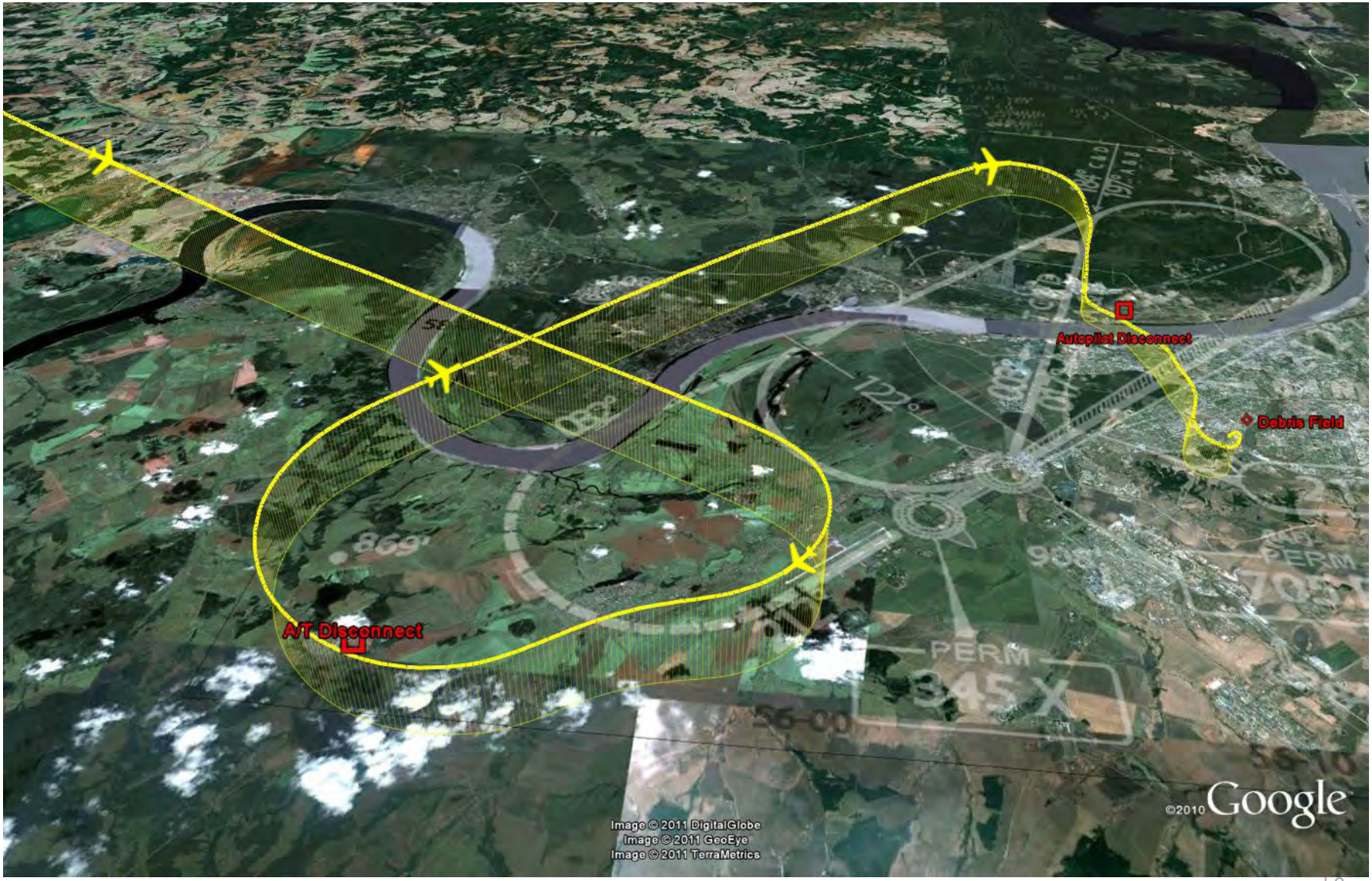
Visualization of Data

2007-01-01 737-400 Accident Indonesia



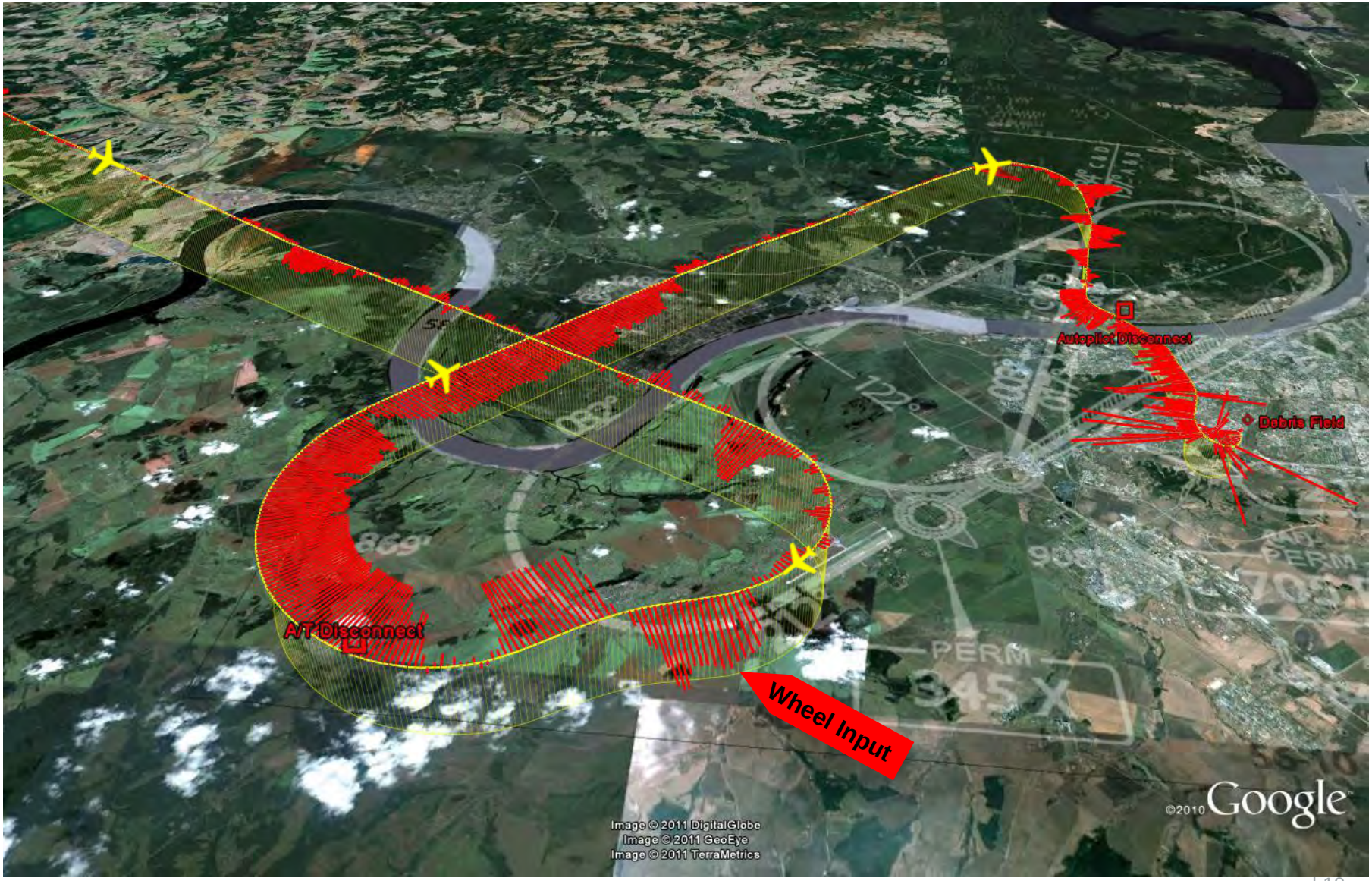
Non-Geometric Data

2008-09-14 737-500 Accident Perm Russia



Non-Geometric Data | Control Wheel

2008-09-14 737-500 Accident Perm Russia

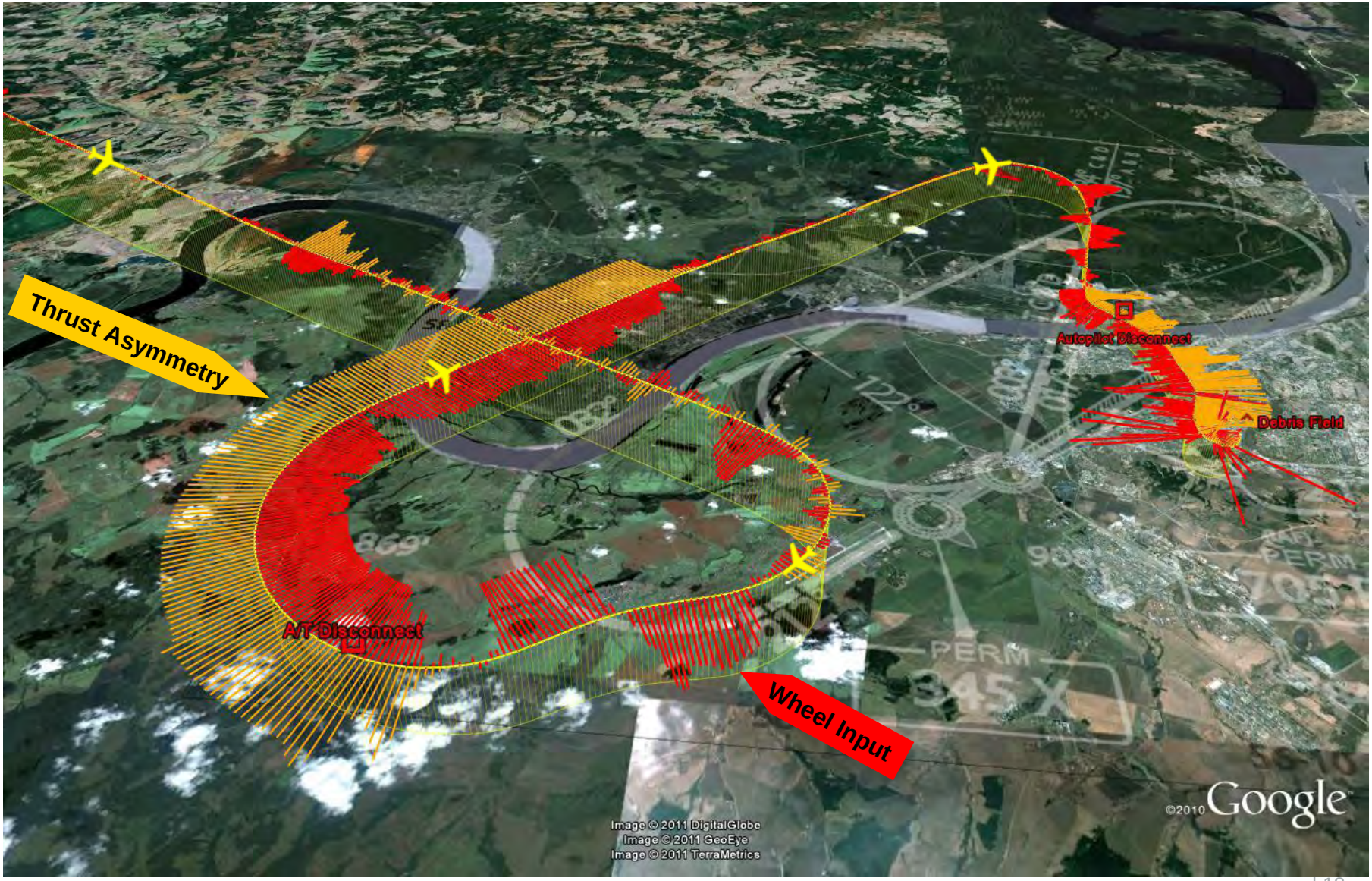


Non-Geometric Data | Thrust Asymmetry

2008-09-14 CJS 737-500 VP-BKO Accident Perm Russia

Non-Geometric Data | Data Synthesis

2008-09-14 CJS 737-500 Accident Perm Russia

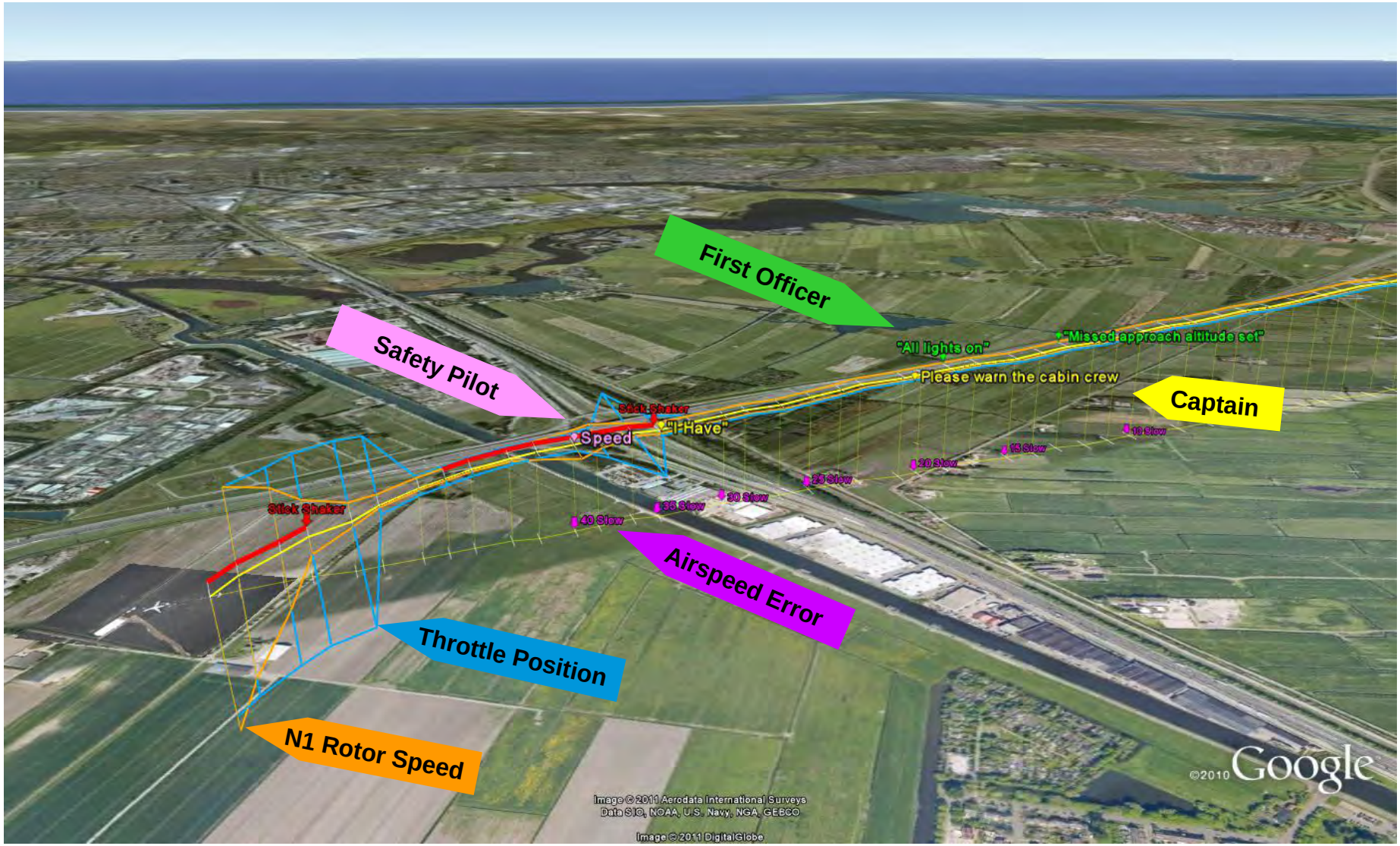


Data Synthesis and Visualization

2009-02-25 737-800 Accident Amsterdam

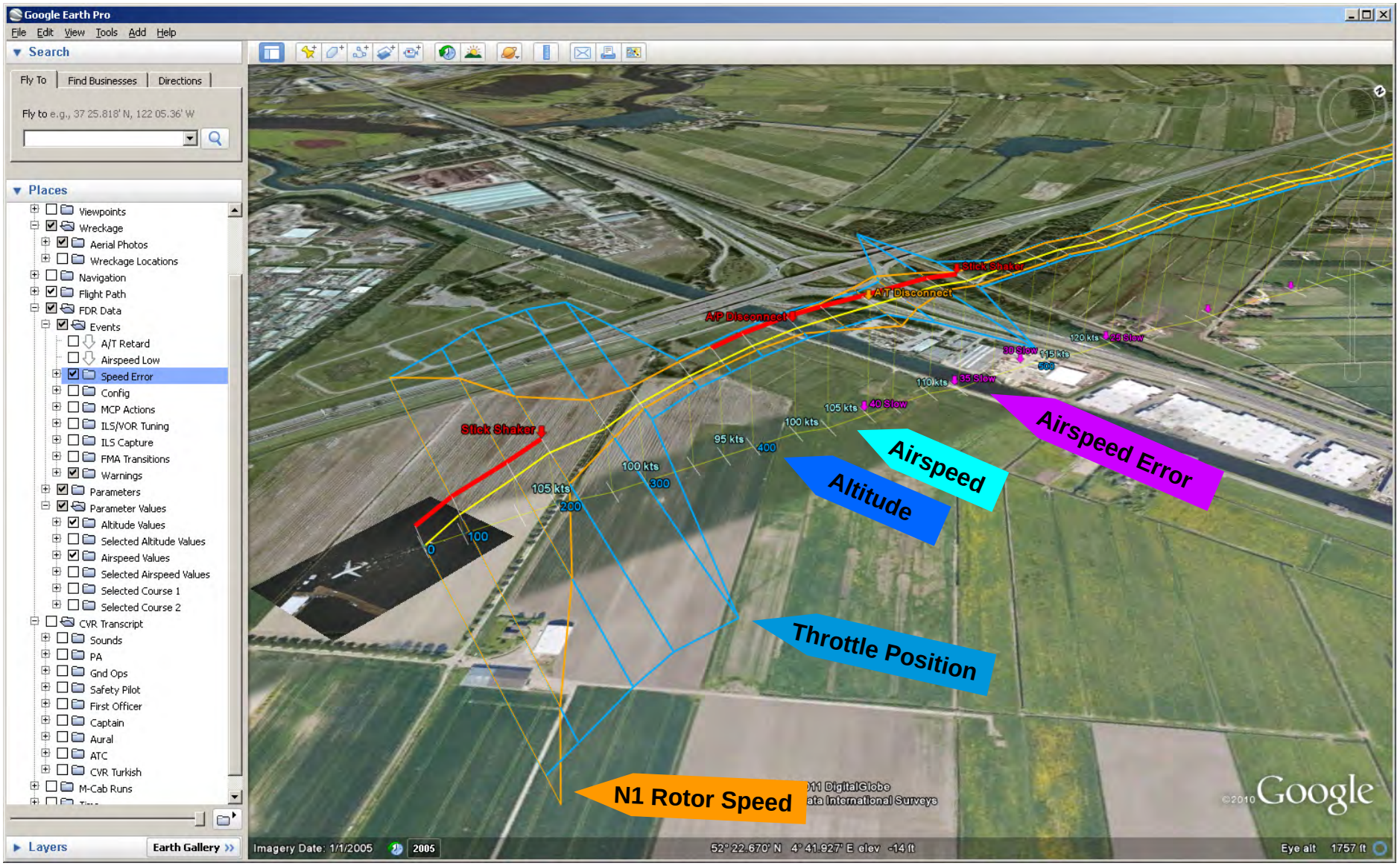
Data Synthesis | Audio and FDR

2009-02-25 737-800 Accident Amsterdam



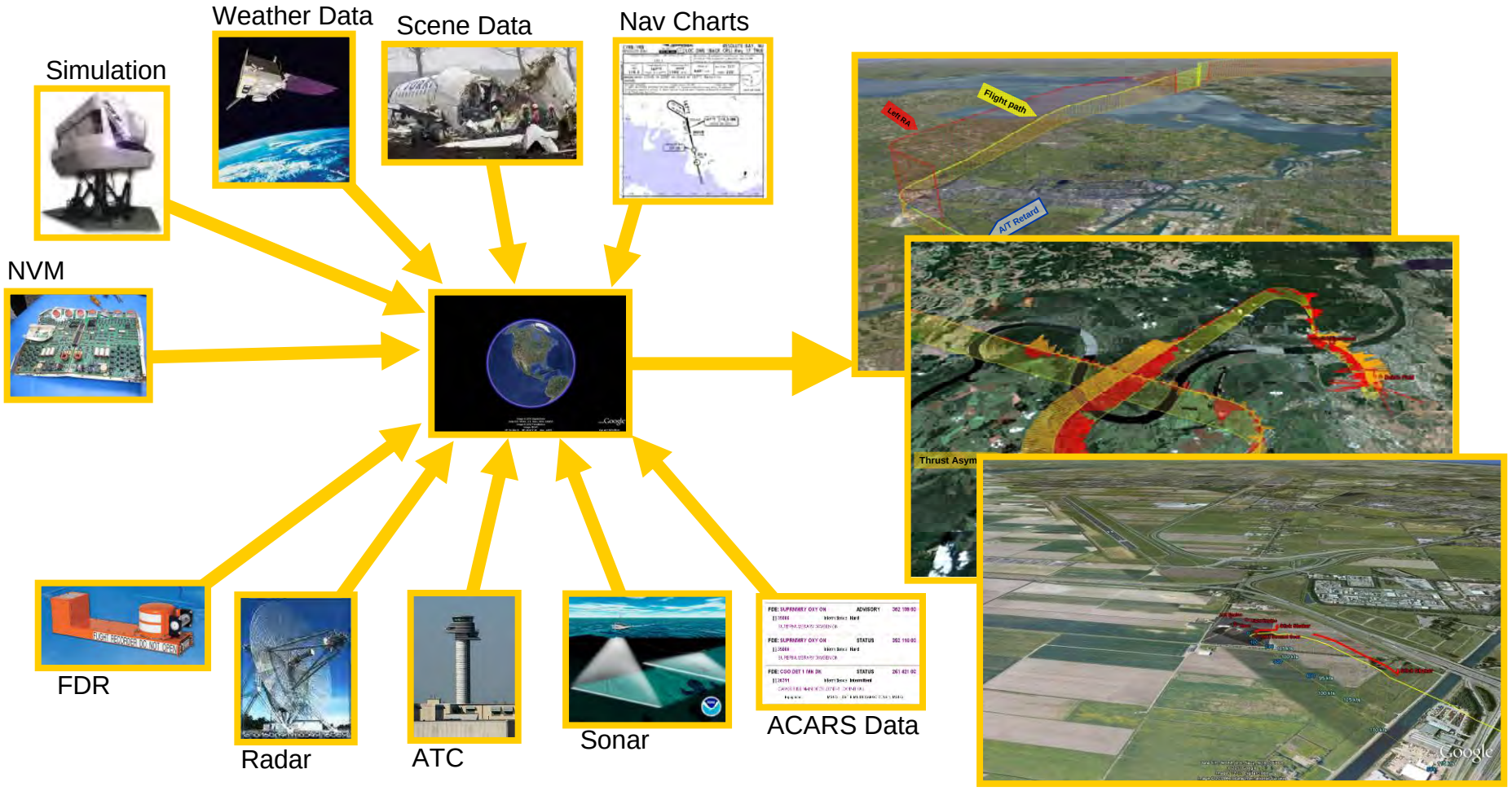
Visualization Options

2009-02-25 737-800 Accident Amsterdam



Wide Variety of Data Sources

Data sources that have been integrated with Google Earth



Nearly any data source can be included

Summary

Google Earth Visualization

- Good “high band-width” communication tool
- Effective at showing relationships between recorded data and events
- Good for data exploration
- Can combine airplane level data from nearly any source
- Shows progression over time in one image

Used to support major investigations by

- Colombian Civil Aviation Authority
- Dutch Safety Board
- Irish Air Accidents Investigation Unit
- Russian Interstate Aviation Committee
- UAE General Civil Aviation Authority
- UK Air Accidents Investigation Branch
- US Marine Corp
- US National Transportation Safety Board

Helps Visualize Airplane Level Inter-relationships