

Google Earth Flight Animation As An Alternative Debriefing Tool

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FDM ANALYST - TRAVIRA AIR



3rd European Operators FDM Conference
6th February 2014, Cologne, Germany

INTRODUCTION



TRAVIRA AIR

A Charter Air Service Operator



13 Fixed Wings



15 Rotary Wings



We run FDM program for both fixed and rotary wing

Challenge: 12 aircraft types with 10 different types of flight recording system

INTRODUCTION



FDAP

2011 – Start FDAP for Maintenance/MOQA
(Unscheduled inspection monitoring)



2012 – Run FDAP for Flight Operation /FOQA
(Fixed Wing)



2013 – Run FDAP for Flight Operation /HOMP
(Rotary Wing)

FDAP = Flight Data Analysis Program | **HOMP** = Helicopter Operation Monitoring Program
MOQA = Maintenance Operation Quality Assurance | **FOQA** = Flight Operation Quality Assurance

What is Flight Data Animation?

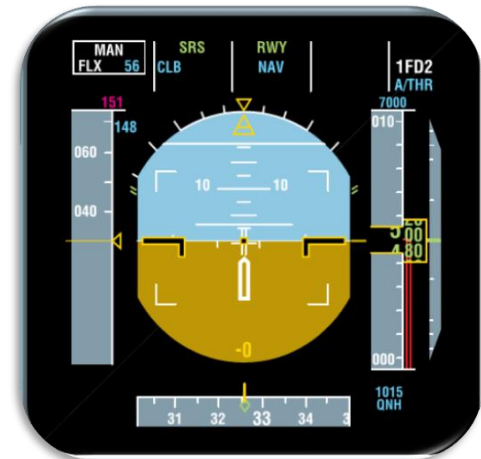


Actual

RECORD



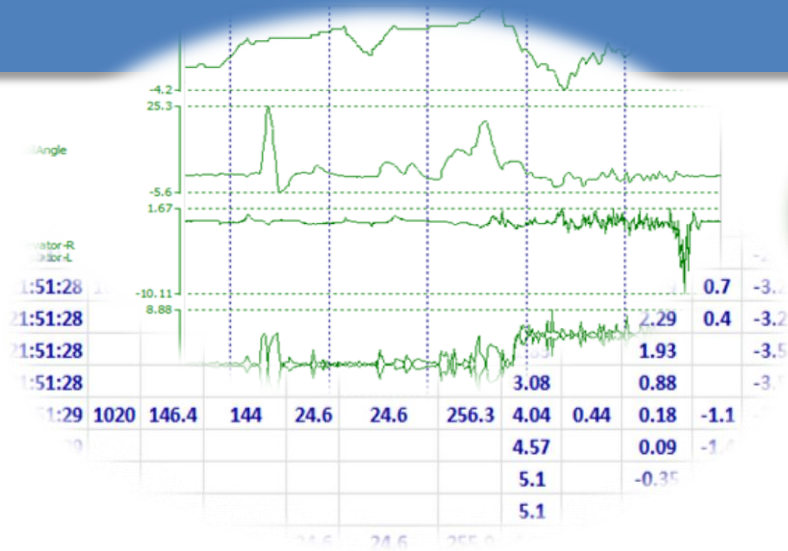
RECONSTRUCT



Model

The process used for reconstructing actual motion and condition of flight using computer graphics model and recorded flight data.

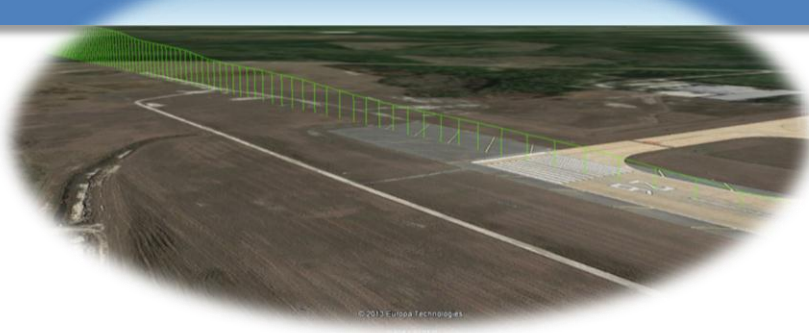
Tabular/Graphic Plot vs. GE Animation



Comparison	Tabular/Graphic Plot	GE Animation
Data display	Change over time ✓	Only one instant in time
Intuitive Presentation	Low	High ✓
Data density	Low	High ✓
Communication tool	Low	High ✓

GE = Google Earth

GE Visualization vs. GE Animation



Comparison	GE Visualization	GE Animation
Data display	Change over time ✓	Only one instant in time
Model dependency	Low ✓	High
Intuitive Presentation	Low	High ✓
Data density	Low	High ✓
Communication tool	Low	High ✓

KML in Google Earth Animation



Keyhole Inc.

2001 **Keyhole Earthviewer 1.0**
Keyhole Earthviewer 1.3
Keyhole Earthviewer 1.7
Keyhole LT 1.7.1
Keyhole NV 1.7.2

2004 **Keyhole 2.2**
Acquired by Google



Google Inc.

2005 **Google Earth 3.0**
Google Earth 4.0
Google Earth 4.1
Google Earth 4.2
Google Earth 4.3
Google Earth 5.0
Google Earth 5.1
Google Earth 5.2
Google Earth 6.0
Google Earth 6.1
Google Earth 6.2
Google Earth 7.0

2013 **Google Earth 7.1**

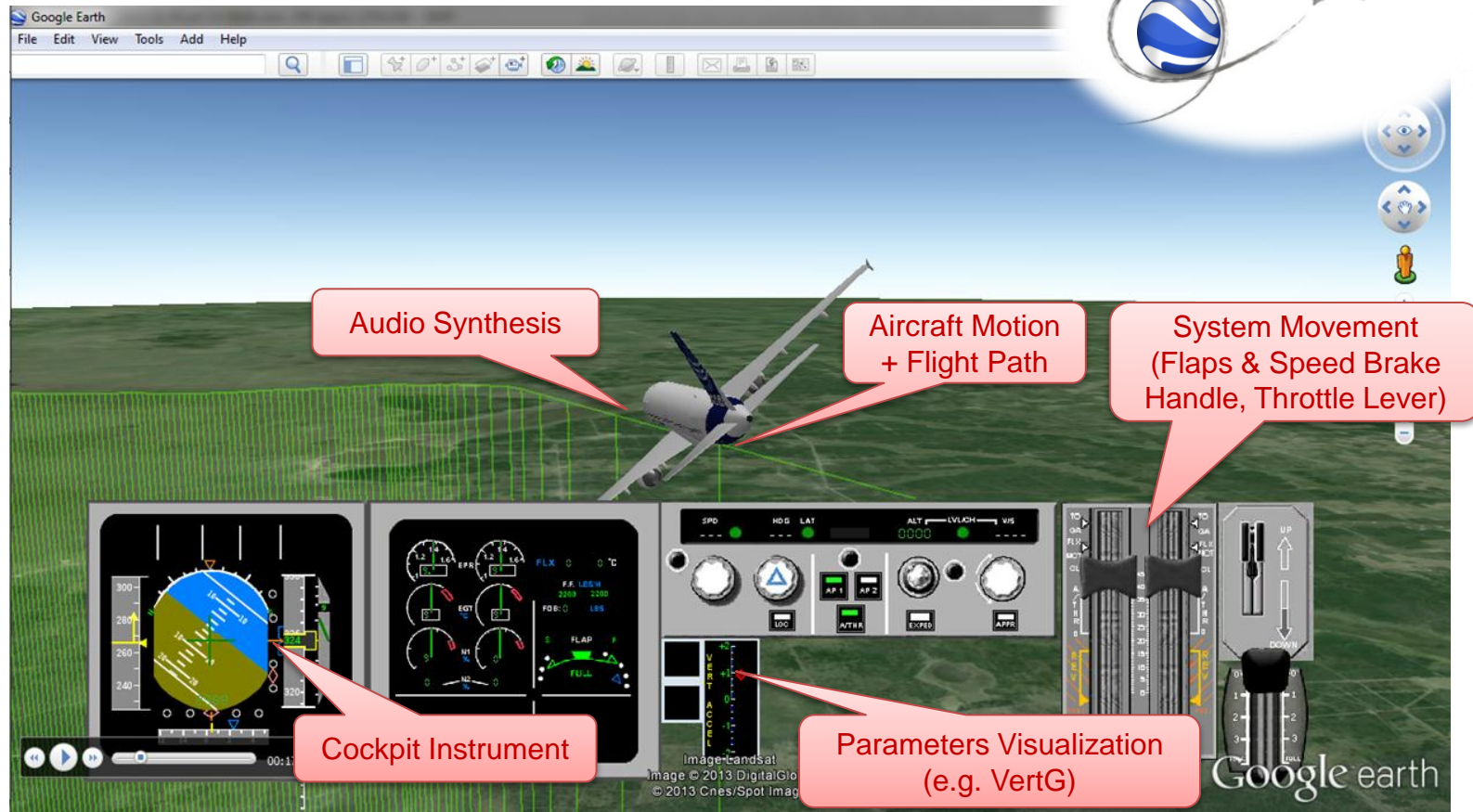
KML is an XML notation and was developed for use with Google Earth



We have to create **KML file** to produce Google Earth Flight Data Animation

KML = Keyhole Markup Language | **XML** = Extensible Markup Language
KML became an **international standard** of the **Open Geospatial Consortium** in 2008

What GE Animation Can Do?

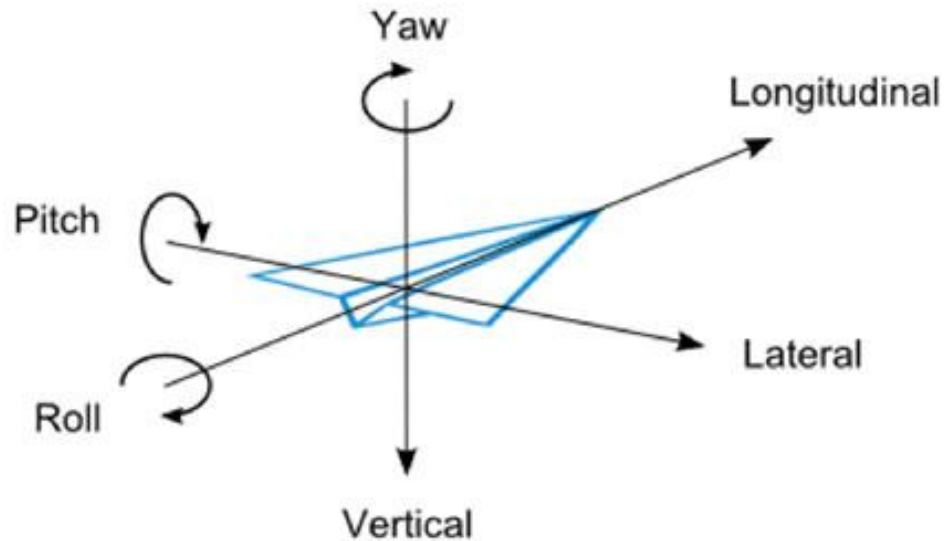


GE = Google Earth

Parameters| Basic Animation

Flight Path: Longitude* + Latitude* + Altitude*

Aircraft Attitude: Pitch* + Roll* + Heading*

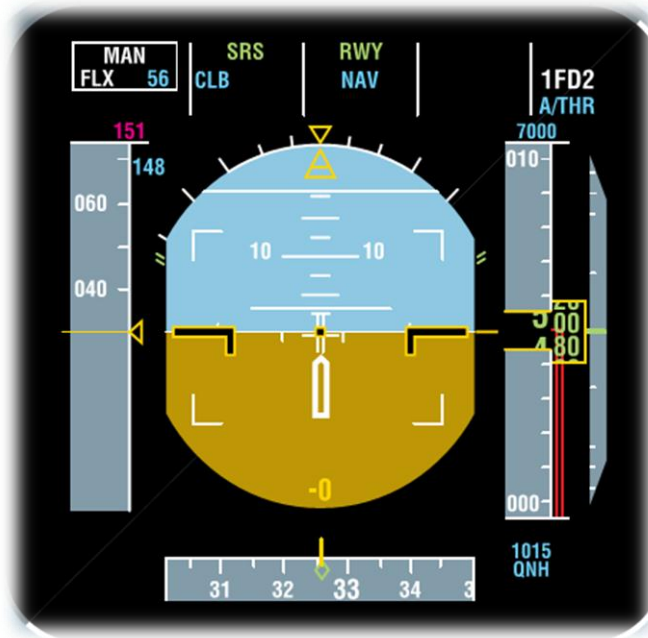


*Recorded or derived parameters

Parameters | Additional Animation

Cockpit Instrument Parameters

Attitude, Airspeed, Engines, Flaps, Autopilot Modes, Switch Selection, Warning, etc.



Parameters | Additional Animation

Audio Synthesis

*Master warning sound, EGPWS warning sound,
Windshear warning sound, CVR Data, etc.*

Supported file format: MP3, M4A, or AAC



Required hardware?




Hardware	Usage	Specification
Computer/ Laptop	Develop & Run Animation	<ol style="list-style-type: none">1. 3,500 MHz Processor2. 256 MB RAM, 400 MB disk space3. Network speed: 128 kbit/s4. 64 MB DirectX9 and 3D capable graphics card5. Windows 2000, XP, Vista, 7, Linux or OS X <p>This is common computer in the market today</p>

Raw Flight Data Conversion



Raw




GMT	RudPedal	N1-Act-1	EGT-1	Slats	MstrWarn	Ar	Alt	Armed
7:12:23	0.7	29	532	27	off	engaged	1244	ARMED
7:12:24	0.7	29	532	27	off	engaged	1236	ARMED
7:12:25	0.7	29	532	27	off	engaged	1236	ARMED
7:12:26	0.7	29	532	27	off	engaged	1236	ARMED
7:12:27	0.7	29.1	532	27	off	engaged	1236	ARMED
7:12:28	0.7	29.5	531	27	off	engaged	1236	ARMED
7:12:29	0.7	29.8	529	27	off	engaged	1236	ARMED
7:12:30	0.7	29.8	525	27	off	engaged	1236	ARMED
7:12:31	0.7	29.7	524	27	off	engaged	1228	ARMED
7:12:32	0.62	29.7	522	27	off	engaged	1228	ARMED
7:12:33	0.53	29.7	521	27	off	engaged	1236	ARMED
7:12:34	0.53	29.6	519	27	off	engaged	1240	ARMED
7:12:35	0.62	29.6	518	27	off	engaged	1236	ARMED
7:12:36	0.62	29.6	518	27	off	engaged	1240	ARMED
7:12:37	0.62	29.6	517	27	off	engaged	1240	ARMED
7:12:38	0.7	29.6	516	27	off	engaged	1236	ARMED
7:12:39	0.62	29.6	516	27	off	engaged	1236	ARMED
7:12:40	0.62	29.6	516	27	off	engaged	1240	ARMED
7:12:41	0.62	29.5	516	27	off	engaged	1244	ARMED

Engineering Unit (Tabular)

Convert raw flight data into engineering unit (use existing FDM/FDR software, in-house or web-based software).

Required software?

Software	Usage	Free	Commercial (€)
Google Earth	Run Animation	 Google Earth	Google Earth Pro €290
Aircraft Model Creator	Build 3D Aircraft Model	SketchUp	SketchUp Pro €429
Image Editor	Build 2D Instrument Model	GIMP	Adobe Photoshop €654
Tabular Data Editor	Edit Tabular Data	Open Office	Microsoft Excel €290
Text Editor	Write KML File	jEdit	UltraEdit €58
Total		€ 0.00	~ €1,721

Acquire Basic Software Skill



Required Process	Software	Duration*
Google Earth	Google Earth	1 hours
Tabular Data Editor	Open Office Calc	1 hours
Image Editor	GIMP	2 hours
Model Creator	SketchUp	3 hours
Text Editor (KML File)	Notepad++/ jEdit	3 hours
Total		10 hours

*It acquires only basic skill of related animation project. Experienced skill will be obtained by practice. You don't need to be on the expert level.

Own GE Animation Toolkit vs. COTS Product



Comparison	Build Own GE Animation Toolkit	Buying COTS Product
Animation Customization	High ✓	Low
Cost	Low ✓	High
Model Customization	High ✓	Low
Time to develop	High	Low ✓

COTS = Commercial-Off-the-Shelf

Advantage Build GE Own Toolkit



Point	Remark
Low cost	Most of required software are free
High customizable	Customizable based on your need
No programmer specialist	KML is simple and easy
Airport model is ready	Google Earth provides it for you (some airports have 3D building and terrain)
Easy instrument model development	Using image editor software in the market
Build once and use forever	No repetition process, but it needs automatization application

Challenge of Build GE Own Toolkit



Build Own Toolkit	Challenge
Model development	Need time & resources allocation
KML language	Simplify code writing and structure
Software Skill	Acquire <i>various software</i> skill
Google Earth bug	Error on 360°/0° heading transition
Smoothing	Mathematical manipulation on data
Automatization	“Build once and use it forever”

Flow Process & Time Frame



Tasks	Duration
Producing Tabular Data	30 minutes
↓	
Creating 3D Aircraft Model	3 days
↓	
Creating 2D Supporting Model	3 days
↓	
Writing KML Animation	1 week
↓	
Testing & Improving	1 week
↓	
Developing Automatization*	1 week
Total Time	4 weeks

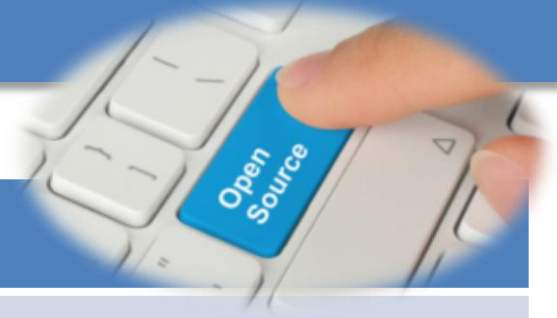
Prerequisite: Mastering basic skill of all required softwares

Recommendation



Point	Remark
Data Rate	Make the data has the same rate (...Interpolation)
Basic Skill Software	A lot of practice will smoothing the development
Relevant Parameter	Focus on examining relevant parameters for animation
Parameters Source	Identify the input source of parameters

How to get the software?



Software	URL Address
<u>Google Earth</u>	<u>http://www.google.com/earth/</u>
<u>KML Reference</u>	<u>https://developers.google.com/kml/documentation/kmlreference</u>
<u>SketchUp</u>	<u>http://www.sketchup.com/</u>
<u>GIMP</u>	<u>http://www.gimp.org/</u>
<u>Open Office</u>	<u>http://www.openoffice.org/download/index.html</u>
<u>jEdit</u>	<u>http://www.jedit.org/index.php?page=download</u>
<u>KML Validator*</u>	<u>http://www.kmlvalidator.com/home.htm</u>

Google Earth Animation Demo





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