

Drone Log Visualization

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Introduction

Service Partner: UAV Center, Vietnam

- Drone manufacturing
- Current applications
 - Monitoring the coast line
 - Recording military drills
 - Monitoring cross-border drug trafficking

Service Partner: Needs A Log Analysis Tool

- Can analyze logs efficiently
- Better than their current tool



Introduction

- Logs contain telemetries (T02, T15, ...)
- Data (mostly time series, quantitative)
 - Sensor data (compass, accelerometers, gyroscopes, GPS, ...)
 - System monitoring information (sensor errors, system errors, ...)
 - GCS-Autopilot communication information



Autopilot

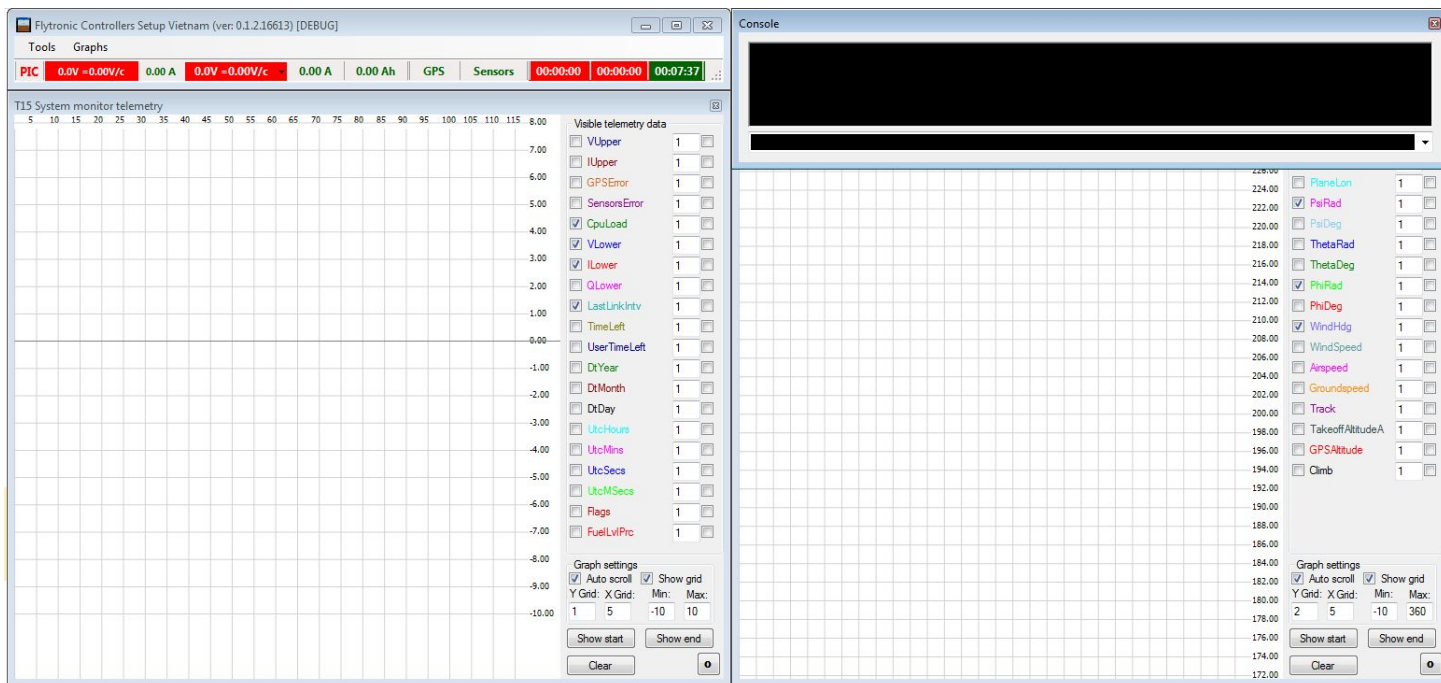


Ground Control Station



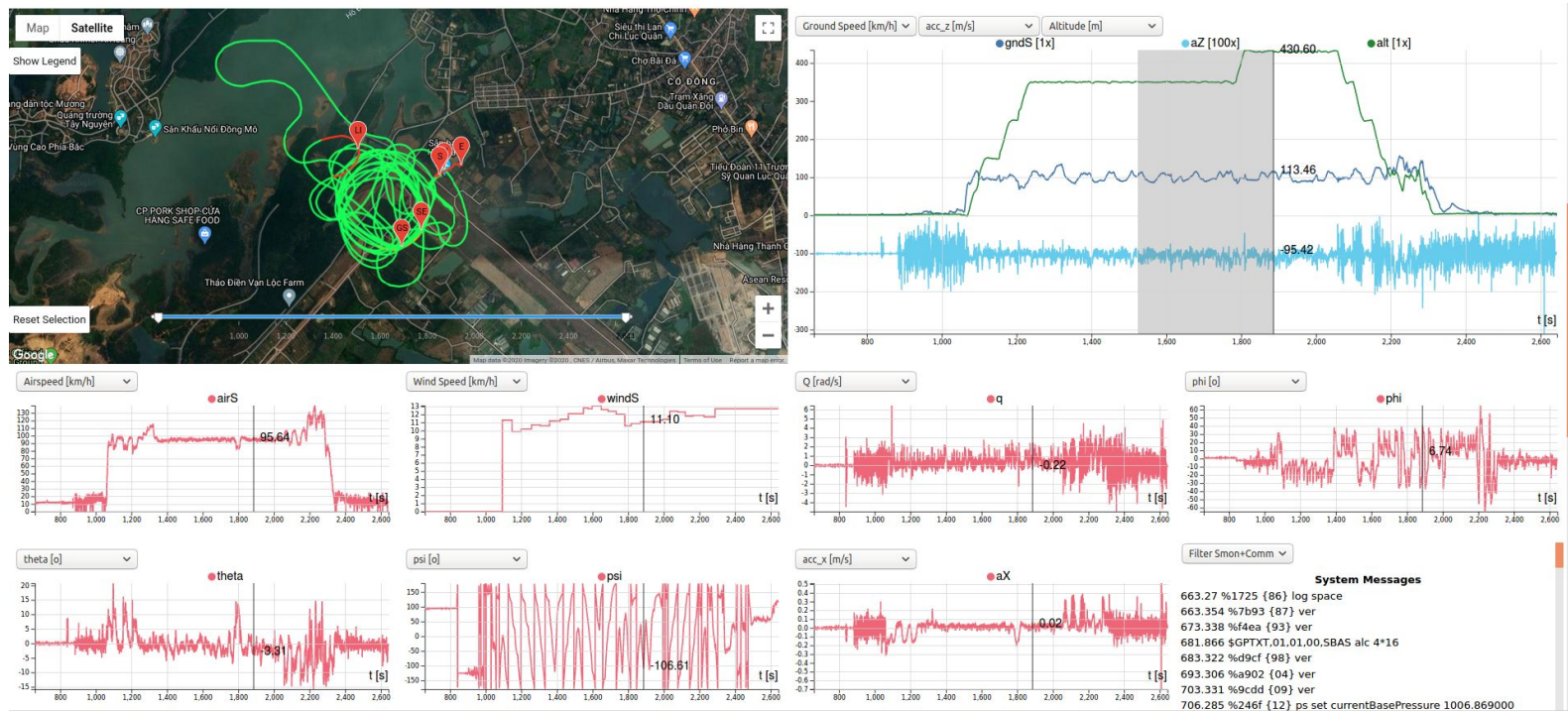
Existing Tool

- Manually arranging windows
- Lots of window switching



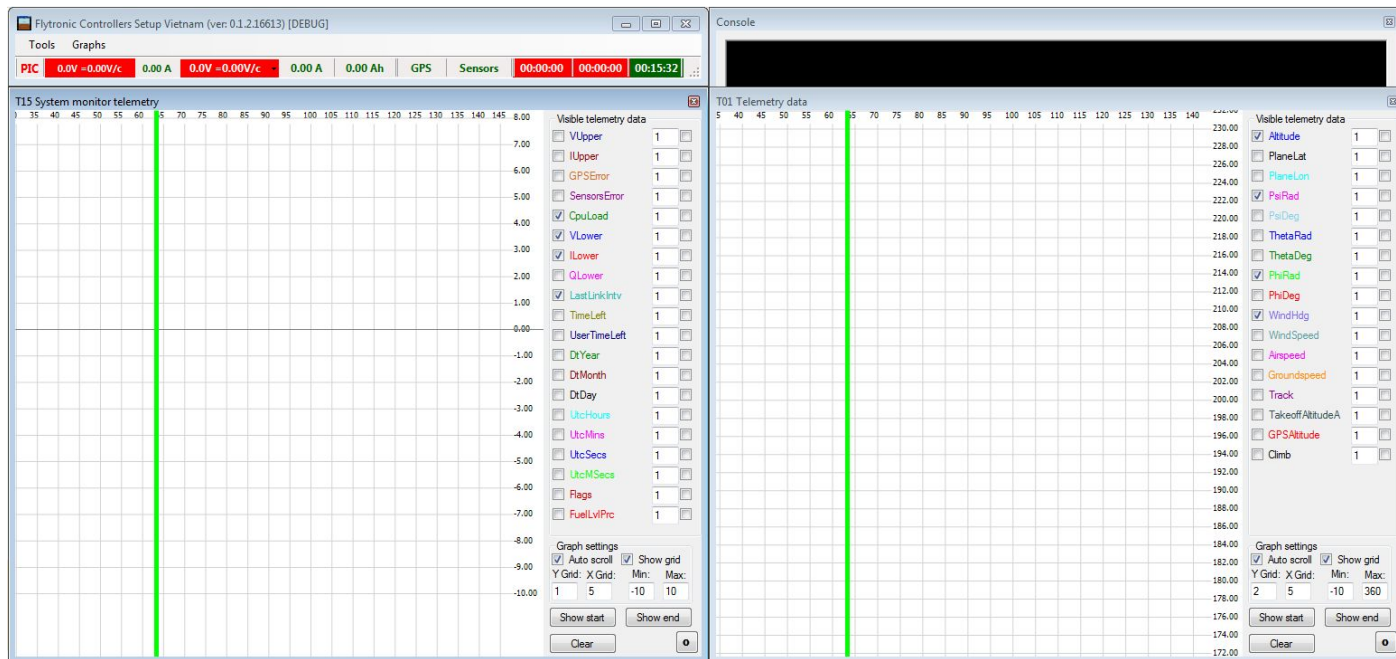
Our tool.

- All components fit in a single page, no need to scroll
- Minimize window switching and reduce cognitive load



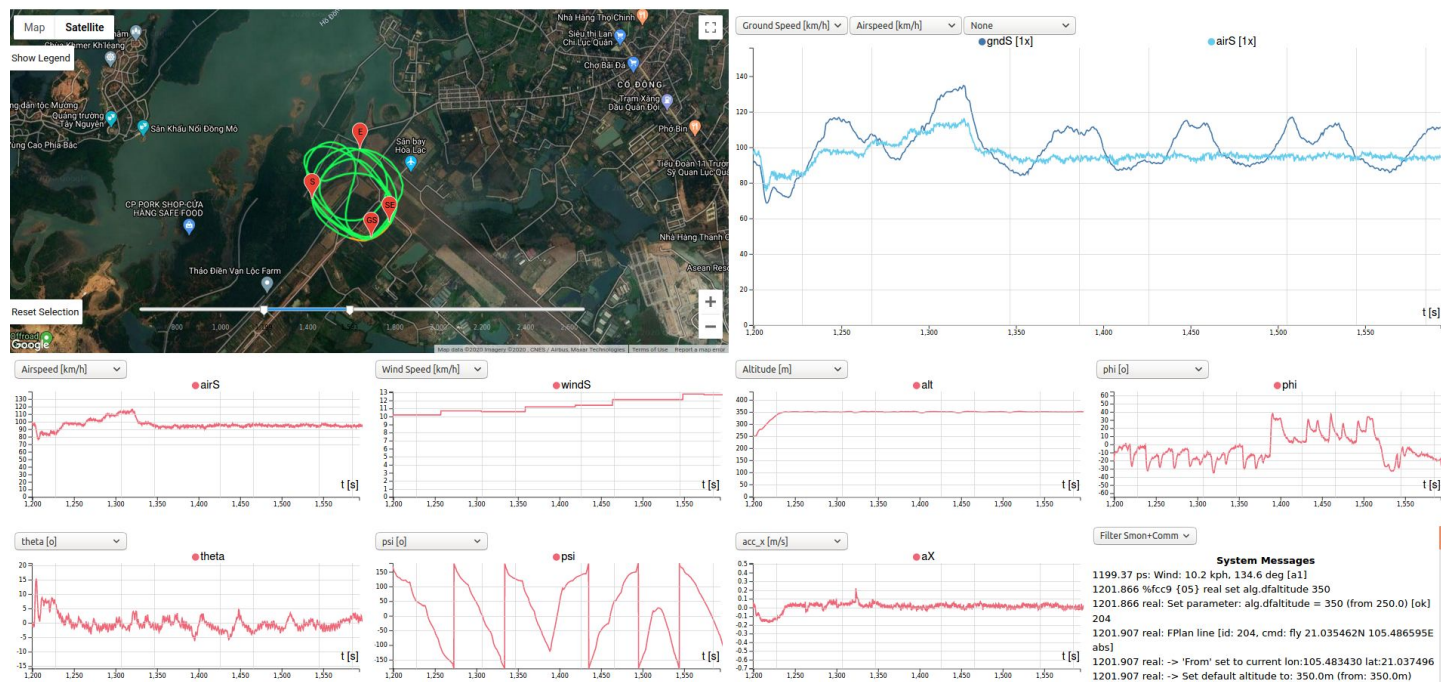
Existing Tool

- Limited interactions
- Manually input scales for attributes



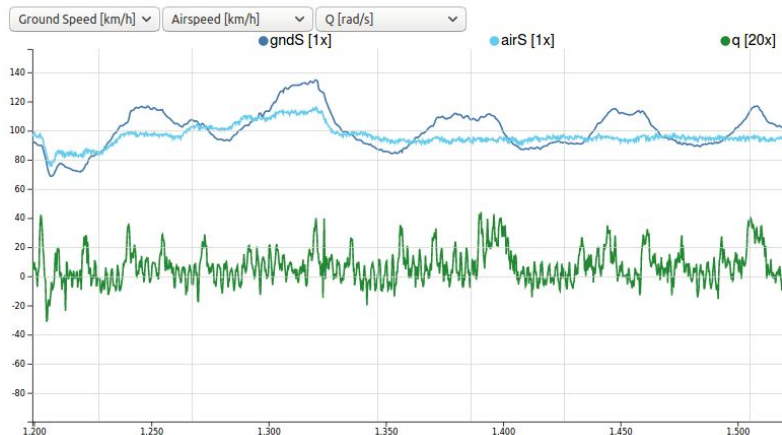
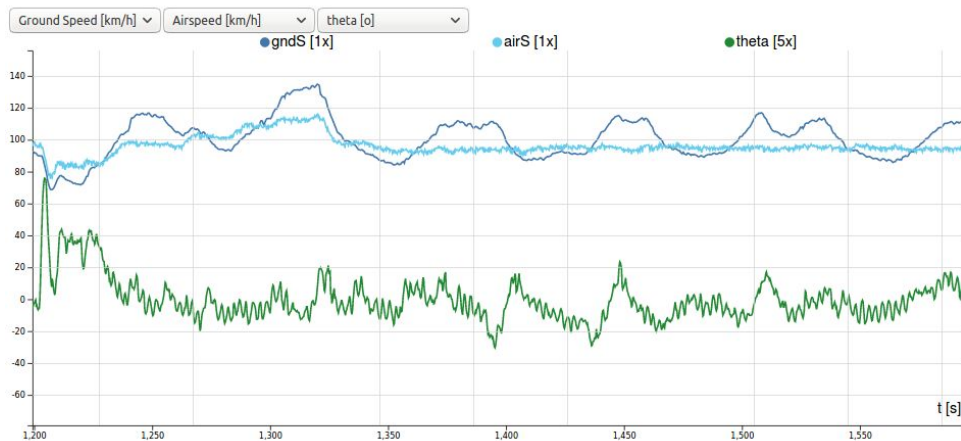
Our Tool

- Linked selections



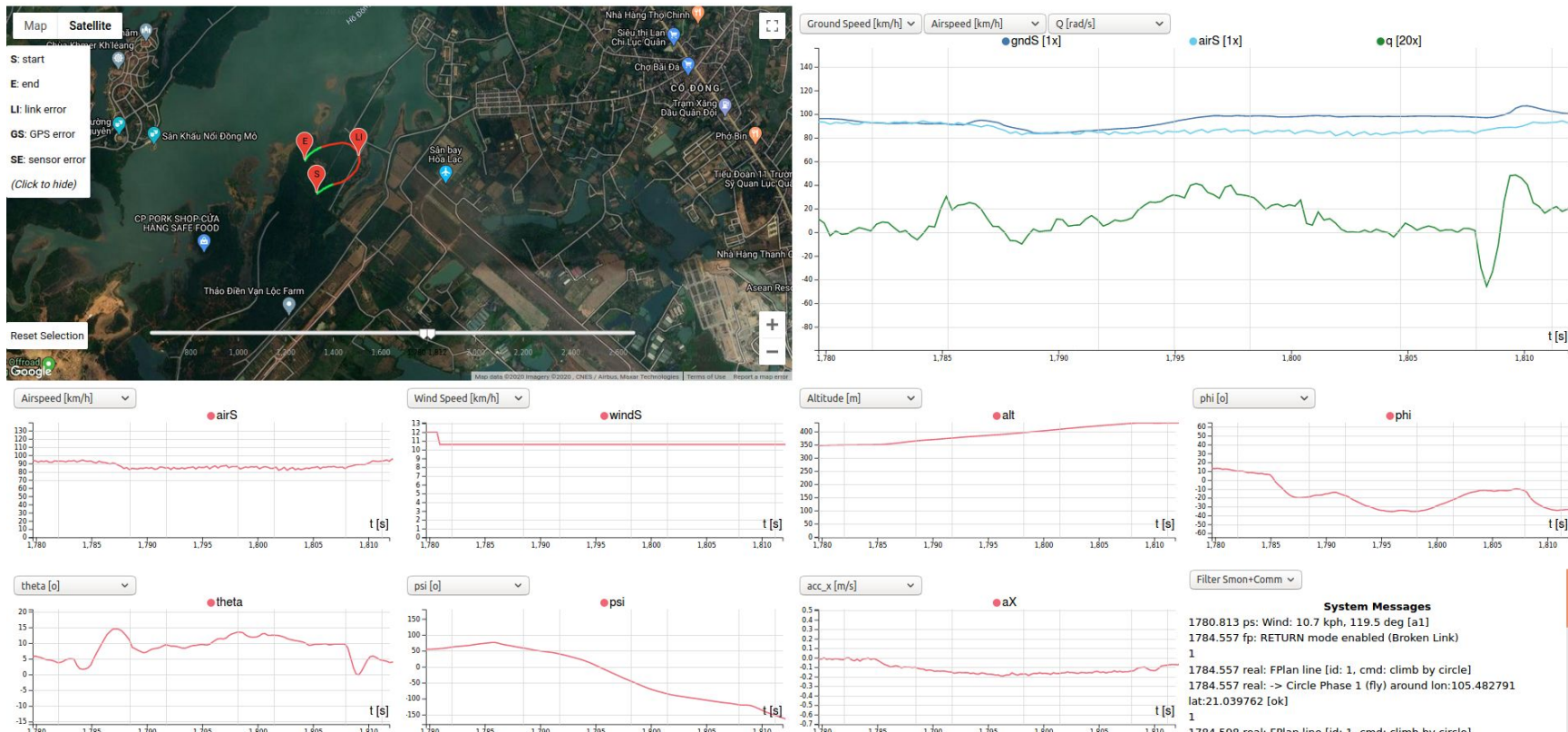
Our Tool

- Autonomous scaling: Scale attributes to display nicely



Our Tool

- Autonomous analysis for potential anomalies



Existing Tool vs. Our Tool

- Existing Tool: C#-based, required installation, only supports Windows
- Our Tool: Web-based can work on most OSes, treat system messages better

AvionicsInstrumentTool.dll	10/4/2014 1:13 AM	Application extens...	24 KB
AvionicsInstrumentTool.pdb	10/4/2014 1:13 AM	PDB File	46 KB
ControllersSetup	10/4/2014 1:13 AM	ClickOnce Applica...	2 KB
ControllersSetup	10/4/2014 1:13 AM	Application	53 KB
ControllersSetup.exe - Kopia.config	10/4/2014 1:50 AM	CONFIG File	3 KB
ControllersSetup.exe - Shortcut	10/16/2014 4:28 AM	Shortcut	2 KB
ControllersSetup.exe.config	10/7/2014 7:33 AM	CONFIG File	2 KB
ControllersSetup.exe.manifest	10/4/2014 1:13 AM	MANIFEST File	12 KB
ControllersSetup.pdb	10/4/2014 1:13 AM	PDB File	54 KB
ControllersSetup.vshost	10/4/2014 1:13 AM	ClickOnce Applica...	2 KB
ControllersSetup.vshost	10/14/2014 6:27 AM	Application	12 KB
ControllersSetup.vshost.exe.config	10/7/2014 7:33 AM	CONFIG File	2 KB
ControllersSetup.vshost.exe.manifest	10/4/2014 1:13 AM	MANIFEST File	12 KB
Flytronic.Components.dll	10/4/2014 1:13 AM	Application extens...	33 KB
Flytronic.Components.pdb	10/4/2014 1:13 AM	PDB File	68 KB
Flytronic.ConsoleTool.dll	10/4/2014 1:13 AM	Application extens...	11 KB
Flytronic.ConsoleTool.pdb	10/4/2014 1:13 AM	PDB File	20 KB
Flytronic.ControllersTool.dll	10/4/2014 1:13 AM	Application extens...	71 KB
Flytronic.ControllersTool.pdb	10/4/2014 1:13 AM	PDB File	106 KB
Flytronic.CoreUtils.dll	10/4/2014 1:13 AM	Application extens...	16 KB
Flytronic.CoreUtils.pdb	10/4/2014 1:13 AM	PDB File	32 KB
Flytronic.DataTypes.dll	10/4/2014 12:46 AM	Application extens...	22 KB
Flytronic.DataTypes.pdb	10/4/2014 12:46 AM	PDB File	48 KB
Flytronic.GraphTool.dll	10/4/2014 1:13 AM	Application extens...	71 KB
Flytronic.GraphTool.pdb	10/4/2014 1:13 AM	PDB File	158 KB
Flytronic.ServoTool.dll	10/4/2014 1:13 AM	Application extens...	8 KB
Flytronic.ServoTool.pdb	10/4/2014 1:13 AM	PDB File	18 KB
FlytronicCli.Telemetry2.dll	5/26/2014 3:57 AM	Application extens...	151 KB
GraphLines	4/12/2020 7:06 AM	XML Document	105 KB
WindowsConfig	4/12/2020 7:06 AM	XML Document	6 KB

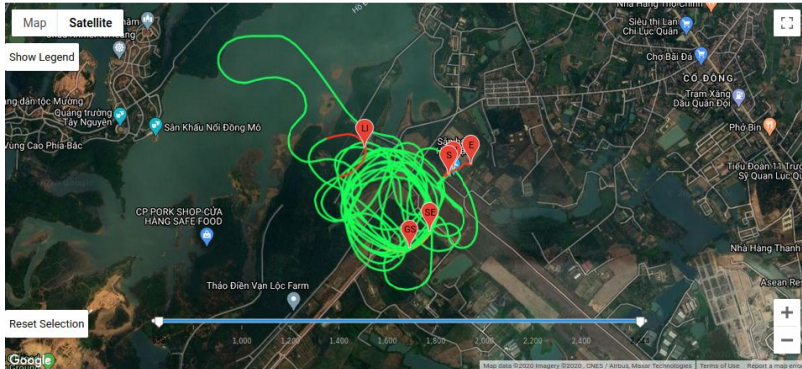
Filter Smon+Comm v

System Messages

```
663.27 %1725 {86} log space
663.354 %7b93 {87} ver
673.338 %f4ea {93} ver
681.866 $GPTXT,01,01,00,SBAS alc 4*16
683.322 %d9cf {98} ver
693.306 %a902 {04} ver
703.331 %9cdd {09} ver
706.285 %246f {12} ps set currentBasePressure 1006.869000
706.285 %246f {12} ps set currentBasePressure 1006.869000
```

Implementation

- We use Google APIs for the map
- D3.line and D3.dispatch for line charts and linking them
- Console textbox: simple HTML text box that is scrollable and searchable by default with filtering in the backend

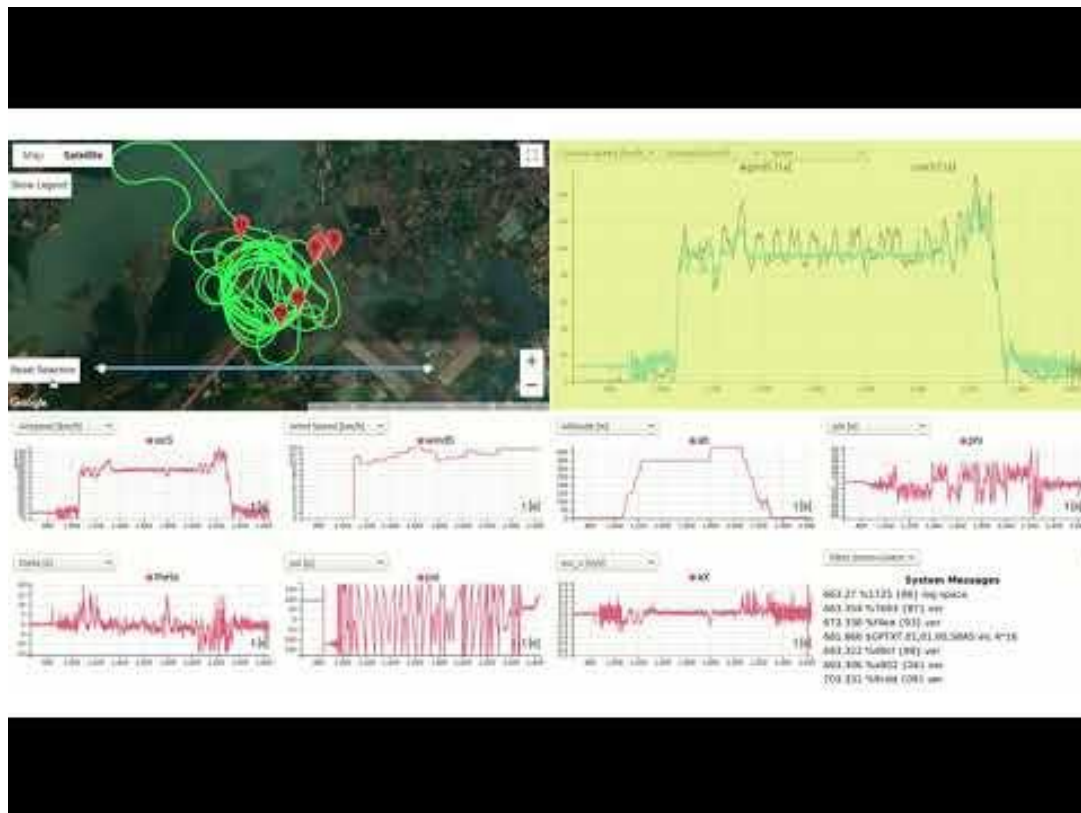


Filter Smon+Comm ▾

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703.331 %9cdd {09} ver
706.285 %246f {12} ps set currentBasePressure 1006.869000
706.285 %246f {12} ps set currentBasePressure 1006.869000
```

Demo



Conclusions

- Our tool can effectively show the flight path as well as the telemetry
- Compared to the existing tool, our tool offers several benefits
 - Information are displayed more intuitively
 - The map helps contextualize the telemetry data
 - The interactivity supports users better to find anomalies in logs

Questions?