**Savvy Aircraft Maintenance Management, Inc.**
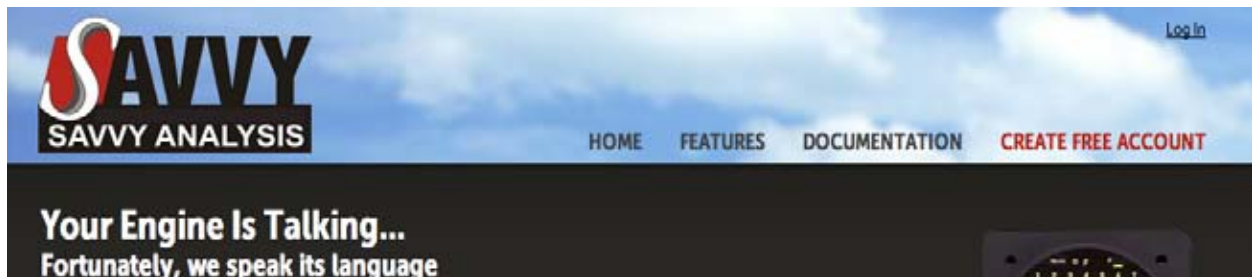4801 Braeburn Drive • Las Vegas, NV 89130

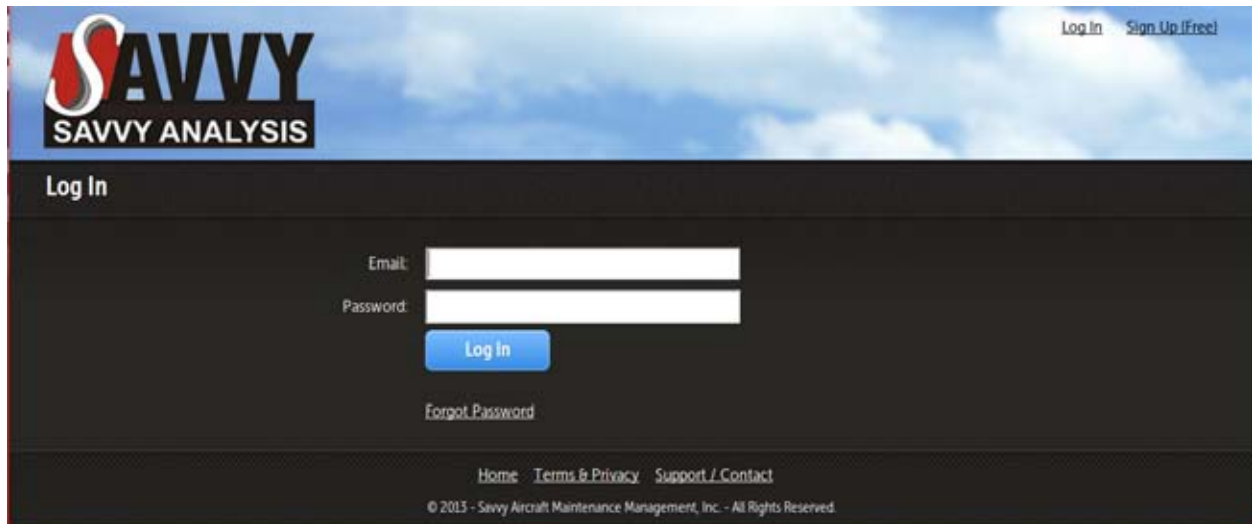# SAVVYANALYSIS.COM USER GUIDE

## Registration

Before you can use the platform for the first time, you need to set up an account. To do this, go to **www.SavvyAnalysis.com**, click on the **Create FREE Account** tab, and fill in the form with your first name, last name, email address and desired login password.





Once you have registered, you may click the link to Log In in the upper right hand corner.
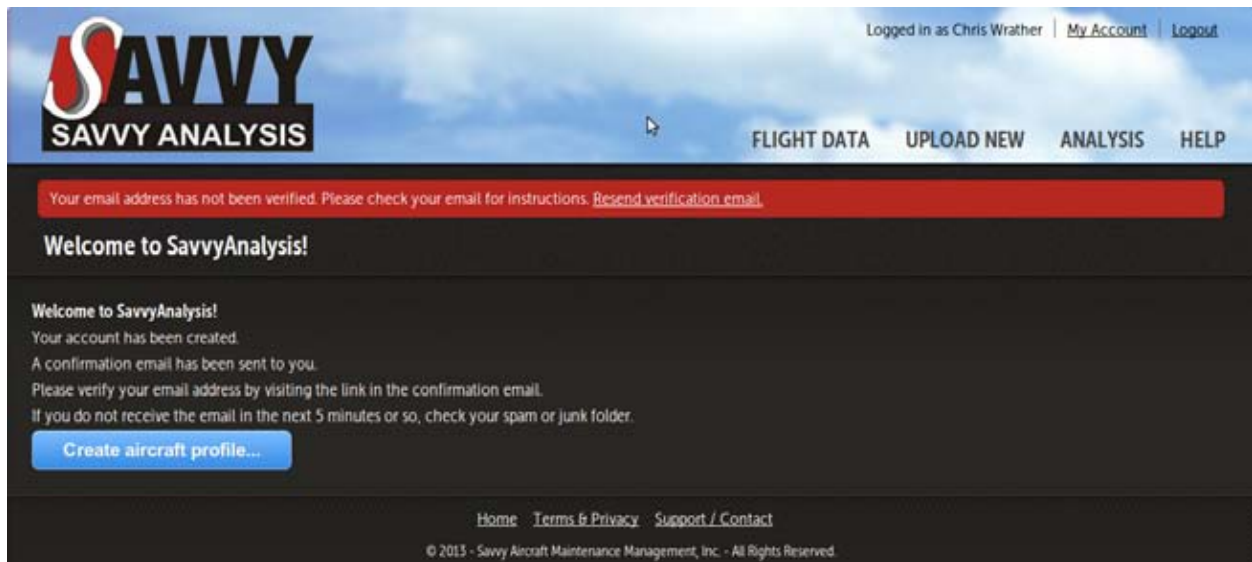
## Log in

Log in to the platform with your email address and password.



…and you will be welcomed as a new SavvyAnalysis user. An email will be sent to you after you have signed up. Please visit the link in the email to confirm that the email address we have on file for you is correct. Until you confirm your email address, you will be presented with a reminder message in a red bar at the top of many SavvyAanlysis.com pages.

## Setup your airplane

After logging in, you will be asked to create an aircraft profile, which you can do on the Setup Your Airplane page.



This page requests information about your airplane, engine, and engine monitor. Fill in the information and then press Continue. (NOTE: If you have more than one aircraft, you can set up additional aircraft profiles at any time by clicking on Flight Data → My Aircraft.)

## Upload files

To view the flights you have uploaded click on Flight Data → My Flights. On your first visit to the platform, of course, there will be no flights in your account.
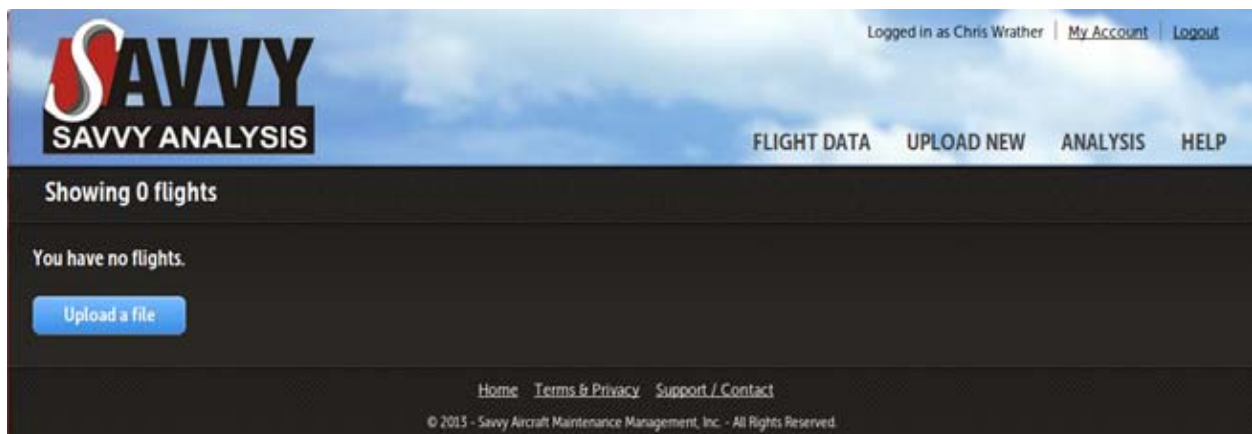
So your first order of business will be to upload one or more files. To do this, click on the blue **Upload a file** button or **Upload New** from the menu at the top of the page. This will take you to the **Upload Files** page.
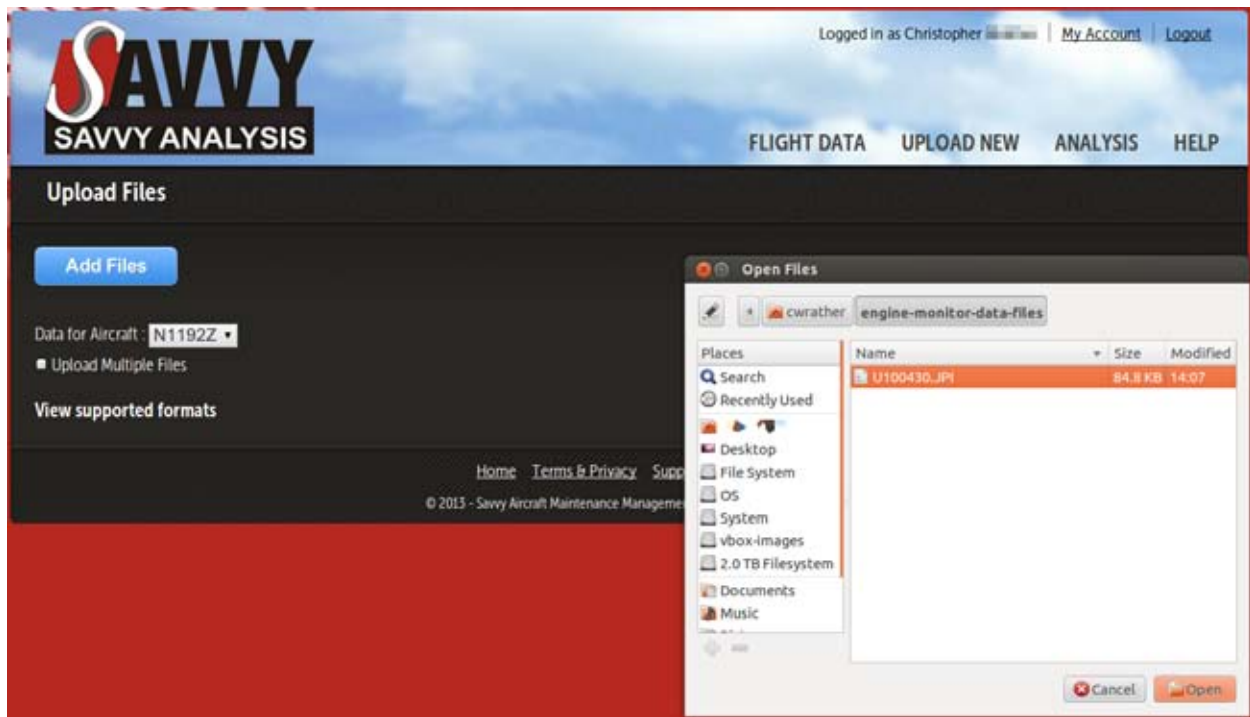


Click on the **Add Files** button to open a standard file-chooser dialog. (It will look a bit different depending on what operating system you're using.)

You may select one or multiple files from the file-chooser dialog. The selected files may be any sort of engine monitor data file (e.g., .JPI, .LOG, .CSV, etc.) or they may be .ZIP archives that contain one or more engine monitor files. If you upload a .ZIP archive, it will be automatically decompressed and any recognizable engine monitor data files contained in the archive will be processed.

Once you've selected one or more files, click the **Open** button in the file-chooser to return to the **Upload Files** page, and you'll see that the platform is uploading the files you selected.

.
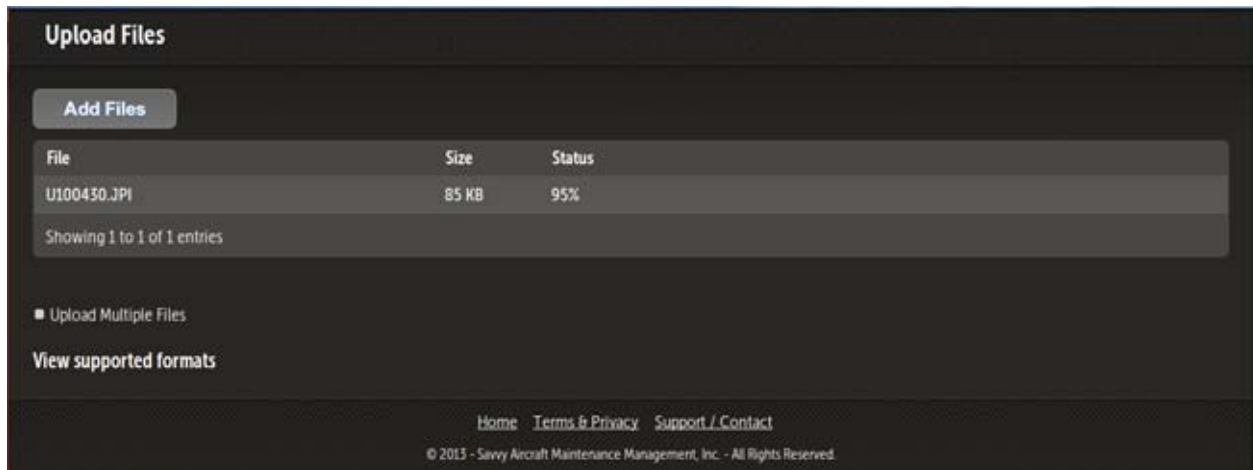
Once your files have finished uploading, you may click on any of the files to see a list of flights contained in that file, or you may click on <mark>Flight Data → My Flights</mark> in the menu bar to go to the <mark>My Flights</mark> page and see all the flights you've uploaded.

## My Flights

The <mark>My Flights</mark> page lists the flights you've uploaded to the platform. You may click on the column headings to sort this list by date, file name, aircraft ID or flight duration. Depending on what kind of engine monitor you have, you may also see flight numbers or Departure/Destination Airport identifiers. You can search for flights using the search box, or permanently delete flights that are of no interest by clicking on the delete icon.
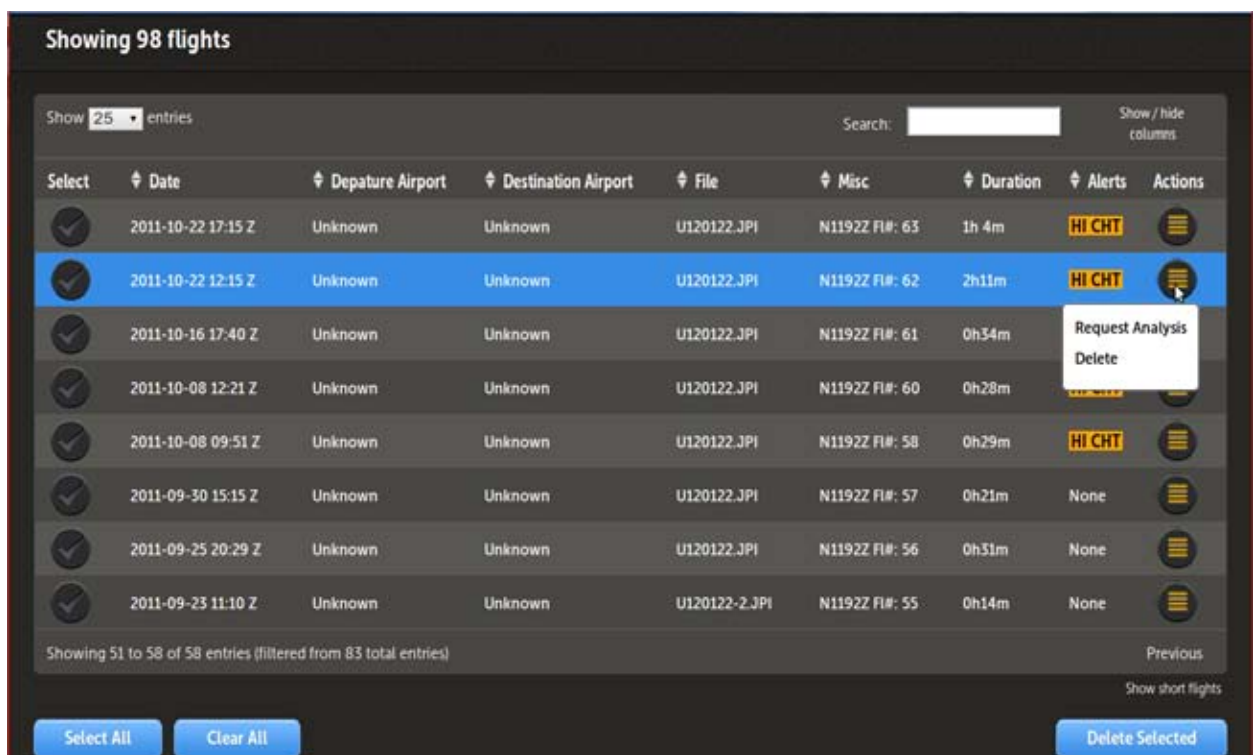
## Unit Conversions

To access the unit conversion page start from any non-flight-data page in Savvy Analysis, such as the ==My Flights== page, which you arrive at after logging in. Hover your mouse over ==Flight Data== and click on ==My Aircraft==.

Once the ==My Aircraft== page loads, click on the ==Actions== button for the aircraft you wish to configure and then click on ==Unit Conversions==. From this page you can enter the name of a data series that you wish to have automatically converted.

Once you click on the ==Series Name== field you can either start typing the abbreviated name of the data series you wish to convert or select it from the most common data series by using the up or down arrow key. Please note that data series names can vary between engine monitors, for example some use RPM others use TACH for the same data.

Once the data series is selected, you can choose what unit conversion you'd like to apply from the ==Conversion== drop-down menu and ==Add== the conversion to the aircraft.

Clicking ==Cancel== will clear the Series name and Conversion fields.

Once you've added conversions, you may delete them by clicking on the ==Actions== button for any conversion you wish to delete.

## Edit Departure and Destination Airport Manually Unit Conversions

From the ==My Flights== page (which can be accessed by hovering your mouse over ==Flight Data== and clicking on ==My Flights==) you can configure the Departure and Destination Airport of a flight by clicking the ==Edit Airports== link on the bottom-right of the page just above the ==Delete Selected== button.
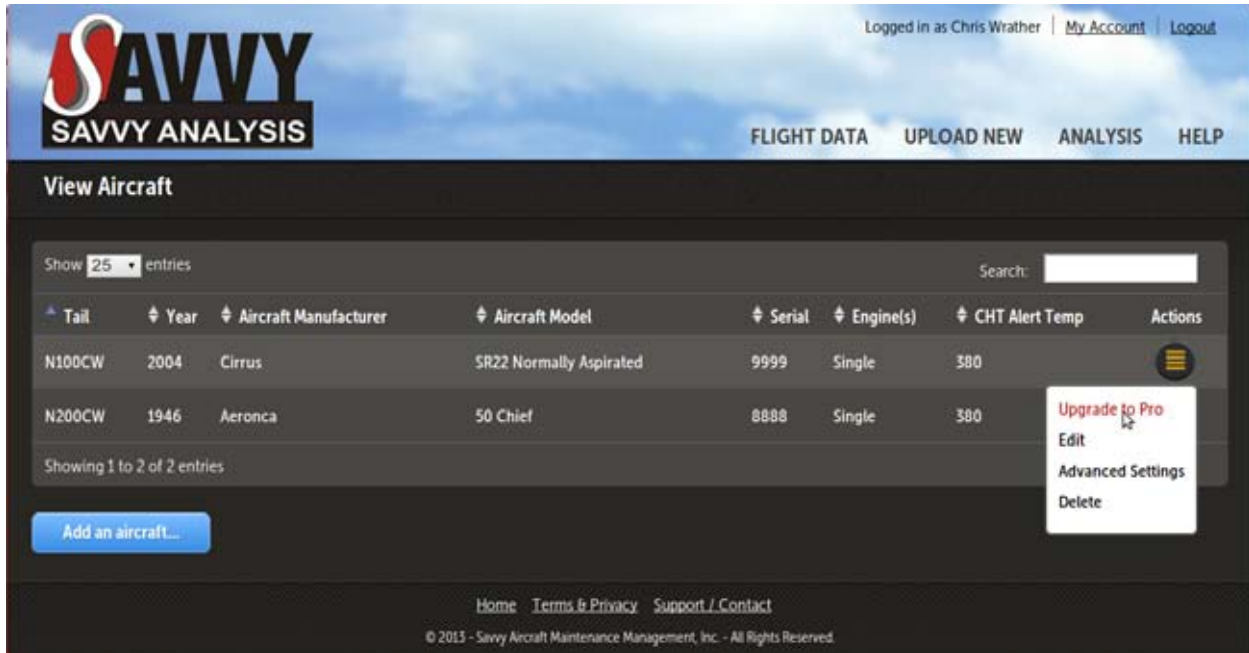
Clicking this enables you to click on the Departure or Destination Airport for any of your flights and edit the text. Once you edit the text in the field you can hit ==Enter/Return== to save the change or hit ==Esc== to cancel it.

To exit Edit Airports mode, click on the ==Done Editing airports== link at the bottom right of the page, above the ==Delete Selected== button, which will return you to the normal ==My Flights== page.

## Requesting Professional Analysis (SavvyAnalysis Pro)

*Note: This section is relevant only to SavvyAnalysis Pro subscribers and Savvy managed-maintenance clients. Other users can skip to the next section.*

**Savvy Analysis Pro** is our paid subscription-based service providing professional analysis of your engine data. If you are already a SavvyAnalysis free user, upgrading any of your aircraft to SavvyAnalysis Pro is easy. Navigate to the <mark>**Flight Data**</mark> → <mark>**My Aircraft**</mark> page, and open the <mark>**Actions**</mark> menu at the far right for an aircraft you would like to upgrade to **SavvyAnalysis Pro**. Click on <mark>**Upgrade to Pro**</mark> and follow the directions.



**SavvyAnalysis Pro** uses a ticket system on the website for communication between you and the SavvyAnalysis analyst. You request analysis of your engine data by creating a ticket. There are two ways to do this.
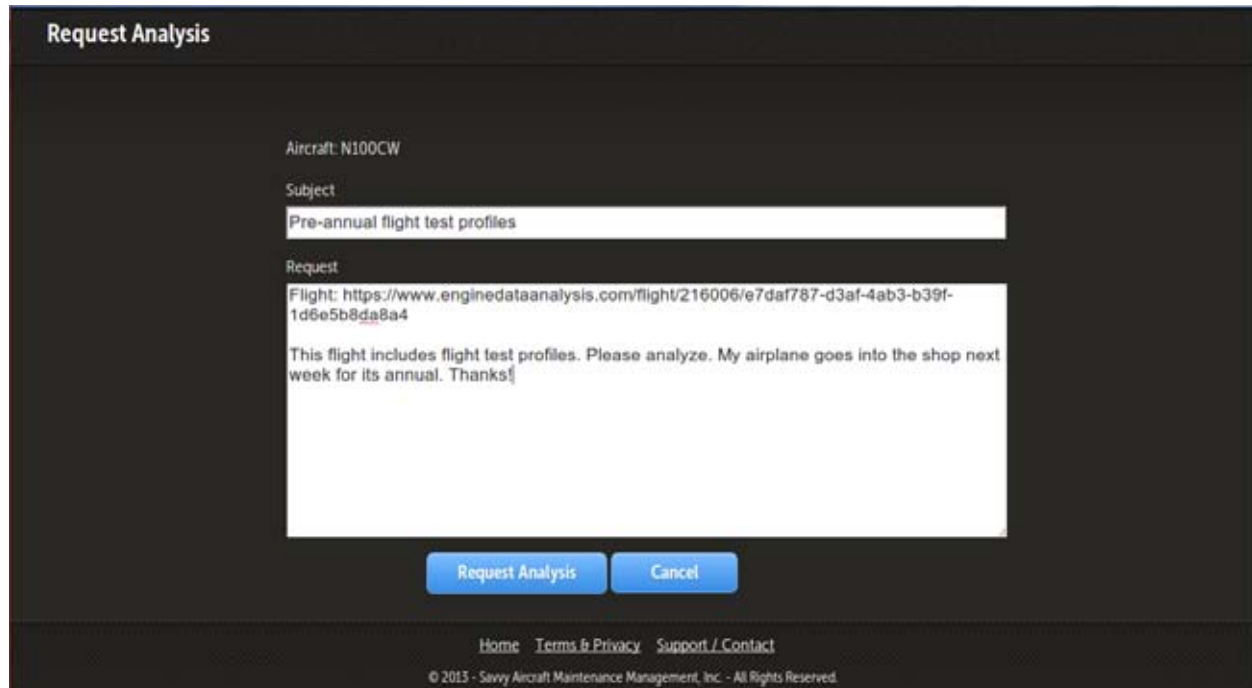
On the My Flights page, find the row corresponding to a flight whose data you would like to have analyzed. In the Actions menu at the far right side of the row, select Request Analysis from the dropdown menu.



Another way to request analysis of engine data for a specific flight is to do it from the chart page for that flight (see next section.). On the chart page, click the "Sigmund" icon  at the top of the toolbar to request analysis of your engine data.

The <mark>Request Analysis</mark> page will open, providing you a form to explain your request to the analyst. You can ensure the most effective analysis of your data by telling us the reason you are requesting analysis. For example, you might have flown the recommended flight test profiles and would like to have them analyzed. Or you might have noticed some particular anomaly during the flight that concerns you. The more you can tell us, the better job the analyst can do. If you requested analysis from the <mark>My Aircraft</mark> page or from the chart page, the **Request** field of the form will be pre-populated with a long string of characters which is a URL identifying the chart for the flight you are requesting be analyzed. This allows the analyst to quickly find the particular flight.



Click the <mark>Request Analysis</mark> button to create the ticket and send it to our analysts. A page will open confirming that your ticket was created, and containing information about your ticket such as the ticket number, date and time created, subject and status.
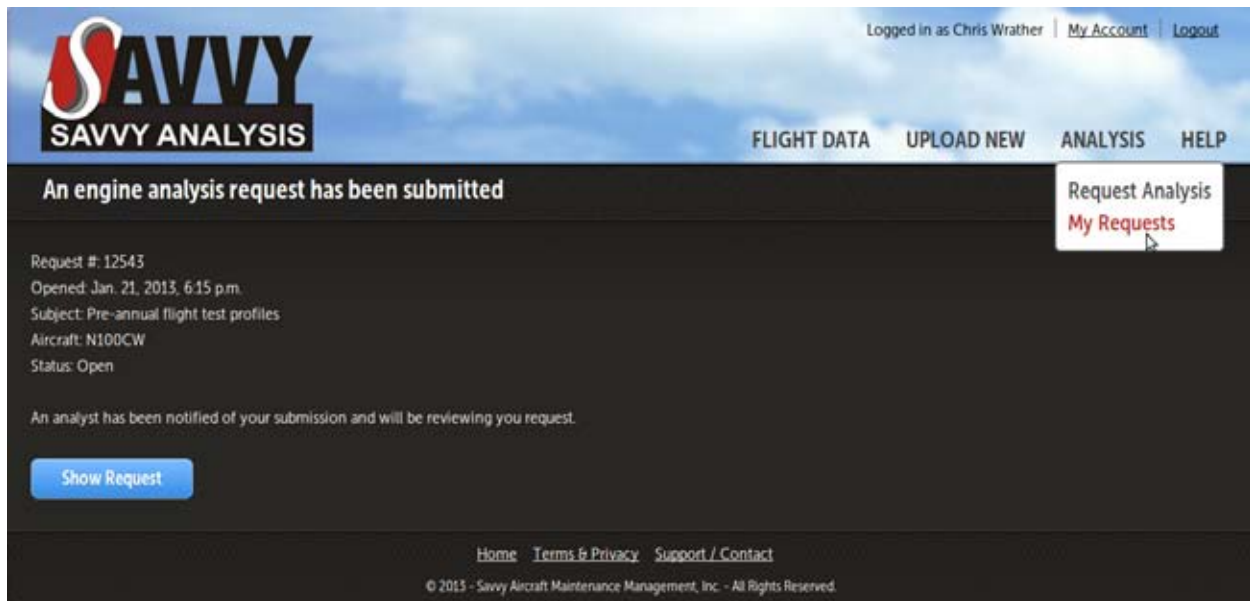
Clicking on **Analysis** in the menu bar at the top of the page opens a drop down menu enabling you to make a new request for analysis or open the **My Requests** page which will provide a list of all your tickets. In this example there is only one ticket in "open" status.
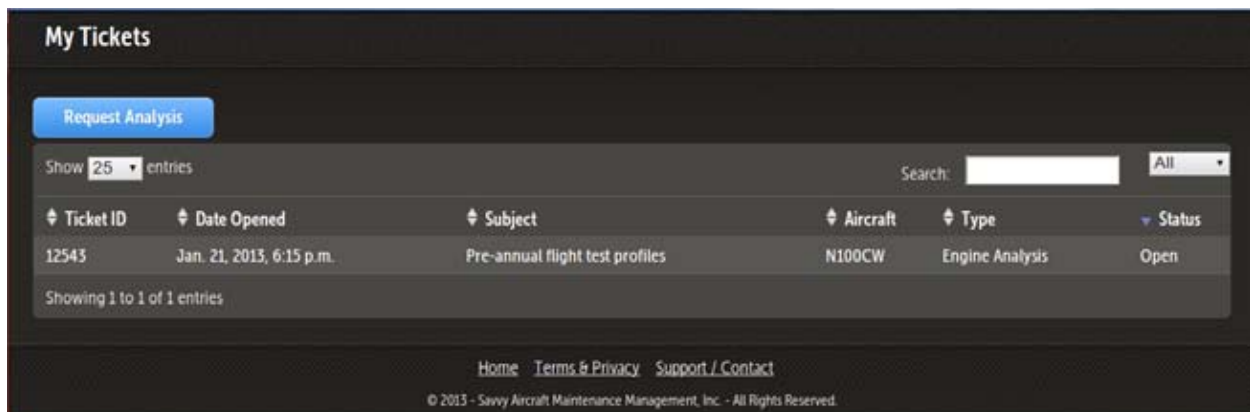


When the analyst posts a response to your request for analysis you will receive an email containing the analyst's post. You can also view the analyst's post by viewing the ticket online. Just click on the ticket in the list on the **My Tickets** page. A new page will open with the ticket number at the top, and chronologically showing all of your posts and all of the analyst's posts on the ticket. In this example, you can see that the analyst has responded to the request for analysis. You can respond back to the analyst on this page. Another way you can respond to the analyst's post is by replying to the email you received when the analyst posted to the ticket. Responding in this way will result in a ticket post which can be viewed on the web site.

**SAVVY ANALYSIS**

FLIGHT DATA    UPLOAD NEW    ANALYSIS    HELP

**Request 12543 - Pre-annual flight test profiles (Open)**

Scroll to bottom                                                    Close This Request

**Date: Jan. 21, 2013, 6:15 p.m.**
**From: Chris**

Ticket #1 for period ending 2014-07-23 01:20:52
Ticket limit: 5
SavvyMx: [Unknown]

Registration: N100CW
Serial: 9999
Year: 2004
Aircraft Manufacturer: Cirrus
Aircraft Model: SR22 Normally Aspirated
Engine Manufacturer: Continental
Engine Model: IO-550
CHT Warning Temperature: 380
Cylinder Count: 6
Engine Monitor Manufacturer: Garmin
Engine Monitor Model: Perspective
Measurement Units: US
Remarks:

Flight: https://www.enginedataanalysis.com/flight/216006/e7daf787-d3af-4ab3-b39f-1d6e5b8da8a4

This flight includes flight test profiles. Please analyze. My airplane goes into the shop next week for its annual. Thanks!

**Date: Jan. 21, 2013, 8:38 p.m.**
**From: Thanos**

Chris, please see attached report.
Attachment: 2013-01-22 Chris Chris N100CW.pdf

Subject

Pre-annual flight test profiles

Request

Submit

When the analyst has completed the analysis of your engine data he will make a post to the ticket and attach a completed **Engine Monitor Data Analysis Report** in pdf format. This report contains the results of your data analysis in a structured format that you can share with others, such as your partner, mechanic or online type club forum. The report will also be attached to the email you receive. An example of such a report is shown below.

**Engine Monitor Data**
**Analysis Report**

**SAVVY ANALYSIS**

| | | |
|---|---|---|
| **Client:** Chris Wrather | **A/C Type:** Cirrus SR22 Normally Aspira... | **Report Date:** 2013-01-22 |
| **Aircraft:** N100CW | **Engine:** Continental IO-550 | This is report #1 of subscription |
| **Flight:** 2013-01-15 | **Monitor:** Garmin Perspective | period ending 2014-07-23 |

**Client Comments**

Flight: 216006

**Summary of Findings**

GAMI lean test results indicate good mixture distribution. LOP mag check results indicate mags times closely together. T/O fuel flow on the high side. Cruise CHT's on the low side.

**GAMI Lean Test** — Satisfactory

| Sweep #1 | Sweep #2 | Sweep #3 | Observations |
|---|---|---|---|
| Time: 00:25:06-00:27:48 | Time: 00:28:00-00:33:48 | | Average GAMI spread is 0.3gph, an excellent spread within the range Savvy likes to see. |
| EGT1 peaked at 13.9 | EGT4 peaked at 14.6 | | |
| EGT2 peaked at 13.9 | EGT3 peaked at 14.5 | | |
| EGT3 peaked at 13.9 | EGT1 peaked at 14.4 | | |
| EGT4 peaked at 13.9 | EGT2 peaked at 14.4 | | |
| EGT5 peaked at 13.9 | EGT6 peaked at 14.4 | | |
| EGT6 peaked at 13.7 | EGT5 peaked at 14.2 | | |
| GAMI spread is 0.2 | GAMI spread is 0.4 | | |

**Ignition** — Satisfactory

**Non-firing plug(s):** None
**Marginal plug(s):** None
**Split magneto timing:** None detected
**Add'l observations:**

**Max Power** — Caution

**Max power FF:** 29gph vs. TCM's specified maximum of 27.3gph
**Max power RPM:** 2710, but generally 2670
**Maximum MAP:**
**Add'l observations:**

**Temperatures** — Caution

**CHTs:** 280degF max, 200-250degF during cruise
**EGTs:** >50degF rise all cyls and both mags during LOP test
**TIT(s):** N/A
**Add'l observations:**

**Engine Monitor** — Satisfactory

**Inoperative sensors:** None detected
**Anomalous channels:** None detected
**Noisy channels:** one detected
**Add'l observations:**

**Powerplant Mgt** — Satisfactory

**Power:**
**Mixture:**
**Test Profile(s):**
**Add'l observations:**

**Electrical** — Not Applicable

**Primary sys:**
**Secondary sys:**
**Other sensors:**
**Add'l observations:**

**Recommendations:**

Savvy recommends fuel system setup per SID 97-3E at next annual inspection to bring T/O fuel flows into spec. Watch for continued low CHT's in cruise. Excessively low CHT's can lead to plug fouling, but the data shows no indication of fouling at this time.

## Charting Basics

Now that we have covered the preliminaries, let's have some fun and create a chart of your engine data! To chart a flight, click on that flight on the My Flights page. After a short delay, the platform will render a graph of the flight data, and the real fun begins.

The chart page may display one, two or four stacked charts, at your option. By default, the initial rendering will consist of two stacked charts for a single-engine aircraft or and four stacked charts for a twin. By default, the top chart will display EGTs (and TIT if it's a turbo), and the bottom chart will display CHTs. (For a twin-engine monitor, the left engine will be depicted on the top two charts and the right engine on the bottom two charts.)



The horizontal row of rectangular buttons above or below each chart is called the **Legend Bar** and the vertical row of round buttons is called the **Toolbar**. We'll discuss what all of those buttons do shortly.

If you hover your mouse pointer over a graph, a vertical line known as a **Dynamic Cursor** will appear under the mouse pointer, and will move left or right as you move the mouse.



Synchronized dynamic cursors will appear on all stacked graphs, and will follow the mouse pointer as you move it.

Attached to each dynamic cursor is a **Dynamic Data Box** that moves with the dynamic cursor and displays the digital values of all charted traces under the cursor. The values in the dynamic data box are color-coded and sequenced to match the charted traces, making it easy to correlate them. For example, if you move your mouse pointer over the CHT graph, the dynamic data box will always show the hottest CHT at the top and the coolest CHT at the bottom.

In addition to the usual parameter(s) whose values are shown in the Y-axis on the left side of each chart, you may optionally select an additional parameter to be charted on any stacked graph associated with a second Y-axis on the right side of the chart. For instance, the graph below shows that fuel flow (FF) has been added to the right Y-axis of the top (EGT) chart, and battery voltage (BAT) has been added to the right Y-axis of the bottom (CHT) chart.

## Zoom and Pan

To zoom any chart, simply depress the mouse button and drag a rectangle...



When you release the mouse button, the chart will zoom in to the selected area, and any other stacked graphs will zoom in unison. Here is the result.

The four orange arrow buttons on each chart may be used to pan the chart up/down/left/right. Holding down an arrow continuously causes continuous panning until you release the arrow.

## Legend Bar

The Legend Bar contains a separate button for every parameter shown on the graph. By clicking on the button for a particular parameter, you can:

- Bold the chart trace.
- Hide the chart trace.
- Isolate the chart trace (i.e., hide everything else).
- Restore the chart trace to normal.
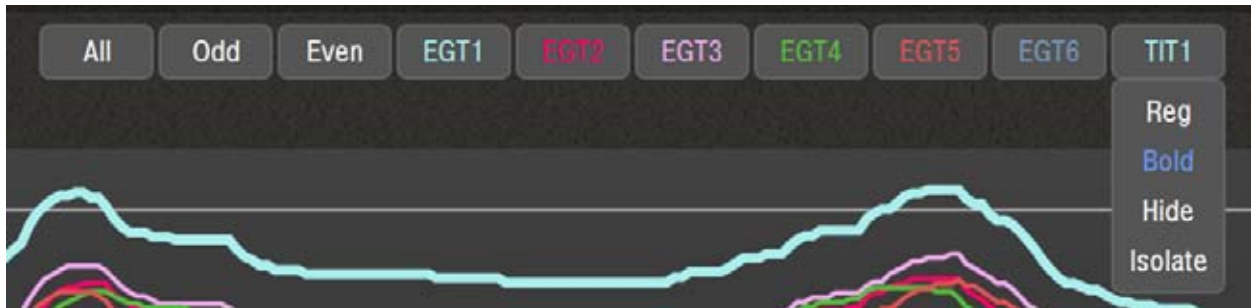


For charts displaying EGT or CHT, there are also three additional legend buttons marked All, Odd, and Even. These buttons allow you to bold, hide, isolate or restore all EGTs or CHTs, just those for odd-numbered cylinders, or just those for even-numbered cylinders. This makes it a snap to analyze an in-flight mag check and see whether or not the two magnetos are timed the same.

## Toolbar

A floating vertical toolbar on the right side of the browser window controls the numerous powerful charting features unique to the SavvyAnalysis.com platform. Hovering the mouse pointer over any of the toolbar icons pops up a "tooltip" that describes the function of that tool. With a bit of experience, you'll quickly learn what each does.

The tool at the top is "Sigmund." SavvyAnalysis Pro clients use him to request analysis of the current chart. If you are not a SavvyAnalysis Pro subscriber, clicking on Sigmund will give you the opportunity to upgrade your aircraft to SavvyAanlysis Pro.

The two tools below Sigmund allow "unzooming" of the charts—either to the previous zoom level or to the original un-zoomed state.

The next three toolbar tools engage the **analysis modes**:

- Toggle **difference** calculations on or off ("Diff Mode")
- Toggle **rate-of-change** calculations on or off ("Rate-of-Change Mode")
- Toggle **GAMI lean test** mode on or off.

The function of these toolbar tools are described more fully on the following pages.

The last toolbar icon brings up the chart settings dialog.  This permits you to set the

number of stacked charts (Automatic, 1, 2 or 4) and the height of the stacked charts (either automatically scaled to the size of your browser window or manually set to small, medium or large). When you set the number of charts to Automatic, you will get 2 charts when you are displaying a flight for a single-engine aircraft, and 4 charts for a twin.

## Static Cursors and the Data Display Area

If you move your mouse pointer to an interesting place on a chart and click, a **Static Cursor** is placed on the chart. It's called a "static" cursor because—unlike the "dynamic" cursor—it stays put and doesn't follow your mouse pointer around. If you toggle the **Data Display Area** on by engaging any of the analysis modes, then all the charted parameter values under the static cursor will appear in the data display area (located just to the right of the toolbar.)
You can click on the data display area, press CTRL-C to copy the displayed values to the clipboard, then then CTRL-V to paste those values into another application or browser window. This makes it easy to grab interesting values from a chart and paste them into an email, ticket post, word-processor document, etc.



You can continue to click on other interesting places on the chart—the static cursor will move to wherever you clicked, and a new set of values will appear in the data display area.

Press the ESC key to remove the static cursor and the contents of the data display area. Click on the red X icon to hide the data display area.

## Diff and Rate-of-Change Tools

If you click on the <mark>Toggle Diff Mode</mark> tool or the <mark>Toggle Rate-of-Change Mode</mark> tool (or both), the platform shifts into a special "interval mode" in which you can drop <u>two</u> static cursors to define a time interval, and the platform will automatically calculate either the difference or rate-of-change of each charted parameter during that interval.

With either <mark>Diff Mode</mark> or <mark>Rate-of-Change Mode</mark> enabled, clicking on the chart drops a static cursor marked "Start," and clicking once more drops a second static cursor marked "End."



The data display area will display both the parameter values under the "start" cursor and also the amount of change ("diff") and/or the rate of change of each parameter between the "start" and "end" cursors. This makes it easy to determine the amount of EGT rise during an in-flight mag check, or the rate of CHT rise during a destructive pre-ignition event.
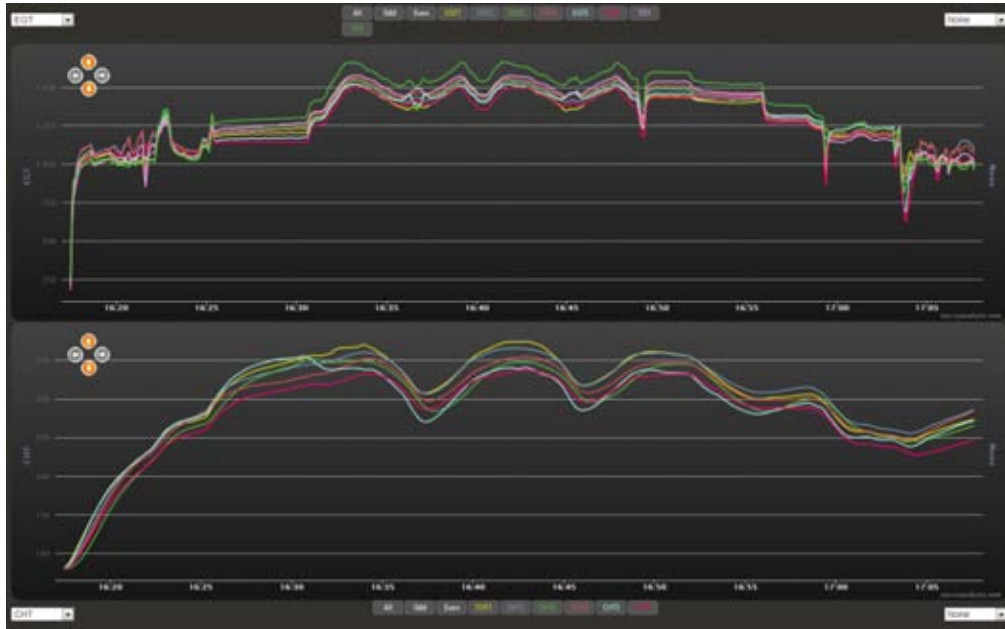
The <mark>Toggle Rate-of-Change Scale</mark> tool can be used to configure the rate-of-change calculations to either units/minute or units/second.
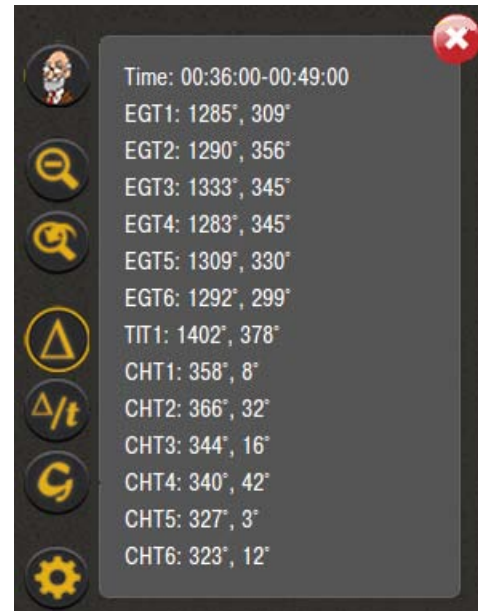
## GAMI Tool

For engine monitors that capture fuel flow data, the <mark>GAMI Tool</mark> automates the process of analyzing the quality of the engine's mixture distribution and calculating the all-important "GAMI Spread." In order for an engine to run smoothly at lean-of-peak (LOP) mixtures, we would like the GAMI spread to be 0.5 GPH or less. This is how the GAMI spread tool is used:

**Step 1:** Render the chart of the GAMI Lean Test mixture sweep in the usual fashion:

**Step 2:** Click on the GAMI tool on the toolbar. This changes the display to one-chart mode (EGTs only), automatically adds Fuel Flow (FF) to the right hand Y-axis, and enables the data display area where the GAMI spread calculations will appear:

**Step 3:** Drag a rectangle to zoom in on the region of the chart where the GAMI Lean Test mixture sweep took place. Zooming in on the region of the chart makes it easier to accomplish the next step. (This flight included four mixture sweeps—rich-to-lean, lean-to-rich, rich-to-lean, lean-to-rich—and we chose the second sweep to analyze.)

**Step 4:** Move the mouse pointer and click to drop a "Start" cursor at the beginning of the mixture sweep to be analyzed, making sure it's to the left of all the EGT peaks:
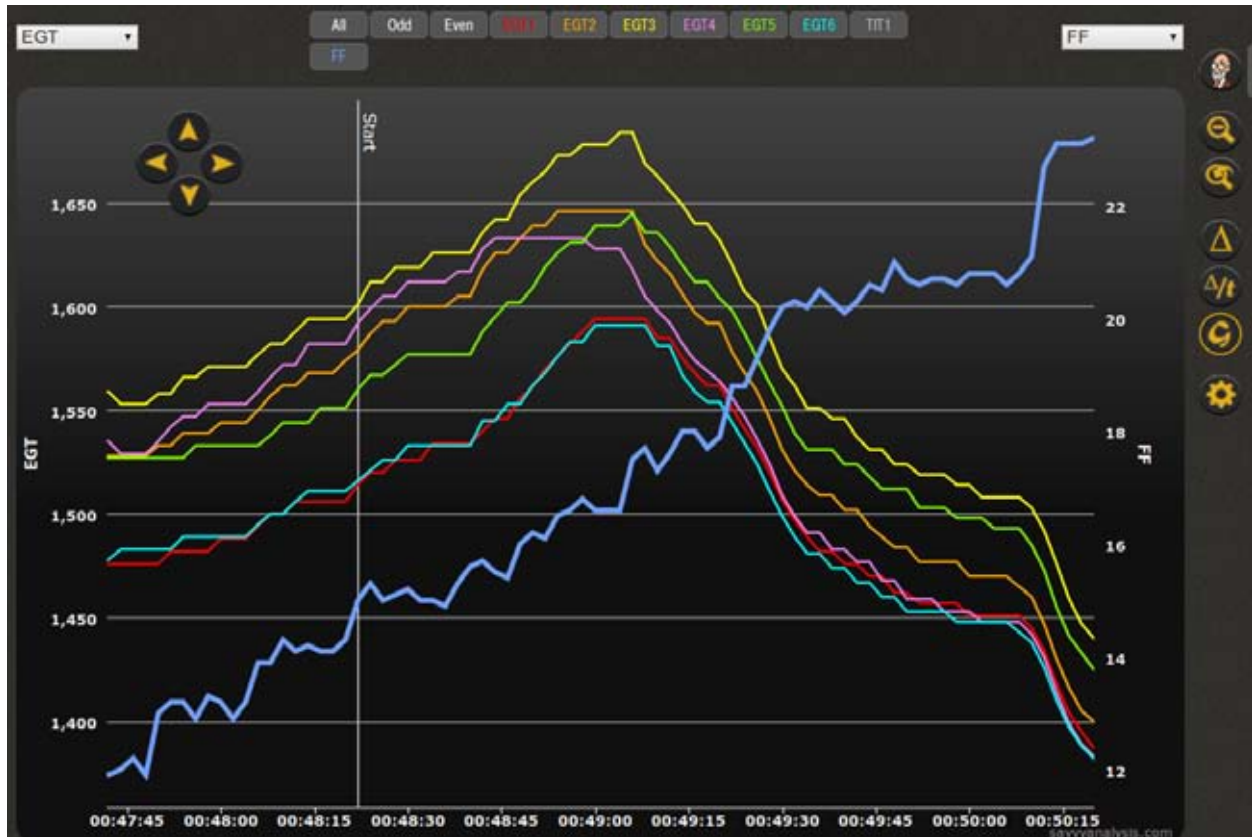
**Step 5:** Move the mouse pointer and click again to drop an "End" cursor at the end of the mixture sweep to be analyzed, making sure it's to the right of all the EGT peaks:
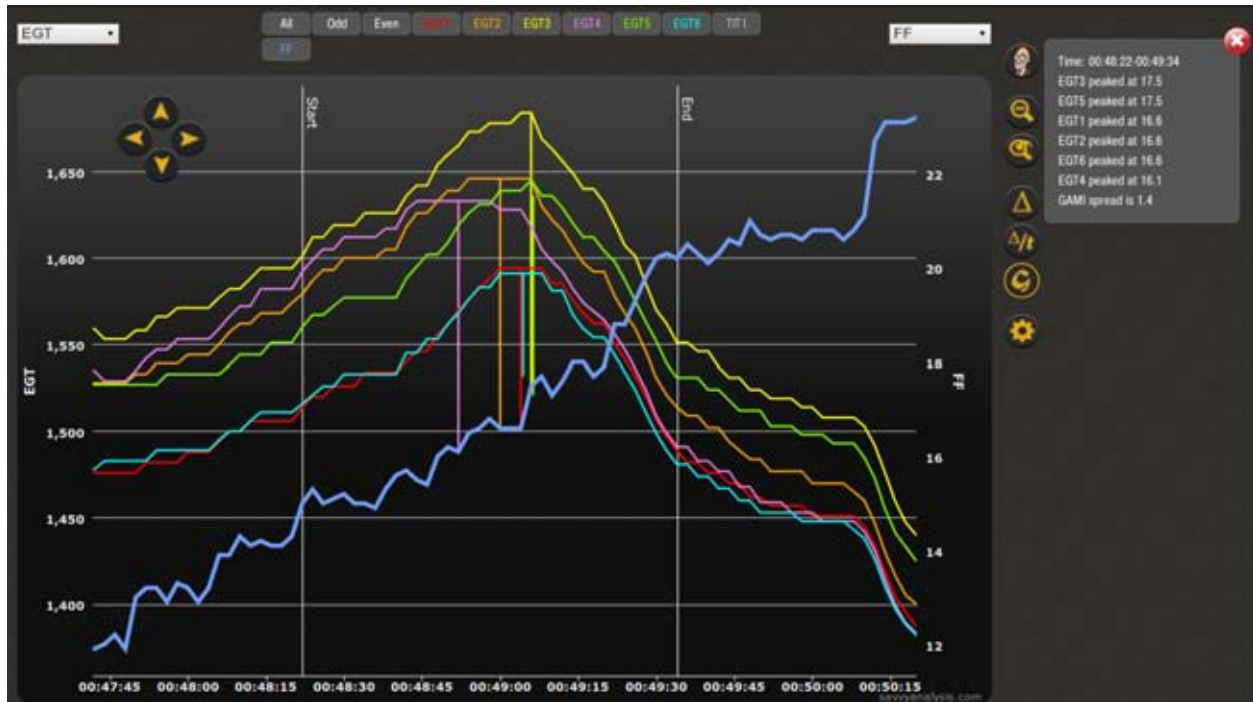


Voila! The GAMI Lean Test results are displayed in the text area in the upper right corner of the chart, where it can be cut-and-pasted into an email, ticket post, or word-processor document.

The peak-EGT fuel flow is listed for each individual cylinder, starting with the leanest cylinder and ending up at the richest cylinder, and then the GAMI spread is calculated automatically.

In this case, cylinder #3 is the leanest cylinder (because it peaked at the highest fuel flow,) and cylinder #4 is the richest cylinder. The GAMI spread is a rather poor 1.4 GPH. Cylinders #3 and #5 are significant lean outliers, and without those two cylinders, the other four would have a decent GAMI spread of 0.5 GPH. The data indicates the #3 and #5 nozzles should be cleaned and the test repeated. If cleaning doesn't resolve the issue, then those two nozzles should be replaced with one size larger.

How cool is that?
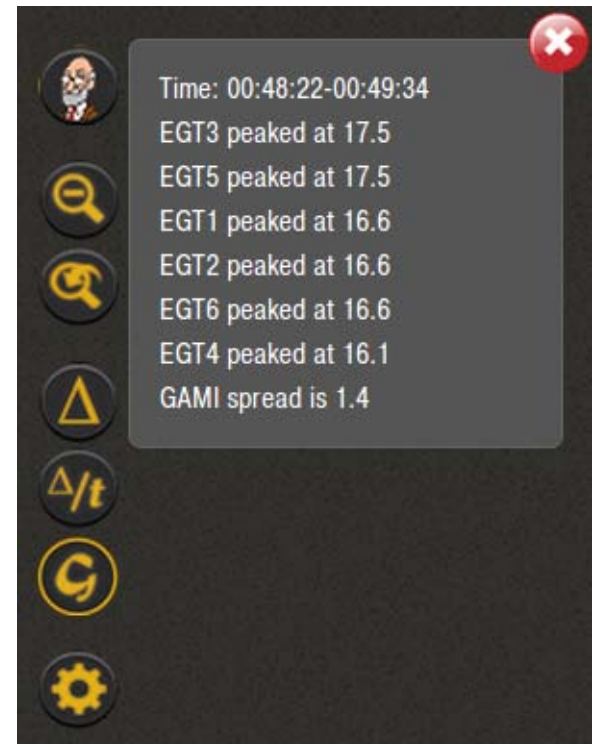
## Sharing Your Flights and Getting Help

By default, the flights uploaded to the platform are private, and may only be viewed by the user who uploaded them. (For Savvy managed-maintenance clients and SavvyAnalysis Pro subscribers, Savvy analysts and account managers may also view the flights.)



However, a user may choose to share selected flights or all flights with anyone else he chooses. This is accomplished using "shareable links," which are obscure, hard-to-guess URLs that a user may share with others to allow them to access his flights.

If you want to share just a single flight from chart mode, you can simply share the link from the URL bar of your browser:
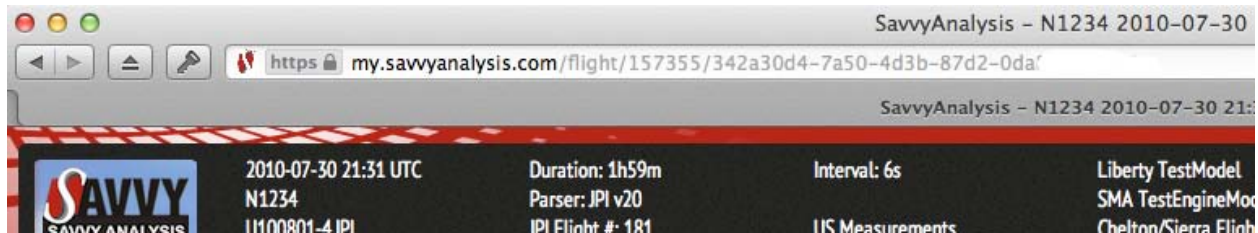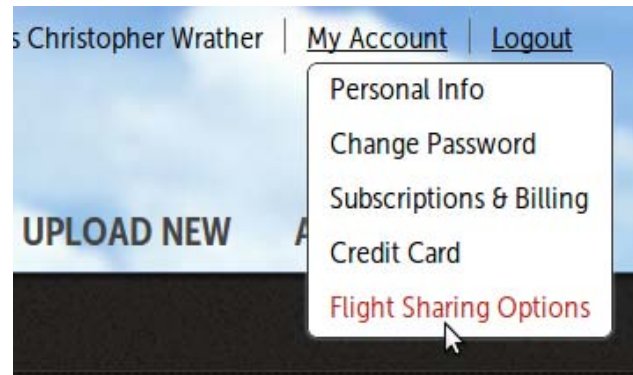


By going to **My Account** → **Sharing Options** you can obtain a sharable link for all your flights. SavvyAnalysis Pro subscribers can also share a link to a page with all of the subscriber's tickets.
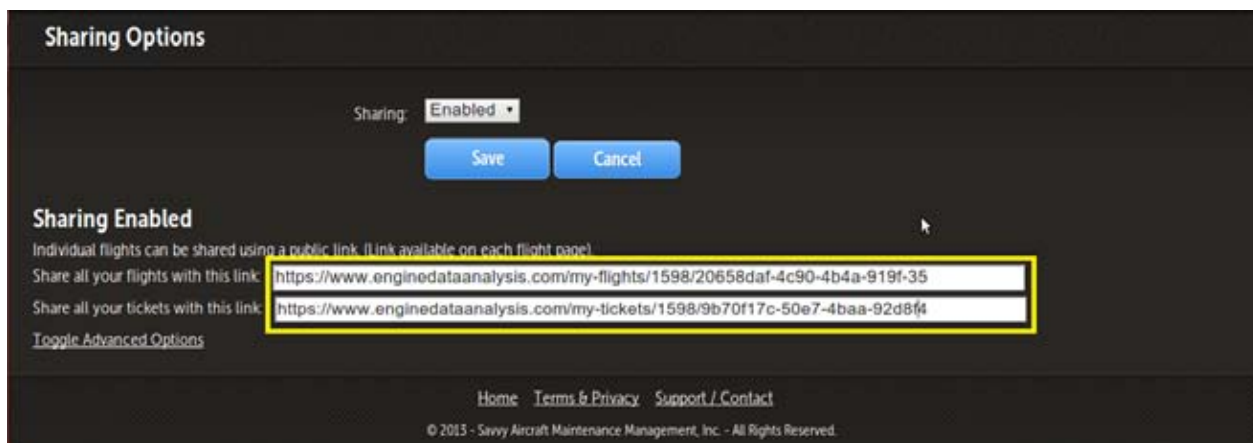


Well, that should be enough to get you started. The best way to gain proficiency with the SavvyAnalysis.com platform is to use it. Be adventurous. Try things. Have fun!

If you need help, have questions, or encounter bugs, please let us know by going to Help → Contact Us and creating a support ticket.