Understanding Flight Log Numbers

Spektrum receivers generate what is known as “Flight Log” data. This data tracks performance for each individual remote receiver as well as the base receiver, and for the system as a whole. The data is reported and displayed using the single letters A, B, R, L, F, and H. In this document we will discuss the background, the meaning of the data items, and how to use this information. The end result will be that you can either improve your installation or to have confidence that it is working well.

BACKGROUND:

In order to discuss the Flight Log intelligently, we first need to explain some basics on which to build our understanding.

The Spektrum radio systems send control data to receivers every 11 milliseconds (11 ms), working out to about 91 times per second, or 91 Hertz (91Hz). For the sake of clarity we will discuss this as if it were exactly 91Hz. The data is sent in packets, also known as Frames, with each packet checked to ensure that it was properly received. Packets which are garbled in any way are discarded. The control data consists of servo commands, gains, flight mode, etc. and is technically called the “forward link” or “forward path.”

Spektrum receivers also send back telemetry. Some receivers are capable only of limited power, resulting in what is called “short range telemetry” which is good for up to about 100-150m (300-450’). Other receivers have much higher power outputs for “full range” which is much farther, though typically less than the control range of the transmitter. The telemetry data is collected from various sensors which may be installed in the model. This is called the “return path” in techno-speak.

The telemetry data is sent back at half the rate as the control data, about 45 times per second. It is also sent in packets which are checked to prevent garbling. Each packet that comes in is known as a “telemetry packet” or “telemetry message” and includes data from a single sensor source.

The Flight Log data is one of the telemetry messages that the receiver sends to the transmitter. Also known as “Quality of Service” (QoS) data, it is used by the transmitter to show the telemetry status bars on the display, as well as to show on the LCD those single-letter items mentioned at the start.

As a model moves around through the sky, the receivers’ orientations and distances are constantly changing with regard to the transmitter. As they change, the signal level (the “loudness” of the radio frequency, or RF) also changes. Much like a human ear, an antenna is somewhat directional – it receives best when it has the proper orientation to the transmitter, and the transmitter sounds loudest in some directions and less loud in others. This document doesn’t cover those properties other than to acknowledge that the signal is constantly changing so far as the receivers are concerned.

THE FLIGHT LOG DATA FIELDS:

The Flight Log data fields A, B, R, and L are individual internal or remote receivers. The A data is always for the internal (base) receiver whether it has 1 or 2 antennas (for reporting purposes, both are considered as one). Fields B, R, and L are always remote receivers. The number given represents the number of packets (frames) which were not properly received. Because the transmitter speaks every

11ms, the receiver knows that it missed a packet simply because none were received within the 11ms window that it should have arrived.

It is normal for the A report to be higher than the others. This makes sense because the base receiver is often down in the fuselage, surrounded by servo leads, batteries, motors, ESCs, etc. The remote receivers are farther away from the clutter and should therefore be expected to receive better, and thus have lower numbers.

The letters A, B, R, and L are often referred to as “fades.” This can be confusing, though, because there is another field named F which is much more important. For the sake of clarity, this document will not use the term “fade.”

The F field is the count of simultaneous loss of data on all active receivers at the same time, that is, the same packet was missed everywhere. The F stands for Frames Lost.

The H field is the count of Holds encountered. A Hold is when 45 frames have been lost at the same time from all receivers. This takes about ½ second, and means that you didn’t have control of your plane for at least that long. It is a VERY serious event, and its occurrence should be considered as a “land NOW” event. You want to carefully analyze why you had a Hold before flying the model again.

FLIGHT LOG VALUES WITH LOG FILE:

To properly understand the Flight Log data, it is best to be working from a telemetry log file (.TLM file type) which is configured on the Telemetry File Settings screen. Opened by a PC-based telemetry viewer (www.tlmviewer.com or www.robo-software.com) it is possible to see how the Flight Log data changes during flight. A typical nearby flight will show a few changes to the letters A, B, R, and only an occasional change to F, and hopefully no changes ever to H. When flying far away from the transmitter, you may notice that the numbers go up some, but this is understandable given that, just like sound, RF “volume” decreases with distance.

With a log file, you can consider what you were doing and where the plane was (especially if you have a GPS sensor) all through the flight, and understand why individual receiver missing frame count changes occurred. Since most will be increments of one or two at a time, they won’t mean anything. If your model is on the ground, you will likely see much higher numbers than if the model is in the air. Due to a phenomenon called “Fresnel Effect” the receiver has a harder time hearing the transmitter when it is close to the ground. Coupled with the effects of ground and moisture in close proximity to the receiver, it is expected that you will see big changes after a crash in the weeds. Look at the flying portion of the log file, not while it is on the ground.

This is why the Frame Loss (F) number is so much more important: It tells you that, at an instant, something occurred that affected all receivers at the same time. It could be distance, or it could be that you flew behind an obstacle (a tree, or a person was between your transmitter and the model). But it’s not the number per se, but how the number changes over time. It doesn’t matter if you see F as 20 or 200 or 2000 – how quickly they occurred to one another is the important point.

Frame Loss (F) has priority over the individual antenna losses (A, B, R, and L). You care about two numbers: H (which should always be 0) and F. A, B, R, and L are ONLY SUPPORTING DATA telling you which antenna, if any, needs to be repositioned. With that in mind, you are not even looking at A on your transmitter if you have a single-antenna/receiver system.

Now that that's clear, let's once again review why you don't care about the value of F by itself. What you care about is F over time.

If F is changing rapidly, you need to figure out why right away. If the plane is out flying, being in telemetry range (450' or so for short range) and getting frame losses means there is either a horrible installation of the receiver, or a dead transmitter. If the frame losses happen while the model is far away from you, that's fine and normal. If they happen while you're maneuvering, that's normal as the orientation is changing and possibly getting blocked momentarily by engine, batteries, etc.

Every second 91 frames (packets) are sent out. If you were to lose 1 every second, that's 1.1% frame loss (1 / 90) and you'll probably never notice it. If you lost 91 all at the same time, you'd have a serious loss of control for a second – and it would show up as a Hold (H).

NO TELEMETRY LOG FILE:

In the event that you don't have a telemetry log file, what you want to do is figure out how many frames were sent during the time period of your flight. If you can, have a friend check the numbers before you get close to the ground, so you don't have to worry about the Fresnel Effect (see previous section).

Since there are 91 frames per second, you want to know how long the flight lasted. If 5 minutes, it means that there were 5 x 60 x 91 frames sent, or 27,300 frames. A 1% failure rate would mean that 273 frames could be lost throughout a flight and it would mean nothing is amiss. Even 2% would be fine. It's not uncommon for gliders to be flying for an hour. In 60 minutes there are 60 x 60 x 91 frames sent – that's 327,600 frames! A 1% failure rate would be F = 3,276 and all would be fine.

That should make it clear that the number doesn't matter – it's how long it took to get that number that matters.

Or, in the other direction: Suppose you had a 10 minute flight. Where would you start to be concerned for Frame Losses? If 1% is your goal (and remember, even 2% is fine) then you would want no more than F = 546.

SUMMARY:

In summary, you need to know the duration of the flight to know if the numbers you see for F are indicators or good or bad performance. Comparing F to A, B, R, and L will tell you which, if any, need to be moved.

The best way to know is to use a Telemetry Log File and, if possible, a GPS sensor (SPMA9587) with one of the viewer software packages.