The 2.4 GHz R/C Revolution (part 1) by Patrick Willis

DISCLAIMER: *I make no claim to be an expert, but I've learned a few things over the years. Anything I write is my opinion based on my experience. Take it for what it's worth and feel free to disagree. -Pat*

About three years ago now, a little-known company came out of the woodwork and presented a 6 channel short-range park flyer R/C system on the 2.4 GHz band. Suddenly,

all the big names realized that they needed to act quickly and produce something better. However, while they were still scrambling to get a single system out on the market, the same little company came out with a full-range 7 channel computer R/C system on 2.4 GHz. Their advertisements used terms such as "bullet-proof" to describe the radio frequency (RF) link between their transmitter and receiver. The hype started to overwhelm all the internet forums and it seemed everyone was trying to find out more about this new technology.

There are four major players in the 2.4 GHz market today. The "little-known" company was Spektrum R/C, who partnered up with JR, and together they have dominated the 2.4 GHz market. Second place goes to Futaba, who entered the market very late and, as a result, lost some of the loyal fans to Spektrum/JR. Third goes to

XPS, who makes 2.4 GHz modules and receivers that sport features that none of the other players have. At a distant fourth place we find Airtronics, who despite their name has been concentrating on surface-based systems for the past several years.

There are other brands that have come out in the past 6-9 months, but none of them have taken a very strong position in the market. Those brands are Assan, Corona/BP, and a few others whose names escape me. Assan is a module based system sold by Hobby City (China). I've read very mixed reviews on the Assan systems and I would not recommend them to someone wanting to fly anything bigger than a park flyer. I don't know enough about the other small players to make any comments.

All of these systems use different proprietary communication protocols and cannot communicate with each other. They also are not allowed, legally, to actively interfere with each other and must be able to "play nicely" together, even when sharing one of the 16 channels that are used for R/C in the 2.4 GHz band. Yes, that's right, they will be on the exact same frequency sometimes, and they must share it.

So, let's start with número uno: Spektrum/JR. Yes, that's right, they're basically the same thing. They are two different companies that partnered up to take a very firm grasp on the 2.4 GHz market utilizing the Spektrum DSM and DSM2 technologies in the existing JR radio systems. Using a lot of advertising hype telling you that you will "never get shot down again!" if you use their system, Spektrum very successfully marketed their DX6 park flyer system, and then later their very popular DX7 full-range system. You can find a few DX7's at our club field on a regular basis.

Sharing Channels continued

Spektrum now sells the five channel DX5e and six channel DX6i, both of which are full-range. JR sells the X9303 and 12X systems with the Spektrum technology on board. JR/Spektrum systems employ satellite receivers that connect to the main receiver, giving signal redundancy. When the system powers on, it boots up like a small computer and locks onto two open channels in the 2.4 GHz band.

Spektrum/JR users learned early on that, unfortunately, there is no such thing as a bulletproof RF link afterall. Reports of inexplicable interference on the supposedly immune 2.4 GHz band came pouring in. How could this be? And, then there was the low voltage re-boot issue. As it turns out, using high-torque digital servos can make your on-board battery pack's voltage spike below the Spektrum receiver's minimum voltage and cause it to momentarily turn off and turn back on again. The problem was that the receiver needed time to re-boot, (think about your computer at home when you turn it on and wait for your desktop to appear). During that time, aircraft came crashing down.

Your humble writer's opinion is that the advertising was misleading as far as the ballistic properties of the RF link go. There is still interference on the 2.4 GHz band. Yes, it's true! I would say there is usually a lot less interference from on-board components such as ignition units, electronic speed controllers, and metal-to-metal contacts such as clevises and pushrods, sparkplugs, etc. rubbing together. However, there can still be environmental factors such as Wi-Fi devices and some types of radar systems. Luckily, our club does not have to worry about such things in our rural location. The main interference actually is only indirectly related to the receiver. You see, people found that the interference from on-board equipment was actually traveling through the servo wires directly to the servos. The receiver was often bypassed completely by the offending RF interference (RFI).

Spektrum/JR, like any company out there would do in such a situation, basically said, "Hey, use an appropriate power system in the first place to avoid lock-outs, okay?" The low-voltage re-boot issue was eventually addressed in a more technical manner and all new receivers came with new firmware that included a lower voltage tolerance and a much quicker re-boot. The interference issue was a result of people not adhering to the old principles of clean installations, for the most part, and were usually pretty easy to resolve.

Before Spektrum/JR was able to mass-resolve their low voltage re-boot issue, however, big name #2 came out with a system they said they'd been working on for many years.

To be continued in the next newsletter...

GLOSSARY OF TERMS Source: http://www.spektrumrc.com/DSM/Technology/glossary.aspx