

LIVE TV FROM (near) SPACE

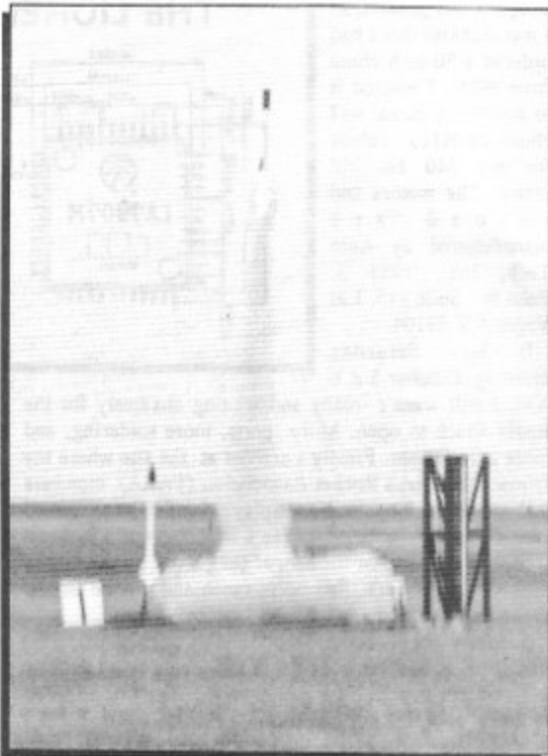
by Hugh Maher N5AVT

Halleluya, it worked! Good video from my rocket, broadcast live from liftoff through splashdown (well, it was muddy). I have been working on my TV transmitting payload for many months. In fact, this project began when a friend (Ron Dunn) mentioned an article about a model-railroad TV-camera (see the "Lionel Railscope" article in the April 1991 issue of ATVQ). That was a year ago, back in June of '91. I've been working on this project ever since. This is more a story of human persistence than of technical prowess.

Ron noted that he had read the story in a T-5 Newsletter that the HUVARS club publishes. Since that article was my only source of information, I called the "T-5" editor. He gave me Bob Rau's name and number. I then got in touch with Bob who turned out to be a fellow amateur radio operator (N8IYD). He had recently written an article in 73 Magazine about using TV transmitters in model rockets. That issue, August 1990, was devoted to TV installations in model rockets, RC airplanes, RC helicopters and balloons. Bob was a big help. He also markets all kinds of electronics hardware for model TV projects (High Technology Flight, 1450 Jeffery St., Ypsilanti MI 48198-6319; Tel: (313) 482-2670 - the Rocket BBS can be reached at (313) 482-2657).

The heart of the system is Lionel's tiny video camera called the Railscope (originally designed to fit inside of an HO scale model train). [Ed. Note: The Railscope is still available from Lionel for \$69 + \$5 shipping; call (800) 727-7297 or (313) 949-4100 to order.] It is a low-resolution, B&W device that operates on 9 volts. However, it's designed to operate as part of a closed-loop system. That is, on the model trains, the camera/transmitter module is wired directly to the receive converter and monitor via the train tracks. That means I would have to design and package transmitting, receiving and converting systems.

After checking some prices, I decided to go for it. I set a target date of October 5, '91, at our club's big annual demo launch. I ordered the "Railscope" from Lionel, the transmitter (TXA5-RC) and the downconverter (TVC-2G) from PC Electronics. I installed the down converter in a Radio Shack aluminum box and powered it with a wall transformer/converter like many calculators use. I used a similar box in the rocket, except that I cut it down with a nibbler, so that it would fit into the payload bay. An aluminum spine on the back supports the video camera. I added a small bracket to support the battery pack, which contains 8 AA cells. Velcro and elastic hold the batteries in place. A 13.5 inch dipole antenna, epoxied to a square dowel, fits neatly in to the nose cone. As for the ground support equipment, I strapped a small B&W TV, a



Rhapsody TV 628, the downconverter and my VCR onto a two foot piece of plywood that went into the back of my car. That left just enough room for the seven miles of AC cord needed at some launch sites.

It was now late September and I still hadn't put it all together and powered it up. I was afraid that I would cook everything! Then on October 1, I braced myself and threw the switch. It worked! With some minor adjustments I was able to walk around my house and transmit live video to my TV. However, there was still a lot to do before the 5th.

I had used my North Coast Phantom NCR 4000HD rocket for some successful 35mm camera flights, so I decided to use that same rocket. The Phantom 4000HD kit is available from North Coast rocketry, 13011 Branscomb Road, Huntsville AL 35803. Even with the 4-inch diameter tubing, the camera, transmitter, batteries, and antenna proved to be a snug fit. Since the fit was tight and the time was short, I decided just to cram the assembly in and add some bubble pack fore and aft.

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The payload section weighed 2.3 pounds, so I was thankful that I had ordered a 50-inch chute from NCR. I wanted it to stay fairly close, so I chose an H123 reload for my 240 Ns ISP motor. The motors and reload are manufactured by Aero Tech, Inc., 1955 S. Palm St., Suite #15, Las Vegas NV 89104.

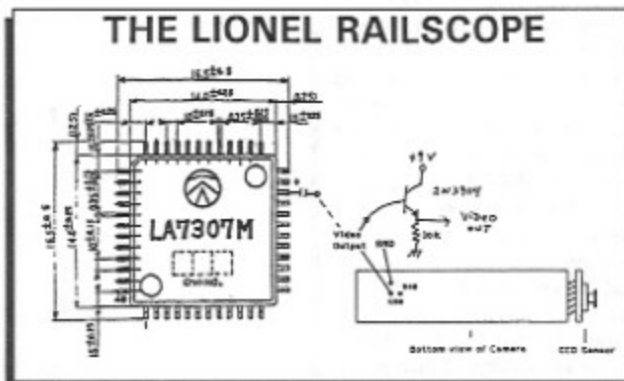
It was Saturday morning, October 5 at 6 AM. I still wasn't ready and waiting anxiously for the Radio Shack to open. More parts, more soldering, and more adjustments. Finally I arrived at the site where my fellow Tulsa Area Rocket Association (TARA) members had set up a huge static display. As the large crowd considered the contrast between a Bull Pup and a Bruiser, I parked my car near the hangar (to get AC power for the ground equipment). This horse ranch and private airport is the home of Ron and Dyana Jantzen.

A fellow employee at FlightSafety International, Ron hosts this annual company fly-in and picnic each October. It was here, just two years ago, that I was first exposed to hobby rocketry during TARA's first demo. Boy was I hooked!

The launch began while I was still adjusting things. My 4000 rocket was on the pad and the LCO was explaining the complexity of this project over the PA to the crowd. I was all thumbs trying to start the VCR, tune the TV (hard to see in the sun), and tune the downconverter. I had to scream at everybody to relay instructions to the pad. Suddenly I saw Ron Dunn's face in the monitor. It's working! "Tell them to launch, tell them to launch, TELL THEM TO LAUNCH," I screamed.

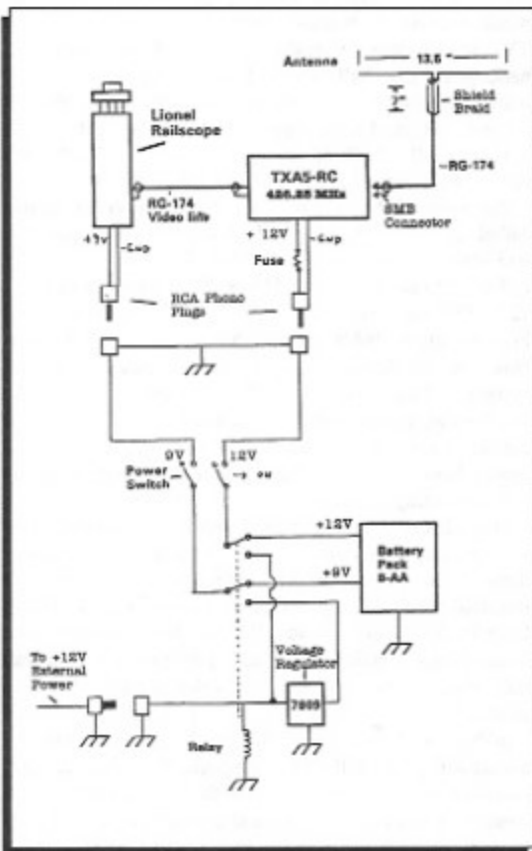
The first flight was successful, but the video was not very good. Post flight analysis revealed that the whole assembly had slipped in the payload bay and the camera lens had slid down past its porthole. Although annoyed with the results, I was encouraged to think that a secure mounting bracket was all that I lacked.

Attempt number two was set for our club launch on January 4. Besides the camera bracing, I was determined to improve the ground equipment packaging. I added a video output jack to my mini B&W for connection to a camcorder. That allowed me to do away with the VCR and its AC power requirements. Now all of the ground-equipment could be operated with portable power.



Again the flight was good but the video was lousy. I had sync problems and the transmitter seemed to be intermittent. During the post flight analysis some of the assembled rocket scientists allowed that the battery connections may be adversely affected during high-G accelerations. Rotating the battery pack 90 degrees removed the suspicion on the battery

holder springs and I got ready for the next try.



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Attempt number three was at the regional "Kloubuster II" launch in Argonia, Kansas on April 11. I had ground tested the system to apparent perfection and felt that everything was ready. So what happened? Same song, third verse; a very weak and badly sync'ed signal. Now I was getting discouraged. I again talked to Bob Rau and also to Dan Green in Illinois. On the basis of those conversations, I decided that the main problem at Argonia was weak batteries. The batteries are good for only 15-20 minutes and the on-ground tweaking and testing was eating up all the juice. To cure this problem, I added an auxiliary (ground) power connection to keep the internal (battery) power disconnected until the actual launch countdown.



had failed to install the black powder "ejection charge" in the RMS! The rocket gods must have been with me that day! The second time on the pad we had poor video on or off external power. I was so dejected that I decided to fly it anyway. However, the rocket gods weren't ready, as they prevented the copperhead from lighting the motor. Off the pad and back to the prep area again. While I was preparing a long thermalite igniter, a friend disassembled the payload and noticed a broken wire. Dale Bramer WB2ZUG not only has good eyes, but very steady hands as he had the assembly repaired, re-installed, and back on



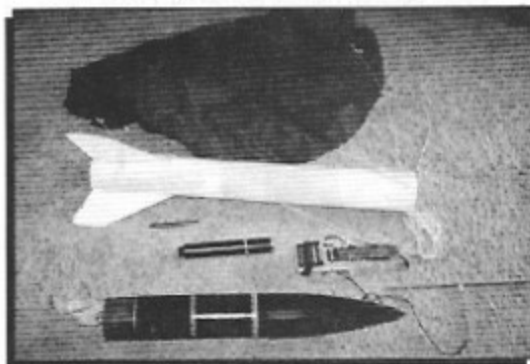
the pad in 15 minutes. On this third launch attempt of the day, the video was good, on and off external power. OK, let's launch! The motor roared and off we flew. Screams of delight! Several members were watching the monitor and enjoying the ride, broadcast live via ATV. You could see the buildings as the spinning slowed down. Because of the way the camera was mounted the world was live, but upside down. At touchdown, some 800 feet away, the transmission continued. The handheld directional corner-reflector antenna from Radio worked superbly. The camcorder recorded the recovery crew picking the payload up and smiling at the camera. Since the batteries are one-shot items I decided to leave the transmitter on while I carried it back to the prep area. Even with the low-resolution recordings you could tell that I was grinning from ear to ear.

The camera operates on 9 volts and the transmitter on 12 volts. In flight, the battery pack is tapped to provide the two power levels. On the ground, I added a 9-volt regulator to the external 12-volt power line. A relay, activated by ground power, does the switching. I also did some repackaging to improve the overall fit and reduce potential cable strain. I was pleased with the results.



By using just a paper clip as the receiving antenna, I could now get good video from three house away. I was ready once again.

Attempt number four was at our June 7 club launch. Light winds and a fair sky had to be a good omen, right? On the first launch attempt of the day we had good video until the external power plug was disconnected, then video was lost. So off the pad it came and back to the prep area. I discovered that a battery had popped loose. While taping the batteries, I suddenly remembered that I



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I owe a lot of thanks to several people for their encouragement and help. Freely given assistance and camaraderie are two major attractions of this hobby. This project took a lot of time and a fair amount of money, but the excitement of success I felt on that day was well worth the effort.

Let's see, if I use a 500 Ns reload we could really see some country. And next time I've got to make the video show right side up. Maybe a kevlar ribbon tied to the nose tip. Hmmm, Sooner Boomer VIII is just three weeks away.

Hugh was first licensed in 1978, he earned his advanced class in 1979. Interests include slow and fast scan TV. He manages a department that designs and builds simulated instruments and other products for flight simulators at FlightSafety International in Oklahoma.



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