

The Eclipse Ballooning Project



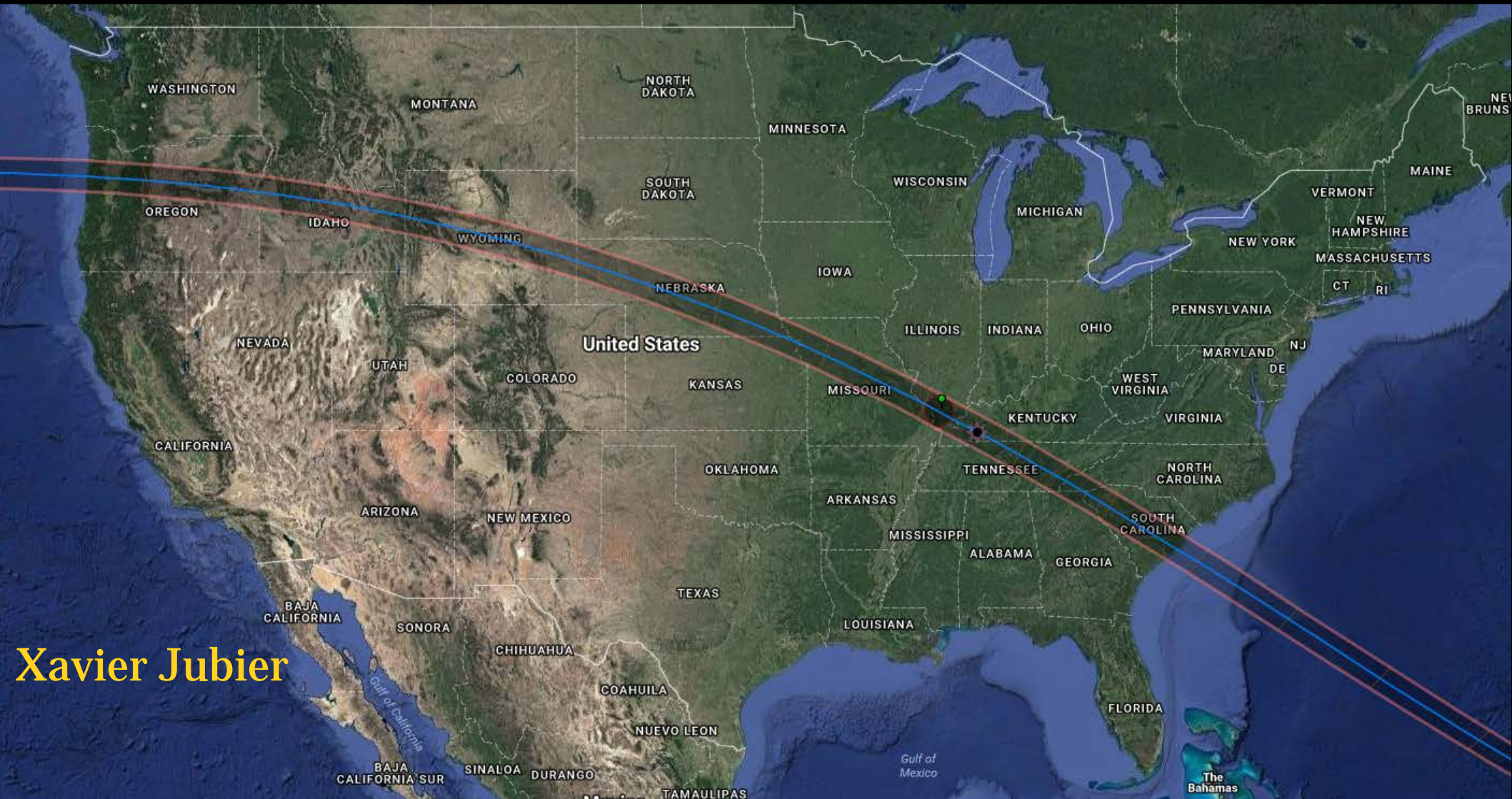
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Marshall University



**(A brief review for those who have not seen
our previous report.)**

The August 21, 2017 Total Solar Eclipse was the first to cross the U.S. in almost 40 years.



Xavier Jubier

- Relatively few people witnessed the prior 1979 eclipse.

- *Millions* saw this one.

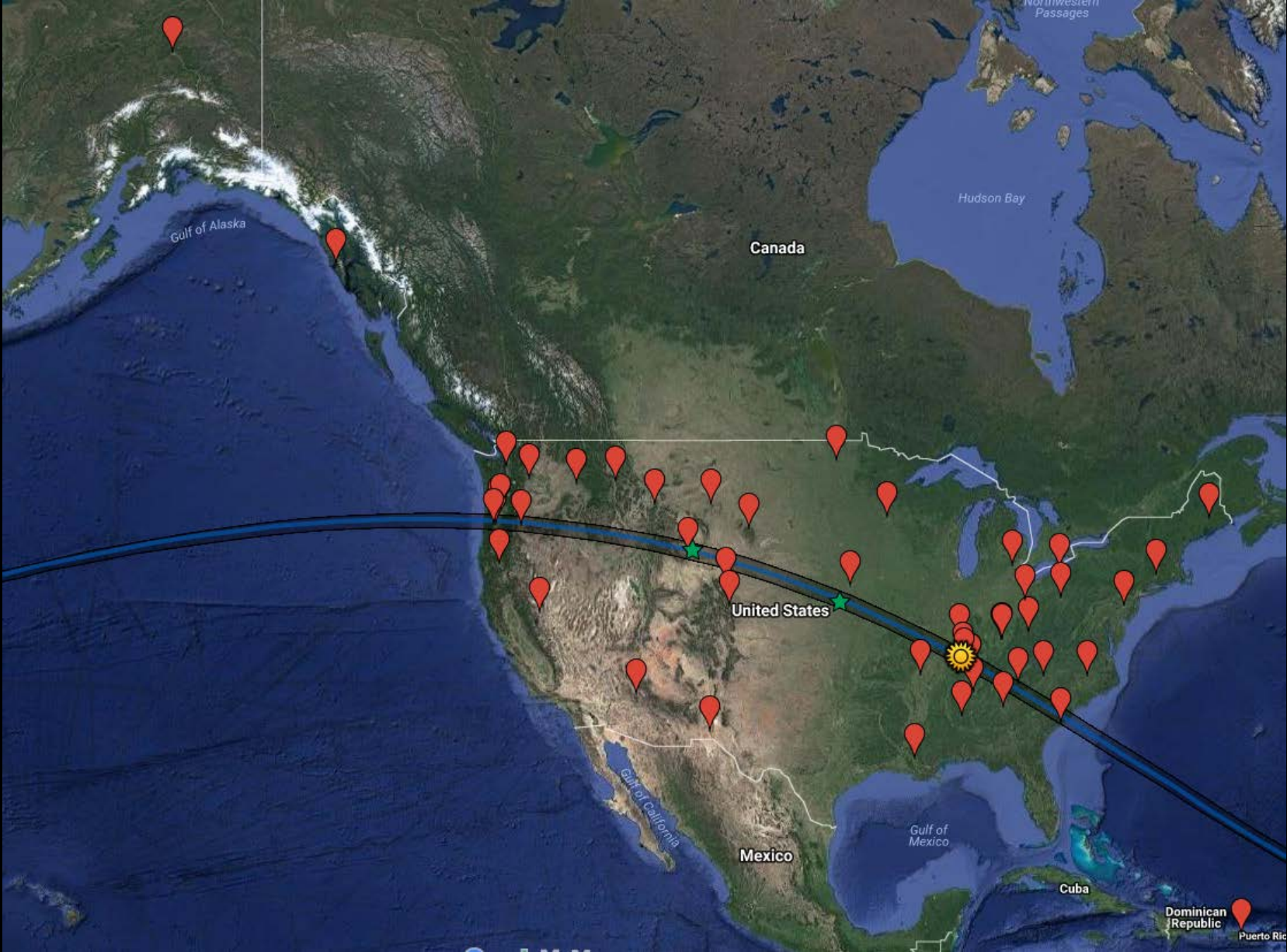
(Remember, too, the internet *did not exist* in 1979)

- Many millions more people used the internet to observe this one – LIVE!

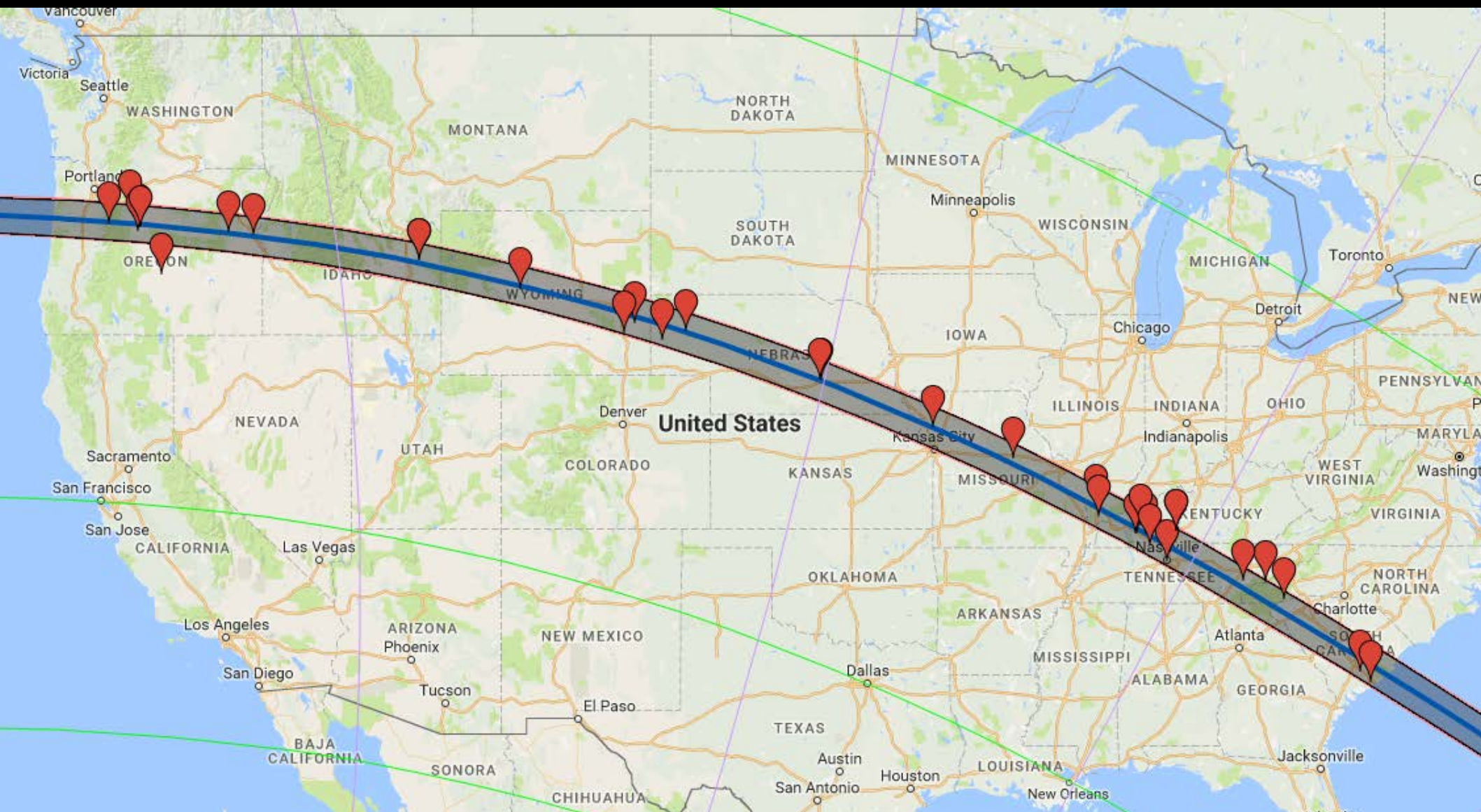
Although many groups were involved with eclipse projects, the concept developed by the Montana Space Grant Borealis team was perhaps the most ambitious...

Provide live streaming internet video and images from multiple high altitude balloons along the *entire eclipse path!*

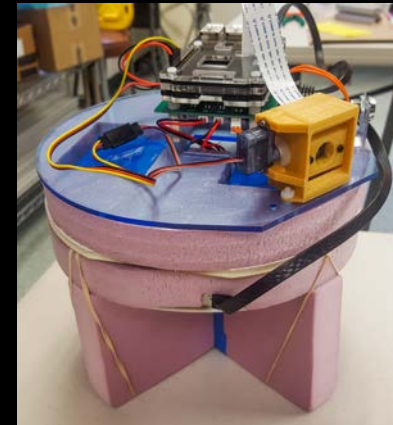
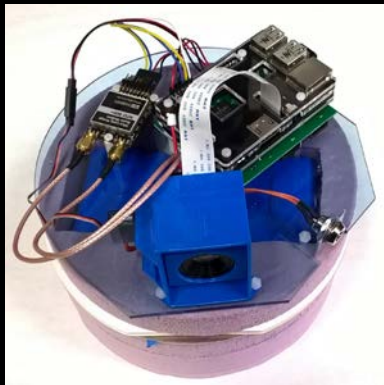
The project involved about 50 teams



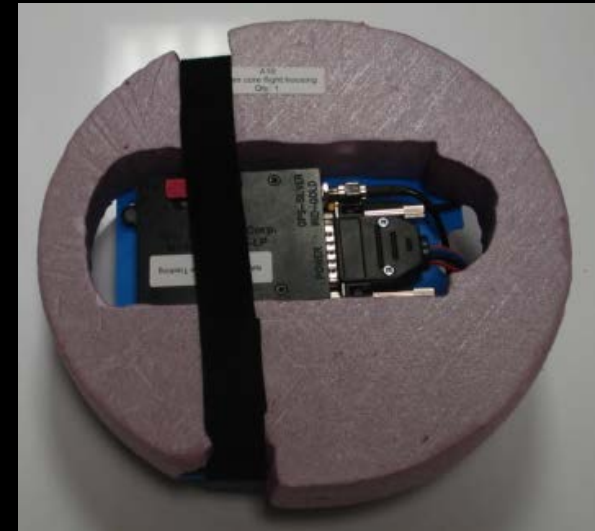
...Launching from multiple sites to provide nearly continuous coverage



MSGC BOREALIS students and staff along with teams from Louisiana State University, University of Minnesota, Iowa State University and University of Colorado Boulder developed the “Common Payload.”



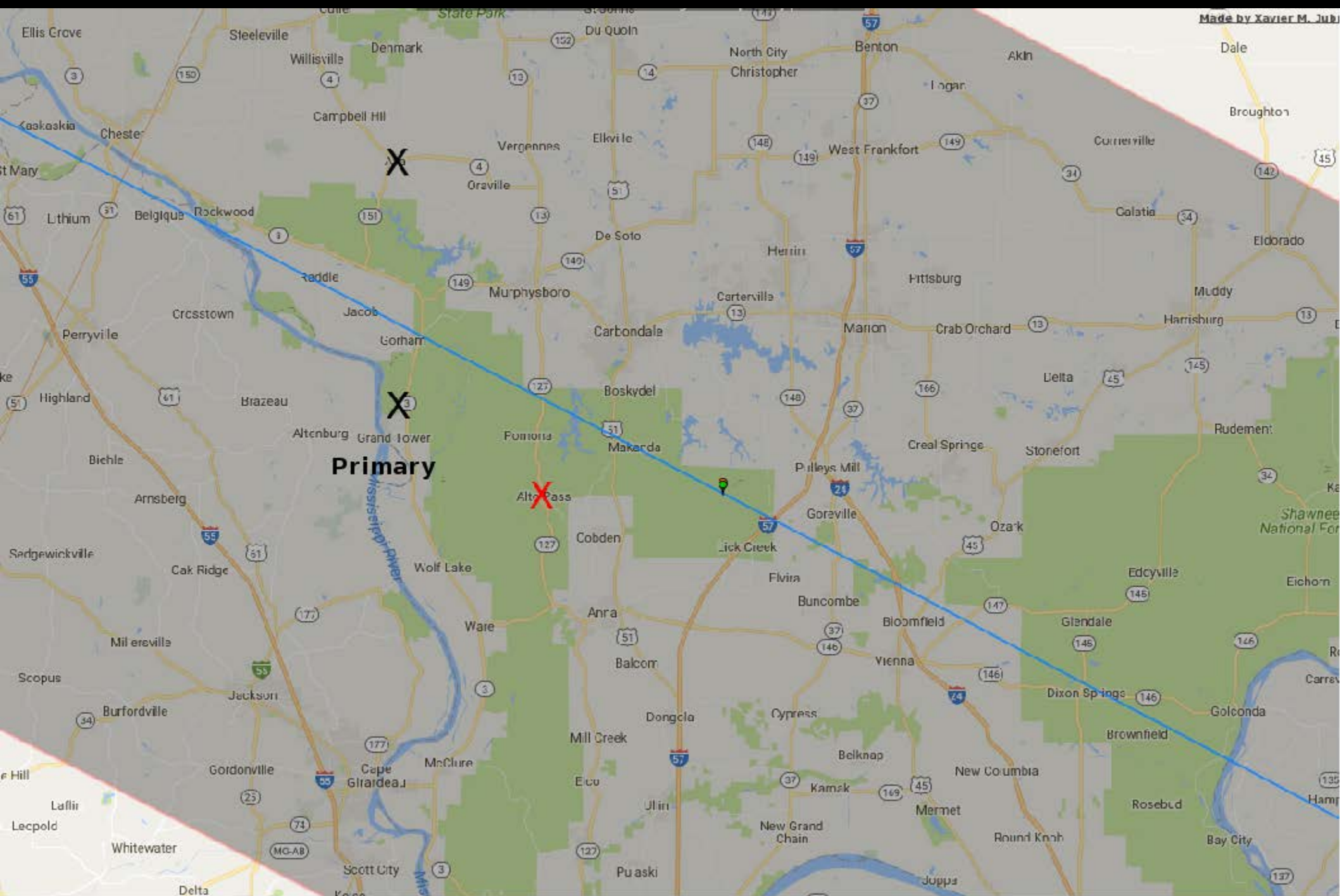
NASA required a means to track and report the balloon positions to the FAA, as well as an emergency cut-down system on each balloon



This is understandable given the impact on controlled airspace over the eclipse path.



Primary and Backup Launch Sites and Base Station Location

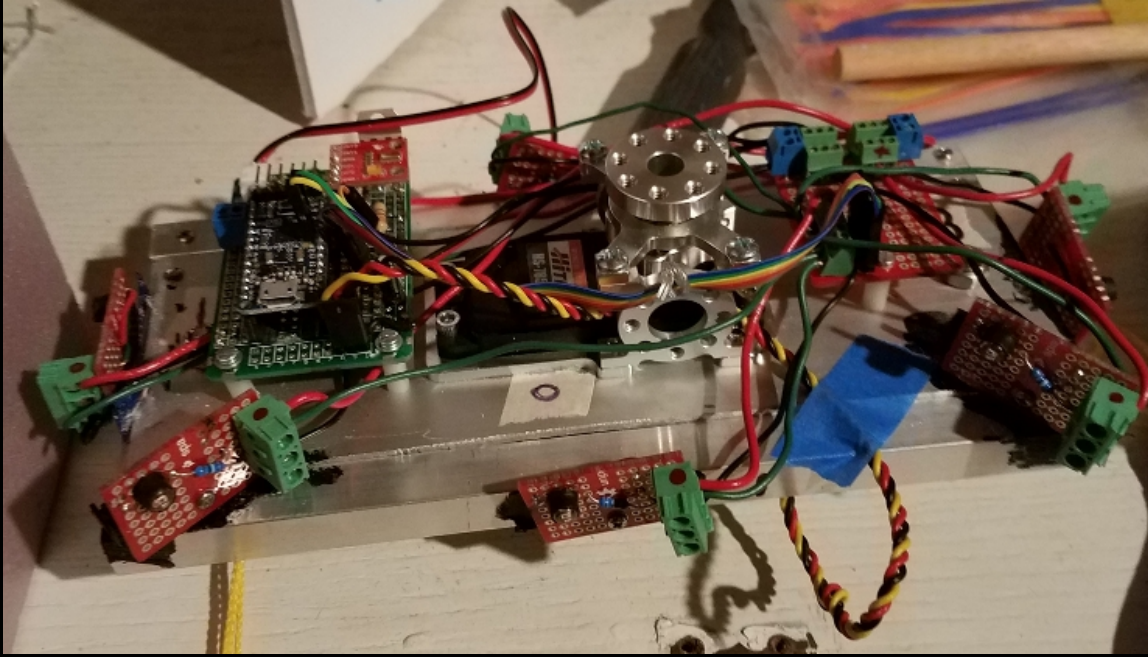


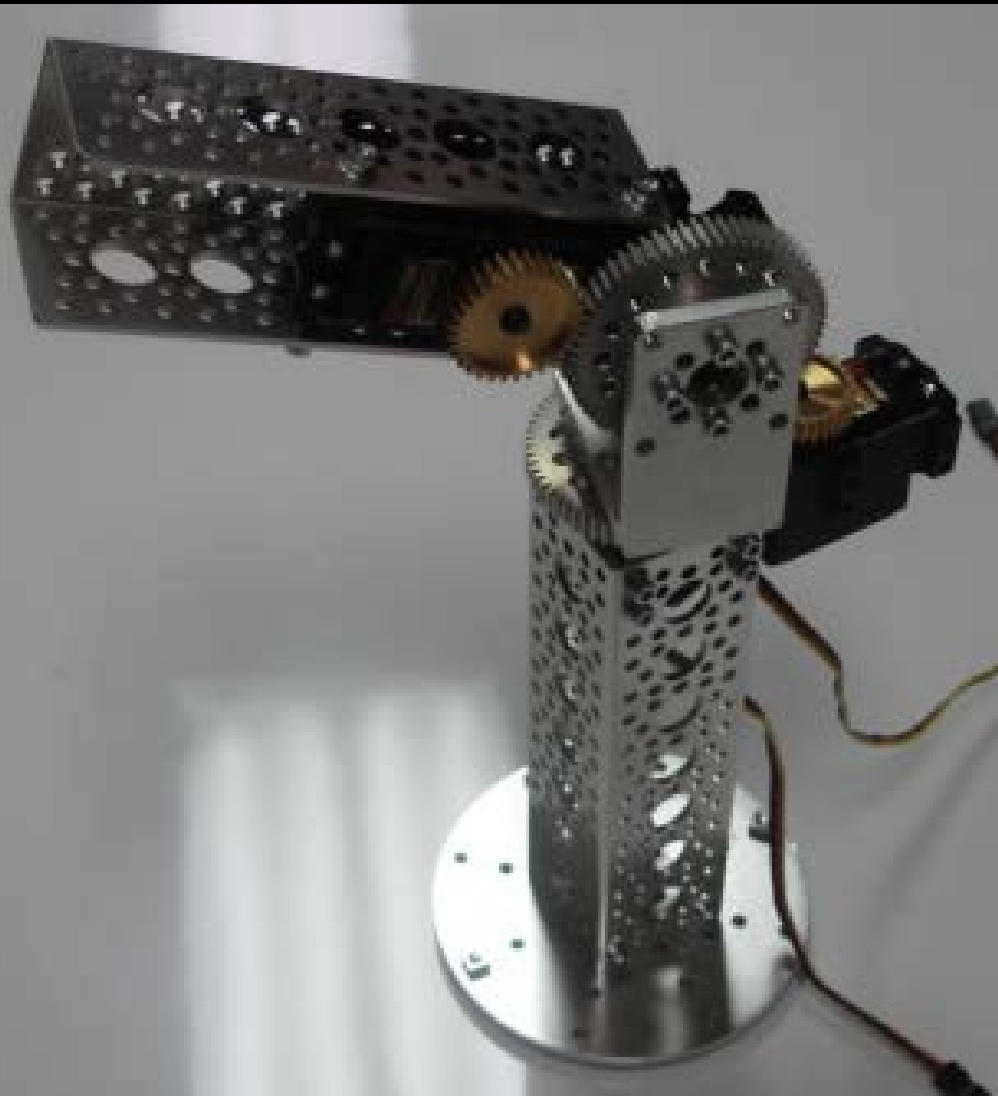
FAA regulations limited us to 12 pounds total weight. The total weight of the Common Payload is 6 pounds.

Therefore each team had the option of developing and flying their own instrumentation during the eclipse.

Marshall used this opportunity to develop a balloon-based autonomous imaging system for eventual use in astronomy research.

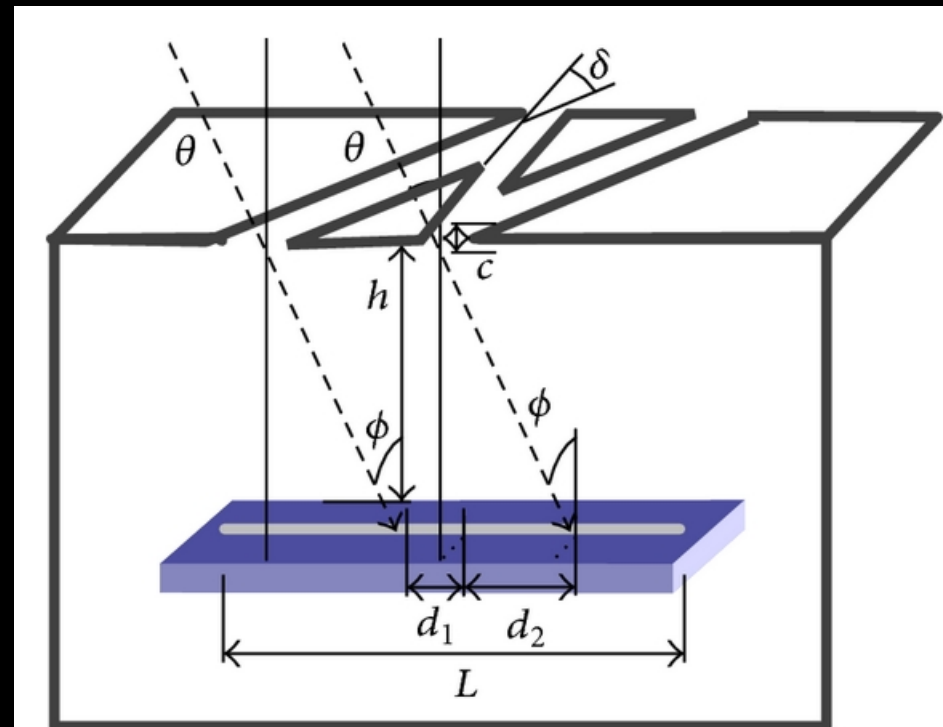
For the initial orientation, a “top module” turns the payload to face the target – the Sun in this case.



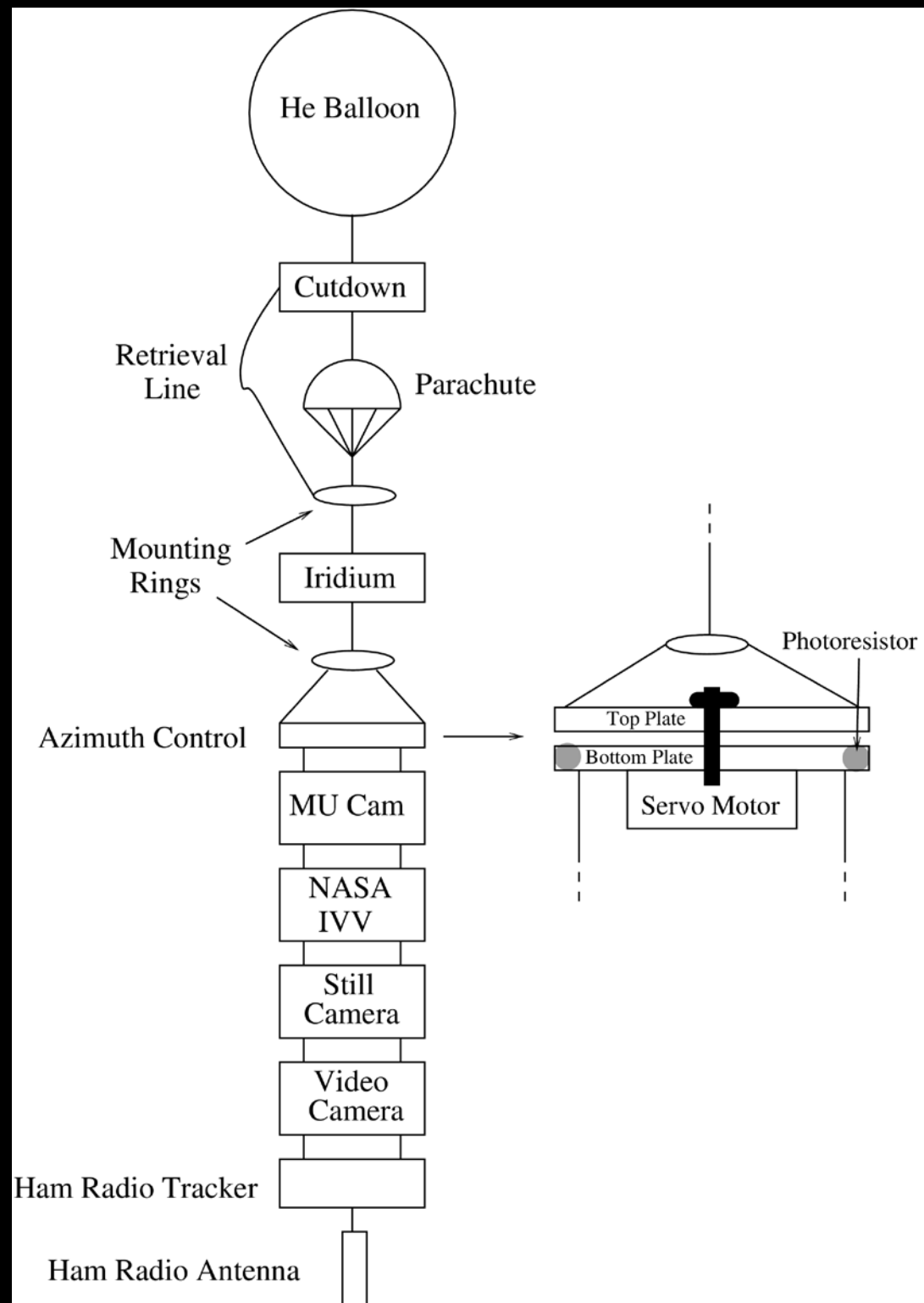


An alt-az mount carrying a CMOS board camera (for this flight) takes over fine guiding.

“N”-masked photoresistors enable mount to find the Sun within the camera's field of view



Flight String



Unfortunately a last minute mechanical failure grounded the camera mount this time, but the top module assembly was tested during the eclipse.

Balloon prep at the primary launch site:





08/21/2017 10:27



08/21/2017 10:53



Fill and Release:



08/21/2017 11:04



08/21/2017 11:23



Base Station:





The flight was near perfect. The balloon stayed in the eclipse path for the entire time aloft.

However, for some reason the balloon was spinning rapidly. This did not occur in test flights but was seen by another group in the area.

The top module worked, but was not intended for this and so could not always keep the instruments in a stable pointing.

Video



Recovery was both lucky, and unlucky.

Dodged a lake and powerlines on landing,
but the payload then took an unexpected trip.







Successes:

Returned video of eclipse from 70,000 – 80,000 ft.

Flew balloon along required path.

Got everything back!

Now have a balloon program at Marshall University for future research and student projects. Two capstones in the works already for this year.

Big, big thanks to MSGC for developing the equipment and WVSG for giving us the opportunity to represent West Virginia in this project



Questions?

