Altimeters versus Optical Tracking in NAR Competition

by Chad Ring
NAR #506

The aim of this project was to determine the acceptability of the use of altimeters in model rocket competition as an alternative to the standard optical tracking which is currently used.

Why do we need an alternative to optical tracking? Optical tracking is somewhat reliable but requires a somewhat extensive assortment of equipment which only a select few clubs actually have. As a minimum, you will need at least two approved tracking scopes, a three way communications system, and able individuals who can pick up the models in the sky. You will also need to determine a method of reduction of the raw data. This is usually done via computer software or on a fairly advanced calculator.

The specific vehicle chosen to loft the altimeter was the Estes Hijax kit. The model is completely stock with the exception of the altimeter and the holes drilled to make it perform.

The Estes Hijax model rocket kits were built completely as a stock kit. Models were constructed entirely through the use of medium cyanoacrylate glue with the aid of an accelerator. Every reasonable effort was made to ensure that both models were identical when completed. It was decided that the back-up model be used only if the primary were either lost or damaged unreasonably.

The motors chosen for the test flights were Estes C6-5 motors. All motors used for any test flights were from the same production batch. The NAR certifies this motor at 9.0 Newton-seconds. These are generally the type of motors more competitors use in altitude competition.

Standard NAR two station optical tracking was used will all scopes being read to an accuracy of 1/2degree. The two scopes that were used were from the NAR's NARAM range equipment. The baseline for the project were measured by laser and computed to be 311 meters. Altitude reduction was accomplished using the standard NAR geodesic reduction methods. Communications were accomplished via walkie-talkies.

All flights were tracked to "ejection". Florescent orange tracking powder was used to aid in tracking.

The altimeter used was an Adept ALTS2-50K. The altimeter has several features which made it useful for this project. The first is that of the momentum sensor which is more simply a spring loaded arm that is held back upon first motion of the model. This enables the altimeter to "zero" itself with the ground elevation making it unnecessary to consider your launch site elevation. Second is that of the use of logarithmic scales which enable the altimeter to be accurate over the large data area. This altimeter uses all the basic components of a read only altimeter but adds two switches for deployment capabilities. I chose this altimeter since the aim of the project was to compare the accuracy of an altimeter versus optical tracking and not to determine how high I fly the models. For competition, any of the altimeters may be used but I believe the model of choice will become the ALT05 which is capable of fitting in an Estes BT-20 sized tube.

Costs of the project were at retail, $5.69 x 7 for the 20 C6-5 motors; $13.79 x 2 for the models; and $112 for the altimeter.

A flight results list is included for the judges reference. The results concluded of this project was that the altimeter variation was significantly proportional to the closure rate of tracking. Therefore, it is suggested that altimeters be accepted for use in NAR competition.

Table 1:

			Track 1		Track 2		
Flight	Altitude	% Closure	Az	El	Az	El	Altimeter Altitude
1	558	3.3	64.5	39.5	39	31	537
2	574.9	2.9	65.5	41	38	31.5	590
3	568.9	3.2	59	38	43	33	581
4	TL	-	41	68	TL	TL	546
5	TL	-	TL	TL	48.5	30	536
6	587.8	1.1	67	40	40.5	31	596
7	579.1	1.9	63	37	45	31.5	571
8	566.9	0.7	66.5	41	38	30.5	-
9	TL	-	56	36	TL	TL	576
10	563	2	69	36.5	43	29	551
11	582.7	0.8	62	36	47.5	31.5	576
12	587.6	1.1	65	39	43	31	595
13	525.6	17.1	65	31	46	30.5	510
14	524	6.1	66	35	42	29	575
15	503	2.1	62	35	43.5	28	510
16	505.8	0.8	60.5	34.5	44	29	515
17	535.6	5.7	65	37	43.5	28	535
18	500	2.9	62.5	34.5	42.5	28.5	475
19	537.3	4.6	62	39	41	29.5	575
20	564.5	6.8	62	38	41	32.5	500

This R&D Report provided as a membership bonus for joining the National Association of Rocketry at http://nar.org

Check out the other membership bonuses at http://nar.org/members/

Thank you for joining the National Association of Rocketry!