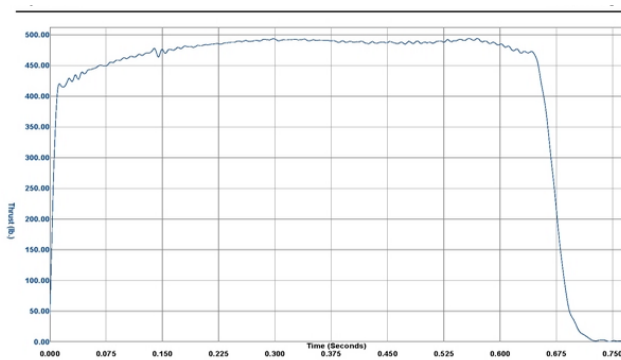


History

The Nike Smoke Drag race is a mass launch of ¼ scale (4") Nike Smoke High Power rockets using 54/2560 engines. The original idea of the launch came from Jack Garibaldi and James Dougherty - after the advent of the CTI K2045 motor the idea was to launch a drag race with the vehicles. Later launches were relaxed to any K impulse motor or above. The first launch was conducted May 2011 as part of the TCC Dairy Aire rocket launch and was intended to get more L2 HPR fliers out on the range – it was a huge turnout. The first launch video from James D can be seen on Youtube here <http://www.youtube.com/watch?v=99EEfoP9GS4>

Overview

The rules of the drag race are simple - a 4" Nike Smoke (any make or manufacturer) and the first flier off the pad (generally) wins. The motor of choice is the Cesaroni K2045, a 54mm 4-Grain load having 1407.6 Ns total impulse, a Maximum thrust of 2231.2 N (501.59 lbs) and an average thrust of 2045.0 N (459.73 lbs). The burn-time is .691 seconds so we're effectively dealing with a step-function for impulse. For reference, a 4" Performance Rocketry Nike Smoke (1/4 Scale Nike Smoke) weighing 10lbs pulls approximately 50gs at lift-off. 5lb rockets are likely to shred and may come close to 100g's if they are recovered. Mach-1 is typical for a 10lb rocket, maximum altitude is expected to be 5-8K AGL and recovery can be anywhere from ½ mile to 1 mile away depending on chute size and winds aloft at the launch site.



Requirements

The best results are from using an all-fiberglass rocket - the Performance Rocketry ¼ Scale Nike Smoke with motor ejection and the CTI K2045 with a 10 second delay (if the loaded weight of your vehicle will be 9-12lbs). Use motor ejection, or an accelerometer based altimeter with main at apogee for back-up, or (with motor ejection) just have your altimeter ride along for flight recording.

HGX, LCX, Marsa54 altimeters have all been used with good results; don't use a Perfectflite or Baro altimeter unless you know exactly how long it will be in Mach.

Shreds, CATOs, and lawn-darts don't qualify - you have to fly and recover the rocket on that motor load. If you don't feel comfortable with your bird (or others don't) or you fail your RSO inspection, you can't fly.

There are many kits but the best ones are those that are fiberglass and can be build up to handle over 50gs of force at boost. Extra glassing is required if you fly the K2045, plan on handling at least 50G's and it is better to build over that for margin.

Performance Nike Smoke - injection molded fins, would benefit from vacuum bagging fins and is the best of the kits. About 4-6lbs of nose ballast keeps the altitude limited to 5-8K AGL.

The Madcow Nike Smokes is another all Fiberglass rockets and is the second choice of the line-up, the fins are not injection molded but the rocket otherwise is the same as the PR kit.

Vehicle can have up to 5lbs of nose ballast depending on weight. For reference, the first winning Nike Smoke weighed 10lbs loaded, the nosecone alone weighed close to 5lbs.

All vehicles will be inspected by the RSO for safety and if your vehicle is not up to snuff, you will not be allowed to fly.

Historical Data

Nike Smoke Drag Race 2011												
	Flier	Kit	Kit Manufacturer	Diameter (inches)	Length (inches)	Empty Weight (lbs)	Motor	Notes	Altitude Band >Mach 1	Time to 3000 ft	Apogee (Baro)	Gs (during boost / motor burnout)
JD (Winner)	James Dougherty	Yes	Performance	4		58	10.5 CTI K2045 Vmax	1/4" Buttons, Aeropack retainer, motor-ejection, 4' kevlar cord and 8' nylon, 72" chute with 4" hole in top				
JG	Jack Garibaldi	Yes	Performance	4		58	10.5 CTI K2045 Vmax					
RS	Ron Swenson	Yes	Performance	4			CTI K2045 Vmax					
JF pad 12	Jimmy Franco	Yes	Polecat Aerospace	4		58	4.6 CTI K2045 Vmax	1/4" buttons, motor eject, 13 ft nylon cord, 30" chute				
KB	Karl Baumheckel	yes	Performance	4		58	10 CTI K2045 Vmax	flame print on rocket makes it look fast sitting still.				
GW	Gary Walker	Yes	Mad Cow Rocketry	4		56	10 CTI K2045 Vmax	"Black Smoke"				
BS	Ben Sandoval	Yes	Polecat Aerospace	5.5	rebuilding		TBD	getting rebuilt				
RD	Richard Dierking	Yes										
SS pad 13	Steve Sawyer	Yes	Performance	4		58	8 CTI K2045 Vmax	ARTS2, RedBee, 48" chute	400-500 ft	3.75 sec	5816 Ft	50.7 / -10.9

Nike Smoke Drag Race 2012													
	Flier	Kit	Kit Manufacturer	Diameter (inches)	Length (inches)	Empty Weight (lbs)	Motor	Notes	Altitude Band >Mach 1	Time to 3000 ft	Apogee (Baro)	Gs (during boost / motor burnout)	Off the Pad
RS pad 11	Ron Swenson (Winner)	Yes	Performance	4			CTI K2045 Vmax						6
RR pad 12	Ryan Reynolds	No	ScratchBuilt	4			CTI K2045 Vmax	Mine weighed in at 6lb 10oz at lift off and pulled 85G's to Mach 1.3 before burnout after which it decelerated at ~35Gs. Apogee was 5377 AGL.			5377 Ft	85/-35	2
JD pad 13	James Dougherty	Yes	Performance	4	58		CTI K2045 Vmax						7
JG pad 14	Jack Garibaldi	Yes	Performance	4	58		CTI K2045 Vmax	I was the one sitting in the middle on 14 that sat and watch the flight from the ground with a shorted igniter then went off after I replaced it only to get the delay grain snuffed out and come in Hot, probably because I was too close to Zylstra and caught some of his Mojo					11
RZ pad 14a	Robert Zylstra	Yes		4			CTI K2045 Vmax	Regular igniter with a stratologger reading 5031, lots of weight in the nose and 1/4 inch G10 fins. The igniter was a normal undipped e-match. The Perfectlite alt read 6184 ft. Motor eject 40" chute. 9 lbs 2 oz lit off wt.			5031 Ft		10
MP pad 15	Matt Powell	yes	Performance	4	58		CTI K2045 Vmax				6184 Ft		9
SF pad 16	Sam Fineberg	Yes	Madcow	4	58		CTI K2045 Vmax	Apogee according to the BRB was about 6200ft			6200 Ft		4
SS pad 17	Steve Sawyer	Yes	Performance	4	58		CTI K2045 Vmax	ARTS2, RedBee, 48" chute			6108 Ft	~50 g's peak	8 2 min smoke

Here's what it looks like



2012 Photo by Steve Jurvetson; Winner Jimmy Franco on far left.

1/4 Scale Nike Smoke



Tripoli Rocketry Association Safe Launch Practices

July 2013

~~F. When three or more rockets (at least one high power) are launched simultaneously, the minimum distance for all involved rockets shall be the lesser of:~~

- ~~1. Twice the complex distance for the total installed impulse. (refer to V. Distance Tables)~~
- ~~2. 2000 ft (610 M)~~
- ~~3. 1.5 times the highest altitude expected to be achieved by any of the rockets.~~

~~G. When more than one high power rocket is being launched simultaneously, a minimum of 10 ft (3M) shall exist between each rocket involved.~~

2017 Edition

6-3 When three or more rockets are to be launched simultaneously, the minimum spectator and participant distance shall be the value set forth in the Safe Distance Table for a complex rocket with the same total installed impulse, but not more than 610 m (2000 ft), or 1.5 times the highest altitude expected to be reached by any of the rockets, whichever is less.

V. Distance Tables

Rocket's Total Installed Impulse, N-s	Motor type	Minimum Clear Distance				Minimum Launch Site Dimensions (diameter or shortest dimension), feet (The larger of 1/2 of the waived altitude or)		Minimum Safe Distance, Commercial Launch				Minimum Safe Distance, Research Launch			
		Regular		Sparky		ft	m	Non-Complex		Complex		Non-Complex		Complex	
		ft	m	ft	m			ft	m	ft	M	ft	m		
0.01 to 160.00	A-G*							30	9	30	9	50	15	50	15
160.01 to 320	H	50	15	75	23	1,500	457	100	30	200	61	200	61	250	76
320.1 to 640.00	I	50	15	75	23	1,500	457	100	30	200	61	200	61	250	76
640.01 to 1280.00	J	50	15	75	23	1,500	457	100	30	200	61	200	61	250	76
1,280.01 to 2,560	K	75	23	113	36	1,500	457	200	61	300	91	250	76	350	96
2,560.01 to 5,120	L	100	30	150	45	1,500	457	300	91	500	152	300	91	500	152
5,120.01 to 10,240	M	125	38	200	61	1,500	457	500	152	1,000	305	500	152	1,000	305
10,240.01 to 20,480	N	125	38	200	61	2,000	610	1,000	305	1,500	457	1,000	305	1,500	457
20,480.01 to 40,960	O	125	38	200	61	3,000	915	1,500	457	2,000	610	1,500	457	2,000	610
40,960.01 to 890,000	P-T	125	38	200	61	3,000	915	N/A	N/A	N/A	N/A	2,000	610	2,500	762

*Distances for commercial Model Rocket Motors. High Power 'F' and 'G' Motors (exceeding the limits in the definition of Model Rocket Motor) shall be flown at the 'H' distance.

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⚠ 600 feet is double the complex K impulse Minimum Safe Distance.

For example, consider 10 K2045, we have 1407 nS * 10 or 14070nS total impulse (N) which is 1000' Minimum Safe Distance (MSD). On the other hand, 5 K2045 = 1407nS * 5 or 7035nS total impulse (M) which is 500' MSD.

Budget

- 4G Case - \$80
- 4G Load - ~~\$143~~100
- Kit - ~~\$149~~189
- Parts - \$50 (Chute, Cord, U-Bolt, Wood centering rings, etc)
 - \$392

This is with motor ejection recovery. Add electronics cost and any enhancements as additional cost. Glue not included.

Links

The 2014 sign-up

https://docs.google.com/spreadsheet/ccc?key=0Aiev7456s_ondEJOTzR4bIFEVEVIRIVKcnI5Qk44Ymc&usp=drive_web#gid=2

Kit - get the original Performance Rocketry 1/4 Scale Nike Smoke kit with injection molded fins from [Rocketry Warehouse](http://rocketrywarehouse.com/product_info.php?products_id=300) [Madcow Rocketry](https://www.madcowrocketry.com/4-inch-nike-smoke-molded-fins/) here: - http://rocketrywarehouse.com/product_info.php?products_id=300 <https://www.madcowrocketry.com/4-inch-nike-smoke-molded-fins/>

The paint scheme is here:

<https://docs.google.com/document/d/19xOCzqIYTJpArFiU4vPO5-eut9rGeEYuhYfnkN0e8NU/edit>

The original G. Harry Stine drawing is here:

https://docs.google.com/file/d/1pd8xSIlzt2CGdCBEnp_SEUCDur4-tDtUa9QJDTidoq6P2oZqDP9bzLVdrL9J/edit

Youtube Videos

- 5/20/2011 - <http://www.youtube.com/watch?v=99EEfoP9GS4>
- 5/20/2012 - <http://www.youtube.com/watch?v=Z2cIt118Kzo&feature=youtu.be>
- 5/20/2012 - <http://www.youtube.com/watch?v=7QrJUvf7qS8> (instant replay on launch)
- 10/22/2013 - <http://www.youtube.com/watch?v=ty31xtNHVvY> and slow motion video <https://www.youtube.com/watch?v=RIVVxbZsRvY> (slow motion)
- 10/22/2013 - <http://www.youtube.com/watch?v=cDl0oANLU3Q> Two Stage Nike Smoke (onboard only <http://www.youtube.com/watch?v=pGvg5cOx5sE>)

References

- *NASA Technical Note D-2009* "DEVELOPMENT OF A SMOKE-TRAIL VEHICLE FOR APPLICATION TO WINDSHEAR MEASUREMENTS UP TO 80,000 FEET" - <http://ntrs.nasa.gov/>
- *Tripoli Safe Launch Practices* - <http://www.tripoli.org/>