TRACKSIDE WITH TOP FUEL

by Robert Szabo

STARTING LINE PRIVILEGES; BUT NOT WHAT YOU THINK: Most fans and drag racers are blown away with IHRA Top Fuel Dragsters and Top Fuel Funnycars. The experience of being around a pair or even a solo nitro drag car is an unforgettable memory. IHRA gave me a photo pass to gather information for this tech page. That provided the unique experience of access to the start up lane, burnout, starting line, and behind the trackside retaining wall; right next to the Top Fuelers. Yet I have to say that being almost anywhere in the stands is as much or even more of a blast. While it might be an unforgettable experience that many would cherish, up close those monsters send you into sensory overload. If you are some distance away, the noise and vibration on your chest and through your feet from the grandstands is a trip.

Behind the starting line, all you see is the rollout, burnout, return, staging, and only a brief glimpse of the run. The racecars instantly disappear into a cloud of fog. The view is blinded by tire & clutch smoke and engine heat waves. You simply cannot see much of the racecar after launch.

Behind the retaining wall, you can see the race firsthand. Yet you are too close to really see the side-by-side action anywhere other than when they go by. In addition, the overload of noise and vibration is a bit much.

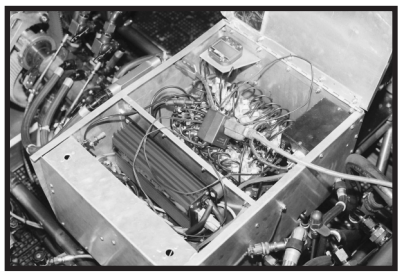
The photographers really earn their way. It is a sensation at first, then a physical burden. Hearing even with ear-plugs and muffs is saturated. If you are downwind, the burning exhaust is not pleasant.

My memories from the grandstands are with much more comfort than from behind the starting line or next to the retaining wall. From the grandstands, you see the launch and the run from start to finish. You see much of the exciting lead and lead change that goes on during many runs. If an engine failure or "going up in smoke" occurs, you see that. From behind the starting line, all you see is a greater cloud, and you get the eye burning sensation and breathing irritation from the rich fuel mixture.

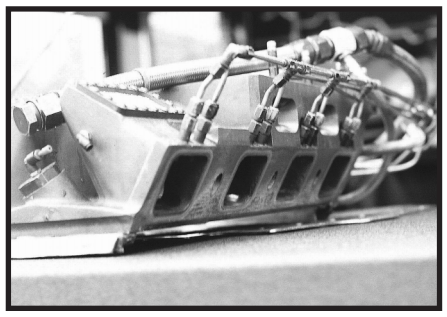
As a photographer and writer, I am not as emotionally involved in the various race teams as the crew who live and work with the race operation. I know of the huge amount of effort, flogging between rounds. To those however, the excitement of seeing your racecar stage at the line and disappear in a flash can only be imagined. The euphoria must be a trip.

The unique aspect of IHRA Top Fuel, like any other IHRA drag racing class, is first the goal of qualifying, then second the goal of round wins. Drag racing is really exciting for spectators as well as the crew and the driver, because every round has a winner. Other racing such as the high-speed oval has a lead car every lap, but only one winner at the end of the day. I watch IHRA drag racing spectator after spectator "going off" in excitement during every round of IHRA competition. Top Fuel with the spectacular noise, vibration, acceleration, and speed of those radical racing vehicles is the climax of the race day to many. Through my writings, I have been privileged to learn some facts about Top Fuel. Discussions with several experts, experienced tuners, and participants revealed the following specs:

TOP FUEL ENGINE: **engine size:** 500 cubic inches (max rules requirement)
cylinder head: two valve Hemi; intake titanium 2.375+ inches diameter, exhaust super alloy 1.8+ inches diameter; good for a shile; with repair needed from occasional to every run; usually a couple sets of heads to a team
valve springs: over 360 pounds of force on the seat closed; with over 1,000 pounds of force open; intake valves must be closed against 40+psi manifold pressure; exhaust must open against way over 1,000 psi combustion pressures that are still burning throughout the exhaust event; that continuation of combustion is why Top Fuel is so loud; valve springs good for only a few runs
block: special aluminum billet; good for maybe 10 to 20 runs
crank shaft: super alloy steel; good for 5 to 10 runs
rods: super alloy aluminum billet or forging; good for one to 10 runs
pistons: alloy aluminum with special heat barrier coating; good for one or two runs
cam: roller with over 0.750 inch lift and 290+ degrees duration; good for a while
induction: 14-71 supercharger pumping over 540 cubic inches of air for every revolution; rebuild every few runs
blower overdrive: as high as 50% overdrive for a total of 810 cubic inches of air for every engine revolution with blower drive belt life as little as one run
fuel system: mechanical fuel injection with very large fuel pump size: combinations varying from 60 to over 100 gallons per minute fuel delivery @ 8,000 RPM or over one gallon per second; fuel pump good for a while
injector hat: carbon fiber or aluminum usually with not more than 65 square inches of throttle area; good for the season
metering valve: usually special Pete Jackson style valve with high volume launch characteristic; good for the season
bypass valve: regulated DJE dome loaded pressure relief valve to regulate bypass fuel volume on the run; good for the season



Haddock's nitro racecar controller combination showing the multitude of regulators & adjustors (by Automan) for nitro fuel as well as clutch multi-stage controls

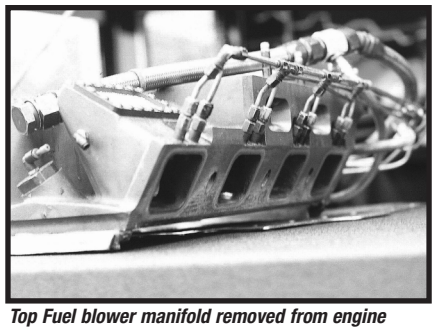


Spectacular Top Fuel Funnycar engine up close from the camp of Terry Haddock, Don Stevens (sponsor & crew), Brian Butler (sponsor & crew), & Mike Stallings; showing carbon fiber injector, high tech supercharger, and various fuel lines & control valves for 7,000+ horsepower

bypass valve controller: timers to control pressure regulation of DJE valve; good for the season
engine idle fuel volume: as much as 4 gallons per minute
fuel volume in one run: over 15 gallons
ignition: two MSD magnetos with over 1 amp and over 50,000 volts at the spark plug; for some teams, good all season; for other teams, occasional repair is necessary
spark plug description: special cold heat range racing plugs, two per cylinder, with cut back outer electrode facing the flame and gap set to as low as 0.010 inches to keep the fire alive in the ultra high volume fuel delivery; new set (16 plugs) every run
engine power: over 7,000 horsepower; torque over 8,000 foot pounds.

Engine cost is less than $100,000 for a complete new assembly. It is probably the most horsepower per dollar compared to other racing engines. While typical engine component life is shown in the previous list, that life expectancy is for rounds with no engine damage. Often minor to catastrophic engine failures occur to any of the engine parts. Component life can go to less than one run regardless of whether the parts are brand new or not. Some engine failures involve almost the entire engine.

Terry Haddock's nitro Top Fuel Funnycar sponsored by Indian Orchard Trucking (Santa Barbara, CA), Butlerbuilt Seats, & Wheel Vintique



Top Fuel blower manifold removed from engine showing 8 manifold injectors feeding oversized ports plus many more hat & cylinder head injectors; all requiring adjustment & balance from run to run; all requiring tuning skill & finesse

DRIVELINE: **clutch:** titanium flywheel and centrifugal pressure plate with multiple sintered iron disks and steel floaters costing as much as $10,000 for an assembly. Disks are reported to last only one or two runs and cost less than $200 per disk. Disks are available at varying hardness. Softer disks are more gradual engagement but wear faster. Harder disks are more radical engagement when they get hot but last longer. Clutch disk hardness is a critical tuning variable. Some teams will combine disks of varying hardness and stack-ups for a run tune-up. Because of the manufacturing variability, some teams have been reported to buy an entire year's supply of disks from one production run. A cost of well over $20,000 to some teams for disks just for National event competition. Added runs for testing can significantly increase the clutch disk and floater cost.
clutch controller: it releases a throughout bearing in predetermined stages; also combined with fuel system enrichment / lean-out controller
transmission: high rear only with reverse to backup from the burnout
differential: very expensive costing over $10,000 with very large super alloy gears and special large diameter axle at 3.20 to one ratio; component life around 50 runs with luck

TIRES: **rear:** 36 inches tall, 17+ inch wide special racing tires costing over $500 per tire that last as little as one run because of (1) the combination of enormous power output and (2) traction from an exceptional IHRA track preparation with VHT traction compound; the two together can tear up a set of tires
front tires: varying sizes depending on dragster or Funnycar; specially built for 300+ MPH runs; some teams are changing front tires as often as every run to every few runs

This extreme tire consumption is an indication of the level of the spectacular speed and performance from top Fuel. This level has become an addiction to spectaculars and the participants of Top Fuel; all of whom are continually looking for even more speed and quicker ET's.

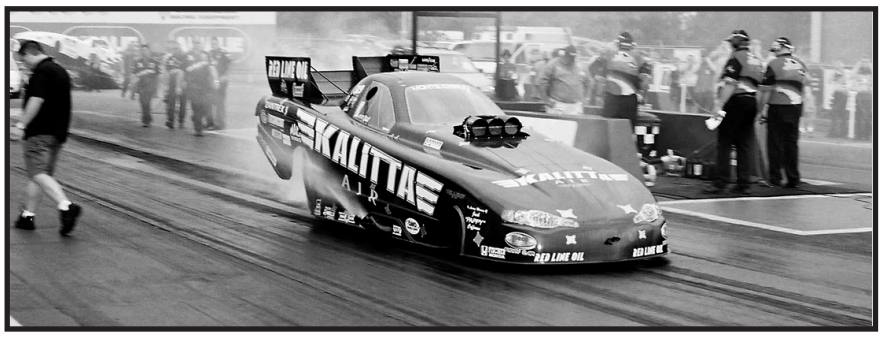
FRAME: Special 4130 alloy steel tubular frame, TIG welded, with very rigid requirements for tubing size, thickness, and design. Designs differ for dragster or Funnycar.

BODY: **Dragster:** aluminum or magnesium with front and rear wings for several thousand pounds of down loading at high speed; costing over $40,000 for a complete racecar
Funnycar: carbon fiber or fiberglass replica body with steel, aluminum, or titanium reinforcements throughout; with aerodynamic surfaces front and rear for several thousand pounds of down loading at high speed; costing over $70,000 for a complete racecar

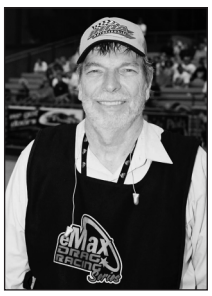
PAINT: can cost over $10,000 for a wild graphic design.

COST PER RUN: According to one famous and former nitro racer: 'Many can afford a nitro drag racer. Only a few can afford to start it.' Cost per run, many thousands of dollars in parts wear, maintenance & repair labor, amortized travel, and support equipment.

ANNUAL BUDGET: Probably a lot more than a million.



Scott Kallita's nitro Top Fuel Funnycar going rounds at the IHRA Nationals; one of the teams reported to do frequent front as well as rear tire replacement; necessary from Kalitta's 8,000+ foot pound engine torque & IHRA race track surface prep with VHT



Bob Szabo is an owner / driver of a blown alcohol drag racecar and author of the technical book: "Fuel Injection Racing Secrets." The author's next book is on methanol racing fuel that will be out shortly. Check the DRM Yellow Pages for Szabo Publishing or look on the Internet at http://www.racecarbook.com or call (707) 446 2917. If you have any comments about this article or any previous articles by the author, feel free to e-mail directly to the author at bob@racecarbook.com or to the DRM staff: pamelamarchyshyn@livenation.com or michaelperry@livenation.com NOTE: If you have spam controls and you Email any of us & want a response, please enter our Email address to clear your spam blocker. Time may not permit us to register to your spam blocker.