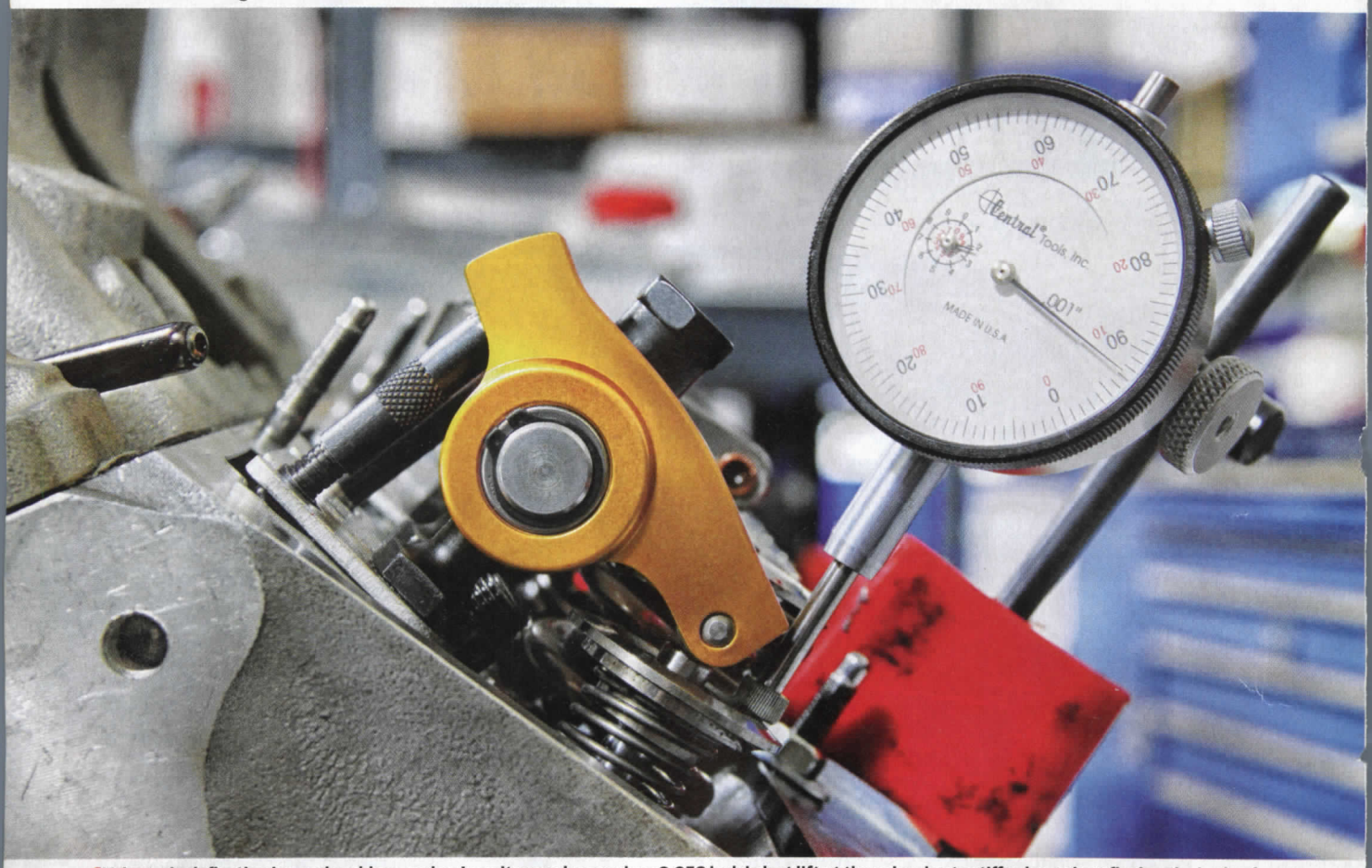
1.6:1 Rocker-Arm Comparo

What's in a Number? More Than You Think

Mike Finnegan



[Valvetrain deflection is a real problem, and we've witnessed as much as 0.050 inch in lost lift at the valve due to stiff valvesprings flexing the body of the rocker arm and pushrod. That was just measuring lift with the engine on a stand. Imagine how much more lift is lost when the engine rpm reaches the stratosphere. Rocker-arm manufacturers sometimes combat this problem by designing more ratio into the body than what's stamped on it.

Curiosity led us to bench-test 20 different ⅜-inch stud-mount rocker arms on a small-block Chevy. All of them were advertised as having a 1.6:1 ratio—and exactly one of them multiplied the lobe lift of the cam to the valve accordingly. In fact, we witnessed ratios as high as 1.668:1 when rotating the engine over with one rocker in place, and the rest were about 1.650:1. You should be happy about that apparent little miscalculation. It's a perceived design flaw, but it's there on purpose to make up for any deflection present in the body of the rocker arm and the pushrod, as both flex under the load of the valvespring, the stresses of harmonics transmitted throughout the valvetrain, and elevated engine temperatures. Designing more ratio into the rocker should result in a true 1.6:1 multiplication of lobe lift to actual valve lift when the engine is running at peak rpm, although there's no way to know for sure (even with a Spintron machine).

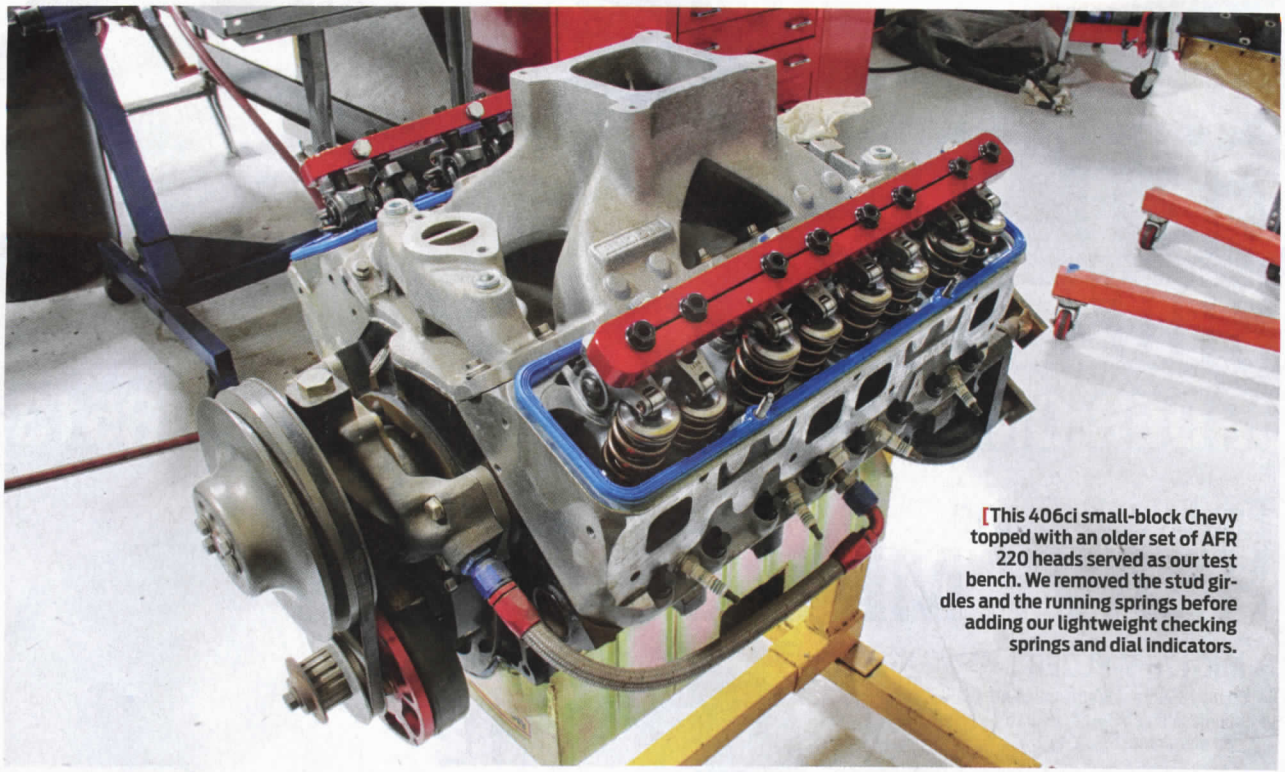
There's more; we weighed, measured, and manhandled every rocker to see what the differences were and then called the manufacturers and distributors to find out what each was made of. The results were surprising.

TESTING

Westech Performance Group in Mira Loma, California, mocked up each rocker arm using a lightweight, 1.550-inch-diameter checking spring fitted to an AFR 220 cylinder head. A Comp Cams solid-roller bumpstick with a 0.436-inch-tall lobe provided the valve lift. We verified the peak lobe lift with a lifter-bore tool and a dial indicator. Another dial indicator carefully set atop the valvespring retainer recorded the peak valve lift. A calculator and simple math gave us the true rocker ratio, and a gram scale recorded the weight of each part. We used dial calipers to carefully measure the external dimension of the axle, bearing, and nose wheel.

WHAT'S NOT IN THE CHART?

In general, the aluminum-body rocker arms in this grouping aren't rebuildable due to the press fit of the nose-wheel axles. The exception is the rockers by Harland Sharp, which can be rebuilt as long as the



[This 406ci small-block Chevy topped with an older set of AFR 220 heads served as our test bench. We removed the stud girdles and the running springs before adding our lightweight checking springs and dial indicators.

pushrod cup is not damaged. Here are a few random facts gleaned from this exercise: Scorpion's Endurance and Platinum Series rockers are essentially the same part, but the Endurance has a 0.200-inch-shorter profile and a shorter polylock, which gives extra valve-cover clearance. Crower's warranty extends only to the body of the rocker arm, not the bearing, axles, or nose wheel.

Most of the aluminum rocker arms are machined from extruded billet stock, although the Crane Energizer and Comp Cams Hi-Energy parts are die-cast, which reduces their strength in comparison to the extruded parts. Steel-body rockers are stronger than aluminum rockers. In an engine application, aluminum's lifespan is significantly shorter than steel or stainless steel due to the fact that it fatigues faster during each heating and cooling cycle. Steel's fatigue limit is approximately half of its tensile strength, while aluminum's fatigue limit is about 40 percent of its tensile strength.

In high-output engines such as those featuring nitrous or forced induction, it's not uncommon to break aluminum-body exhaust rocker arms due to the stress of opening the valve against the added cylinder pressure during the exhaust stroke. Some racers run an aluminum intake rocker and a steel or stainless exhaust rocker to prevent breakage. Many companies are now building steel-body rockers that are as light as or lighter than their aluminum counterparts. Hot rodders with naturally aspirated engines don't have to worry about cylinder pressure breaking an aluminum rocker—just don't screw up your valve-lash spec or allow a broken spring to beat the rocker against the valve. Those things will break it even faster.

BRAND	PART NO.	PRICE	WEIGHT IN GRAMS	MATERIAL	MAX RATED OPEN SPRING PRESSURE IN POUNDS	A	B	C	D	WARRANTY	LIFT AT THE RETAINER IN INCHES	RATIO	PUSH-ROD LENGTH VS. STOCK	REBUILD-ABLE?
SCORPION RACE	10001472 SPC1002	$214.95	192	7000 Series Aluminum	850	0.750	0.560	0.600	0.360	Lifetime	0.722	1.656:1	+0.160	No
SCORPION ENDUR-ANCE	10001424 SPC3002	$257.95	163	7000 Series Aluminum	800	0.750	0.560	0.480	0.360	Lifetime	0.720	1.650:1	+0.050	No
SCORPION PLATINUM	10001442 SPC 2002	$268.95	178	7000 Series Aluminum	800	0.750	0.560	0.600	0.360	Lifetime	0.725	1.663:1	+0.160	No
CROWER STAINLESS STEEL	73640-1 73715R-1	$472.95	200	17-4 Stainless Steel	1,200	0.880	0.685	0.550	0.315	Lifetime (body only)	0.714	1.638:1	0.000	Yes
CROWER ALUMINUM	72840-1 72915R	$393.95	169	7000 Series Aluminum	900	0.750	0.560	0.550	0.350	1 year (body only)	0.716	1.639:1	+0.015	No
SUMMIT RACING ALUMINUM	SUMG6920B-1	$199.95	190	7000 Series Aluminum	950	0.735	0.560	0.600	0.360	1 year	0.720	1.650:1	+0.050	No
CRANE GOLD RACE	11759	$395.95	162	7000 Series Aluminum	700	0.750	0.560	0.475	0.370	1 year	0.708	1.624:1	0.000	No
CRANE ENERGIZER	11746	$239.95	167	380 Series die-cast aluminum	450	0.750	0.560	0.475	0.370	1 year	0.708	1.624:1	-0.100	No
HOWARD'S PURPLE RACE	90071	$239.95	189	7000 Series Aluminum	900	0.750	0.560	0.600	0.360	Lifetime	0.724	1.660:1	+0.150	No
LUNATI VOODOO	15310	$264.95	177	7000 Series Aluminum	550	0.750	0.560	0.540	0.360	90 days	0.710	1.628:1	-0.015	No
HARLAND SHARP ORIGINAL	10001-1	$239.95	144	2024 T3511 Series Aluminum	650	0.750	0.475	0.550	0.375	Lifetime	0.724	1.660:1	0.000	Yes
HARLAND SHARP HEAVY-DUTY	H1002	$229.95	159	2024 T3511 Series Aluminum	750	0.750	0.475	0.550	0.375	Lifetime	0.717	1.645:1	-0.100	Yes
HARLAND SHARP DIAMOND	D1002	$351.99	140	2024 T3511 Series Aluminum	600	0.750	0.475	0.550	0.375	Lifetime	0.720	1.650:1	-0.050	Yes
PROFORM HS ORIGI-NAL	66908	$159.95	139	306 Series Aluminum	500	0.750	0.468	0.560	0.375	1 year	0.710	1.628:1	+0.260	No
PROFORM HS HD	66929	$185.95	159	306 Series Aluminum	700	0.750	0.560	0.475	0.363	1 year	0.697	1.600:1	0.000	No
COMP CAMS HI ENERGY	17002	$165.95	176	A380 Series Die-cast Aluminum	350	0.750	0.560	0.543	0.360	1 year	0.711	1.631:1	0.000	No
COM CAMS HI-TECH	1102	$403.00	219	15-5PH Stain-less Steel	800	0.875	0.685	0.542	0.375	Lifetime	0.713	1.635:1	+0.050	Yes
COMP CAMS ULTRA PRO MAGNUM XD	1602	$323.95	154	8650 Chrome-moly Steel	750	0.875	0.685	0.542	0.375	Lifetime	0.727	1.668:1	0.000	Yes
COMP CAMS ALUMINUM (RED)	1002	$312.95	154	7000 Series Aluminum	400	0.750	0.478	0.500	0.463	1 Year	0.727	1.668:1	+0.100	No
COMP CAMS ULTRA GOLD	19002	$279.00	168	7000 Series Aluminum	400	0.750	0.560	0.475	0.360	Lifetime	0.720	1.650:1	0.000	No

CHART KEY

A: Diameter of trunion bearing | B: Diameter of trunion axle | C: Nose-wheel diameter | D: Nose-wheel width

***All length, width, and thickness measurements are in inches**


Crower stainless steel


Summit Racing aluminum


Comp Cams Hi-Tech stainless


Proform Performance HS Original aluminum


Crower aluminum


Howard's Cams aluminum


Comp Cams Ultra Gold aluminum

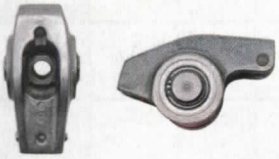

Proform Performance HS HD aluminum


Lunati Voodoo aluminum


Harland Sharp Diamond aluminum


Comp Cams Hi Energy aluminum


Scorpion Race Series aluminum


Crane Cams Energizer aluminum


Harland Sharp Heavy-Duty aluminum


Comp Cams Ultra Pro Magnum steel


Scorpion Endurance Series aluminum


Crane Cams Gold aluminum


Harland Sharp Original aluminum


Comp Cams Red aluminum


Scorpion Platinum Series aluminum

ALL ALUMINUM IS NOT CREATED EQUAL

300 series: Silicone, copper, and magnesium; most common alloy used in die-casting
1000 series: Pure aluminum
2000 series: Aluminum and copper; high-strength aluminum used in the aerospace industry
3000 series: Aluminum and manganese; low- to medium-strength alloys; examples of products using these alloys are beverage cans and refrigeration tubing
4000 series: Aluminum and silicon; most alloys in this series are either welding or brazing filler materials
5000 series: Aluminum and magnesium; these alloys are used primarily for structural applications in sheet or plate metals—all 5000 series alloys are weldable
6000 series: Aluminum, magnesium and silicon; these alloys are heat-treatable and commonly used for extrusions, sheet and plate—all are weldable but can be crack sensitive. Never try to weld these *alloys without using* filler metal.
7000 series: Aluminum and zinc; these are high strength aerospace alloys that may have other alloying elements added HOT ROD

Contacts

COMP CAMS; Memphis, Tennessee; 800.999.0853; CompCams.com

CRANE CAMS; Daytona Beach, Florida; 386.310.4875; CraneCams.com

CROWER CAMS & EQUIPMENT COMPANY; San Diego, California; 619.661.6477; Crower.com

HARLAND SHARP; Strongsville, Ohio; 440.238.3260; HarlandSharp.com

HOWARDS CAMS; Oshkosh, Wisconsin; 920.233.5228; HowardsCams.com

LUNATI; Olive Branch, Mississippi; 662.892.1500; LunatiPower.com

PROFORM PARTS; Warren, Michigan; 586.774.2500; ProformParts.com

SCORPION PERFORMANCE PRODUCTS; Ocala, Florida; 352.512.0800; ScorpionPerformance.com

SUMMIT RACING; 800.230.3030; SummitRacing.com