Flathead Performance Cams

Here we discuss aftermarket performance cams for the Ford Flathead engines, but have included a few of the stock cams for comparison. Performance cams arrived soon after the first Model Ts rolled off the assembly line. New performance cams followed the production of each new model, so Model A/B performance cams and flathead V8 cams followed soon after those engines arrived. Below is a preliminary table with the numbers for a combination of antique and currently available cams. Unfortunately, we're not into Model As, so we don't know much about those. For Model A cams, I refer you to Bill Stipe at Specialty Motor Cams. The information in the table comes from books, catalogs and websites.

In order to evaluate performance cams (see Cam Performance), it is important to have detailed information on the stock cams. Ford listed only seat-to-seat numbers in their manuals (see Cam Design History). Throughout the flathead era, Ford cams employed opening and closing ramps that ended at a lift of 0.015 inches and the timing numbers were taken at this lift. The only exceptions were the Model T and Model B (exhaust), which had no ramps, and the 1949-51 V8 (8BA). The 8BA had greater ramp height (0.018 to 0.020) and correspondingly larger valve lash. In addition to seat-to-seat numbers, the duration at 0.050 lift is very important when evaluating the performance potential of cams. We have calculated the 0.050 numbers from the original Ford drawings and listed them here for the first time.

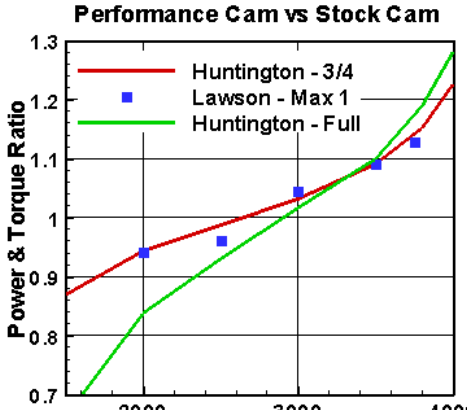
We have not personally verified the accuracy of all the numbers presented in the table We have checked a few Ford cams and found that they agreed well with the drawings. We can also vouch for the Stipe Model T cams and the TilTech V8 cam (see Degreeing a Cam), since we designed them and have verified their accuracy. We have checked a couple of V8 performance cams and found in both cases that the seat-to-seat duration was greater than the values in the table. This seems to be the most common area where discrepancies occur. On flathead and other cams we typically find that the seat-to-seat duration is greater than specified by ten degrees or more. Some manufacturers list "advertised" or "gross" duration rather than true seat-to-seat numbers. Isky states that their numbers are taken at 0.020 lift. What does 0.020 have to do with anything? So, be careful when using the values listed in the table. Before you buy a cam, make sure you have all the numbers and you know at what lifts they were measured Both the seat-to-seat and 0.050 numbers are important, so do not buy a cam without knowing these values. We recommend that once you purchase a cam you should do a thorough job degreeing it. If it does not meet the specifications return it. If you don't mind a poor idle and poor low end performance, then don't worry about seat-to-seat duration.

	intake	intake	exhaust	exhaust	intake	exhaust	intake	exhaust									
	open	close	open	close	adv	adv	0.05	0.05	valve	intake	exhaust	lobe	deg.	intake	exhaust	valve	
Cam	BTDC	ABDC	BBDC	ATDC	duration	duration	duration	duration	overlap	center	center	separation	adv.	lift	lift	lash	reference
Model T Cams:																	
Stipe Improved Stock	**-12**	**52**	**39**	**1**	**220**	**220**	**185.2**	**185.2**	-11.0	**122.0**	**109.0**	**115.5**	**-6.5**	**0.250**	**0.250**	**0.010**	**original specs**
Stipe 280 grind	**-10**	**54**	**45**	**7**	**224**	**232**	**191.8**	**199.4**	-3.0	**122.0**	**109.0**	**115.5**	**-6.5**	**0.280**	**0.280**	**0.010**	**original specs**
Laurel-Roof (Stipe)	**-10**	**55**	**55**	**10**	**225**	**245**	**196.7**	**205.2**	0.0	**122.5**	**112.5**	**117.5**	**-5**	**0.310**	**0.310**	**0.010**	**original specs**
Green Engineering	-10	55	55	10	225	245			0.0	122.5	112.5	117.5	-5	0.300	0.300		
Gordon Cam	-5	60	50	5	235	235			0.0	122.5	112.5	117.5	-5	0.300	0.300		
Muskegon Cam	-5	50	55	10	225	245			5.0	117.5	112.5	115.0	-2.5	0.313	0.313		
Model A/B Cams:																	
Stock Model B	8	56	56	8	244	244	207.8	214.9	16.0	114.0	114.0	114.0	0	0.334	0.341	.015/.022	original drawing
Early V8/6 Cams:																	
Stock 37-48 (78-6250)	0	44	48	6	224	234	197.1	201.0	6.0	112.0	111.0	111.5	-0.5	0.307	0.307	.011/.015	original drawing
Stock 49-51 (8BA-6250)	5	44	48	3	229	231	197.9	198.8	8.0	109.5	112.5	111.0	1.5	0.307	0.307	.014/.018	original drawing
Stock 49-50 Merc (8CM)	10	50	50	10	240	240	207.5	207.5	20.0	110.0	110.0	110.0	0	0.338	0.338	.012/.014	original drawing
Stock 46-52 6 cyl 7HA	11	41	48	10	232	238	205.2	211.4	21.0	105.0	109.0	107.0	2	0.350	0.350		original drawing
TilTech 8CM Plus	**10**	**50**	**50**	**10**	**240**	**240**	**213.0**	**213.0**	20.0	**110.0**	**110.0**	**110.0**	**0**	**0.350**	**0.350**	**.012/.014**	**proposed**
Harmon-Collins Semi	16	54	54	16	250	250			32.0	109.0	109.0	109.0	0	0.320	0.320	.011/.013	Huntington
Winfield Semi	14	58	58	14	252	252	217.5	217.5	28.0	112.0	112.0	112.0	0	0.295	0.295	.012/.014	Huntington, Isky
Schneider 248F	16	52	56	12	248	248	220.0	220.0	28.0	108.0	112.0	110.0	2	0.350	0.350	.010/.012	Schneider
TilTech V8_220	**14**	**54**	**54**	**14**	**249**	**249**	**220.0**	**220.0**	28.0	**110.0**	**110.0**	**110.0**	**0**	**0.360**	**0.360**	**.012/.014**	**Tilden**
Potvin P329	16	60	59	17	256	256			33.0	112.0	111.0	111.5	-0.5	0.329	0.329		
Harmon-Collins 3/4	19	59	54	14	258	248			33.0	110.0	110.0	110.0	0	0.320	0.320	.011/.013	Huntington
Winfield 3/4	18	62	58	14	260	252			32.0	112.0	112.0	112.0	0	0.305	0.295	.012/.014	Huntington
Harmon-Collins Full	19	59	59	19	258	258			38.0	110.0	110.0	110.0	0	0.320	0.320	.011/.015	Huntington
Winfield Full	18	62	62	18	260	260			36.0	112.0	112.0	112.0	0	0.305	0.305	.012/.014	Huntington
Schneider 260F -.326	22	58	62	18	260	260	220.0	220.0	40.0	108.0	112.0	110.0	2	0.326	0.326	.010/.012	Schneider
Isky 77-B	19	61	61	19	260	260	220.0	220.0	38.0	111.0	111.0	111.0	0	0.325	0.325	.014/.014	Isky cam card
Crower SPL59A	22	62	62	22	264	264	224.0	224.0	44.0	110.0	110.0	110.0	0	0.322	0.320		
Isky 88	21	63	63	21	264	264	224.0	224.0	42.0	111.0	111.0	111.0	0	0.320	0.320	.010/.012	Isky cam card
Isky Max #1	13.5	55.5	55.5	13.5	249	249	226.0	226.0	27.0	111.0	111.0	111.0	0	0.364	0.364	.014/.014	Isky cam card
Schneider 260F - .355	22	58	62	18	260	260	226.0	226.0	40.0	108.0	112.0	110.0	2	0.355	0.355	.010/.012	Schneider
Comp Cams Thumpr	25.5	61.5	75.5	43.5	267	299	227.0	241.0	69.0	108.0	106.0	107.0	-1	0.355	0.355	.010/.012	Schneider
Winfield SU1A	29	71	71	29	280	280	229.0	239.0	58.0	111.0	111.0	111.0	0	0.343	0.365	.012/.012	Isky cam card
Winfield SU1A	28	72	62	22	280	264			50.0	112.0	110.0	111.0	-1	0.350	0.330	.012/.014	Huntington
Schneider 250F	17	53	57	13	250	250	230.0	230.0	30.0	108.0	112.0	110.0	2	0.365	0.365	.010/.012	Schneider
Schneider 270F - .350	27	63	67	23	270	270	234.0	234.0	50.0	108.0	112.0	110.0	2	0.350	0.350	.010/.012	Schneider
Schneider 270F - .425	27	63	67	23	270	270	236.0	236.0	50.0	108.0	112.0	110.0	2	0.425	0.425	.010/.012	Schneider
Isky 400 Jr	18	60	60	18	258	258	244.0	244.0	36.0	111.0	111.0	111.0	0	0.400	0.400	.018/.018	Isky cam card
Potvin P357	23	67	66	24	270	270			47.0	112.0	111.0	111.5	-0.5	0.357	0.357		

EAB in 21*btdc 68*abdc ex 56*bbdc 11*atdc 0.328 lift 240 duration

footnotes:

1. Angles and duration measured at 0.020 for Isky cams, not seat-to-seat

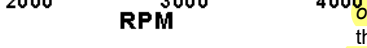


How would you select a cam from the table above? When talking about performance street cams, Huntington states in his classic book (see References - "How to HopUp Ford and Mercury V8 Engines"):

Obviously what we want is longer valve open periods, greater lift, and quicker opening and closing.

This statement is in perfect harmony with our Cam Design method. At the top of the Cam Performance page is a plot of dyno data for a stock flathead V8 engine with various cams. The data, from Roger Huntington's book, is still valid today. In his excellent new book, "Flathead Facts", John Lawson presents more recent dyno data comparing cams. We have used both sets of data to construct the plot at the left. The graph shows the ratio of power and torque for performance cams relative to a stock cam in the same engine. Lawson used an Isky Max-1 cam, while Huntington did not state which 3/4 and full race cams he used, most likely Winfield or Harmon-Collins (see What's a 3/4 Race Cam?), .

As stated on the Cam Performance page, we first need to consider what we're after in a performance camshaft. When selecting a cam, you must remember not to overdo the duration. This is called



overcamming, and it's one of the most common mistakes made when building a motor. As you increase the duration you will increase the peak horsepower, but you will lose some low end torque. The graph at left shows this tradeoff for 3/4 and full race cams. As the duration is increased, this tradeoff become more pronounced. No one wants a street motor with no power below 3000 RPM.

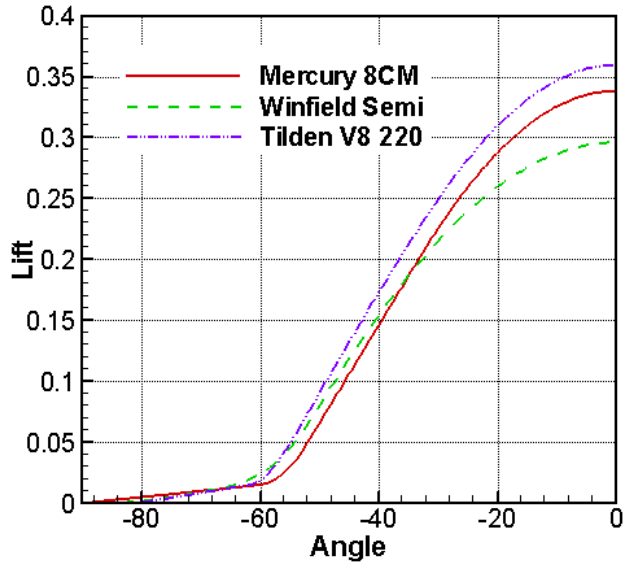
For a street performance motor, we believe that most of the available 3/4 cams lose too much low end torque for good drivability. The Max 1 and 3/4 race cams shown in the graph have intake duration of about 225 degrees. The large majority of stock motors (both the 8BA and 59AB) had about 197 degrees of intake duration. Although this may conflict with popular folklore, we believe the cam in a street motor should not have more than 215 to 220 degrees duration at 0.050. Unfortunately, we are not aware of any performance cams with less than 220 degrees duration. If you can find a Mercury 8CM cam, that would be a good option. We designed the TilTech V8_220 and had one ground for our pickup project, but it may have too much duration. More recently we designed the 8CM Plus cam shown in the table, but one of these has not yet been ground. High compression heads, more cubes, improved carburetion, better flow, and gearing can make up for the loss of low end power, but a low duration cam will always have more torque than a long duration cam, and we all love these engines for their torque.

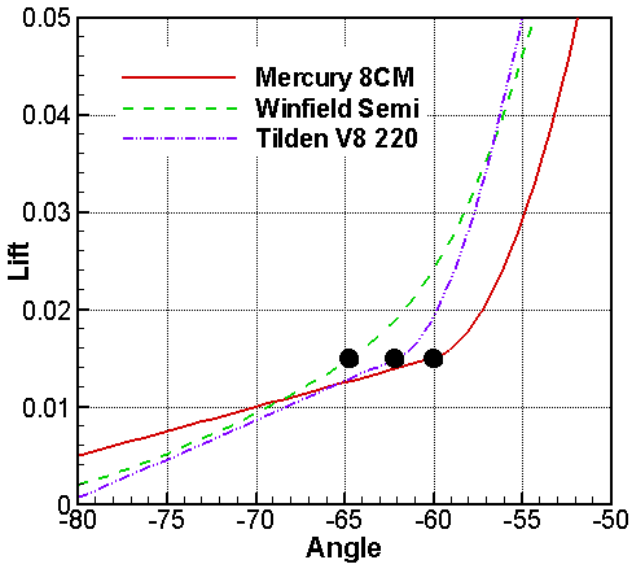
Now that we've determined the duration needed, what about the greater lift and quicker opening/closing. As discussed on the Performance page, high lift and quick opening are desirable attributes. We believe that most "performance" cams (both antique and current) open and close slower than a stock cam and have less lift than they should. The performance cams are less aggressive than a stock cam (see What Is an Aggressive Cam?). The Mercury 8CM cam had a duration of 208 at 0.050 and 240 at 0.015 (seat-to-seat). We'll use Crane's concept of *Intensity* as a measure of quick opening, defining it as the seat-to-seat duration minus the 0.050 duration. This use of intensity only works because most of the cams in the table have a similar valve lash (see What's Wrong with 0.050 Duration?). By this definition, the Mercury 8CM had an intensity of 32 degrees. Some of the Ford cams had intensity as low as 27 degrees, which is about the limit for opening the valve quickly. Ford engineers knew what they were doing when they designed the stock cams. They just designed them with low duration for good torque and drivability.

The Mercury 8CM cam had a lift of 0.338, while all of the Ford V8 cams had 0.307 lift. It is easy to get more lift by increasing the duration, and yet, many of the performance cams have less lift than the 8CM. We found detailed cam profile data for a NOS Winfield Semi (or 1/2 Race) cam, and used that to construct an accurate representation of the entire lift curve. The opening half of the Winfield profile is shown (below left) together with the 8CM cam and the TilTech V8 220 cam we designed for our '40 Pickup project. Our design is basically similar to the 8CM, but with 12 degrees more duration. That's why it's lift curve parallels the 8CM curve. The duration at 0.050 is 208, 218 and 220 for the 8CM, Winfield and TilTech cams, respectively. The Winfield cam does not achieve the same velocity and has a much lower deceleration rate at the nose, so it does not reach the same lift. The left graph is a bit cluttered at low lift, so the graph at the right is an expanded view of the opening part of the lift curve, with the 0.015 lift points indicated. The Winfield cam is clearly slower to open. It has a seat-to-seat duration of 260 (252 was advertised, see table), which gives an intensity of 42 degrees, much higher than any of the stock cams. Our cam has an intensity of 29 degrees, which is in line with the stock cams. The conclusion is that the Winfield cam is slower opening and has less lift than a stock cam. We believe this conclusion applies to many of the aftermarket cams. If you believe the numbers in the table above, some cams are quick opening and others are not. We purchased one of the quick opening cams for our pickup project. Based on the specifications, it had an intensity of 28 degrees, which is very good. However, after we took degree measurements, we found that the intensity was 41 degrees. At that point, we sent the cam back and developed the TilTech V8 220 cam. Based on experience, we have become very suspicious of seat-to-seat numbers listed for performance cams. As explained in the Cam Perfomance page, slow opening and closing contributes to poor idle and off idle performance and poor low speed torque. If you want a lumpy idle and poor low end performance, then you should pick a slow opening/closing cam.

In the preceding paragraph, we do not wish to disparage the Winfield cams. In fact, we regard Ed Winfield as one of our personal heroes. Developing cam profiles in the 1950's was a tedious task. We wish that we knew how he developed his cams. Did he use graphical methods? He didn't have the resources of the Ford Motor Co. Our understanding is that he was not highly educated. Given that, some of his accomplishments are truly incredible.

We have no financial interest in the TilTech V8 cams, if you would like one for your project, you should contact Bill Stipe at Specialty Motor Cams. If you would like a different cam designed for your application, you should contact us.





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