DETAILS OF THE WORLD SPEED RECORD ATTEMPT MACHINE

Max Lambky ***MPH 582*** ***Page 34***

Part one

Now we know something about Max and the rider of the record attempt machine, it is time we found out something about the bike and the thinking behind it. I am printing it in the order that Max dictated it - Ed.

Tow release. The streamliner, due to its very tall overall gear (1.5:1), has to be towed up to 50 to 75 mph before engaging the motors. This reduces the load on the clutch in that you don't have to slip it as you would with a standing start. This reduces heat build up in the clutch and reduces loads on the gear train. There is nothing in the rules to prevent this, so virtually all streamliners use this method to get under way. A tow line approximately 50 feet in length with a parachute on the 'liner end, also a stainless rod with a mushroom-shaped end is attached. This is the male end which is inserted in the female part attached to the 'liner. A pawl with an over-riding cam is released by the rider's foot when the rider is signaled by the tow-truck driver (by sticking his hand out of the window) when tow speed is attained. When the glider type release is released, the parachute propels the tow line away from the 'liner. This prevents any entanglement which might occur. The tow vehicle also has a boom attached to the rear bumper; it sticks out about three feet and prevents salt from the wheels of the tow truck being kicked up onto the windscreen of the 'liner.

'Liner frame. The frame has evolved over the past four years. No less than three frames have been made; the reasons for this are many. The first one was four feet longer and Don Vesco, co-rider with Stu Rogers, said that it had too much tail behind the rear axle. "This," said Don, "would cause major problems in the handling department due to too much sail area". You have to go with experience on things like this; Don has probably made more runs in a motorcycle streamliner than any other person on earth. He is the former record holder at 318 mph with a double-engine turbo-charged Kawasaki streamliner.

The second frame was run in November last year. The 'liner handled really well; however, two problems were encountered. First, the tech officials: the rules state that the minimum frame tube diameter can not be less than 1.1/4 inches with a wall thickness of 0.095 inch. In the area of the engine pod the tube size was smaller than this specification. After much debate between the officials and me, I finally convinced them that my design incorporated the engine pod as a stress member in this area, so they allowed Don to make the two runs we made. The other thing Don encountered was that the 'liner's windscreen shape restricted him to peripheral vision; when lying in the prone position you could not see over the nose, ie, no direct ahead horizon was visible. This proved unworkable, not least because Don had recently lost the vision of one eye during a freak accident at a local California race track. Since losing the eye he has competed successfully at Daytona in the BMW-sponsored Battle of the Legends (Don is tough!).

One other problem was that the cooling water volume tank was under the legs of the rider in the cockpit compartment. This could, in the event of a rupture, cause hot water to spray onto the rider - not a good thing! The last thing was the oil tank. In an effort to achieve a low centre of gravity, the oil tank was built into the frame below the engine pod. This was later decided not to be such a good idea. If you should blow an engine it would be impossible to clean the metal from the tank; also the other engine's oil would be contaminated. One other problem, the capacity of the tank was too great; it held 12 quarts. I talked to Dave Matson about this and he said that two quarts is all he runs and the 40W Castrol R racing oil in his bike does not get over hot and does not lose any of its viscosity. So, without much deliberation, it was decided to build a third frame. Totally re-designed, it now employs 1.1/2 inch 4130 chrome moly tubing throughout. The roll cage was raised two inches, which allowed the rider to raise his eye level to a point where he can now see over the nose, which in turn allows him to see the horizon and the black oil line which he follows to the end of the run.

The salt varies in condition from year to year which, of course, affects the length of the course which can be laid out. The longer the course, the faster everybody goes. It is hard for the average person to understand this point because he is not dealing with 350 mph plus speeds. Five miles seem more than adequate to get up to speed, but it's not. At those speeds you cover the distance very fast. With, let's say, a five mile run in before you reach the last timing light and, let's say, a five mile shut down, the 'liner only runs about 1 minute 20 seconds from the time you release the tow rope until the rider is climbing out of the 'liner. The 'liner has to accelerate very fast to achieve those speeds, which is why I chose the John Surtees' five-speed gearbox. I feel it will do two things: it will reduce the ratio between the gears which in turn will reduce wheelspin as the power is applied between shifts. I feel it will also reduce the strain on the gear train. One thing which is a point of concern is the strength of the gearbox. When the Surtees' five-speed was made the gears had to be made slightly narrower to get that extra gear in it. Even though the gears are made of the very best material available, it has yet to be proven if the transmission will stand the 400 plus horsepower the machine develops. John says that if we don't get too vicious with the thing he thinks it will work.

Both front and rear suspensions have been changed somewhat since our runs in November. The front swinging arm was modified to accept one spring over shock (made specially for the 'liner by Pro Shock). The geometry of the unit, plus the weight of the tyres was given to the manufacturer, who put the figures into their computer and came up with the design. The shock is robust in design, with less of a rebound cushioning effect when the spring is compressed as bumps are encountered. This, as explained to me by Pro Shock, will help keep the front wheel on the ground. An adjustable slide is employed on one end of the shock, which allows the liner to be raised and lowered to achieve proper ride height, and also changes the attitude of the entire 'liner. This will aid me in tuning the 'liner for optimum down force and drag. The rear suspension is similar in design and has the same adjustable characteristics. The rear swinging arm is of loop design, and the shock is mounted at its rear. There are also two rollers which run on the frame at the rear of the swinging arm, which prevent the swinging arm from flexing during full-power runs, which in turn prevents what we call rear end steering, a condition to be avoided due to the 'liner's long wheelbase (which is now 160 inches). Even small changes in alignment between front and rear wheels can lead to a disastrous loss of control, where the rear end fails to track perfectly behind the front - no fun at 300 mph and beyond!

Outriggers or skids? All streamliner motor cycles must have a set of outriggers to hold the motor cycle up during its initial start. As the 'liner increases in speed the gyro effect of the wheels and, to some extent, the rotating parts of the engines themselves, allow the 'liner to come up on its wheels as any two wheeled vehicle does. At this time the outriggers may be raised as they are no longer needed, and are next deployed when the liner is being brought to a stop. My outriggers have CO2-operated cylinders, which raise and lower the outriggers. The outriggers have mercury switches which turn on a red light on the dash for stop and a green light for go! There are two other features of the outriggers that are worth mentioning. The outrigger's foot, which measures two inches by seven inches, is made of stainless steel and is shaped like a ski. The outriggers are mounted on a floating pin which allows them to pivot as required to achieve full contact with the salt. Also on the skid end of the actuating cylinder, a slide adjustment is employed, so whatever the ride height of the 'liner may be, the skid can be adjusted to achieve the desired distance from the salt to the bottom of the skid plate when the 'liner is in its upright position. We have found that this measurement is one inch.

Parachutes. Two parachutes are required by the rules to stop the 'liner. One is referred to as the high-speed chute, and the other is the low-speed chute. Both chutes were designed by Stroud Safety Equipment and are of the ribbon type. The high-speed chute measures approximately three feet in diameter and is deployed at any speed. The low-speed chute, which is 4.1/2 feet in diameter, is only deployed at speeds below 150 mph.
My design in deploying both parachutes is unique. The conventional way to deploy parachutes is a spring-loaded pilot chute, which when released pulls the main chute from its bag. My method uses an aluminium cylinder four inches inside diameter, 24 inches long, having a machined piston from 7075 T6 aluminium with three Chevrolet piston rings at one end. The chutes are stuffed entirely into the cylinders. Two 12 gauge shotguns were sawn off and welded to removable plates on the end of the tubes. The triggers are fired by solenoids, and in the case of solenoid failure, a back-up manual lanyard is used. This system works very well. The chutes are fired out about 30 feet, which allows them to get into good air really fast and to blossom so they can do their job. Mercury switches are in the electrical circuits, so if the 'liner should go on its side the chutes are fired out automatically. This is a safety rule and I think, a good one.

Engine to engine drive train. When coupling two engines together, a lot of stresses come into play. You must solve them in two ways: strength of the coupling chain and engine timing. I first coupled the engines together with a standard Vincent primary chain; this wasn't strong enough, and after just a few engine start-ups, pulled the chain in half. We have since gone back to the drawing board after researching this problem. I asked others who run double-engine bikes, mostly Harley-Davidsons, how they solve this problem. The answer was Hyvo chain. So sprockets were procured and machined and the 'liner now has a much stronger Hyvo chain coupling - the two engines together, as well as a Hyvo driving the new Kawasaki clutch. It should work just fine. By the way, it all runs in oil, or should I say automatic transmission fluid. The transmission fluid provides a better cooling effect and allows the clutch to release better due to its lower viscosity, and still provides adequate lubrication for the Hyvo chain. Also, running the chain through a lower viscosity oil bath makes for more horse power at the rear wheel.

Clutch. The clutch proved to be the Achilles' heel during our 1996 runs at Bonneville. Since that time, we have commissioned A.R.T. to build a wet clutch that will transmit 600 horsepower. He has a clutch dyno so there will be no guesswork this time. All parts are machined from billet material, and employ fingers that are used to lock it up at 1,500 rpm clutch speed. We feel the clutch problem is solved.

Jack shaft. It was necessary to design a jack shaft for several reasons. The driving chain from the transmission to the rear wheel would have been much too long; also there would have been a major alignment problem. The chain (10,600 lb tensile strength racing Tsubaki 530) runs from the transmission sprocket to the jack shaft(right hand side of the motor cycle). This chain runs in an oil bath. A pair of large double-row sealed bearings support the jack shaft, which is 1.1/2 inches in diameter. The shaft runs from the right to the left side, where a sprocket is then employed to drive the rear wheel. This allows room for a large diameter sprocket needed to obtain an overall gear ratio of 1.5:1. I have employed a feature of this sprocket, wanting to be in control of the weakest link in the gear train: four keyways were machined in the sprocket and shaft. Keys were then made of various materials, allowing me to create the weak link. I would rather shear a key than break a chain, or worse, break a transmission gear. The chain from the jack shaft sprocket to the rear wheel is lubricated with a drip system, which is turned on before each run.

Tyres and wheels. The front tyre is a special one from Goodyear, 21 inches tall with a six-ply construction, mounted on a split 15 inch aluminium wheel. One wheel half was machined to accept an O-ring (helps to hold the air, or should

I say helium, in). The tyre was then mounted and excess rubber was removed from the tyre to lighten the centrifugal force, which tries to tear the tyre apart at 350 mph; this also provides a perfectly round tyre. One hundred and ten pounds helium pressure is used both front and rear. Both wheels were spun to 450 mph to check tyre growth - both only grew three per cent! The rear tyre, also from Goodyear, has six-ply construction. It is 26 inches tall and wider than the front. Its footprint is enough to provide the streamliner with enough traction to go to 425 mph - we hope!

To be continued.