



**andersen**  
P R O M O T I O N S

## **PM-18 Mazda MZR 2.0 Race Engine History and Development**

The 2-litre PM-18 Mazda MZR engine finds its origins in the highly regarded Elite Engines Swift 014.a SCCA Formula Atlantic club racing motor, which was introduced in 2015 in an effort to rejuvenate the Formula Atlantic category in SCCA club racing. The category had been shrinking in terms of entries, largely due to the venerable and increasingly fragile Toyota 1600 cc engine and the related high costs of operation. The Toyota engine was a highly stressed unit that produced 250 horsepower and 145 ft./lbs. of torque in club configuration, reaching 10,500 rpm. Life expectancy was a mere 750 to 1200 miles, depending on the engine builder.

Elite Engines worked in conjunction with Ove Olsson of Olsson Engineering to marry the Mazda 2.0 engine to the Swift 014.a chassis. Following the completion of sump and valve cover designs and finalization of the chassis installation, development of the engine was carried out by Elite Engines. The goal was to generate an engine that produced 265 hp and 180 ft./lbs. of torque to reach parity with the Swift 016.a Atlantic cars, which were powered by 2.3-liter Mazda engines.

The new engine was designated the Mazda 2.0-014A. It utilized the factory Mazda 2.0 cylinder head, block and crankshaft. Aftermarket parts included Carrillo connecting rods, PSI valve springs and Ferrea valves. These companies are considered among the best in the industry and they worked closely with Elite Engines on all design aspects for longevity and reliability.

Pistons were a concern in the Toyota Atlantic engine as piston speeds exceeded 89 feet per second. CP-Carrillo, a specialized company owned by Pankl, a renowned industry leader, produced pistons for all of the Elite Engine family which could handle up to 92 feet per second. The Mazda 2.0-014A engine functioning at the 9000 rpm rev limit only runs at a piston speed of 82 feet per second, so well within the tolerances.

The remainder of the components are manufactured by Elite in its Haas-outfitted CNC machining department. Dry-sump pump, flywheel and top-end components such as lifters, titanium valve spring retainers, camshafts, all pulleys, fuel rails and intake manifolds are all produced "in house."

Another concern with the Mazda 2.3-liter Pro Atlantic engine from the 2000 era were timing-chain issues which led to engine failures. Elite Engines resolved this problem by removing the timing chain system and designing a belt-drive system incorporating HTD (high-torque drive) belt-drives on all pulleys. This allowed the MZR 2.3 to rev 1000 rpm higher than the original Cosworth Atlantic engine and the MZR 2.0-14A to rev to 10,000 rpm with no valve-train drive failures.

The resulting MZR 2.0-014A engine has proven very successful in meeting the desired power and torque goals. It revs to 9000 rpm with reliability exceeding expectations. After 3,600 miles of racing, the internals of the prototype engine (bearings, pistons, rings, cams, lifters) all passed inspection and were put directly back into the engine to add more miles and determine their ultimate life point. The only component changed at the 3,600-mile point were valve springs to ensure reliability.

The Mazda 2.0-014A engine is an unqualified success. Nine engines have been built so far with an additional seven on order for SCCA racing with a growing, nationwide club level interest.

## **PM-18 MZR 2.0 Engine Utilizes Same Internals as Elite Mazda 2.0-014A Engine**

Tatuus – the manufacturer of the new PM-18 chassis – has worked in conjunction with Elite to co-design the MZR front cover and cam cover that forms the top motor mount -- similar to the MZR USF-17. The sump and the lower front motor mount are the same parts utilized on the MZR USF-17. The oil pump, however, is slightly different with a larger pressure section for more oil volume to accommodate the higher rpm's. The oil pump is connected to the cartridge oil filter via an O-ring tube to remove the Aeroquip supply hose and fittings. This is designed to clean up the engine bay of the PM-18. The cartridge oil filter is a non-bypass filter that can be removed for inspection.

The intake manifold is another component co-designed by Elite and Tatuus. It incorporates a factory Mazda throttle body for the drive-by-wire throttle system which pulls air from behind the drivers head. The carbon fiber intake manifold is produced in Italy by Tatuus.

The flywheel is a lightweight version of the USF-17 with removable ring gear to keep costs down for teams. The clutch package is provided by Tilton and is the same twin disc unit as used on the USF-17, as are the alternator, crank sensor, engine harness, coil and plug wires.

The PM-18 engine has been designed for reliability. The past history of the Toyota Atlantic series engine expense has been rewritten with the new PM-18 Mazda MZR by Elite Engines.