## • • • • • Innovations

### WHY AIRSTREAM AND MANY OWNERS HAVE SWITCHED TO DISCS



Electric drum brake technology has been virtually unchanged for decades. The electric drum brakes that are most likely in your Airstream right now are direct descendants of the drum brake first invented in 1902 by Louis Renault.

Electric drum brakes are still predominant on travel trailers, but they aren't nearly as effective as disc brakes. Moisture can cause them to grab, or slip, depending on how damp they get. Braking action fades due to heat generated during braking results in reduced braking, especially under hard stops. Because drums can't dissipate heat effectively, this effect rapidly increases with time, which the driver feels as a loss of braking power, or fade. This can happen in a fraction of a second under hard stopping conditions.

Unfortunately, heat also decreases the effectiveness of the electromagnets as well, which causes a "double whammy" effect. Less-effective magnets means the driver must step on the brake pedal harder to get the same response.

Compounding the problem is the fact that modern tow vehicles have disc brakes which are virtually immune to fade, as well as being far more aggressive in their braking capacity. In hard stopping situations, the trailer brake fading results in an increasing transfer of inertia to the tow vehicle. Tow vehicle braking systems are not designed to stop more than the maximum weight (GVWR) of the tow vehicle, so the result is vastly extended braking distance at exactly the wrong moment. In short, trailers with drum brakes (especially heavy trailers) are mismatched with a tow vehicle that has disc brakes.

As trailers have become heavier and larger, disc brakes have been a logical evolution, but the old-fashioned drum brake that one can find on any vintage Airstream has remained the staple of the RV industry. A primary reason is cost: electric drum brakes are cheaper.

In short, trailers with drum brakes (especially heavy trailers) are mismatched with a tow vehicle that has disc brakes. Airstream offered a hydraulic disc brake system in the 1980s, but due to complexity of the vacuum-powered actuating system, they discontinued the option after only a few years. As technology advanced over the last couple of years, the complexity of proportionally-actuated disc brakes on the trailer has became manageable, less costly and more reliable, so starting with the 2005 Classic models, Airstream has begun to offer disc brakes again.

Kodiak, the manufacturer of the disc brakes used by Airstream, claims their disc brake system offers smoother and shorter stops, which was borne out by our experience (see sidebar). This is due to the lack of fading as well as vastly superior braking capacity of discs compared to drums. With the Kodiak system, the brakes can stop 8,000 pounds per axle, so in a tandem axle, you have 16,000 pounds of stopping capacity – or better than 50% more stopping power than the heaviest tandem axle Airstream with drums. That can easily be the difference in a controlled hard stop and a white-knuckle experience or worse.

### **Deciding To Upgrade**

Since the overwhelming majority of Airstreams on the road today have electric drum brakes, an upgrade package is available and can be installed by the factory service center in Jackson Center OH, as well as some Airstream dealers. The upgrade can be done to any Airstream, including vintage trailers of any size.

One common question is whether the resulting disc brake system is serviceable at any brake shop. It is, and all of the necessary replacement parts are readily available at auto parts stores. The Kodiak system uses a standard General Motors brake pad, and brake technicians will find no surprises when working on the Kodiak disc brakes.

However, the Kodiak brake system uses a slightly different rear (inner) wheel bearing as compared to the Airstream electric drum brake system. This bearing is a higher capacity bearing, and the two bearings cannot be interchanged. While they may appear the same, they are not and installing the wrong bearing will result in bearing failure. This applies to retrofitted rigs as well as factory equipped units.

Another question stems from the instructions printed in the Tekonsha Prodigy brake controller owner's manual. That manual states that the popular Prodigy unit is not tested for disc brake systems. Active Technology, maker of the ActiBrake disc brake actuator used in the Airstreaminstalled system, states that their system has been tested and is compatible with Prodigy as well as a number of other proportional brake controllers. However, the ActiBrake cannot be used with time-based brake controllers. (For more information, see the Active Technology website and download their Owner's Manual and Installation Instructions.)

An interesting benefit of the Active Technology / Kodiak hydraulic disc brake system is that it can be used as a temporary parking brake while hitching and unhitching. While electric drum brake users are warned not to pull the emergency break-away cable for more than a few seconds, (lest the electromagnets burn out) the disc brake system doesn't have that limitation. The ActiBrake unit has an "Extend-A-Hold" feature which can keep the brake lines pressurized indefinitely without constantly running the actuator pump. After a short period of constant operation of the pump, the pressure in the line is locked and the pump shuts off. Every 30 seconds, the pump fires back up to ensure constant pressure on the lines. This feature also comes into play during prolonged stopping and ensures that the brake fluid is not overheated in the pump. Any



Standard e-coated disc brake parts as used by Airstream.

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change in the electrical signal to the actuator releases the "Extend-A-Hold" feature instantly.

When the break-away cable pulled, the trailer is locked in place, with all disc brakes fully engaged. However, the pump draws a lot of DC power whenever the pump is running (up to 21 amps). That will drain a trailer battery if accidentally left on while parked and not connected to shore power, so this feature should be used during hitching and unhitching only. It can and should also be used when changing a flat tire as a precaution against the trailer rolling. Additionally, this practice checks the emergency breakaway switch whose operation is seldom verified otherwise.

While upgrading to disc brakes is not cheap, they are becoming popular with Airstreamers. Whether for safety, convenience, or improved performance, it is an upgrade that is likely to become even more popular in the future.

## **How Drum Brakes Work**



Drum brake internals showing the electromagnet and brake shoes.

In an electric drum brake system, the brake controller in the tow vehicle sends voltage to electromagnets at each wheel. These electromagnets "grab" the outer wall of the brake drum which tries to drag the magnet in the direction of the spinning wheel. The magnet is connected by a linkage to the brake shoes, so that the dragging of the magnet pulls the brake shoes into contact with the drum, which slows the trailer.







Inside of brake drum showing where the electromagnet engages the drum.

# Converting to



In May 2006 we converted the official Airstream Life trailer from the factoryinstalled electric drum brakes to the Kodiak/ActiBrake disc brake system (same as used on the 2005 and later Classic models).

Our trailer is a 2005 Airstream Safari 30 "bunkhouse" which has a GVWR of 8,400 lbs. In other words, it's a big heavy trailer. With four 12" drum brakes on it, stopping was usually adequate as long as we kept plenty of space ahead, but there were discomforting limitations.

Brake response on our Safari varied widely depending on dampness, temperature, and speed, which made modulating the brakes for a smooth stop difficult. Recently we also encountered a problem in which a brake wire became crimped inside the drum and caused an intermittent short and the loss of one of the four brakes.

In hard stops, brake fade was noticeable after only a second or two. This gave us more than one scary moment, including one memorable Texas off-ramp where the trailer didn't stop in time and pushed us into an intersection.

A disc brake conversion on a tandemaxle Airstream costs about \$2,500, but Bill Glidewell, CEO of Kodiak, comments "It's easy to sell a brake upgrade to someone who just went through a stop sign." He's right. We stopped in at Roger Williams Airstream in Weatherford, TX to have the upgrade done.

Converting to discs takes at least a full

day. First, the old drum brakes are removed entirely, and the electric wires are trimmed and totally disconnected as they are not used in the disc brake system. New mounting hardware is bolted in place, and an integrated hub/rotor (the "disc") is installed on the existing axle. The wheel bearings are re-packed and the new disc brake caliper is attached to the mounting hardware.

Note that on Airstream factoryinstalled disc brakes, Airstream is using a black "e-coated" assembly, which protects against typical corrosion and is the standard within the automotive industry. If you are upgrading from drum brakes on an existing trailer, you can also choose silver cadmium plating or solid stainless steel for superior corrosion resistance. In our installation, silver cadmium plated mounting hardware/rotors along with stainless steel calipers were used, which makes sense for trailers which frequently are exposed to road salt or salt air. The added cost is minimal.

Changing the brakes and re-assembling all of the wheels goes relatively quickly, but then the hard work begins. The technicians must locate a suitable spot for the hydraulic actuator. This device is the heart of the system. It contains a microprocessor that listens to the tow vehicle brake controller signal and controls a rotary pump that pressurizes the hydraulic lines which activate the disc brakes.

Airstream currently uses the ActiBrake actuator made by Active Technology. This unit is about the size of a large toaster. It is a fairly hefty unit and must be mounted securely. It is weatherproof and typically attached to the front A-frame, but in our case space restrictions prevented that, so we installed it in a bedroom closet. The

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# Disc Brakes



- 1. Technician Denver Russell removes tire and rim
- 2. Removing electric brake drum assembly
- 3. Installation of caliper mounting hardware
- 4. Securing electric brake wiring (no longer used)
- 5. Integrated disc/hub mounted on axle spindle
- 6. Installing "packed" outer bearing
- 7. Disk brake assembly installed
- 8 & 9: Running hardened steel hydraulic brake lines. Flex lines connect the steel lines to the brake calipers to allow vertical movement during axle suspension travel.

actuator must be the highest point in the brake system. The actuator can take the brakes from zero to full locking pressure in seven tenths of a second.

Once the actuator is mounted, the brake wires from the tow vehicle and the breakaway switch are re-routed to the actuator's location. Additionally a fused, dedicated 12V positive and a negative wire are run from the trailer battery(s) to the actuator. When the driver presses the brake pedal, an electrical signal from the brake controller (in the tow vehicle) is used by the actuator to determine how much pressure to apply to the hydraulic fluid, and hence to the disc brakes. The braking action at the trailer is directly proportional to the braking action in the tow vehicle.

The next step in installation is to run hydraulic lines from the new disc brake assemblies to the actuator. The hardened steel hydraulic lines are attached on the underside of the belly pan. This can take some time if the actuator is not located in a convenient spot.

Once the lines are run and connected, the actuator is filled with brake fluid, air in the lines is bled off, and the actuator is tested. The next step is a road test and adjustment of the brake controller. At first, the brakes will respond poorly until they are broken in, but the breaking-in process does not take long. After half a dozen stops our brakes started to work much better. We gradually ratcheted down the gain setting on our brake controller over the first three hundred miles as the brakes became more effective. Once the break-in period was past, we realized that the trailer brakes are actually doing the majority of the braking for the combined rig, which ensures that the trailer is always pulling itself into alignment behind the tow vehicle during braking. This reduces the potential for jackknifing during a panic stop.

Driving disc brakes is a bit different from drums. The actuator initial response is very slightly delayed as compared to the electric drum brake system, which creates a different feel for the driver, but once the disc brakes start engaging, they provide greater braking capacity. Getting used to disc brakes is easy, since each braking event is much smoother and considerably more effective.

For us, the problems of grabbiness in damp conditions, and brake fade in hot conditions, simply went away. Stops are now surprisingly short, with hardly any effort. Now that we've converted our trailer to discs, it's hard to imagine going back to drums. • • •