The Federal Outdoor Impact Laboratory (FOIL) at the
Turner-Fairbanks Research Center of FHWA at
McLean, Virginia uses a test bogie in place of a real car
for crash tests of breakaway sign and luminaire supports.
The test bogie is made up of a steel framework on car
wheels with a crushable front end. The crushable front
end was designed to simulate the crash of a real car
when impacting a breakaway roadside device. During a
crash test, the crushable front end is collapsed but the
rest of the bogie is generally undamaged. The aluminum
honeycomb blocks used in the crushable front end are
relatively inexpensive and easily replaced. Thus, crash
tests with a bogie can replace real car tests that are
much more expensive and time consuming to perform.

Searching back in the ancestry of the bogie used at
FOIL, we find there were several generations of
surrogate test devices. These were:

• Rigid Nose Pendulum (Prototype Only)
• Crushable Nose Pendulum (Prototype without
  Slider)
• Crushable Nose Pendulum (with Neoprene Faced
  Slider)
• Crushable Nose Pendulum (with Aluminum
  Honeycomb Faced Slider)
• Low Speed Bogie (2250 lbs/20 mph)
• "Breakaway" Bogie (1850 lbs/up to 60 mph)

The "breakaway" bogie currently used at the FOIL has
been validated for the testing of breakaway supports.
Recently a major test program was completed using the
bogie to crash test 44 luminaire supports. Several types
of breakaway bases were tested including slip bases,
transformer bases, couplings, anchor bases and
progressive shear bases.
The workshop planners asked for presentations that
would be provocative. Therefore, due to our successful
use of the bogie at the FOIL, here is Provocative
Statement 1:

1. The "breakaway" bogie should be mandated for
certification testing of breakaway sign and luminaire
supports.

This mandate would have the benefits of lower cost
and greater repeatability of results. Results would be
more repeatable because of:

• Precise control of vehicle weight.
• Identical frontal crash characteristics.

Due to the success with bogies at the FOIL, FHWA
researchers have proposed plans to design and validate
a series of bogies, each custom tailored to test a specific
type of roadside hardware. The status of this bogie
development program is as follows:

• Breakaway Bogie (Presently Validated and
  In-Service)
• Base Bending Bogie (Preliminary Design
  Underway)
• Crash Cushion Bogie (Development on Hold within
  FHWA R&D)
• Guardrail Bogie (Planning Stage Only)
• Rigid Barrier Bogie (Planning Stage Only)

The above proposals for several new types of bogies at
the FOIL lead to Provocative Statement 2:

2. Other surrogate vehicles (bogies) should be
mandated for certification testing of roadside safety
hardware as they become available. A procedure should
be established for the acceptance of new surrogate test
devices.

During the series of 44 bogie tests on breakaway
supports conducted at FOIL we learned that some test
setup parameters greatly affect the test results and the
reporting of results. For example, variations in the
mounting bolt torque for transformer bases, the
clamping bolt torque for slip bases and the mounting
circle diameter for transformer bases had a substantial
effect on breakaway energy required, and thus the
change in velocity of the bogie.

Additionally, the 1985 AASHTO specifications for the
testing of breakaway supports require that the stubs of
the breakaway devices have no substantial portions
extending more than four inches above the ground. In
many cases it is difficult to judge what constitutes a
"substantial" stub of material, yet this criterion can cause
a device to pass or fail. "Substantial" should be defined
such that a testing agency can determine a pass or fail
condition accurately.

The above observations during our bogie tests of
breakaway luminaries lead to Provocative Statement 3:

3. Mounting bolt torques for breakaway devices that
are being crash tested should be precisely defined, either
by quantifying the torque or specifying acceptable torque
ranges. The mounting bolt torques actually used should
be reported. Transformer bases should be tested using
the maximum bolt circle diameter. The term
"substantial" in the AASHTO stub height criterion
should be defined or quantified.

Just as the bolt torque and bolt circle requirements for
breakaway supports need to be specified in crash test
setup procedures, other roadside safety hardware may need more detailed setup procedures for crash testing. This leads to Provocative Statement 4:

4. A procedure should be defined for specifying new test setup requirements as new knowledge regarding the effect of these setup requirements on test results is determined from other new surrogate test vehicles as they are brought on line.