Mobile Weather Data Collection
Weather-related Vehicle Data Elements

- Hours of operation
- Elevation
- Accelerometer data
- Vehicle speed
- Heading
- Rate of change of steering wheel
- Exterior temperature
- Windshield wiper setting
- Rain sensor
- Sun sensor
- Adaptive Cruise Control (ACC) radar

- Atmospheric Pressure
- Ambient noise level
- Headlights
- Relative humidity
- ABS
- Traction control
- Stability control
- Pavement temperature
- Brake

Intellidrive
Mobile data collection of pavement temperature & condition

Pavement Temperature

Pavement Condition
Mobile Pavement Temperature Measurement

Maintenance Vehicles

Thermal Mapping
Thermal Mapping

- At night, across a road or runway network some sections will be warmer or colder than others.
- Thermal Mapping is the process of identifying the pattern of temperature variation across roads and runways under different weather conditions.
A thermal fingerprint of the route is produced identifying warm and cold spots.
The Thermal Mapping Survey

Thermal ‘finger prints’ of the road network are produced.

The finger prints are integrated on to a digital map of the road network.
Some road networks can have RST differences of up to $10 \degree C$ on a given night.

Color ‘bands’ are in $2 \degree C$ resolution.

Higher resolution would ‘swamp’ the map with color.
Display Resolution

- The minimum display resolution for carriageway length is 100 metres, any smaller would not allow the human eye to see it.

- The minimum temperature over a particular length of road is used.

For example, a bridge deck may only span 10 metres. However, it is important that the engineer is aware of a potential problem, so 100 metres is banded the same colour.
Thermal Mapping – Lessons Learnt

- Provides a good piece of overall jigsaw
- Care must be taken to shield IR sensor from erroneous influences
- Large amounts of spatial data to digest (every 2 meters)
- Limits to how much data can be displayed in different formats i.e. Color Bands in 2 °C /100M graphical resolution deemed best (but perhaps technology can now support better zoom)
- Does not provide pavement condition
How do we handle pavement condition?
Non-intrusive Road Surface Condition Sensors

- Remote surface state sensing
- Spectroscopic measuring principle
- Independently measure
  - Water
  - Ice
  - Snow or Frost
- Measurement of Friction
Friction Measurements by FINRA

- Vehicles equipped with calibrated deceleration sensors
- At clients request two sensors were trialed in mobile situations
Mobile Road Surface Condition

- Numerous vehicle types in over 5 countries

Mobile measurement of:

- Grip, Surface state, Film layer:
  - Water, Ice, Snow (water equivalent)
  - Temperature (guide whilst mobile accurate whilst static)
Mobile Road Surface Condition

- Time and location data stamping
- Ability to log and display data on vehicle or push of the data to a Server via GPRS
- In-cab Visualisation of the data
- Warning of threshold crossed
Current limitations of pavement state sensors

Current non-intrusive technology is calibrated to surface type (ability to manually calibrate at present)

Response time is 4.5 seconds i.e. a reading every 80 meters at 40mph

Environmental housing not specifically designed for mobile use
Data Display – In-vehicle / Web site

- Visualization of the data:
  - Map
  - Graphical
  - Tabular
- Further work to establish:
  - Verbal
  - Public
Mobile Weather Data Collection Summary

Direct measurements of pavement temperature and conditions, now possible, can substantially help drivers and maintenance alike.

Work to continue on information distribution i.e. how, what and who?

Be aware of current mobile sensor limitations e.g. Lack of de-icing chemical data.