

All data gathered in the front cargo compartment of an MD-80 aircraft.  
 Temperature in Celsius units. CO in parts per million. (One ppm = 1.141 milligrams per cubic meter)  
 Barometric pressure in inches of mercury. (One atmosphere = 1013 millibars = 30.00 inHg)  
 (All units selected to optimize scale for a single-graph presentation.)  
 Flight times are shaded; airport codes are designated.

## CO in the Air

### Bear Facts -- #83

**Of course! But wait. What are typical levels of CO in cargo bays of aircraft?  
 This is important to know if CO detectors can be used  
 to monitor combustion as a safety precaution.  
 Here are some real facts.**

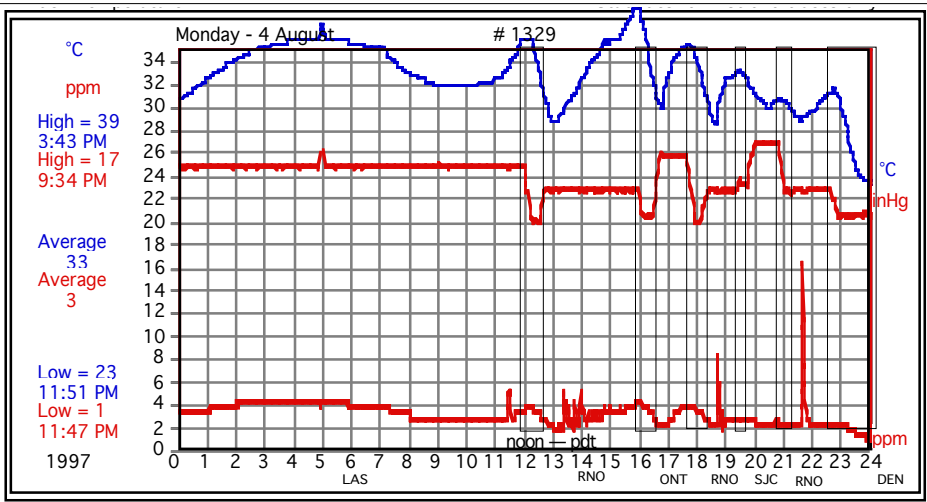


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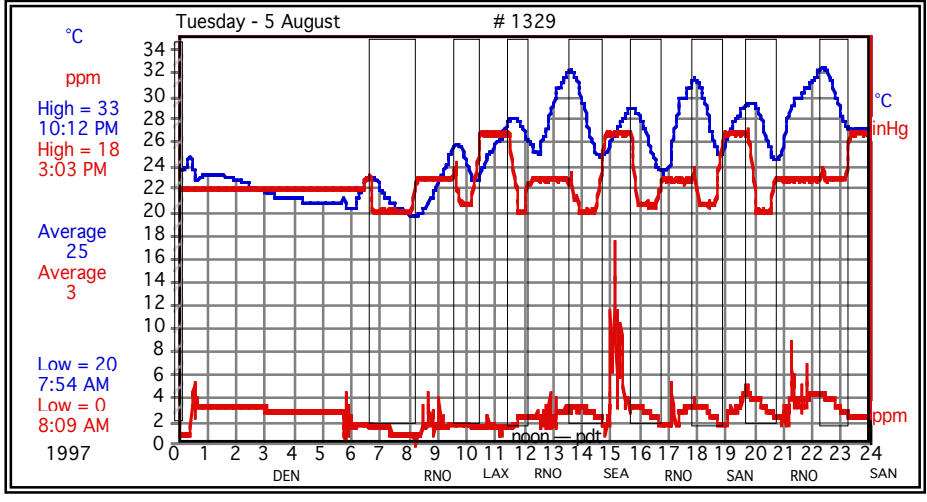


the DataBear

Bear Facts are published to provide useful insights into the operation and applications for the DataBear™ Measurer and associated complete instruments.



Two days prior to data on reverse side. Principle source appears to be ramp tugs & motorized cargo belts although there is an airport pollution-level component. CO trapped within the cargo compartment slowly dissipates over time as the compartment air exchanges. Elevated-signal changes contain some modest temperature and pressure effects (see page bottom)



In-flight times are shaded (as revealed by flight records and confirmed by barometric pressure.) Airport locations are specified by 3-character standard references.

Carbon monoxide is a precursor to fires. It is created when combustion begins, even in the smouldering stage. Because this invisible gas is an early detector, CO sensors have been proposed for installation in the cargo bays of all aircraft as an early way to inform the flight deck that a fire may exist on board. Before taking this step it is important to gather a sense of what levels might be expected.

This Bear Facts displays some real data gathered during a randomly selected week of flights to show what might be experienced independent of a fire on board. Three data sets are displayed: CO, Celsius temperature and barometric pressure. The effect of temperature and altitude can be observed. The shading shows when the aircraft is aloft; ground data show the effect of ramp tugs and ambient air levels.

These “naturally occurring” levels have to be eliminated from setting an alarm. It is clear that altitude does not have an adverse effect on reliable electrochemical sensors. Nor does temperature. However, when the cargo door is opened an alarm should be disabled because high levels can be observed from adjacent vehicles.

After take off, the decay in CO levels shows the air exchange rates in the quasi-sealed cargo compartments. This is a measure of the degree of their isolation from the passenger. This is not an exhaustive study (oh yes it is!) or a rigorous review: it is designed to demonstrate what could be accomplished using Langan Measurers to gather data within the cargo compartments of any aircraft. We thank Reno Air for their cooperation in gathering these data.

Over temperature range data can vary  $\pm 10\%$  of the signal, i.e.  $\pm 0.1$  to  $0.5$  ppm (to 2 ppm spikes.)  
 Over pressure range data can vary about  $\pm 6\%$  at altitude, i.e.  $0.1$  to  $0.6$  ppm (CiTiceL® DataBook)  
 National Clean Air Standards for CO are 20 ppm for one hour and 9 ppm CO for 8 hours.

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**Langan CO Instruments are a simple and convenient way to measure ambient air quality. anywhere.  
 Recently a realtime digital display has been added as a built-in option.  
 This allows an immediate observation while the basic instrument stores the results  
 for weeks or months. The Model T15 is a handy portable measuring tool.**