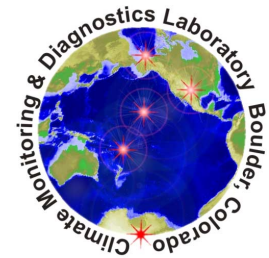




# Carbon Monoxide and Methane Airborne Gas Chromatograph



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# What is a Gas Chromatograph?

## Separation and Detection (Electron Capture Detector, ECD) of Unknowns (one channel)

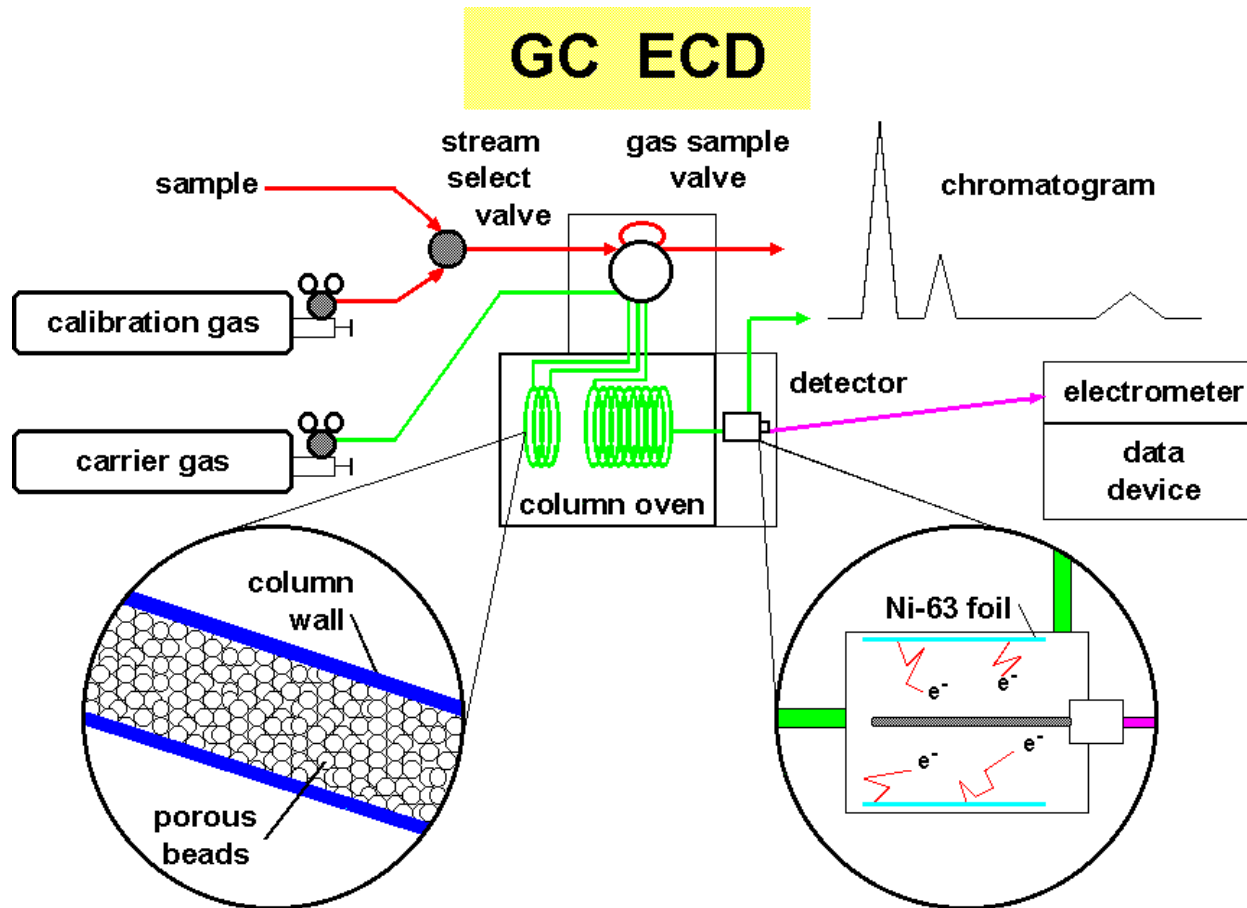


Diagram courtesy of Thayne Thompson

# Airborne GCs flown on NASA airborne platforms



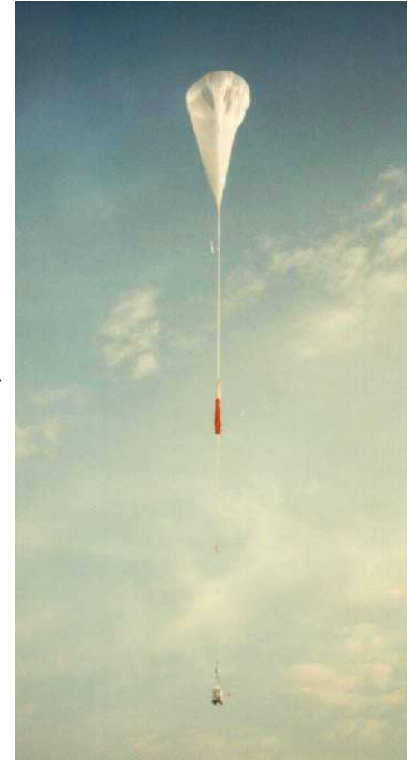
**WB-57F**

**JPL Gondola**

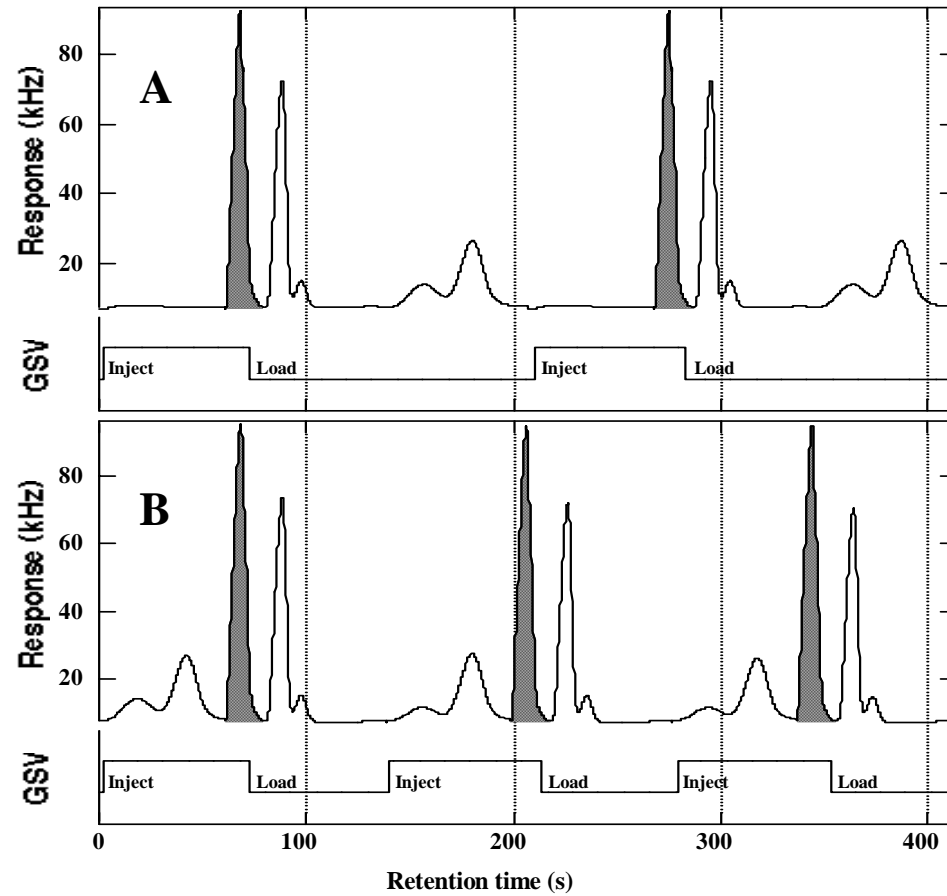


**ER-2**

**DC-8**



# Speed up the chromatography: Foldback or Stacked Chromatography



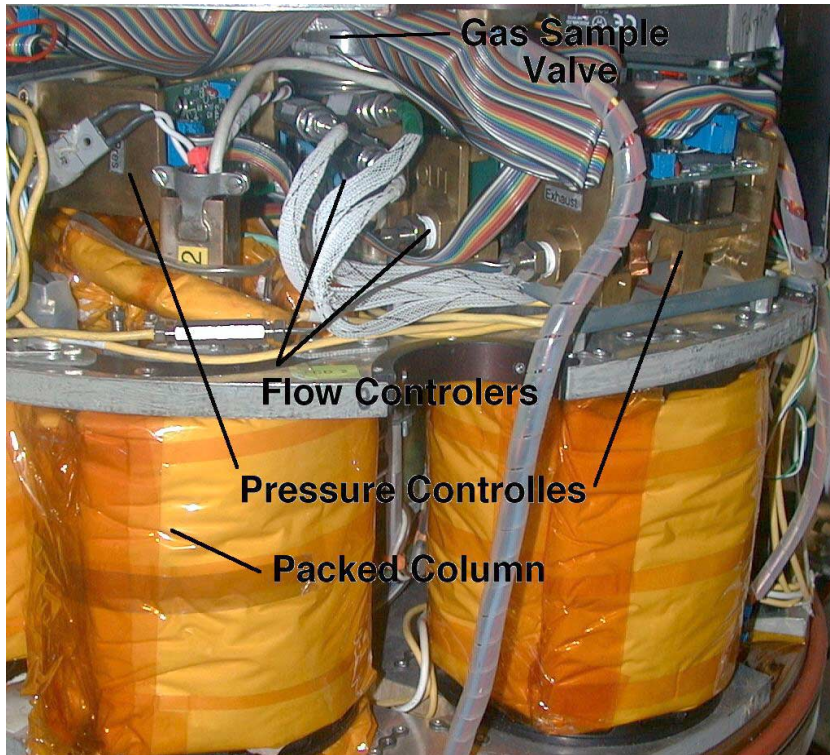
# Chemical Enhancement on ECDs

- ECDs measures oxygen and halogen containing gases
- Using NOAA/AL work in the 1970s, adding 5-30 ppm of nitrous oxide ( $\text{N}_2\text{O}$ ) to the ECD make-up gas enhances the sensitivity to hydrogen, methane, carbon monoxide, vinyl chloride, and  $\text{CO}_2$ .
- Example of foldback chromatography
- Sample frequency: 140 s
- Precision of methane (0.5%), carbon monoxide (5% or better), hydrogen (7% or better)

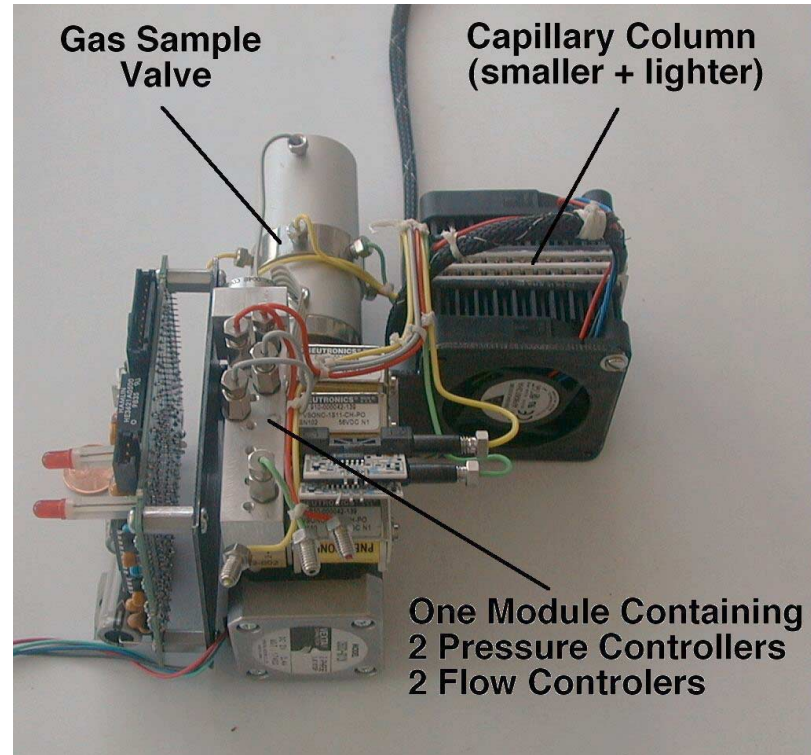


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# PANTHER Modular Pneumatics

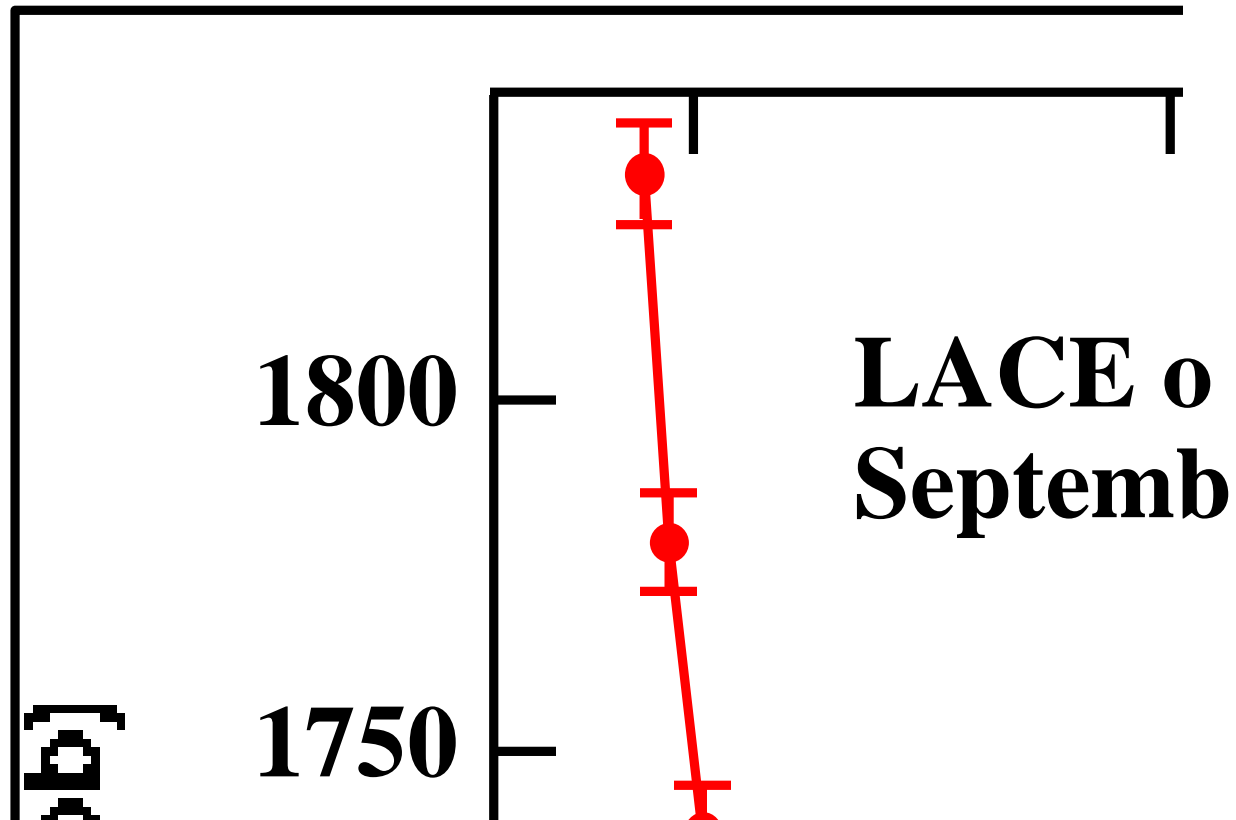


Before with LACE



Modular with PANTHER

## Example of Measurements on NASA WB-57F Aircraft



LACE methane ( $\text{CH}_4$ ), carbon monoxide ( $\text{CO}$ ), sulfur hexafluoride ( $\text{SF}_6$ ), and halon-1211 from the September 24, 1999 flight from ACCENT-2 on the NASA WB-57F aircraft.

# Summary

- GC is recommended because there exists no single light-weight instrument for both CH<sub>4</sub> and CO.
- Sampling frequency could be improved by use of wide-bore capillary columns
- Prototype GC could be built for \$30K, second channel could be added for additional \$20K.
- Second channel could measure C<sub>2</sub>Cl<sub>4</sub>, a short lived chemical with known emissions.
- 30 GCs could be built for less money. A SBIR could be issued for development & construction.