# The Hazardous Gas Detection Lab

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### Activities

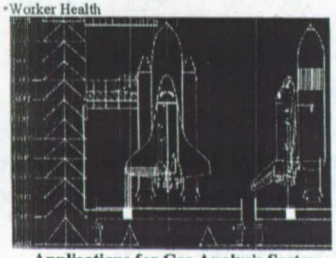
- Quantitation of Hazardous Gases in the Field
- Instrument Development
- Method Development
- Evaluate Commercial Components

### Hazardous Gases of Interest

- Explosives & Fuels
  - Hydrogen & Oxygen
  - Hydrazines
  - TNT, RDX, HMX
- Toxins
  - Hydrazines
  - Volatile Organic Compounds (VOCs)

### Gas Monitoring at KSC

- Shuttle Processing
- International Space Station (ISS) Processing
- ELV Processing
- Environmental Monitoring
- Worker Health

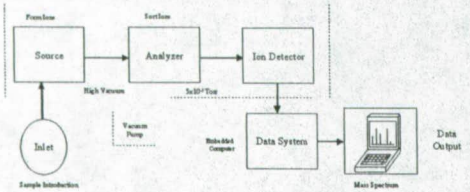


### Applications for Gas Analysis Systems

- Air Quality
  - Environmental
  - Workplace
- Leak Detection
  - CRT Industry
  - Refrigeration Industry
  - Automotive Industry
  - Food Industry
- Process Monitoring
  - Semiconductor
  - Petrochemical
  - Cross-Country Pipeline
- Medical Analysis
  - Blood Analysis
  - Liver Analysis
- Battlefield Threat
  - Chemical Weapons
  - Biological Weapons
  - Land Mine
- Contraband Detection
  - Explosives
  - Drugs
- Geological Prediction
  - Volcanic Eruption
  - UV Hazards

### What is Mass Spectrometry?

Chemical analysis by transferring a charge to the molecule, separating and detecting

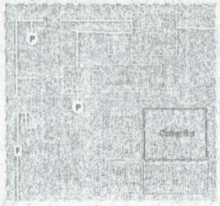



### Why Mass Spectrometry?

| | |
|---|---|
| ?Extremely Specific | ?Power Efficiency |
| ?Sample Variety | ?Weight |
| ?Qualitative | ?Size |
| ?Quantitative | ?Cost |
| ?Rapid Response | ?Ruggedness |
| ?Large Dynamic Range | ?Operator Training |

### Mass Spectrometer System

- Mass Analyzer
- Pumping System
- Power System
- Control System
- Sample Delivery
- Calibration System
- Structural Framework

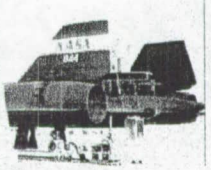


### Parameters of Importance to KSC

- Quantitative Accuracy
- Traceability
- Ruggedness
- Reproducibility
- Ease of Operation
- System Size
- System Weight
- Power Efficiency
- Low Detection Limits
- Low MW Compounds – $H_2$, He

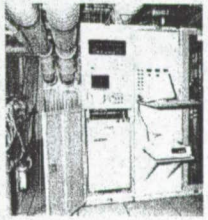
### Current Strengths at KSC (for small & large systems)

- Quantitative Accuracy
- Quantitative Traceability
- Ruggedness
- Reproducibility
- Certified to Save Lives & Equipment
- Ease of Operation
- Autonomous Operation



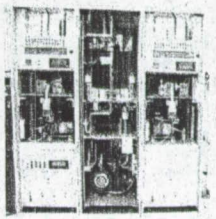
### I-HUMS

- Fixed Sector – 5 Channel
- < 30 s Response Time
- Accuracy – 10%
- LOD < 25 ppm (100 ppm He)
- In-House LabVIEW Control



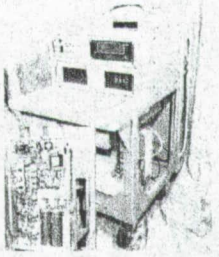
### HUMS

- Fixed Sector – 5 Channel
- < 30 s Response Time
- Accuracy – 10%
- LOD < 25 ppm (100 ppm He)
- In-House C++ Software
- Local & Remote Control



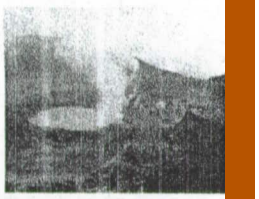
### HGDS 2000

- Linear Quadrupole
- < 30 s Response Time
- Accuracy – 10%
- LOD < 25 ppm
- Redundant Systems
- Local & Remote Control
- 1800 lbs (820 kg)



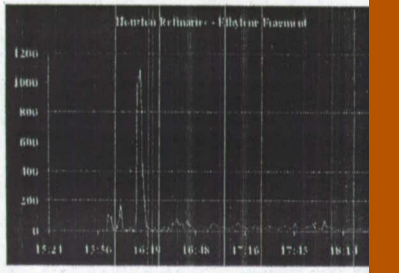
### PAMS

- Fixed Sector – Single Channel (2,3 or 4)
- < 30 s Response Time
- Accuracy – 10%
- LOD < 0.1 ppm
- In-house LabVIEW software control
- 346 lbs (157 kg)
- Disassemble to 3 parts



### AVEMS

Linear Quadr
350 W (steady
6 s Scan
30 s Response
Rugged (25 to –60°C, 760 – 5
47 kg (1
90,00
Autonc
20 ppm
Monitor 16




Detection of Hydrocarbon Pollutant when flown over refineries at ~5000 ft.

### SAMS – The Next Generation

- Linear Quadrupole
- Weight reduced; < 70 lbs
- Size reduced (Backpack Size)
- Helium LOD < 1 ppm
- Reduced Power Demand by 30%
- Improved Autonomy