

# Lunar Regolith Simulant Materials Workshop January 24 – 26, 2005

A collaboration between Marshall Space Flight Center and Johnson Space Center

Marshall Institute  
Marshall Space Flight Center  
Huntsville, Alabama

# The Status of Lunar Simulants

## Workshop Overview and Objectives

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**ARE WE REALLY GOING BACK ?**



January 24, 2005

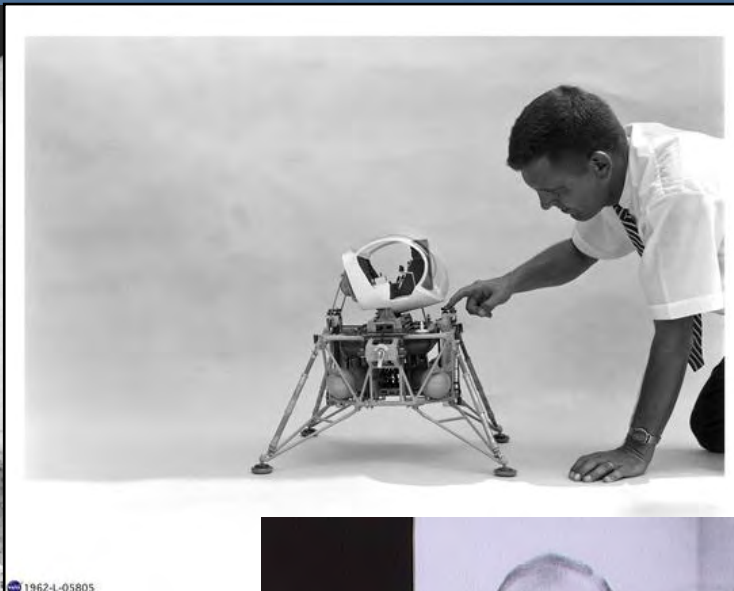
**IF WE ARE...**

**... TO DO WHAT?**

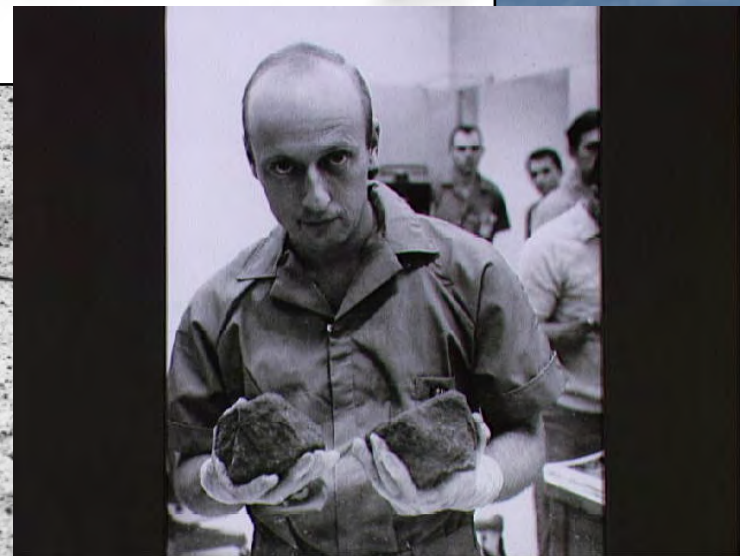
**... AND WHERE?**

The South Pole Region of the Moon as seen by the Pentagon's Clementine probe – a possible area of water ice? Image Credit: Naval Research Laboratory

January 24, 2005



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**WHAT DID WE LEARN ?**

January 24, 2005

# We learned a lot from Lunar Samples

- >380 Kg (Apollo, Luna)

... and the use of Simulants over the years

- Apollo, Lunar Rover: over 34 types !
- 1985 Minnesota Lunar Simulant 1 & 2 (Weiblen)
- 1989 Workshop on Production and Uses of Lunar Simulants (McKay & Blacic)
- 1991 Lunar Sourcebook (Heiken, Vaniman, et al.)
- 1992 JSC-1 simulant (McKay, Carter, Boles et al.)
- ~ 1993 FJS-1, Japanese Space Agency

# Where are we now?

- MLS-1, JSC-1 are gone...
- Researchers make their own simulants or buy from small suppliers
- In 2004
  - 17 projects funded by Exploration Systems Mission Directorate will study or develop technologies for lunar surface
  - Over 15 SBIR/STTR projects awarded that need lunar simulants
  - 1 SBIR to develop new lunar simulants

# What lunar simulants do we need?

- Widely-accepted standard materials make it possible to compare technology performances
- The simulants developed must be relevant to the lunar exploration architecture
  - Planned Landing regions
  - Planned and funded Lunar activities
- The simulants must be prioritized
  - Spiral development of lunar simulants over the years?  
(2008 Lunar Reconnaissance Orbiter)

And in what quantities?



# Workshop Agenda

- Presentations
  - Lunar science and Regolith properties
  - Planned and funded lunar activities
  - Requirements for simulant materials
- Working sessions (1991 Workshop conclusions)
  - Session 1 - **What simulant properties do we need to support the development of each lunar activity?**
  - Session 2 - **What approach should be adopted to define a family of simulants? What combination of properties is needed for each simulant?**
  - Session 3 - **How do you produce, characterize, validate and distribute these simulants?**

# Products of the workshop

- MSFC intends to deliver 3 products to NASA Exploration Systems Mission Directorate / HQ
  - Workshop proceedings
    - Will contain abstracts and presentation materials from the workshop
  - Report on Lunar Simulant Materials
    - Will contain conclusions and recommendations on lunar simulants needs, definition, production, cost & acquisition strategies
    - Planned deliveries: March 31, 2005 (interim); June 30, 2005 (Final)
  - Lunar Regolith Simulant Materials Requirements document
    - Will define specification standards for simulants and their production
    - Planned deliveries: March 31, 2005 (interim); June 30, 2005 (Final)

A photograph of an astronaut in a white spacesuit walking on the lunar surface. The terrain is dark, rocky, and covered in dust. The astronaut is moving away from the camera towards the horizon. The background shows the dark sky of space and the curved horizon of the Moon.

**Off we go !**

**Special thanks to...**

**Paul Carpenter, co-chair**

**Lori Lewis**

**Narayanan Ramachandran**

**Raymond French**

**Ron Schlagheck**

**Bonnie Hankins**

**Chuck Owens**

**ISS,inc. Team**

**Science Committee**

**David McKay**

**Lawrence Taylor**

**James Carter**

**David Carrier III**

**Paul Carpenter**

**Laurent Sibille**

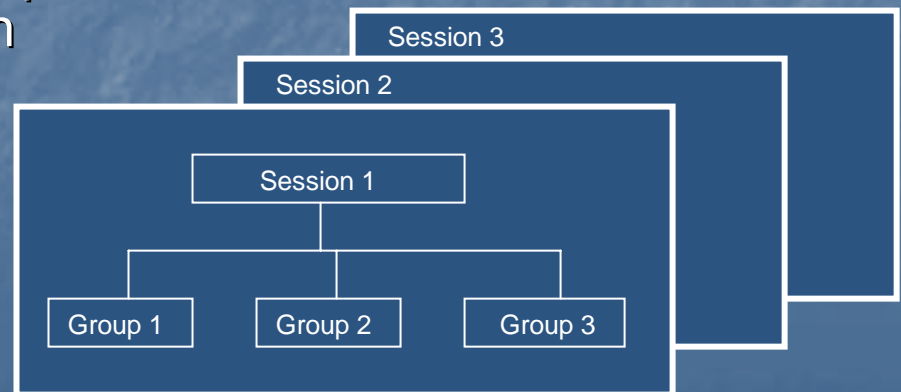
# Working sessions - Approach

## ■ Presentations

- Open workshop, presenters are responsible for complying with all export control requirements concerning their presentations
- Presentations will be video taped and edited for possible distribution as part of the Workshop proceedings

## ■ Sessions

- Workshop sessions are scheduled for Tuesday and Wednesday
- These sessions will be used to record simulant requirements, characteristics, production techniques and suggest technologies that will be necessary in the production of lunar simulants required for their application



# Working sessions - Approach

- Each session will build from the previous
- Each session will have a time limit
- The material gathered during the work sessions will be discussed after each session
  - The Science Committee may seek out individuals during and post-workshop, for further clarification of comments, requirements and rationale

# Working sessions - Approach

## ■ Electronic Meeting System

- The MSFC Electronic Meeting System (EMS) will be used to capture knowledge and requirements during this workshop
- Participants are encouraged to become familiar with the EMS system by contributing comments and ideas during or after each presentation into the laptops located just outside the main conference room
- The EMS will also be used during the Workshop Sessions Tuesday and Wednesday to capture requirements and rationale
- EMS facilitators will be available to support the working sessions

# Working Session Overview

- Session facilitator will begin by leading the group through a few examples of what needs to be accomplished
- Each Session will address a single question:
  - Session 1 - **What simulant properties do we need to support the development of each lunar activity?**
  - Session 2 - **What approach should be adopted to define a family of simulants? What combination of properties is needed for each simulant?**
  - Session 3 - **How do you produce, characterize, validate and distribute these simulants?**
- Working session space is limited

**BREAK !**

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