JSC/EC5 U.S. Spacesuit Knowledge Capture (KC) Series Synopsis

All KC events will be approved for public using NASA Form 1676.

This synopsis provides information about the Knowledge Capture event below.

Topic: Arizona Geology Field Trip

Date: March 27, 2008 **Time:** Unknown **Location:** JSC

DAA 1676 Form #: 33154

This is a link to all lecture material and video: \\js-ea-fs-01\pd01\EC\Knowledge-Capture\FY08 Knowledge Capture\20080327 Arizona Geology Field Trip\For 1676 Review & Public Release

*A copy of the video will be provided to the NASA Technical Library and STI Program's YouTube via the Agency's Large File Transfer (LFT), or by DVD using the USPS when the DAA 1676 review is complete.

Assessment of Export Control Applicability:

This Knowledge Capture event has been reviewed by the EC5 Spacesuit Knowledge Capture Manager in collaboration with the author and is assessed to not contain any technical content that is export controlled. It is requested to be publicly released to the JSC Engineering Academy, as well as to STI for distribution through NTRS or NA&SD (public or non-public) and with video through DVD request or YouTube viewing with download of any presentation material.

* This file is also attached to this 1676 and will be used for distribution.

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Presenter: Gretchen A. Thomas

Synopsis: A variety of hardware developers, crew, mission planners, and headquarters personnel traveled to Gila Bend, Arizona, in February 2008 for a CxP Lunar Surface Systems Team geology experience. Participating in this field trip were the CxP Space Suit System (EC5) leads: Thomas (PLSS) and Ross (PGS), who presented the activities and findings learned from being in the field during this KC. As for the design of a new spacesuit system, this allowed the engineers to understand the demands this type of activity will have on NASA's hardware, systems, and planning efforts. The engineers also experienced the methods and tools required for lunar surface activity.

Biography: Gretchen Thomas has worked for NASA for more than 20 years in PLSS technology development and integration. She has served as the PLSS architecture and integrated testing lead for EVA technology development. Her specialty areas have included carbon dioxide removal systems, thermal control systems, and system integration and analysis. Thomas earned a bachelor of science in mechanical engineering from the University of Houston, and in 2000, she received a master of science in space studies from the University of North Dakota.

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Arizona Geology Trip
February 25-28, 2008

Crew & Thermal Systems Division

March 27, 2008

Gretchen A. Thomas

CxP PLSS Lead Engineer

Amy J. Ross

CxP PGS Lead Engineer

Introduction

The purpose of this knowledge capture is to present the activities and findings of a CxP geology experience trip in Gila Bend, Arizona Feb. 25-28, 2008

- The CxP Lunar Surface Systems team, lead by Dr. Dean Eppler, organized this trip for a variety hardware developers, crew, mission planners, and headquarters (~10 people)

- This is the first in a series where the team hopes to work with additional personnel from each group to create the same experience and understanding to as wide an audience as possible

Purpose and Objective

Trip purpose

- to have “students” participate with an experienced field geologist in a short field problem to understand the demands this kind of activity will place on the design of lunar surface systems and operations

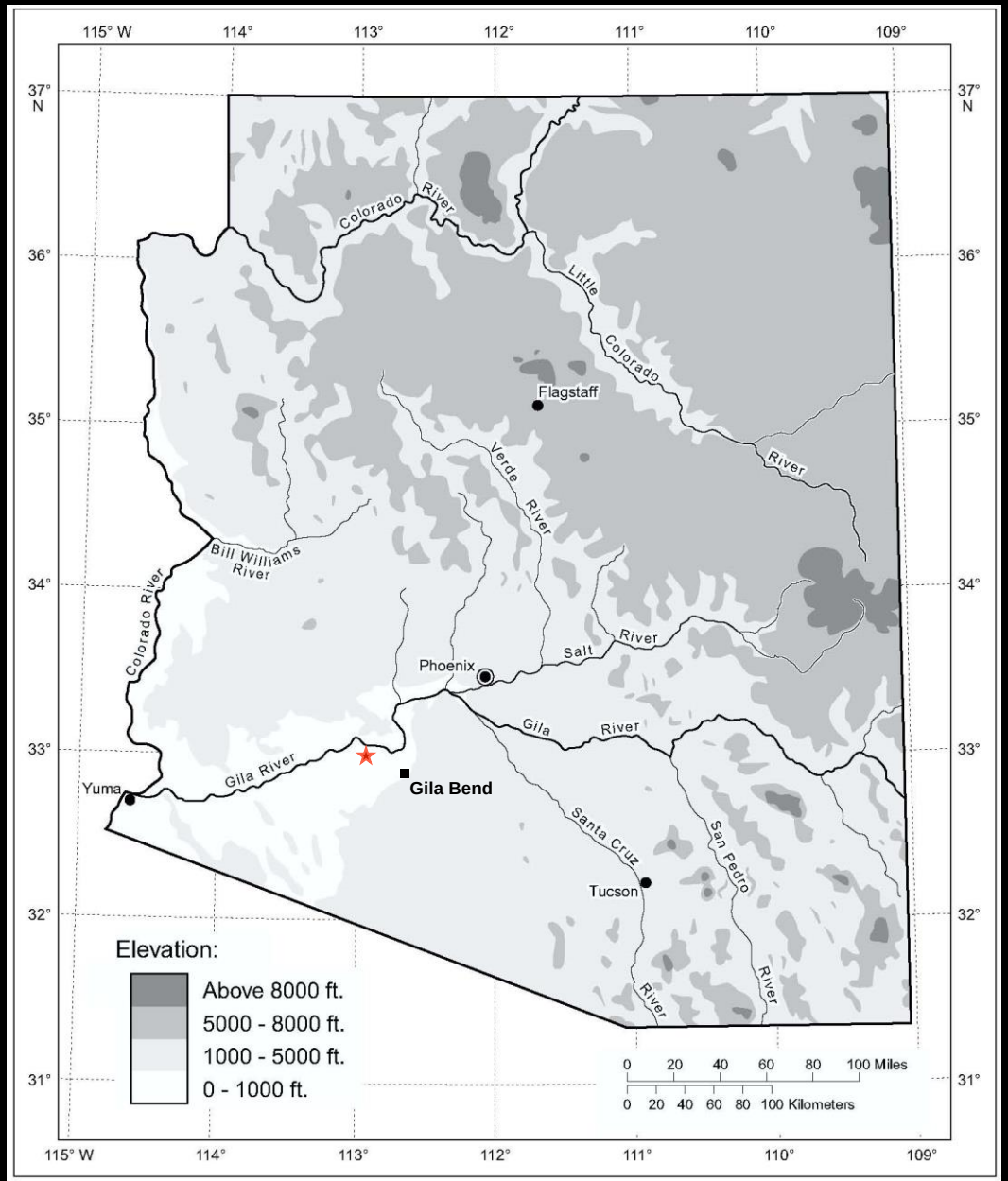
Primary objective

- not to make geologists out of us, but to allow us to appreciate the activity, methods, and tools required for surface exploration

Location

Gila Bend, AZ

Warford Ranch
Shield Volcano



Arizona's Topography and Rivers

ARIZONA GEOGRAPHIC ALLIANCE

Courtesy: Arizona Geographic Alliance
Department of Geography, Arizona State University
Douglas Minnis

Parking Area and Access Road

Gully Near Parking Area

Lower Edge of Volcano Vent

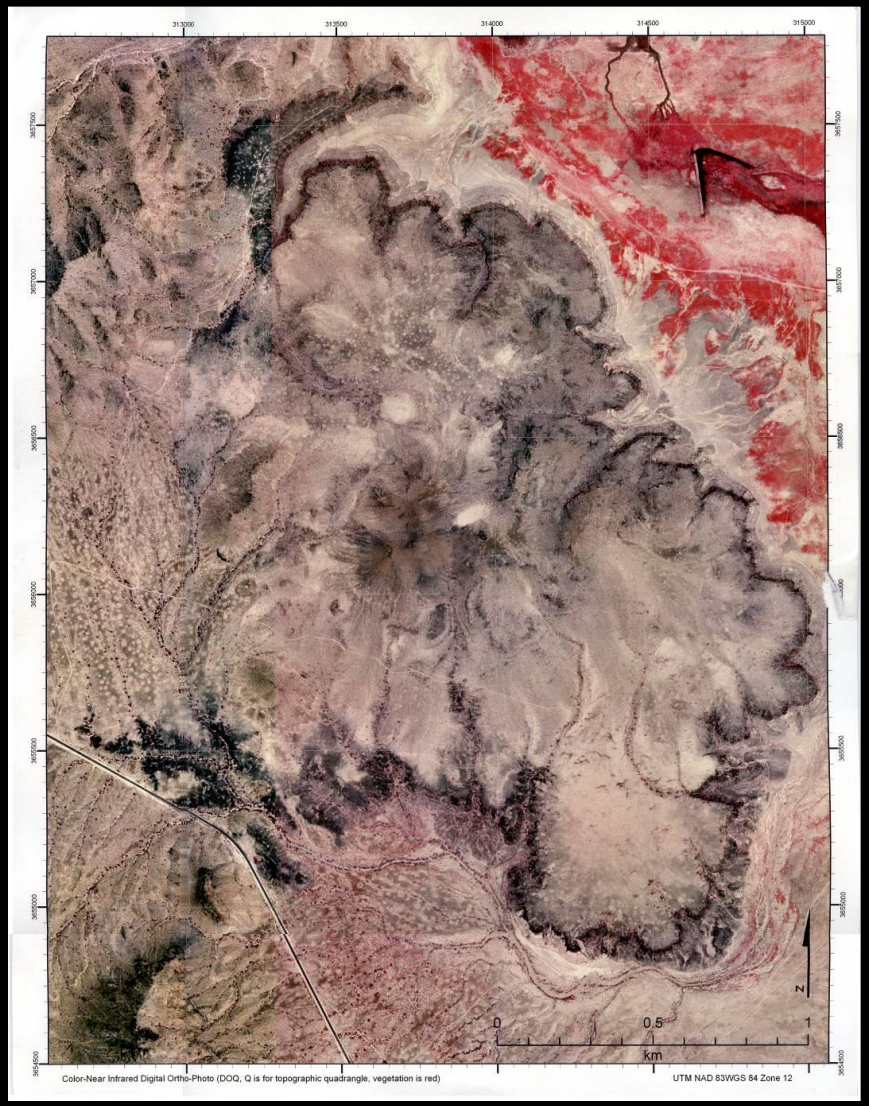
Cliff Face Near Canyon

Method

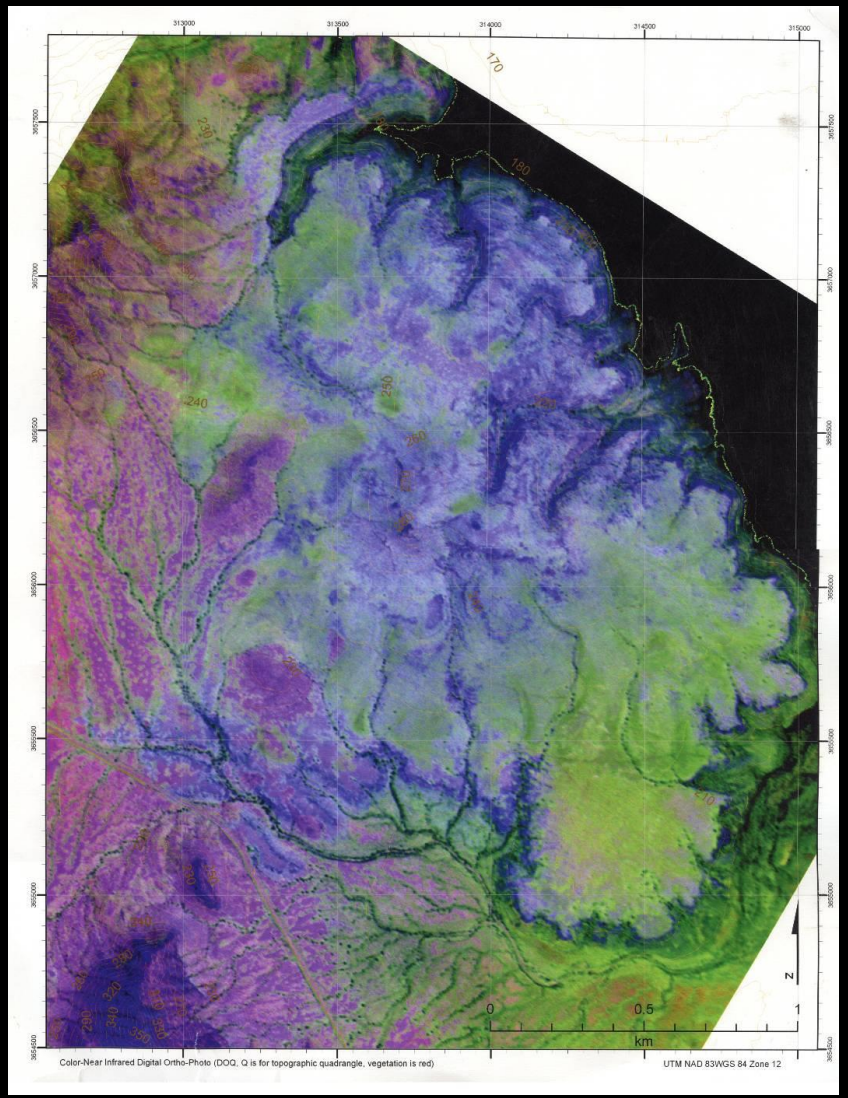
Conduct a Pre-Field Exercise Briefing to Overview:

- basic geology terms
- known characteristics of the volcano field area
- use of geology tools, both handheld and remote sensing images

Warford Ranch Shield Volcano Field Site



False Color Aerial Image



Thermal Imaging Mapping Spectrometer (TIMS)

Method

Conduct the Field Exercise

- Pair teams of 2 students with an experienced geologist
- Teach students observation methods to identify the following, so that we can characterize, explain, and discover the geologic history and evolution of the area
  - Orientation of layering
  - Nature of layer contacts
  - Layer thickness
  - Shape and size of constituent minerals in the rocks, as well as overall textures of the rocks themselves

Method

Conduct the Field Exercise, cont'd.

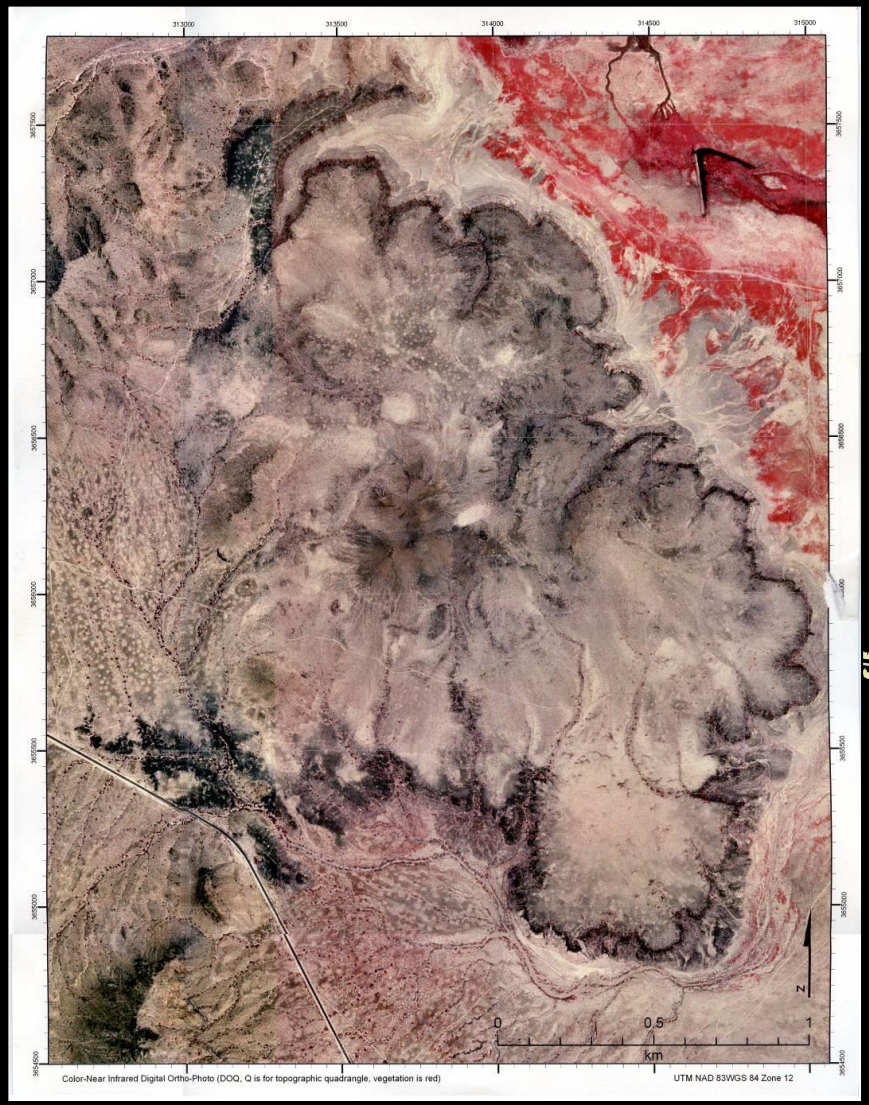
- Teach students protocols for effective field research
  - Pre-planning (before you go in the field)
  - Observation (in situ vs. available remote sensing)
  - Hypothesis
  - Test and Verification of the hypothesis
  - Re-planning

Method

Conduct the Field Exercise, cont'd.

- Teach students data recording methods
  - Mapping
  - Sketching
  - Field notes
  - Sample collection
  - Position locating and navigating

Mapping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Method

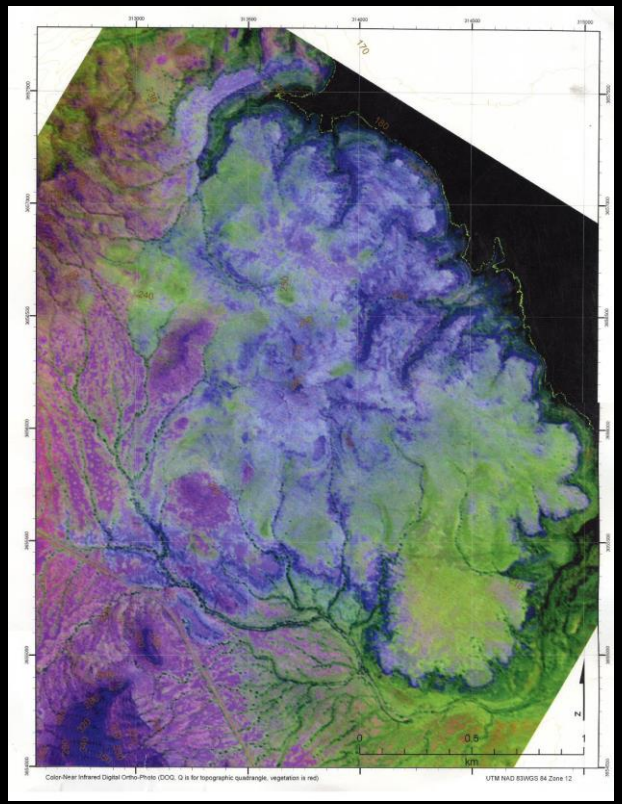
Debriefs and best-practice discussions were conducted each evening

- Discuss geological hypotheses, evidence, and features found by each field team
- Compare team experiences
- Discuss the need for and usefulness of various tools and data
- Note issues that would be relevant to lunar/Martian field planning, astronaut training, and hardware design
- Plan the next days activities, traverses, & objectives
- Provide feedback for future field events

Findings

Suit-Specific Observations: Mobility

- Crewmember demands for mobility and stability will be challenging to meet
- The interesting places are not flat or easy to walk on



Findings

Suit-Specific Observations: Equipment

- Remote sensing cannot replace human eyes or evaluation
- The need for instrumentation, visual aids, recording devices, data access, and note taking materials must not be underestimated and represents one of our biggest challenges

Findings

Suit-Specific Observations: Real Time Changes

- Minor deviations to traverse plans are made within an area as observations are made
- Major real time plan or traverse changes are not normal even for earth-bound geologists
  - Interesting sites are rolled into the next day's plan rather than random wandering or major deviations
  - Safety is key—be able to be located by rescuers or be able to return by dark
- Mission planners will have to consider efficiency, a deviation today can save effort to revisit a very remote or difficult site tomorrow—the suit system should be ready to accommodate this

Questions ?