



Lunar Polar Prospecting Workshop

Introduction

George Sowers

June 14, 2018

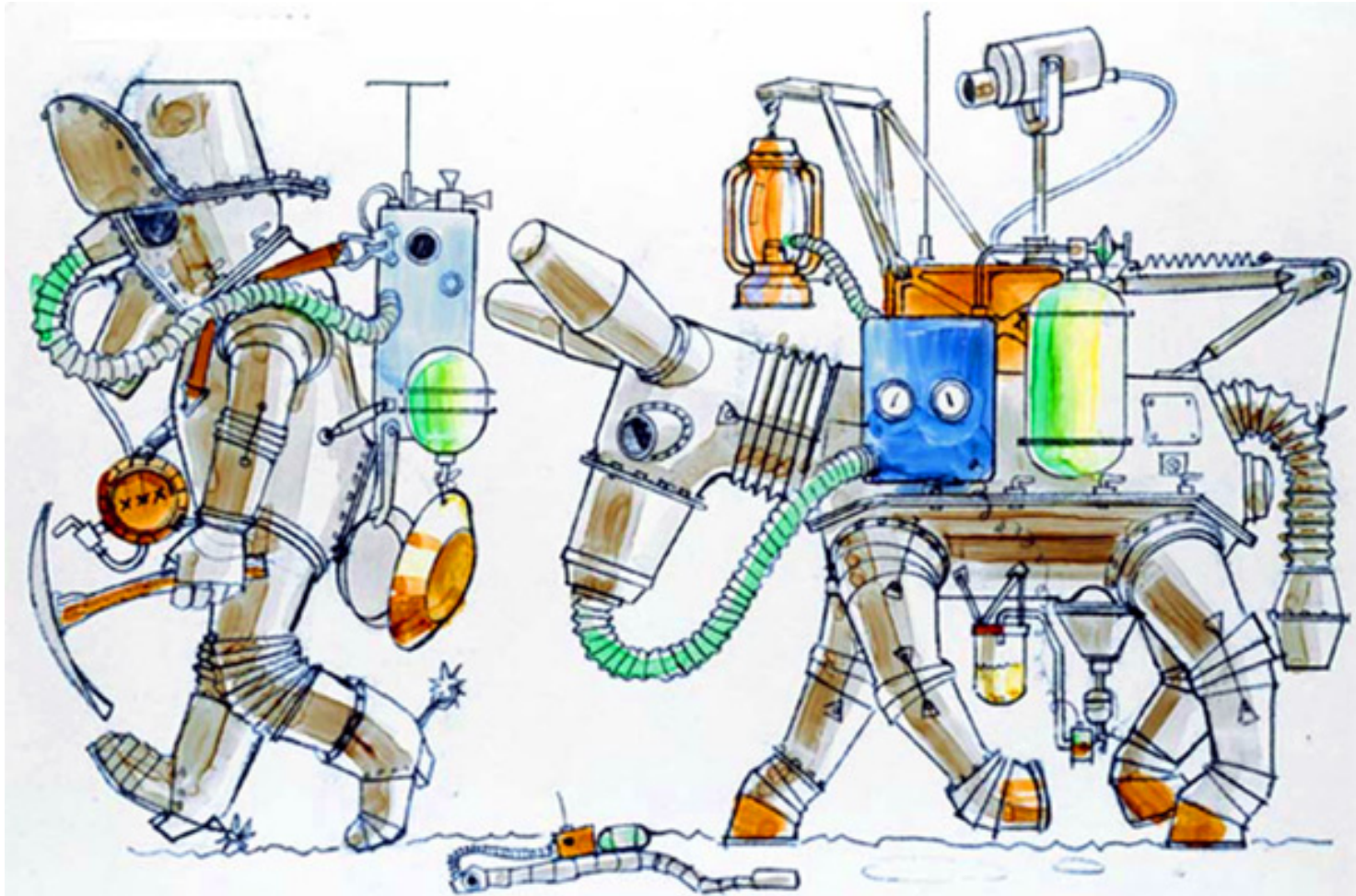
Motivations

- Create a permanent human presence in space
- Bring the resources of the solar system within the economic sphere of humankind
- It starts in cislunar space—creating the cislunar economy
- The economic engine is the free market to provide growth and innovation
- The first step in commercializing beyond LEO is space-sourced propellant for in-space transportation
 - The lunar poles appear to be the most accessible source
- Dramatically lowers the cost for **all** other activities
- The first step of the first step is **prospecting**

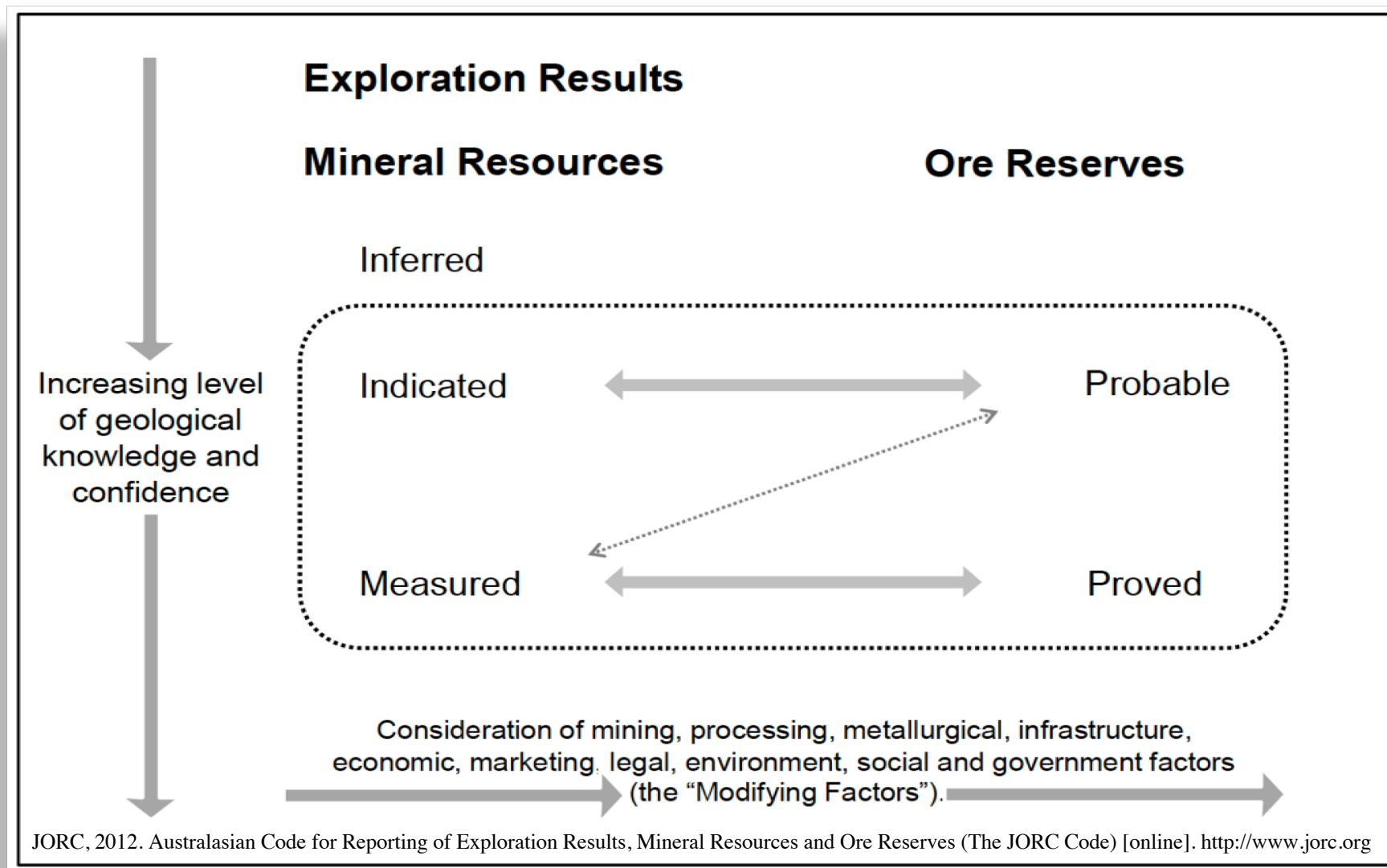
Objectives

- Objectives:
 - Develop a roadmap for a lunar polar prospecting campaign that can lead to **industrial scale production** of water/propellant **within a decade**
 - Missions, timeframes, costs
 - Disseminate this roadmap to space agencies, commercial companies and academic institutions interested in developing lunar water/propellant resources

Prospecting on the Moon



Developing a Proven Reserve



Agenda, June 14

- Introduction George Sowers 1:30-1:50
- Lunar polar ice Clive Neal 1:50-2:20
(What is our current state of knowledge of lunar polar ice?)
- Mining considerations George Sowers 2:20-2:50
(What do we need to know to effectively extract ice?)
- Prospecting technologies Chris Dryer 2:50-3:20
(How we're going to find out)
- Break 3:20-3:30
- Team instructions George Sowers 3:30-3:45
- Team activities 3:45-5:30
- Reception 6:00-8:00

Agenda, June 15

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|--------------------------------|-------------|
| • Continental breakfast | 07:30-08:00 |
| • Teams complete output charts | 08:00-09:50 |
| • Break and reassemble | 09:50-10:00 |
| • Team briefings | 10:00-11:30 |
| • Group discussion | 11:30-12:00 |
| • Next steps | 12:00-12:30 |
| • Adjourn | 12:30 |

Teams

- Prospecting campaign objectives
 - Close mining strategic knowledge gaps, SKG's
 - Achieve knowledge state to enable industrial scale ice mining and propellant production within the decade
- Teams (organized by phase of the prospecting campaign)
 - A) Remote sensing
 - Focused examination from lunar orbit
 - Cubesat & smallsat technology, drones
 - B) Low cost impactors & landers
 - Use of commercially available landers (e.g. NASA's CLP)
 - Impactors, dumb landers, geo-physical techniques
 - Informed by phase A
 - C) Rovers/samplers/analyzers
 - Higher cost, sophisticated missions to gather definitive data in a few select locations
 - Informed by phases A & B
 - Sample return?

Team Products

- List of recommended missions
 - Objectives
 - Data produced
 - Strategic knowledge gaps addressed
 - Pre-requisites
 - What missions/data/infrastructure needs to enable and/or inform this mission
 - Description
 - Instruments
 - Spacecraft
 - Estimated mass
 - Concept of operations
 - Required technology development
 - Timeframe
 - ROM cost