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Lava tube analogue test site for Moon and Mars in West Iceland

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1. Introduction

The association **4th Planet Logistics Iceland** **(4PLI)** is setting up one of the first natural cave sites for testing Moon and Mars exploration gear, technology, and life support, with the focus to use lava tubes (naturally occurring volcanic caves) as a habitat.

4PLI has access to Stefánshellir lava tube in West Iceland and organizes the activities at the site. We are working to make the cave a simulation and testing site for space exploration companies and institutions.

Orbiter reconnaissance images confirmed the existence of lava tubes on Moon and Mars. With its volcanic origin and its arctic climate, Iceland is a very good analog environment to test material and simulate space missions. In addition the intensity of sunlight in Iceland (65°N) is about the same as at Mars' equator, making botanical experiments with natural sunlight realistic as well.

Figure 1: Inside Stefánshellir cave, close to one of the many different skylights, picture by Dominika Zub.

Our goal is to increase research of lava tubes on Moon and Mars, to enable exploration for reasons such as use as a base for astronaut shelters and finding water and life.

2. Why lava tubes

The construction of habitats on Moon and Mars in caves provides the following advantages:

• protection from radiation, from dust and storms on Mars, protection from meteorites (important on the Moon which has no atmosphere)

• little temperature variation between day and night

• reduction of mass to be lifted from the earth for building habitats, lowering the cost of a mission

• increased possibility to find water and microbial life forms

Video of field expedition

Information video about the concept of using lava tubes on moon and Mars

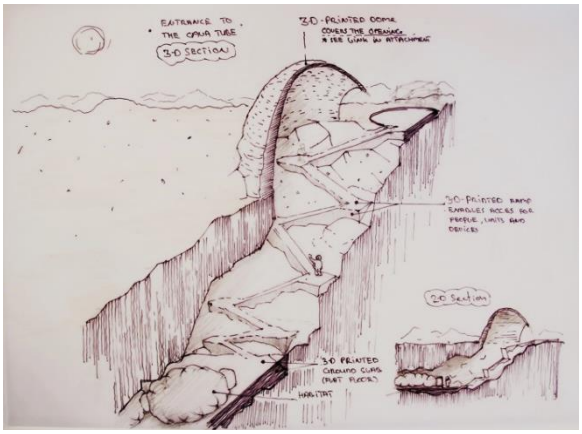

Figure 2: Drawing of a possible lava tube habitat, by architect Dmitry Zhuikov, zaarchitects.com, advisory board of 4th Planet Logistics.

3. About the site and association

Stefánshellir cave in West Iceland is an optimal Moon/Mars analogue test site location for reasons such as:

1. West Iceland is not far from Keflavík international airport (3 hours drive).

2. The cave is situated in the highland desert, however well accessible by car during summer months.

3. During winter months, the area can be used for isolation tests, as the site is cut off from civilization yet easily accessible in emergency cases, unlike other Arctic and Antarctic locations.

4. The landscape and geology of Iceland is similar to Mars due to its volcanic origin and its arctic climate and is from many aspects one of the most suitable Moon/Mars analogues on earth.

5. The intensity of sunlight in Iceland (65°N) is about the same as at Mars' equator.

6. Stefánshellir lava cave was chosen by the Icelandic Speleological Society as the most suitable test site partly because nearly all sensitive speleothems such as stalactites have been destroyed or stolen by collectors. Risk of further damage to the cave by experiments of the project is reduced due to this unfortunate fact.

We are providing access to a lava tube in West Iceland, a partner (4PLI) in Iceland for grant applications related to space research and a network of scientists and key individuals in Iceland.

We are looking for investors and partners (institutions, companies and scientists) operating in Iceland, especially in the field of underground extraterrestrial activities.

Entrance 5
Vertical techniques

Entrance 6
Survey Robotics

Entrance 8
Extreme crawlers

Entrance 9
Astronaut training

Entrance 10
Lander - habitat traffic

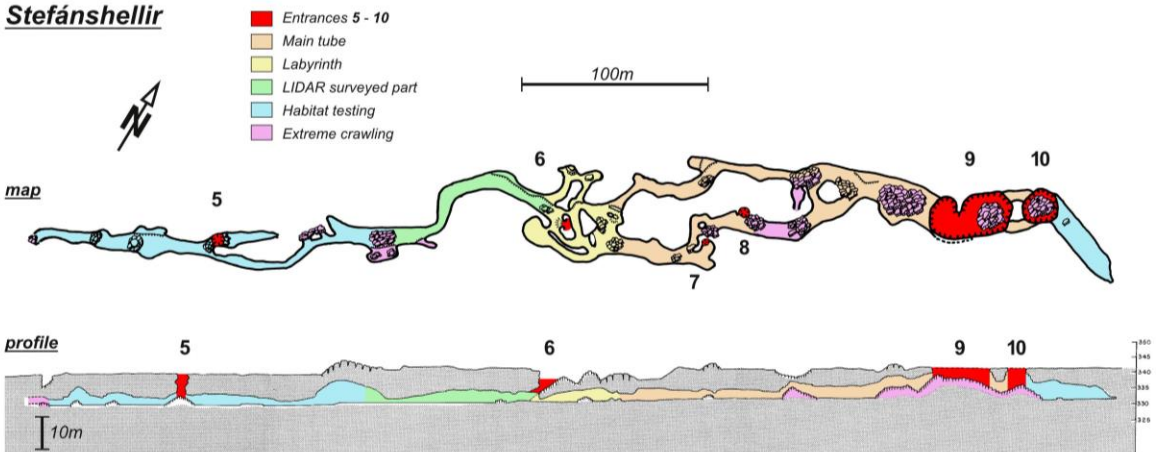

Figure 3: Map and section of the lava tube (by J.R. Reich 1973). Coloring shows zones of different possible use of the cave.