Geology Field Training in Preparation for Suborbital Spaceflights

Kirby Runyon
Planex - Planetary Experience Consulting LLC, Ellicott City, MD, USA. kirby@planex.space, https://planex.space

Introduction
Following main engine cutoff (MECO), suborbital astronauts flying with Virgin Galactic or Blue Origin will traverse the altitude range of 220,000 to 345,000 feet (67-105 km or 42-65 miles) [Virgin Galactic and Blue Origin Payload User Guide]. From these altitudes and launch sites, the geologic landscapes of New Mexico, west Texas, and northern Mexico are clearly visible. For suborbital crews to fully understand and appreciate the view from space, field training in the geology of these areas is crucial. Research opportunities enhanced by geologic field training could include education, Earth observation, comparative planetology, planetary spacecraft ConOp testing, or remote sensing TRL development.

Earth and Planetary Geology Training
Earth's complex geology is of interest both for its own sake and as a planetary analog for researchers and tourists alike. The geologic landscape of New Mexico is dominated by basin and range geology, leading to dramatic topography, volcanic edifices and flows, dry lake beds, and aeolian (wind-blown) geologic landforms (Fig. 1). Many of these features are visible from suborbital altitudes above their launch sites.

The panoply of geology in and around New Mexico is analogous to numerous planetary surfaces, including Mars' Valles Marineris; volcanic edifices, lava and impact melt flows across numerous planets such as Venus, the Moon, Mars, Io, and Vesta; and sand dunes of Mars, Venus, and Titan.

Planex – Planetary Experience Consulting LLC
A core business area for Planex is in geologic field training expeditions for suborbital astronaut crews, whether they are tourists or researchers. As Planex's CEO, I am a PhD planetary geologist with experience in geologic field training for both undergraduate geology students and commercial astronauts. Several geologically-rich sites around New Mexico offer excellent training and hiking opportunities to prepare flight crews to view—and understand—what they will see from suborbital altitudes (Fig. 2). To fill out an indication of interest and availability form for 2023 expeditions, visit https://forms.gle/Te9tv3W6uXTTtS3WA, also linked to at https://planex.space.

Fig. 1. Shadows of commercial astronauts pointing spaceward during their geology field training at White Sands in 2022. They will see from space the area they learned about and explored by foot.

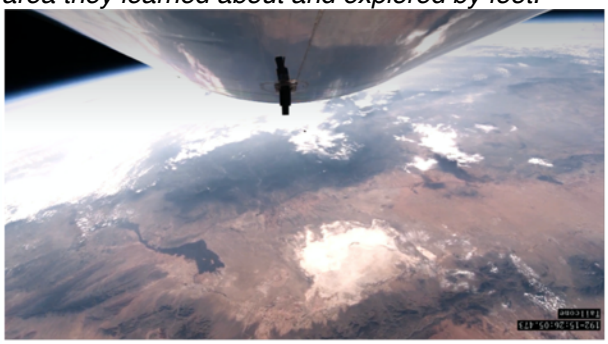

Fig. 2. View from suborbital space during Sir Richard Branson's flight on SpaceShipTwo. White Sands is visible near bottom-center as the irregular white patch. Credit: Virgin Galactic video still.

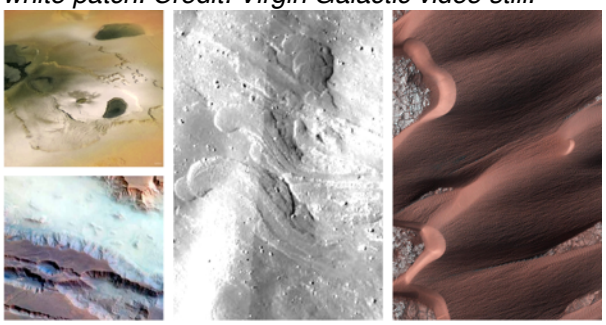

Fig. 3. Analogous geologic landforms on Io, Mars, and the Moon. Top left: an Io volcanic caldera; bottom left: Mars' Valles Marineris; Middle: lunar impact melt flow in Lowell Crater; Right: Martian barchanoid sand dunes. Credit: NASA & ESA.