The space shuttle Atlantis climbs upwards to orbit from pad 39A at 18.32 EST Feb 7, 2001, Mission STS-102. Imaged by Pat McCracken, NASA.

The sunlit exhaust plume casts an immensely long shadow. At first sight its direction and shape are enigmatic.

On the ground, the sun has already set and is 6° below the horizon. Miles above, the shuttle and its plume have broken out into sunlight and their shadow stretches through the atmosphere. It narrows due to perspective as it extends farther and farther from the camera. Its dark umbral part also physically tapers away because the sun is an extended rather than point source of light.

And the bright object it apparently points to? The camera looks north eastwards and the recently risen Moon is 9° high. The Moon is within a few hours of full and roughly marks the antisolar point to which all sun shadows aim.

Rockets trails in the stratosphere & mesosphere here.