

Re: Space Policy: Why Mars should be our top priority.

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*Source:* <http://sci.tech-archive.net/Archive/sci.space.policy/2009-04/msg00442.html>

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- *From:* Marvin the Martian <[marvin@xxxxxxxxxxxxx](mailto:marvin@xxxxxxxxxxxxx)>
  - *Date:* Fri, 24 Apr 2009 22:28:39 -0500
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On Fri, 24 Apr 2009 19:14:47 -0700, Fred J. McCall wrote:

Marvin the Martian <[marvin@xxxxxxxxxxxxx](mailto:marvin@xxxxxxxxxxxxx)> wrote: :  
:Energy wise & rocket wise, Mars is closer than the moon, :

You've said this before. I've pointed out that the source you gave doesn't agree with your claim. Go add it up for yourself.

Yes, I've said it before.

You didn't point out anything.

Let's go here:

[http://en.wikipedia.org/wiki/Delta-v#Delta-vs\\_around\\_the\\_Solar\\_System](http://en.wikipedia.org/wiki/Delta-v#Delta-vs_around_the_Solar_System)

From LEO to the moon surface is 4.1 km/s + 1.6 km/s.

So the KE from LEO (Low Earth Orbit) to the moon is  $1/2 m v^2 = 16.24 \text{ kJ/kg}$ .

From LEO to Mars is  $2.5 + 0.7 + 0.6 = 3.8 \text{ km/s}$  The red arrows indicate

the opportunity to Aerobrake; using the planet's atmosphere to slow down rather than needing rocket energy. So the KE from LEO to Mars is 7.22 kJ/kg, less than half the energy of the trip to the moon.

For further benefit, there's the Mass ratios. Since the mass ratios go as  $\exp(\Delta V / v_e)$  where  $\Delta V$  is the final velocity of the rocket and  $v_e$  is the exhaust velocity of the rocket engine.

[http://en.wikipedia.org/wiki/Specific\\_impulse](http://en.wikipedia.org/wiki/Specific_impulse)

If you have a fuel/oxidizer with a specific impulse of about 360, you have an exhaust velocity of  $g \cdot I = 3.5 \text{ km/s}$ .

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So, your rocket mass ratio from LEO to the Moon

So, the KE from LEO to the moon is  $\exp(5.7/3.5) = 5.1$  This means that the rocket to get you to the moon, when fueled, is 5.1 times the mass actually delivered to the moon surface.

On the other hand, from LEO to Mars with the same rocket fuel is  $\exp(3.8/3.5) \approx 3.0$  So, you can put a lot more mass on Mars than you can on the moon with the same rocket from LEO.

What I said is true, and what you said... yeah. right.

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