

Man on Mars by 2019 using 3 Shuttles
To Reduce Program Costs
MODIFY THE SPACE SHUTTLES FOR A MANNED MISSION TO MARS
Before planned 2011 Retiring of the STS Fleet

Send 3 Shuttles to Mars

.....by Michael J. Coppi, X711mjc@cs.com, 01/05/09

As a former Aerospace Engineer with the Space Transportation System, I envision that **the U.S.* can complete a manned Mars mission** (landing/return) within ten years. Such could also be accomplished on a **much lower budget** (in relation to a 100% newly designed program), by using **existing hardware** (the 3 Space Shuttles as primary components [+ some new equipment]) and **including backup systems to ensure mission success.**

* Alternately, a world-wide joint mission (e.g. NASA, ESA, RSA, JAXA, CNSA).

Here's an outline -- naturally there are details to work out, but this mission SHOULD BE viable [Orbiter Names are used arbitrarily].....

OUTLINE SYNOPSIS:

- A. Discovery to Mars - Atmospheric Penetration, Landing, Return-to-Orbit Module
- B. Atlantis to Mars Orbit - Docks with + Returns Excursion Crew to Earth
- C. Endeavour Accompanies as Contingency Rescue - Backup of All Elements

OUTLINE SUMMARY

- i). Launch into low earth orbit an unmanned vehicle carrying a spaceworthy 'CANister' [CAN] - supply of food/water/oxygen to support 3 astronauts during **journey to Mars.**
- ii). Launch into low earth orbit an unmanned vehicle carrying a Booster Rocket Motor [BRM] for **propulsion to Mars.** (Perhaps with a plasma engine such as a VASIMR [variable specific impulse magnetoplasma rocket]).

'CAN' and 'BRM' are 'parked' together, possibly [preferably] docked-with/tethered-to International Space Station [ISS]. See below [note c] for alternative to BRM.

- 1). Launch 'Discovery' from KSC pad 39A - in the cargo bay is an MEM [Mars Exit Module - designed to carry crew from **Mars surface to Mars orbit** upon completion of surface exploration].

MEM/Additional crew could also be pre-launched/picked-up at ISS.

- 2). Discovery picks up CAN/BRM/MEM/Crew as necessary. MEM must go in cargo bay, 'CAN' is attached via a hatch/airlock for access en-route [nominal length of trip to Mars = 9 months]. 'BRM' is 'strapped on' for boost to Mars + course corrections and insertion into Mars orbit.

Discovery makes a one-way trip to Mars (to be immediately followed by Atlantis for crew return - see below), where it will serve as lander (or introduction into Martian atmosphere of lander) - see further below.

3). Atlantis is launched. Minimal [2] crew. Payload [food/water/oxygen for crew of 2 to Mars + return of 5 astronauts] is pre-stowed in cargo bay and/or picked up in orbit like Discovery's 'CAN'. Also picks up a pre-launched 'BRM' [double capacity BRM = fuel to/from Mars].

Atlantis is the 'return from Mars' vehicle. Launched within days/weeks of Discovery from KSC pad 39B. Atlantis follows Discovery to Mars to receive MEM/crew upon return from Martian surface.

4). **Discovery** arrives/orbits Mars, jettisons CAN & BRM. Fires existing onboard OMS [Orbital Maneuvering System] pods and **enters Martian atmosphere**, positioned to land at smoothest possible locale.

Landing will be rough but upright and survivable. Perhaps oversized tires on retrofitted landing gear [perhaps even skis]. Early deployment of drag chute could possibly compensate for thin Martian atmosphere. See alternate landing scenario further below (MEM ejected as independent soft lander).

5). After 2-week [+/-] excursion, **MEM launches** directly from cargo bay, **docks with Atlantis in Mars orbit** (jettison after crew/sample transfer or stow in cargo bay). Utilize Atlantis' double-capacity CAN & BRM for **return to Earth**, de-orbit as usual, land at KSC or Edwards AFB.

6). **Endeavour** has been launched within a month of Discovery, and [with its own CAN/BRM/MEM + minimal crew] has followed Atlantis **to serve as backup/rescue**. (If unused, it can be possibly be fitted for a later Moon Sample Return Mission [MSRM]).

Why relegate retired Space Shuttles to eternity in a museum? **The 3 Orbiters can be modified to serve as the backbone of a manned explorative journey of Mars - an STS Finale.** Enterprise is already at the Smithsonian, the remainder of the fleet is spaceworthy, and that's exactly where the shuttles should spend their final days: IN SPACE.

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Notes:

a). Could be accomplished with two Shuttles [2 journey, 1 lands, 1 returns], or three [3rd as backup/rescue Mars Lander w/MEM]. Both [or all three] Orbiters coupled together in "train" configuration with powering Shuttle at rear would eliminate need for separate BRMs and Cans, plus consolidate interplanetary travel.

b). The biggest argument might be concern over Discovery's Mars landing in thin atmosphere and on uncleared ground. Prior reconnaissance can easily choose a relatively barren area with just small rocks. Possibly even "ski"-type landing gear (deployed with explosive charges) instead of wheels. Recall that landing is one-time only.

Alternately, landing crew transfers to MEM, MEM ejects from Discovery within Martian atmosphere, MEM parachutes and/or retrofires to independent soft landing, Discovery impacts unmaaned, acts as 'seeder' per addendum [further below].

c). Perhaps a Mini External Tank [MET] as 'payload' in cargo bay of Discovery upon launch from Earth. Removed from bay in earth orbit [replaced with pre-launched MEM] and attached to the Mars-bound Shuttle [similarly to ET]. Main engines would then be available [greater thrust, throttleable and re-fireable for corrections and orbit insertion]. 'MET' option would remain in Cargo Bay of Atlantis with direct feed line to Main Engines.

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From a concept originally proposed 3/15/2005 by Michael J. Coppi
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Q & A

I remain adamant that **this project is feasible** and needs to be pursued. Concerns [such as below] are anticipated - the general answer being that **any obstacles CAN be overcome**. The main thing is that **70% of the equipment needed for a manned mission to Mars ALREADY EXISTS. The opportunity to utilize these resources** [Shuttles + STS Launch Capability] **should not be forsaken**.

I urge promotion of an agenda that incorporates Space Shuttles as the primary component of a manned Mars program. I contend that such a paradigm shift is necessary to achieve this goal.

Addressing particular queries --

Q:

>>>>>>>

Mass in LEO [Low Earth Orbit]... booster rocket motor component would have to be very large.... [plus extra] propellant to prevent boil-off. This is an Aries V-class payload.

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A:

I propose solid BRM's for primary acceleration/deceleration, prelaunched to LEO and strapped onto a configuration of 2 or 3 Shuttles. MET[s] carried aloft stowed as payload for necessary throttleable maneuvers - liquid propellant such as hydrazine might be considered for stability.

Q:

>>>>>>>

Entry speeds... entering the atmosphere from hyperbolic speeds... [shuttles' tiles] could not take the additional heat load.

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A:

I consider the existing heat shielding/re-entry capability of the Shuttles as one of the primary "pre-built" components of this concept.

Not 'direct' entry; orbital insertion first.

We might need BRM and MET, or 2 BRM's - one for departure acceleration, one for capture on arrival. Then 2 more BRM's for return. These [4] have all been prelaunched, attached in Earth orbit, configured for separate jettison.

Q:

>>>>>>>

Shuttles landing on Mars... at 100,000 feet (the place where Earth's atmosphere is as thin as it is on Mars' surface), the shuttle is going much faster. Landing would be difficult, and deploying the drag chute would not help.

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A:

Consider the "MEM ejection" scenario, wherein crew transfers to landing module [stowed in cargo bay], module ejects within Mars atmosphere, parachutes/retros to independent soft landing. Upper stage returns to orbit following surface excursion.

Q:

>>>>>>>

Power... fuel cells... deployable solar power system... batteries.

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A:

A concern for any interplanetary voyage. Let's consider what we already have as assets, not as constraints.

Here we encounter the most basic conundrum: Is it not more cost-efficient to modify an existing system

rather than start anew?

Q:

>>>>>

Timeline Cost/Manpower... space shuttle [operations] costs \$3B/year... not be able to 'switch' to development

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A:

All the more reason to GO with this program NOW, and especially before the ops force dissipates and/or systems capability is modified [Orion] or lost completely [SRB construction, ET construction, etc.]. New engineering must be contracted.

- Mike Coppi, BSAE, Cal Poly Pomona, 1982

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Addendum --

Seed Mars Now!

.....by Michael J. Coppi, X711mjc@cs.com, 01/05/09

We must begin now to prepare Mars for future colonization by Humans.

The 'search for life' program is now anticlimactic at best, moot at worst. It almost seems a waste to keep sending sterile launders. In fact the uncertainty that all landers have been 100% sterile puts in question the source of any "life" ever found. Remember too that meteorites from Earth may have already seeded Mars in the distant or recent past..

Future probes should be deliberately "contaminated" with any and all organisms that have the slightest chance of surviving and taking root in the Martian environment.

Life forms accustomed to Arctic/Antarctic locales are obvious prime choices.

The simplest method of delivery would be to shield the probe for entry into the Martian atmosphere, then allow it to crash to the surface.

More sophisticated soft landers could even provide nourishment and/or shelter for moss, grass, microbes, even insects.

There's certainly CO2 in the atmosphere to possibly support some hardy polar algae, moss or plant from Earth that can survive with just the moisture from ice that's been found just beneath the Martian surface. Eventually leading to simple grasses. More plants = O2 added to atmosphere for eventual animal life.

Terra-Forming efforts must start now!

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