Re: Moonlab − could the SIVB be used to put a Skylab on the Moon?

Source: http://sci.tech−archive.net/Archive/sci.space.policy/2007−05/msg00071.html

- *From*: Willie.Mookie@xxxxxxxxx
- *Date*: 7 May 2007 09:19:32 −0700

On May 7, 5:14 am, Pat Flannery <flan...@xxxxxxxxxx> wrote:

> Damon Hill wrote:
>
> > Skylab was launched "dry"; no propellants, no J−2. A "wet"
> > S−IVB on a Saturn 1−B was proposed, but soaking station
> > equipment in LH2 was a Problem.
>
> Could you use modified slosh baffles in the tanks for floors, and outfit
> her with cargo carried atop the Saturn 1B that launched her?
> At most this should take two Saturn I launches.
> Is that cheaper than one Saturn V launch?

Skylab was actually the refitted S−IVB second stage of a Saturn IB booster (from the AS−212 vehicle), a leftover from the Apollo program originally intended for one of the canceled Apollo Earth orbital missions.

A product of the Apollo Applications Program (a program tasked with finding long−term uses for Apollo program hardware), Skylab was originally planned as a minimally−altered S−IVB to be launched on a Saturn IB. The small size of the IB would have required Skylab to double as a rocket stage during launch, only being retrofitted as a space station once on−orbit. With the cancellation of
Apollo missions 18−20 a Saturn V was made available and thus the "wet workshop" concept, as it was called, was put aside and Skylab was launched dry and fully outfitted.

Skylab's grid flooring system was a
highly visible legacy of the wet workshop concept.

> The one we really should have gone for is the Saturn V S−II wetlab concept.

That was what vonBraun proposed.

> With cargo equivalent to the weight of Skylab sitting atop the the S−II
> stage, we should have been able to outfit the S−II stage with one
> launch to a basic configuration,

Yes.

> and then get it fully functional with a
> second Saturn V launch carrying all the other equipment atop the S−IVB
> (take out the TLI requirement, and that S−IVB could carry some mighty
> heavy stuff into LEO)

Yes. But a second launch wouldn't be needed. Unless you wanted to tether two S−II space station modules together and spin them for gravity.

> This would really be something to see; if we had done it that way, we'd
> probably still be using it today.

Yes we would.

> It would be huge as far as internal crew volume went.

And cheaper than ISS by a large factor.

> You could have done a six−crew Shuttle−supplied station that way.

An two SIVB end to end with a docking collar at each end, with two coilable booms extending about 100 m in opposite directions, each attached to a S−II station − would be pretty much the start of a rather massive station that would be added to over time.

http://en.wikipedia.org/wiki/Wet_workshop

And with RL−10 engines to land on the moon, the basis of a technology that would be used for moon habitation, long−term habitation modules for interplanetary flight, and mars habitation.

http://www.astronautix.com/astros/vonbraun.htm

I am thinking about Philip Bono's rombus design −

http://www.astronautix.com/lvs/rombus.htm

− imagine each of the 8 drop tanks on the rombus are about the size of a Shuttle's SLWT − ET − This woud make the entire vehicle system 6.5x bigger than the original rombus, and this super−rombus would put up about 3,100 MT (6.8 million pounds − nearly a fully loaded Saturn V!) into LEO. Great for a 20 GW inflatable solar laser powersat.

But, such a vehicle lightly loaded could take ALL EIGHT SLWT−ETs to orbit, and THEY could be used as a space station or lunar base.

Equipped with a small LOX/LH thruster cluster (RL10 based!) and carrying about 250 MT each of residual LH/LOX mix − with ALL the propellant of the central rombus vehicle depleted, and the entire system separates when its at apogee opposite the launch point. The main core is on a one orbit sanger sub−orbit − in reversal of normal operation, a wet−station ET cluster (of 8 total!) would continue a low gee burn to escape Earth while the rombus main vehicle returned to the launch center. The ET cluster would fly to orbit the moon or mars, or venus or mercury, or land on the moon, mars, or mercury. Instant space city!

With a NERVA engine added to the RL10 cluster and 100 MT of LH and 20 MT of LOX (to attain orbit before firing up the NERVA engine − with bimodal electrical power) the system could carry six to twelve astronauts each in the intertank space during lift−off, and allow them to cruise to Mars inside the LOX tank once depleted. And then when landed on Mars, refuel the LH tank by decomposing atmospheric water vapor there into LH − and oxygen − and return to Earth − to do it all again. The NERVA is 5 MT in this scenario, and the 12 astronauts and their payload 100 MT − per tank.

8 flight elements with 12 astronauts each, 96 astronauts total, lots of spare capacity − especially if flown in parallel with an unpiloted permanent station.

Similar systems can be imagined for the moon, but here you'd need rocket braking as well as carrying ALL the propellant, until a source of water is found. But duration is shorter and so stores are less.

> Bring up the supplies via Shuttle and trade out three of the crew every six months, using the remaining three crew to get the three new crew up to speed.

http://www.astronautix.com/craft/stsation.htm

The Shuttle's ET could also be used − and its larger than the S−II ... configured as a strap on tank (1 of 8) on a Bono style super−rombus vehicle a wide range of missions can be imagined that would make use of ETs as space stations, moonbases, mars bases, mission modules, planetary bases, etc., especially if equipped with a nuclear power source and nuclear propulsion element.

> Cargo delivery could also be done via Atlas−Centaurs, or for heavy stuff, Titan III's, using automated docking gear...an ability we should have developed decades ago, Progress−style.

An ET −SLWT− equipped with an annular aerospike engine at its base − could operate as a SSTO capable of placing 30 MT into LEO. Which would cheaply resupply the stations described. A modular plug in NERVA 'sustainer' engine would give such a vehicle 'legs' to cross the solar system cheaply. Resupplied with hydrogen on mars or the moon, the vehicle would return. A 3−component vehicle with two cross−feeding to a central core, could place 225 MT into LEO −which would provide a single mission of the type described above. A 7−component vehicle with 6 supplying a central core would place 700 MT into LEO − a fully fueled ET element. 8− ETs strapped on to a rombus style central core −would increase capacity to orbit to 3,100 MT − all using a common element throughout.

A subscale version 1/3 the size of the ET − to test these concepts would have 1/3 the capacity (10 MT/75 MT/1030 MT) at a program cost of about 1/2 that of the full−scale system.

This would be a $18 billion program − throughout. Done in phases.

> Pat

William

.