

Re: How serious is the May window?

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- *From:* "Jorge R. Frank" <jrfrank@xxxxxxxxxxxx>
 - *Date:* Tue, 21 Feb 2006 21:43:36 -0600
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"Katipo" <hamilton@xxxxxxxxxxxx> wrote in
[news:csKKf.151756\\$VH5.1305462@xxxxxxxxxxxx](mailto:news:csKKf.151756$VH5.1305462@xxxxxxxxxxxx):

"Jorge R. Frank" <jrfrank@xxxxxxxxxxxx> wrote in message
news:Xns9770EA47157E0jrfrank@xxxxxxxxxxxx

"Ten Quidado" <TenQuidado@xxxxxxxxxxxx> wrote in
[news:kXwKf.2381\\$VI6.1288@newsread1.news.pas.earthlink.net](mailto:news:kXwKf.2381$VI6.1288@newsread1.news.pas.earthlink.net):

"Jim Oberg" <jamesoberg@xxxxxxxxxxxx> wrote in
message
[news:8pwKf.28428\\$7y1.14428@xxxxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:8pwKf.28428$7y1.14428@xxxxxxxxxxxxxxxxxxxxxxxxxxxx)

Yeah, I –KNOW– everybody is
supposed to be 'working toward' a
mid–May liftoff, but then why are
the working troops I talk with all so
skeptical that it can -- or even
SHOULD – be done? Any other
'straws in the space wind'?

I'm betting on August.

I'd bet against it. The launch windows for the rest of the year are
May 3– 22, July 1–19, August 29–Sept 14, Oct 26–30, and Dec 23–27. If
they don't launch in May or July, there's not much August window
available.

Exactly how do launch windows? My understanding it is the time when
the distance the craft needs to travel to reach its destination is the
shortest. Is that all there is to it?

There's a little more to it. :-) A launch window is actually a composite

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of several constraints:

1) Rendezvous planar window – roughly speaking, the target orbit plane is fixed in space while the Earth rotates under it. There are only two times each day when the launch site passes through the orbit plane, one on the south-to-north leg of the orbit and the other on the north-to-south. The second one isn't used by the shuttle for range safety reasons; it would cause the ET and SRBs to come down in inconvenient places.

2) Rendezvous phase window – once you've launched in-plane with the target, you have to catch up to it. How long that takes depends on where the target is within that orbit plane. If a vehicle has limits on phasing capability, it may not be able to launch in every planar window. The shuttle orbiter doesn't rendezvous until flight day 3 or 4 so it has enough phasing capability to launch into any planar window.

The two constraints above apply to any rendezvous flight, and since all future shuttle flights will rendezvous with something (either ISS or HST), they always apply. For the shuttle, they don't affect whether you can launch on a particular day, just what time of day you can launch (planar window) and how long the window is open (both).

For all shuttle-ISS flights, a third constraint applies.

3) Beta constraint – beta is the angle between the orbit plane and the line of sight to the sun. It determines how much of the orbit is lit and how much is in the shadow of the Earth. That affects thermal control of both orbiter and ISS, and ISS solar power generation. It turns out that if the beta angle is greater than sixty degrees while an orbiter is docked to ISS, it's impossible to find an orientation for the stack that satisfies all three constraints, so NASA doesn't launch on those dates. This constraint isn't very limiting; it creates "cutouts" in the launch window every 2–3 months that last 2–3 weeks. These cutouts fall during the nighttime during the summer, and during the daytime during the winter.

How come there are so few windows for the shuttle?

There are two additional constraints that apply to the shuttle Return-To-Flight test missions:

4) Daylight launch – for photography to see if the foam-shedding problem is fixed.

5) Lit ET separation – for photography of the ET from the orbiter's umbilical well camera, for the same reason.

In practice, 5) is more constraining than 4). They are very limiting; in

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combination with the beta cutouts, they limit shuttle launches to four periods during the spring/summer/fall roughly two months apart lasting roughly 2–3 weeks, with two more periods during the winter lasting maybe a few days, if you're lucky. These two constraints go away after two flights with no ET foam shedding above the allowable limits.

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JRF

Reply—to address spam—proofed – to reply by E—mail,
check "Organization" (I am not assimilated) and
think one step ahead of IBM.

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