

DATE: September 14, 2010

SUBJECT: NSG C-band Requirements Splinter Group Minutes

LOCATION: Teleconference

ATTENDANCE:

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INTRODUCTION

Mr. Jim Bangerter convened the September 15, 2010, Human Space Flight (HSF) Network Support Group (NSG) C-band requirements meeting to discuss C-band requirements and budget.

MEETING ITEMS

- A. Mr. Bangerter stated that there are issues with the C-band budget; funding is being reviewed, and there has been an increase of support due to the Visiting Vehicles (VV). Is it possible to reduce costs using new technologies such as GPS? Is it possible to reduce the coverage and cost while supporting new customers? He stated that he and Mr. Gary Morse need to evaluate the costs and provide an estimate for C-band passes required over the next few years.
- B. Mr. Morse stated that it is possible to do some things such as looking at the costs of certain sites. Kwajalein is desirable at certain times, but the cost has increased to 30 – 60k per pass. This is problematic. Is it possible for the Johnson Space Center (JSC) Trajectory Operations Officers (TOPO) not to schedule Kwajalein? How many passes would this be? Could GPS or 2-way Doppler substitute for C-band passes?
- C. Mr. Bob Marriott asked what drives the C-band requirements for each vehicle. For example, why does Soyuz require the support it now receives, is it pointing data? If the TOPO can get the vector, is any C-band support required? Mr. Joe Aquino stated that the Russians can provide the vectors. NASA wanted the vectors for Very High Frequency (VHF) support.
- D. Mr. Bryan Corley stated that the Soyuz does not have GPS, but does have a transponder. C-band data is available from ANT for the two burns the first day, but ANT is going away. Mr. Mike Gawel stated that ANT will not be available after October 1. ANT is really backup, however, and used for contingency in the event of a non-nominal burn. Mr. Pepper Powers stated that the Goddard Space Flight Center (GSFC) Flight Dynamics Facility (FDF) receives C-band tracking data after the 2nd burn on Orbit 4. FDF does not require Soyuz C-band support provided Russian vectors are available. FDF does receive the Russian vectors via the TOPOs.
- E. Mr. Morse stated that if there is a problem, C-band support can be requested.
- F. Mr. Corley stated that in the case of all VV, the support is really only for contingencies.
- G. Mr. Aquino noted that the Automated Transfer Vehicle (ATV) and H-II Transfer Vehicle (HTV) wanted the C-band support while they evaluated their GPSs.
- H. Mr. Morse stated that there is the impression that the NASA radars are free and this is not the case. Space Shuttle has allocated funds to the Range for the support. Mr. Robert Jones stated that the Dryden Flight Research Center (DFRC) supports 8 hours shifts and Space Shuttle support requires 4 hours overtime; therefore, each mission equals approximately 100 hours overtime.
- I. Mr. Morse asked if the cost would be reasonable for contingency support only from the Eastern Range (ER), Wallops, and NASA radars.
- J. Mr. Ronnie Brautigam asked how soon a response would be needed from the Range in a contingency. The range is not manned 24x7 and a response might not be available until

the next morning. Mr. Bangerter stated this was understood. Mr. Morse stated that the call-up time needs to be determined (e.g., is it 4 hours). Mr. Gawel stated that Space Shuttle support is different than VV support as the DDMS is available 24x7 for Space Shuttle and not VV support. He stated that he could not estimate the timeline at the meeting.

- K. Mr. Morse stated that the **recommendation should be** that JSC will not schedule VV C-band support for routine operations. A process needs to be determined for contingency call up.
- L. Mr. Marriott stated that Soyuz support should not be required unless there is a declared contingency.
- M. Mr. Morse stated that if there are requirements for C-band support, funding needs to be identified. NASA Space Communications and Navigation (SCaN) will not be providing funds. The International Space Station Program (ISSP) does not want to fund the support either. The budget requirement needs to be reduced.
- N. The question was raised as to what happens should there be a non-nominal burn on Orbit 3 and ANT is not available and the Russian vectors are not in. Mr. Corley stated that the Russians have Orbit 5 passes and the vectors are available from that. When burns are moved, JSC knows ahead of time and can try to call up radar support. Mr. Gawel stated that it will depend on the time of day, whether support will be available or not.
- O. Messrs. Mike Gawel, Jim Bangerter, and Gary Morse accepted an action item to work with the ER to determine the response time to call up C-band support in a contingency (e.g., VV support) (action item 0910-NSG Cband-01).
- P. Mr. Bangerter stated that there is an upcoming Soyuz launch and asked if it would be possible to test the process of getting the Russian vectors and processing them. Mr. Warren Mitchell accepted an action item to, for the upcoming Soyuz launch, practice the process of receiving vectors from the Russians on ascent and provide a process time estimate (action item 0910-NSG Cband-02).
- Q. Mr. Powers stated that the FDF uses only the Russian vector for the 3rd burn on day 2. FDF does not do this for the 2nd burn on day 1, but the 2nd burn could be supported via the same process. Mr. Mitchell stated that FDF needs data from more than one site. Mr. Powers stated that FDF uses its own orbit solution for burn 2 and does perform a comparison of the FDF and Russian solutions. FDF gets its solution at approximately the same time as the TOPOs. Mr. Bangerter stated that ANT will not be available for the next launch and Mr. Powers stated that the FDF solution could be degraded.
- R. Mr. Bangerter stated that if the Russian vector comes in, in a timely manner, and our solution is degraded, then we should rely on the Russian vectors. Mr. Bangerter asked if the data can be received from the Russians earlier and Mr. Corley replied that JSC receives the data as quickly as FDF, and that we get preflight nominal data and provide it to the FDF.
- S. Mr. Morse stated that a contingency is a contingency and best effort is understood. The C-band support is not needed for Soyuz when the Russian vector is available.

- T. Mr. Morse asked that the discussion return to ATV/HTV support. Mr. Corley stated that the C-band support is back up. The programs have GPS and coherent Tracking and Data Relay Satellite (TDRS) transponders. Mr. Aquino stated that the C-band requirement was a NASA self-imposed requirement to provide a check. Mr. Marriott stated that there was concern regarding TDRS acquisition on the first flights.
- U. Mr. Morse stated that ATV/HTV C-band support can be provided for the upcoming winter flights, but should be evaluated for reduction/elimination on future flights.
- V. Mr. Bangerter stated that he believes the C-band support is not needed.
- W. Mr. Corley noted that the first mission involved a lot of demonstrations that do not come into play in subsequent missions. He also noted that if ANT is not available, procedures need to be modified. Telemetry and filtered solutions are available from the control centers and sent to FDF. Mr. Marriott asked what is needed if the data is not available from the control centers. Mr. Powers stated that coherent passes are needed from the TDRS East and West (a total of 4 passes).
- X. Mr. Gawel stated that more C-band radars will be going away in the future. A new plan will be coming out and timeframes will be available.
- Y. The question was raised as to Orion C-band requirements. It is possible that Orion may be returning in 2013. There were previous ascent and orbit requirements. The onorbit requirements are no longer valid. Mr. Morse stated that the integration process is important. If programs or projects are going direct to the Range with funds without coming to these groups (e.g., the NSG) that is a problem.
- Z. The question was raised as to Commercial Orbital Transportation Services (COTS) C-band support. Mr. Aquino stated that this is another example of NASA levying requirements on itself. Mr. Bangerter stated that after the first flights, C-band support will not be needed. Mr. Marriott concurred stating that the support would be needed for the demonstration flights only. Mr. Corley stated that there will be multiple GPS on the Dragon vehicle. Mr. Corley stated that Kwajalein would be needed for the first flight for the contingency 3rd orbit. Mr. Bangerter stated that Kwajalein would have to be scheduled even if not used. Mr. Marriott stated that Kwajalein would be needed for re-entry for demo flights 1 and 2. Mr. Bangerter stated that the program needs a requirement. Mr. Morse stated that if there are going to be multiple Kwajalein requirements, this is key to planning. Mr. Aquino stated that Kwajalein is a self imposed requirement and not a SpaceX requirement. SpaceX has stated that they do not want C-band support. Mr. Bangerter stated that SpaceX is possibly getting commercial communications support near the re-entry point. Mr. Corley stated that SpaceX is working on support from ships and the P3 aircraft (recording only).
- AA. Mr. Marriott asked why C-band support is required when the Space Shuttle is docked to the ISS. Ms. Carolyn Propst stated that this is a requirement from the early days of the program. Mr. Morse stated that this is funded via the SSP and operations should continue as they have, but keep in mind the cost of Kwajalein.
- BB. Mr. Aquino stated that he will talk with JSC Code DA-8 regarding these discussions.

CC. Mr. Morse stated that he will be receiving PIN rates from DFRC. He stated that he needs to know the Wallops range rates. Mr. Rob Hurley was assigned an action item to provide Wallops Range C-band PIN or per pass rates to Messrs. Jim Bangerter, and Gary Morse (action item 0910-NSG Cband-03).

DD. Mr. Jerry Wolfe stated that there is the Kwajalein assurance waiver issue to be worked. It may not be possible to get real-time data. Mr. Morse stated that if real-time or near real-time data is not available for Commercial Orbital Transportation Services (COTS), then the site would be of little use. The White Sands Missile Range (WSMR) does have a workaround in place. Ms. Propst stated that this applies to Space Shuttle as well. Mr. Gawel stated that the Kwajalein waiver is good through July only. He is waiting to hear on the status of the waiver. Ms. Propst asked if there would be a delay in receiving the data without the waiver and Mr. Gawel stated that there would be.

ACTION ITEM REVIEW

The following action items were assigned at the September 14, 2010, NSG HSF C-band requirements splinter meeting:

0910-NSG Cband-01	Mike Gawel/ER, Jim Bangerter/GSFC/NASA/HSF ND, Gary Morse/KSC/NASA
ACTION:	Work with the ER to determine the response time to call up C-band support in a contingency (e.g., VV support).
0910-NSG Cband-02	Warren Mitchell/GSFC/FDF
ACTION:	For the upcoming Soyuz launch, practice the process of receiving vectors from the Russians on ascent and provide a process time estimate.
0910-NSG Cband-03	Rob Hurley/Wallops ROC
ACTION:	Provide Wallops Range C-band PIN or per pass rates to Messrs. Jim Bangerter, and Gary Morse.

NEXT MEETING

If further meetings are required, they will be announced via email.

(Original approved by)
Mr. Jim Bangerter/GSFC/NASA/HSF ND