



July 28, 2013

Dr. Matt Mountain, Director  
 Space Telescope Science Institute  
 3700 San Martin Drive  
 Baltimore, MD 21218

Re: JSTAC recommendations regarding GO funding during *JWST* science operations

Dear Dr. Mountain:

The level of General Observer (GO) funding that is provided to enable the astronomy community to process the data from *JWST*, to model the results and to publish the scientific outcomes is a crucial factor in maximizing the science return from *JWST*. The very large investment by the US in *JWST* needs to be reflected in a level of GO funding that ensures a commensurate scientific return.

At the JSTAC meeting in May the committee participated in a discussion of GO funding that was guided by a presentation by Neill Reid (SMO Lead) regarding the methodology that had been developed as a cooperative effort between the *JWST* Program Scientist at NASA HQ, the *JWST* Operations Scientist at GSFC, and the *JWST* Mission Head at STScI. The JSTAC's attention to this topic arose in the Dec 2012 JSTAC meeting where NASA Astrophysics Division Director Paul Hertz identified a number of "questions to JSTAC." One of these dealt with GO funding: *Question to JSTAC: What are metrics for determining appropriate level of GO funding in context of lessons learned from Spitzer, Hubble, etc.?*

The approach that was presented to the committee at its May 2013 meeting was to use the experience from the GO funding for *HST* (post-SM4) and *Spitzer* during its cryogenic operations as reference levels, and to identify scaling factors that could be used to assess an appropriate level of funding for *JWST*.

The scaling factors that were identified included (i) observing efficiency (i.e., the fraction of time spent on-target), (ii) complexity (e.g., number of instruments, observing modes, complexity of modes and datasets), (iii) the learning curve for users (e.g., the initial difficulty of dealing with novel capabilities and datasets) and (iv) inflation adjustments.

The JSTAC was asked if the calculation of the *JWST* GO budget should take these factors into account, and if there are additional factors that had been overlooked.

The discussion by the committee focused primarily on the estimates in Neill Reid's presentation that had been derived as part of the cooperative effort noted above:

*Observing efficiency:*  $E_{JWST} \sim 1.56 E_{HST}$ ,  $E_{JWST} \sim E_{SPITZER}$

*Complexity:*  $C_{JWST} \sim 1.2-1.6 C_{HST}$ ,  $C_{JWST} \sim 1.25-1.75 C_{SPITZER}$

*Learning curve:*  $L_{JWST} \sim 1.4 L_{HST}$  (decreases to 1 in later cycles)

*Inflation escalation:*  $S_{JWST} \sim 1.27 S_{HST}$ ,  $S_{JWST} \sim 1.34 S_{SPITZER}$

There was clear consensus on the committee that these four factors were appropriate for consideration. The committee clearly felt that augmentation in the GO funding for *JWST* relative to *HST* and *Spitzer* was needed. The discussion focused on the degree of augmentation.

The factor that elicited the most discussion was that of *Complexity*. Many members noted that, in their experience, the factors under *Complexity* relative to both *HST* and *Spitzer* appeared to be underestimates. An example of how the new capabilities on *JWST* would prove to require

significantly more effort was cited by comparing the substantially increased challenge of reducing *HST* ACS and WFC3/IR grism data vs single object spectroscopy from STIS and COS. In reality, however, this change is small compared to what the astronomy community will experience for *JWST* – *JWST* is far more complex, with several new capabilities for a space-based observatory. *JWST* will include six different coronagraphic modes, aperture mask interferometry, multiple IFUs at near and mid-infrared wavelengths, and a multi-object spectrograph.

One new aspect was identified in the discussion and that was a factor relating to "time criticality". *JWST* is an *observatory-class* mission and experience shows that the maximal science from *JWST* will occur when scientific results are published quickly and followed up by further observations before the mission ends. The short (relative to *HST*) five-year mission lifetime requires a particular effort to minimize "scientific turn-around" and science publications.

With these two additional considerations, the estimates for the individual factors were seen as appropriately justified. The committee understood that the baseline estimate for the degree of augmentation relative to *HST* and *Spitzer* would come from multiplying the adjusted factors, but did not actually discuss any explicit level of the augmentation.

In summary the JSTAC committee:

- 1) clearly felt that an augmentation of GO funding for *JWST* relative to that for *HST* and *Spitzer* was needed;
- 2) endorsed the factors that had been chosen to evaluate the degree of augmentation;
- 3) was concerned that the current augmentation factor for *Complexity* was too low;
- 4) suggested that consideration be given to the crucial aspect of "time criticality" that results from the five-year mission lifetime; this could be accommodated within this set (under *Learning curve?*) or by augmenting the number of factors;
- 5) understood that the overall augmentation would come from multiplying the above factors, adjusted for any changes resulting from the JSTAC discussion.

The JSTAC would like to commend those at STScl for their efforts on this important issue and appreciates that this discussion was a cooperative effort between the *JWST* Program Scientist at NASA HQ, the *JWST* Operations Scientist at GSFC, and the *JWST* Mission Head at STScl.

The JSTAC committee fully supports efforts to establish an appropriate level of GO funding for *JWST* in the current post-launch operations budget. The JSTAC emphasized that, in view of the brevity of the mission, the return on the US investment of \$8B cost to launch for *JWST* will be fully realized only if the level of GO funding is adequate to permit very rapid analysis of the data and prompt publication of the results.

Sincerely yours,



Garth Illingworth  
Chair, JSTAC

For the JSTAC committee members: Roberto Abraham, Neta Bahcall, Stefi Baum, Roger Brissenden, Tim Heckman, Malcolm Longair, Christopher McKee, Bradley Peterson, Joe Rothenberg, Sara Seager, Lisa Storrie-Lombardi, Monica Tosi

JSTAC Ex-officio representatives of the space agencies: Jean Dupuis (CSA), Hashima Hasan (NASA HQ), John Mather (GSFC), Mark McCaughrean (ESA), Eric Smith (NASA HQ)