

Comments re: PVB's "GBT Construction – Reasons for Delay and Lessons Learned"

(Combined comments of BP and JLD – Dec 18, 2001)

A philosophical general comment: I think the overarching rubric of any GBT post mortem has to be "it had never been done before". Most (all?) of the discussion of why/how the GBT's problems occurred can be traced back to the fact that no one (not NRAO, not AUI, not RSI, not NSF, not all the brilliant minds on all the advisory committees) had ever done a fully steerable 100 meter clear aperture structure with an active surface with the GBT's exacting specifications. That fact presented a huge (if unrecognized) risk to doing the project. The bottom line: we did it. And, we did it well.

There is value in looking at the project's weaknesses to help avoid repeating them in the future. But, don't ever let them forget NRAO did something never done before, and we almost did it on budget, if not on time. And, the fact that the project time effectively doubled and we *still* did it almost on budget makes the effort that much more impressive.

If they're doing this examination to learn, that's good. If they're doing it to criticize, they don't know what they're talking about.

Origin of the Project and Definition of the Scope

BP: I'm not sure of the chronology of the design evolution, but at some point the decision was made to build the clear aperture dish rather than the standard symmetrical dish. I'm not sure how or when in the evolution the antenna cost estimate was adjusted for this change, but clearly whatever delta was added was not enough. Whatever formula or method was used to factor up the cost was a swag, which experience has proven wrong.

BP: Re bullet 3 – you mention that there was considerable pressure from the Hill to complete the project as soon as possible. There also was considerable pressure within NRAO (perceived by the project office, at least) to complete the project asap. Someone (Sieilstad, I think) did a calculation which showed the amount of dollars per day of the \$75 million being lost to inflation at some assumed rate. Of course, the number was large, so there was pressure within NRAO to hurry the project along to minimize the affect of inflation.

This is somehow connected to the eventual 5 year schedule (1 year design, 1 year fabrication, 3 year construction). Hall and I have talked about the original schedule; neither of us remember exactly how it came to be. He says when he arrived at NRAO he was handed the schedule which had been developed by scientists! In any event, it was the schedule we asked the bidders to meet in the antenna RFP. Now we realize, with the benefit of hindsight, it was unrealistic from the outset, but the bidders all proposed it because it was what the RFP clearly required.

Contract

JD: Re bullet 1 – the \$55M contract was close to our estimate of approximately \$57M.

BP: Re same -- apparently, our estimate was too low. The lack of experience (both ours, our consultants, and the industry in general) led to a low estimate, matched by RSI in their own ignorance or naivete. Remember that RSI hired Ted Riffe to help them prepare their bid. Ted knew the total project appropriation (it was public) and was able to coach RSI on how much we would require for in-house expenses, thereby deriving how much we would allow for the antenna contractor. That's the number RSI was bidding to. Even at that, they came in higher and we removed some items from the spec (final paint, rotating subreflector, etc) to negotiate them down to the \$55M

BP: Re bullet 4 – the two other bids were not only “significantly higher in cost”, they were higher than the entire project appropriation, even after a spec adjustment and a request for best and final offers! We were left with one bidder within the project’s ability to contract. We were caught, as it were, on the horns of a dilemma: either (1) scrap the bid and reconceptualize the antenna design, thereby giving up probably a year or more in the schedule, (2) go back to the Government for more money, or (3) go ahead with the one bidder we had. As you have written, RSI had a decent history, and we thought the antenna could be built for close to \$55M based on our estimate.

And, if folks want to speculate about what we should have done differently, remind them that we don’t know how RSI would have reacted had we chosen option (1) above. RSI wanted the job, and they had submitted a responsive and responsible bid which was within our project budget and close to our own estimate. If we had rejected their bid because the other bids were higher, there is a high likelihood that RSI would have protested. A bid protest could have been disastrous. At the time, the choice was clear—go for it with RSI.

Problems

JD/BP: Re bullet 1 – you may want to use some other word than “defective”. I think a defective bid is one that is not acceptable due to its deficiency in some area. RSI’s bid was, in hindsight, just wrong, way too low. But remember, they had a pretty clear idea what our antenna budget was, and they wanted to win the award.

BP: Re bullet 2 – “overly optimistic” is kind. It was just as wrong as RSI’s bid; way underestimated. All of this, again, I think is under the rubric “this had never been done before”.

Claims and Arbitration

BP: Re bullet 4 – I think the decision (PVB’s, I presume) to allow the project team to focus on completing the project while enlisting others (scientists again!) to support the legal counsel was a strategic masterstroke. It worked out very well for us who were still involved on a daily basis with RSI to be able to divorce ourselves somewhat from the ongoing claims, thereby preserving the working relationships. This should be a model for how to respond to future claims.

JD: Re bullet 6 – the funds made available by the one-time shift in the fiscal year were award funds *only*. The legal expenses were not included in the fiscal year change; the legal expenses were paid with NRAO operating funds.

Observations

BP: Re bullet 1 – True. If we had a D&D phase, we probably would have realized the price would be much higher. But, one might speculate that had the real price been known, we might never have been funded to build the project.

BP: Re bullet 6 – I still contend the legal costs should not be accounted as a project cost. The final project cost is \$75M less the \$510k plus the \$4.07M claim (a total of \$78,560,000) for a 4.7% overrun.

GBT Construction – Reasons for Delay and Lessons Learned

Origin of the Project and Definition of Scope

- **project was politically driven following collapse of the 300 Ft Telescope: a new telescope would be built and Green Bank would continue as an NRAO operating site;**
- **with community input, we decided to build a single-dish telescope that was significantly more powerful than any in existence, rather than copy, for example, the German 100m;**
- **funding came up front, first \$75M, later reduced to \$74.5M, with considerable pressure from the Hill to complete the project as soon as possible.**

Contract

- **a fixed price antenna contract for \$55M with RSI, contractor responsible for design and construction to performance specifications;**
- **a single, small (\$150k) change order near the beginning of construction;**
- **winning low bid from a firm that had performed well on earlier contracts (VLA panels, VLBA complete antennas);**
- **two other bids were significantly higher in cost, with most of difference in management, and less experience in antenna construction.**

Problems

- **winning bid may have been defective, although our estimates did not indicate this;**
- **winning bid had an overly optimistic schedule;**
- **RSI and subcontractor were weak on design, the first sign of trouble;**
- **RSI made many poor management decisions and project management weakness was compounded by sale of RSI to COMSAT and, eventually, to Lockheed Martin;**
- **contractor claimed to have spent twice the value of the contract in completing job.**

Claims and Arbitration

- contractor filed three claims totaling \$30M under the disputes provision of the contract, making a “defective specification” argument;
- AUI/NRAO offered \$4.5M in settlement, the estimated cost of litigation, which was rejected by the contractor, who called for (binding) arbitration;
- following a lengthy period of discovery, arbitration proceedings were held by the American Arbitration Association;
- AUI/NRAO mounted a vigorous defense, filing counterclaims, engaging expert witnesses, and assigning scientific staff members to assist AUI counsel;
- the arbitrator awarded the contractor a net award of \$4.07M;
- award and legal costs were paid from NRAO operating funds, the funds made available by a one-time shift in the Observatory fiscal year.

Observations

- single dishes are their own prototypes and the project should have had a design and development phase;
- we threatened default, but default was never a realistic option - a second contractor would have wanted at least as much as the first, and the money was largely gone;
- we could have re-scoped the project at the first sign of trouble, extending the cost and the schedule, and come in both on-time and on-budget *as redefined*;
- in effect, we chose to get the telescope finished for the agreed upon price, giving up schedule and letting the contractor absorb the costs of delay;
- we took a calculated risk that the contractor, dependent on government contracts, would not walk off the job - more contingency would have reduced this risk;
- although the arbitration award and legal costs added (12%) to the project total, the original scope of work was done for the original amount of money budgeted;
- the performance specifications in the contract should have been more complete and detailed, allowing less room for the construction of claims.