NAVIGATION TECHNOLOGY SATELLITE I

Charles A. Bartholomew
Naval Research Laboratory

ABSTRACT

The NTS-1 satellite was launched on July 14, 1974. This spacecraft is one of a series of technology satellites to be launched in support of the NAVSTAR GPS Program. NTS-1 was designed to verify the error budget and measure related performance factors including a commercial rubidium vapor frequency standard modified for space conditions. A description of this spacecraft and preliminary performance data will be discussed.

Paper was not received.

QUESTION AND ANSWER PERIOD

MR. CALLAHAM:

I observed that you had a very high rate of clock drift in terms of microseconds, before you issued a tuning command to the satellite. And after you issued the tuning command that you had calculated, I assumed you stopped the drift. You overshot and got a drift of roughly equivalent magnitude in the opposite direction. Since this was unexpected and since it took you 12 hours at least, to figure out that this was what the clock was doing, what would the poor user do if he got this sort of information and didn't know that's what the clock was doing?

MR. EASTON:

What we plan to do in operation, of course, is adjust the clock much closer and have it synthesized so that we can adjust for any drift in the clock. So it won't have these big changes in operation.

DR. SOICHER:

Are both frequencies on all the time? In the ionospheric experiment that you conducted, did you conduct amplitude scintillations? Who has the data available, and have you seen any significant scintillations at L band?

CAPTAIN HOLMES:

To answer your first question I presume you mean when you say both frequencies, you mean are both the L band and the UH frequencies on all the time? The answer to that is no, the reason for it is that because of the tumble of the satellite we have not achieved the temperature stabilization in the satellite that we had hoped for. As a result, we have peak temperatures in excess of 30 degrees centigrade and we don't feel that we can operate or that we should operate at least at this time, both frequencies continuously.

With regard to whether we have seen any significant scintillation data, I would have to say that right now because of the tumble rates and because of the changing rates that have been introduced into the satellite in order to translate the spin into a tumble mode, we would not I don't think right now that we want to say that the data is such that we would be sure that we've achieved significant results.

DR. SOICHER:

I'd like to suggest that the GPS people that L band may exhibit amplitude scintillation and of worse magnitude especially in equatorial regions and Arctic regions.

I'm sure that some work is being done along these lines, but it ought to be done in view of the power of this other system.

CAPTAIN HOLMES:

We would agree 100 percent with that.

DR. HELLWIG:

You show the tuning curve for the rubidium--how is the tuning done?

MR WHITE:

Dr. Hellwig, I'm not actually sure I understand your question. How do we calculate the tuning we did? Why did we do it? It was a C field command. We changed the current to C field. The reason we didn't hit the right spot was because we were using some tuning curves that we had generated on the ground for it under some different conditions, and it turns out that the temperature in the satellite was sufficiently different and when I guessed the new word, I guessed the wrong word.

We intend, in later work, to generate the tuning curve in the satellite and see what we can expect in the way of a Delta F change and see what happens then.

DR. ALLEY:

Is it possible to predict when the satellite will stabilize sufficiently to allow laser ranging to be done to the reflectors?

CAPTAIN HOLMES:

We're in the process of assessing what impact the current tumble rate will have on the experiment. Our feeling is that we will probably be able to do the laser ranging experiments even under the present conditions.

DR. ALLEY:

What was the period of tumble? How long might they be facing the earth?

CAPTAIN HOLMES:

The period is roughly 35 minutes, and that will provide probably on the order of 10 minutes of laser viewing time.

DR. ALLEY:

But you know the phase of that tumble sufficiently well that one could predict?

CAPTAIN HOLMES:

Yes.