VLBA ACQUISITION MEMO #168

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To: VLBA Data Acquisition Group

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Subject: More computer simulations on head wear and transition from thick to thin tape

If we assume that the volume of wear is proportional to travel (one of the basic laws of tribology - the science of wear) then the volume wear rate of a headstack will be independent of the contour (for a fixed operating environment). If we assume a headstack lasts 5000 hours the volume wear rate is

$$38 \times 300 \times 25400/5000 = 60,000 \text{ cubic microns per hour}$$

for an initial depth of gap of 38 microns and a step width of 300 microns. In order to wear an initially flat headstep into the stable profile (see Acquisition Memo #141) for 1 mil tape about 15×10^6 cu microns of material have to be worn away which will take about 11 days at the assumed wear rate. However, of more interest are the times needed to go from 1 mil to 0.5 mil tape. In this case, there is the relatively long time (about 5 days) to go between stable profiles for the two tape thicknesses and the relatively short time to go from a stable 1 mil profile to a usable 0.5 mil profile. Figure 1 shows the initial profiles for 0.5 mil tape along with the stable profile for 1 mil tape. Note that at higher tensions it should be possible to go immediately from thick to thin tape. Immediately going from thin to thick tape is always possible.

Figure 2 gives the time taken to obtain gap contact in going from a previously heavy use of thick tape (assumes a stable profile) to thin tape as a function of operating vacuum and headstep width. If the accuracy of these simulations can be verified then it might be advantageous to obtain headstacks with a wider headstep for use on transports which have to handle both tape thicknesses. [In the calculations made for Figure 2 it is also assumed that the wear rate is proportional to pressure - the second law of tribology.]

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MODULUS OF ELASTICITY = 8E05 LBS/SQ."
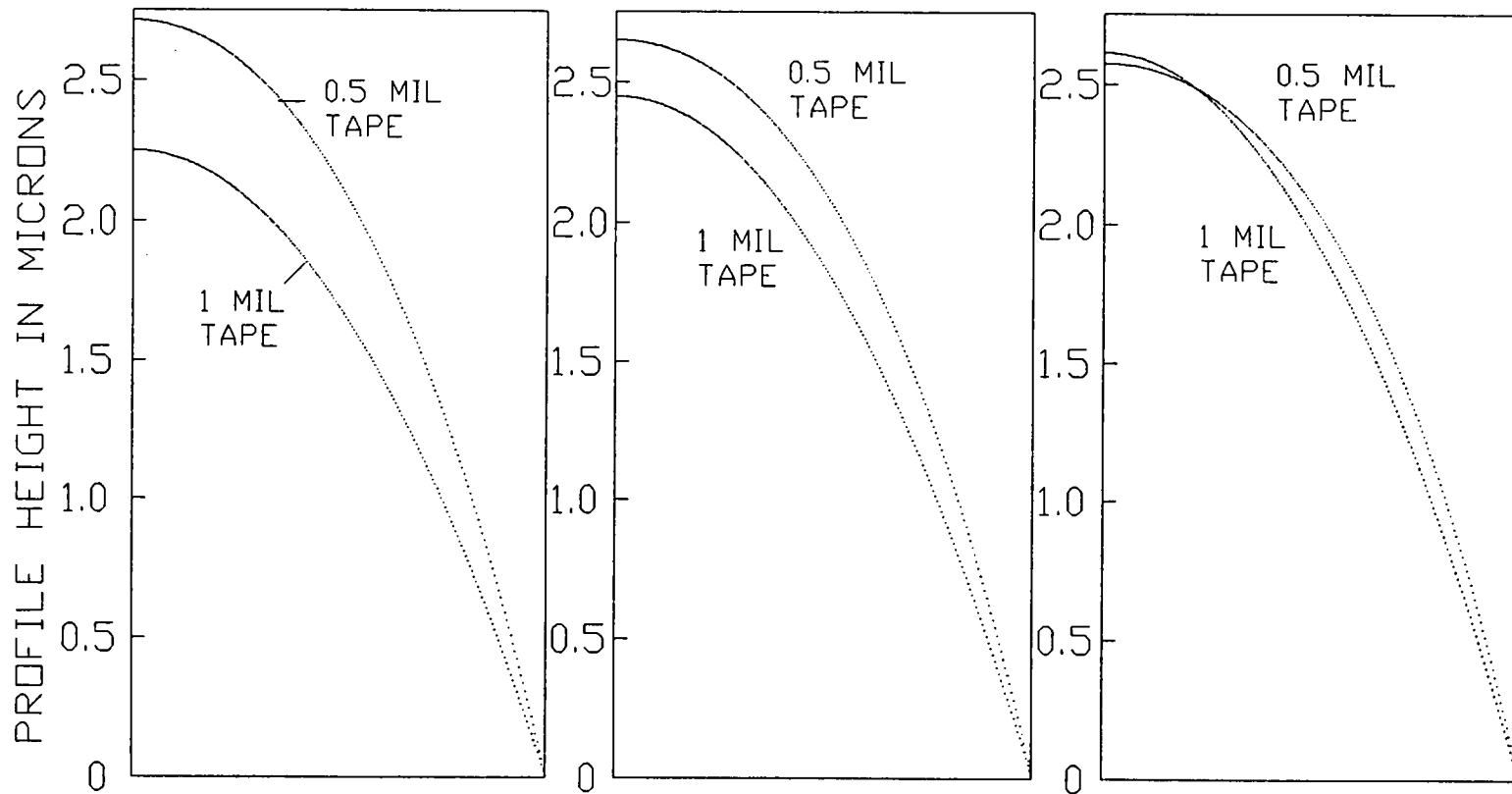HEADSTEP WIDTH = 300 MICRONS
WRAP ANGLE = 10 DEG (FULL ANGLE)

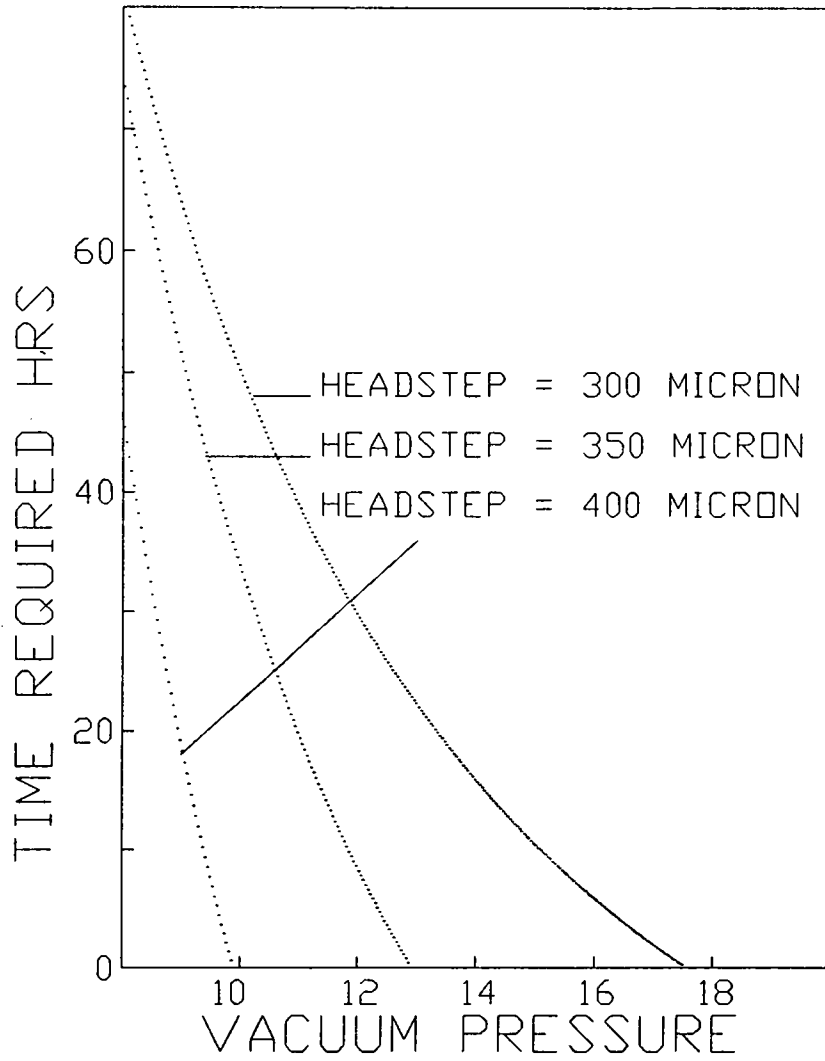FIGURE 1   STABLE PROFILES FOR 1 MIL TAPE AND INITIAL
PROFILES FOR 0.5 MIL TAPE

FIGURE 2 TIME REQUIRED TO RECONTOUR
HEADS FOR 0.5 MIL TAPE