To: Chris Blades, Al Holm  
From: Lisa E. Walter, Rick White  
Date: 8 Dec 89  
Subject: HSP Mode I Target Acquisition Test  
CC: Peggy Stanley, Colin Cox, Olivia Lupie

Four Interactive (Mode I) Target Acquisition tests were performed for the HSP on 30 August 89. The results are shown below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Positioned by</th>
<th>Object Position (SIAS)</th>
<th>Slew (SICS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>cursor</td>
<td>x = 13.6875</td>
<td>v2 = -1.852</td>
</tr>
<tr>
<td></td>
<td></td>
<td>y = 3.375</td>
<td>v3 = 0.243</td>
</tr>
<tr>
<td></td>
<td>centroid</td>
<td>x = 13.1653</td>
<td>v2 = -1.788</td>
</tr>
<tr>
<td></td>
<td></td>
<td>y = 3.02067</td>
<td>v3 = 0.416</td>
</tr>
<tr>
<td>04</td>
<td>centroid</td>
<td>x = 9.67537</td>
<td>v2 = 0.026</td>
</tr>
<tr>
<td></td>
<td></td>
<td>y = 8.60075</td>
<td>v3 = -0.595</td>
</tr>
<tr>
<td>07</td>
<td>cursor</td>
<td>x = 8.8125</td>
<td>v2 = -2.788</td>
</tr>
<tr>
<td></td>
<td></td>
<td>y = 18.6875</td>
<td>v3 = 2.086</td>
</tr>
<tr>
<td>0a</td>
<td>centroid</td>
<td>x = 18.1918</td>
<td>v2 = 0.148</td>
</tr>
<tr>
<td></td>
<td></td>
<td>y = 13.0154</td>
<td>v3 = 4.219</td>
</tr>
</tbody>
</table>

The last test, 0a, was believed to have a problem with the slew or the orientation of the North arrow because the V2 slew looked too small. So the slews were checked by hand according to the following SIAS to SICS conversion:

\[
x_c = -V 2 = a_{00} + a_{10}*(y_a - y_{wa}) + a_{11}*(x_a - x_{wa})
\]
\[
y_c = -V 3 = b_{00} + b_{10}*(y_a - y_{wa}) + b_{11}*(x_a - x_{wa})
\]

where \(x_a, y_a\) are the SIAS coordinates and \(x_c, y_c\) are the SICS coordinates, or the sign opposites of the V2V3 slews.

Each of the slews obtained during the test agreed with the results obtained by hand. However, it is not clear that the images displayed during the test were oriented correctly. Of the four test cases, one (04) is difficult to make a visual judgement on because the target was so diffuse. Of the remaining three, the orientation of the North angle appears to be different than we expected based on the PDB beta angles, the angular relation between the SIAS and V2V3 axes (see Figure 1). Possibly we have not done this calculation correctly, though; we are still trying to understand the details of this problem. Still, our best guess is that the beta angles in the PDB are not consistent with the SIAS-to-SICS conversion coefficients in the PDB.
Below is a summary of the inconsistency that we find:

<table>
<thead>
<tr>
<th>Test</th>
<th>DET</th>
<th>V2</th>
<th>V3</th>
<th>v2</th>
<th>v3</th>
<th>ours &lt;&lt; theirs</th>
<th>ours &lt;&lt; theirs</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>POL</td>
<td>-1.8</td>
<td>+ 0.4</td>
<td>+ 0.4</td>
<td>+ 1.8</td>
<td>v2 &lt;&lt; V3</td>
<td>v3 &lt;&lt; -V2</td>
</tr>
<tr>
<td>07</td>
<td>VIS</td>
<td>-2.8</td>
<td>+ 2.1</td>
<td>+ 2.1</td>
<td>+ 2.8</td>
<td>v2 &lt;&lt; V3</td>
<td>v3 &lt;&lt; -V2</td>
</tr>
<tr>
<td>0A</td>
<td>UV2</td>
<td>+ 0.15</td>
<td>+ 4.2</td>
<td>+ 4.2</td>
<td>+ 0.15</td>
<td>v2 &lt;&lt; V3</td>
<td>v3 &lt;&lt; + V2</td>
</tr>
</tbody>
</table>

Note that the last observation has a different mapping from our V2V3 to the OSS display values of V2V3. That explains why the last observation was noticeably inconsistent in the direction of its North arrow compared to the other tests.

Attached are diagrams illustrating 1) the definition of the beta angles, 2) the visual results obtained during the August 1989 test and, 3) the orientation that Rick and I think the images should have had.

We have been informed that the problems we discovered are probably due to the fact that the PDB is incorrect. Olivia Lupie is now updating the PDB for the HSP. We will re-run the target acquisition test when the update is officially completed.
Figure 1

Beta Angles
Angular relation between V2V3 and SIAS axes
According to OSS, the position of the V3 axis with respect to North is 0.0007080 deg.

For all 4 test cases, the north and east arrows are centered on point (0, 0), which is the location of the SICS origin in SIAS coordinates.

Figure 3

Figure 4

Figure 5

Figure 6

HSP Mode I Target Acquisition Test Results
30 Aug 09
These diagrams have been oriented so that v3, which corresponds to north, always points up.

Figure 4

Test 04  VCLRUT

Figure 5

Test 07  VCLRVT

Figure 6

Test 01  VCLRP T

Figure 7

Test 04  VCLRUT

Figure 8

Test 07  VCLRVT

Figure 9

Test 01  VCLRP T

How the target acquisition tests should have looked.
According to OSS, the position of the V3 axis with respect to North is 0.040,000 deg.

For all 4 test cases, the North and East arrows are centered on point (1.0, 0.0) which is the location of the SICS origin in SIAS coordinates.

HSP MODE I TARGET ACQUISITION TEST RESULTS
30 Aug 07
These diagrams have been oriented so that V3, which corresponds to North, always points up.

Figure 6:

Test 01 VCLRP_L_T

\( a_x = 0 \quad b_x = 0 \)
\( a_y = 0.15317 \quad b_y = -0.160832 \)
\( a_z = -0.22711 \quad b_z = -0.22213 \)
\( \beta_1 = 228.9745 \quad \beta_2 = 315.9745 \)

Figure 7:

Test 04 VCLRU1_T

\( x = 8.6 \quad \beta = 141.8846 \)
\( y = 9.7 \)
\( a_x = 0 \quad b_x = 0 \)
\( a_y = 0.38124 \quad b_y = 0.88946 \)
\( a_z = 0.46797 \quad b_z = 0.15312 \)

Figure 8:

Test 07 VCLRV_L_T

\( x = 8.8 \quad \beta_1 = 46.1946 \quad \beta_2 = 136.1960 \)
\( y = 18.7 \)
\( a_x = 0 \quad b_x = 0 \)
\( a_y = -0.27153 \quad b_y = +0.28834 \)
\( a_z = +0.36109 \quad b_z = +0.35246 \)

Figure 9:

Test 08 VCLRU2_T

\( x = 18.2 \quad \beta_1 = 190.9660 \quad \beta_2 = 109.0960 \)
\( y = 13.0 \)
\( a_x = 0 \quad b_x = 0 \)
\( a_y = -0.38363 \quad b_y = -0.13437 \)
\( a_z = +0.15930 \quad b_z = +0.96556 \)

How the target acquisition tests should have looked?