3/21/01
Examples of 3-Axis mode usage for Science Observations:

1. CRISP functionality test –

A. In this test we want to center the moon in the CRISP field-of-regard and keep it there while acquiring a set of images.

Steps:

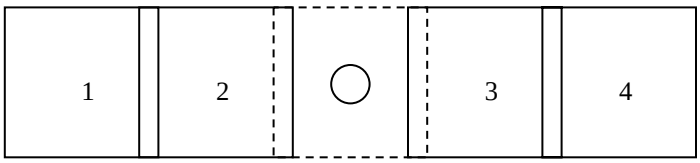
1) Orient s/c – Guidance Mode 5 (except boresight needs to be crisp, gm5 has [0,0,1])
   virtual boresight = any unvignetted CRISP boresight
   aimpt = moon center
   roll vector = [0,-1,0]
   roll reference = Sun ok????

2) Set CRISP tracking 'on' (target = moon, boresight = center of imager, motion removal on). This will center the CRISP field-of-regard on the moon, and remove deadband motion.
3) Acquire images

B. Put CRISP field of view in 4 adjacent positions (in mirror scanning plane) relative to moon. At each position stop and acquire sets of images.

Steps:

1) Continue s/c orientation same as above.
2) Continuing with CRISP tracking on, we now also command scan mirror to move to an offset position relative to the moon center so that the CRISP fov is at the position 1. We then acquire images.
3) Repeat for other positions.



2. **CRISP imager/spectrometer coalignment, psf, etc. –**
In this test we will want to microstep the CRISP slit across the moon while acquiring CRISP spectrometer data.

Steps:

1) Command spacecraft to the inertial orientation as in example 1A (Guidance Mode 5)
(except boresight is needs to be for CRISP, gm5 has [0,0,1])
Virtual boresight = any unvignetted CRISP mirror position
Aimpoint = moon center
Roll Vector = [0,-1,0]
Roll Reference = Sun ok?
4) Set CRISP tracking 'on' (target = moon, boresight = center of slit, dead-band motion removal on). This will center the CRISP field-of-regard on the moon, and remove deadband motion.

2) Command a mirror offset to move slit off target until moon is completely outside of slit. Then scan the mirror to cause slit to to move all the way across moon while acquiring spectrometer data and imaging data.

3. **CRISP mirror pointing and mirror plane test –**
Here we want to take CRISP images at 5 different mirror positions (2 aft, 3 forward) spread across the extent of the mirror plane. The purpose is to calibrate the geometry of the mirror plane.

Steps:

1) orient spacecraft in fixed inertial position such that the mirror plane will intersect a region of sky with many good star clusters: (Guidance Mode 10)
Virtual Boresight = Anything in y-z plane (default CRISP unvign. boresight ok)
Aimpoint = selectable inertial J2000 vector
Roll Vector = [0,1,0] (this'll work)
Roll Reference = selectable inertial J2000 vector

(Roll reference and aimpoint selected so that s/c is pinned in an orientation that will allow the CRISP mirror plane to view selected region of sky).

2) Command CRISP to first fixed mirror position, acquire data
3) Command CRISP to move to second mirror position acquire data
4) Repeat for remainder of the positions.

Note: it will NOT be necessary to remove deadband about x axis in this observation. A little smear in the stars will be good.

GENE – wants more

4. CFI Pointing Test and OPNAVs

Acquire CFI images of some star or star field.

Steps:

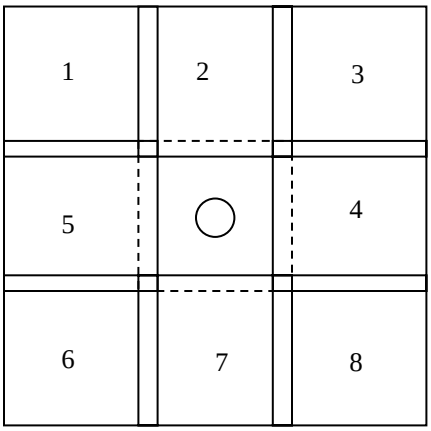
1) orient s/c : (Guidance Mode 11)
   Virtual Boresight = center of CFI
   Aimpoint = inertial J2000 vector
   Roll Vector = [0,1,0] ok
   Roll Reference = anything (inertial ok)
2) Acquire images

5. CFI Functionality Test

Put moon at center of CFI, then acquire a set of images. Then put center of CFI at 8 additional positions which make a 3x3 grid centered on the moon.

Steps:

1) Orient s/c : Guidance Mode 5, except need default boresight to be CFI
   Virtual Boresight = center of CFI
   Aimpoint = moon
   Roll Vector = [0,1,0] ok
   Roll Reference = sun ok?
2) Acquire images
3) Re-orient s/c: Guidance Mode 5, except need default boresight slightly offset from CFI
   Virtual Boresight = slight offset from CFI center to achieve position 1
   Aimpoint = moon
   Roll Vector = [0,1,0]
   Roll Reference = sun ok?
4) Acquire images
5) Repeat for all 7 remaining positions.



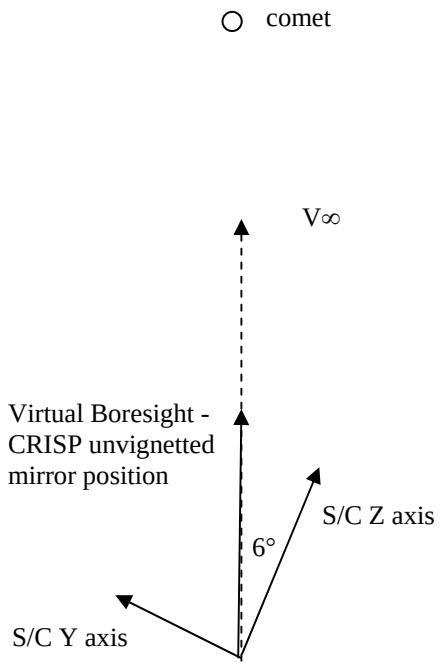
6. CRISP Comet Approach Observations

In these observations we will be orienting the s/c so that the z axis is slightly offset from the V∞ at an angle that will put CRISP viewing regard on the comet. For unvignetted/vignetted CRISP observations that angle would be about 6/3 deg from s/c V∞ in the trajectory plane, toward the comet.

Steps:

1) orient s/c : Guidance Mode 2, or 6 or new one (depending on what combination of aimpt and roll ref; must change default vir.bore to be CRISP unvign, and fix roll vec = +y if use sun as roll ref.)

   Virtual Boresight = smallest unvignetted CRISP mirror position (including uncert.)
   Aimpoint = inertial vector of V∞, or comet? Karl says comet is better
   Roll Vector = [0,1,0] ok
   Roll Reference = inertial, or sun?
2) Set CRISP tracking 'on' (target = comet, boresight = center of slit, dead-band motion removal 'on'). This will center the CRISP field-of-regard on the moon, and remove deadband motion.
3) Acquire images or spectrometer data



7. CFI Comet Approach Observations

Same as above, except for CFI. Orient the s/c so that the z axis is slightly offset from the s/c trajectory direction, at an angle that will put CFI viewing regard on the comet.

Steps:

1) orient s/c: Guidance Mode 3, 8 or 9 or new one (depending on what combination of aimpt and roll ref, but if use sun as roll ref need to fix roll vector to be +y)

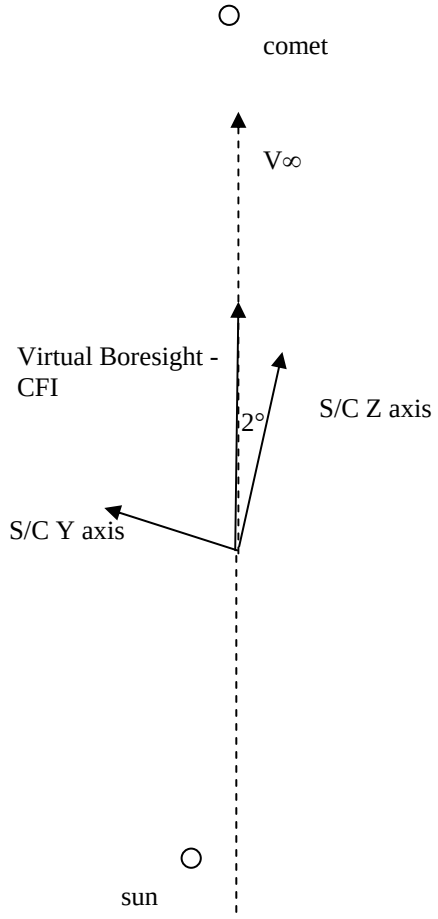
Virtual Boresight = CFI center

Aimpoint = inertial vector of V∞, or comet?

Roll Vector = [0,1,0] ok

Roll Reference = inertial or sun?

2) Acquire images



8. CFI/CRISP Comet Encounter Observations

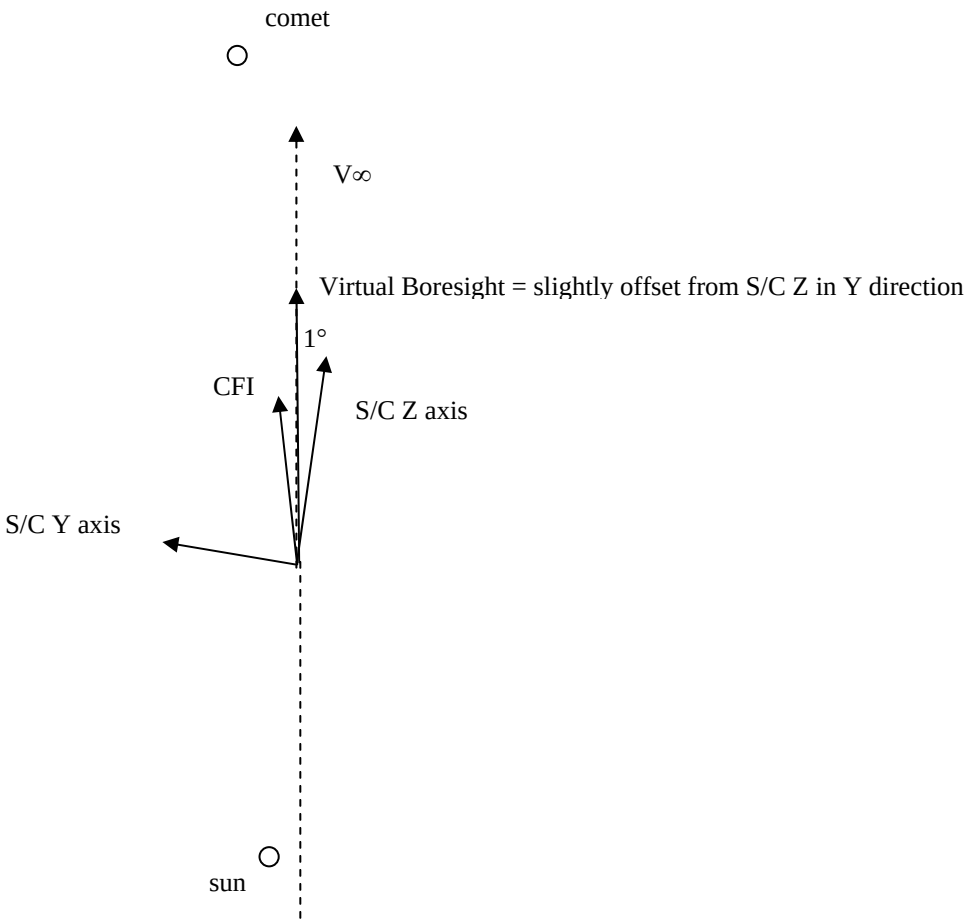
In these observations we will be orienting the s/c so that the z axis is slightly offset from the s/c trajectory direction. The main difference between this one and above number 7, and 8, is that we're using comet as roll reference (has to be far enough off V∞ to give a good solution).WHEN TO SWITCH TO THIS MODE?

Steps:

1) orient s/c : Guidance Mode 1(need change default vir.bore to be slightly off from Z)

   Virtual Boresight = slightly offset from Z in the direction of Y axis for the small angular offsets required at different times (i.e., .5 deg at about –180 sec)
   Aimpoint = inertial vector of V∞
   Roll Vector = [0,1,0]
   Roll Reference = comet
2) Acquire images and spectrometer data

This first diagram shows example at about 3 minutes before closest approach where we want Z to be slightly offset from V∞ to allow CFI to view comet.



Next diagram shows case where we want Z to be exactly aligned with V∞ for the final approach sequence.