

# J m d h k I \ h i h j b l e g u f h i j p b y f

u j g b l g b b k b o j h g b a p b y h j b l , k l u d h d k  
h j b l e g h c k l g p b c  
l h j - Jared "Smitty" Smith

## I h ^ h l h d

I j f b g Z g u c h d m f g l h e z Jared Smith, © 2005. <u fh\_ k \ h [ h g h i \_ ] h ^ b l v w l m  
k l Z x , k g z y i \_ h ^ k k u e d h c g z h j b g z g u c h d m f g l . ? k e b u [ky ` b l k v k h f g h c](http://smithplanet.com/stuff/orbiter/orbitaloperations.htm) , y  
h i m [ e b d m x k k u e d m g z z r i h ^ . <u l z \_ f h \_ e z k z h k l h y l \_ e v g u \_ u i m k d b w l h c  
k l Z b , g h b f c l \_ \ b m , q l h h j b g z g u c h d m f g l  
( k f . <http://smithplanet.com/stuff/orbiter/orbitaloperations.htm>) f h ` \_ l [ u l v b a f g \_ g k p e x  
z l m z b a z b b .

G z k l h y s \_ j m d h k ^ k l h i g z g z g h e y h [ m q g b y k e ^ m x s b f h [ b l z g u f h i z b y f -  
u z g b z b \_ h [ b l , k b g o h g b a z b y h [ b l b k l u d h d z k h j [ b l z g h c k l z p b c . W l h g \_ i h k l h  
i g g v g h [ o h b f u o i h p m j . J m d h k ^ l h d e a z \ k \_ [ y i h y k g g b y z o o k l b c , Z  
l z \_ g h [ o h b f u c w d k h k \ f o z b d m h [ b l z v g u o i h e l h \ . <u [ m ^ h a g z d h f e \_ g u k g z [ h e \_  
l h q g u f b b w n n d l b g u f b i p f z , i h a \ h e y z b f b u i h e g b l v a z z q m k [ e b \_ g b y b k l u d h d b k  
h [ b l z g h c k l z p b c .

L [ h z by:

- [Orbiter - Space Flight Simulator 2005](#) - i h k e g y k b y k b f m e y l h z .  
x = h l h c k p \_ g z c k d h k f b q k d b f d h z [ e f g z h [ b l \_ . < g z h y s f \_ j m d h k h k l \_ b f l k y \  
b m k l z g u c D e l t a G l i d e r , o h l y u f h \_ b k i e a h z e f h c d h z [ e v , b f z b c  
z z h ] b q g u \_ o z b k l b d b i h l y \_ b a z z k m l h i e b z .  
x < k p g z j b b h e g z [ u l v d h k f b q k d z y k l z p b y , k d h l h j c b [ m m l i h k b l k y k [ e b g b \_ b  
k l u d h d z . K l z p b y h e g z [ u l v g z k l z e g h c h j [ b l \_ . < g z h y s f \_ j m d h k h k l \_ b f l k y  
\ b m F m g z g z D h k f b q k d z K l z p b y .

< b z h ] \_ O r b i t e r L a u n c h p a d ( b z h ] a z n h z k f m e y p b b ) , \ u [ b l \_ d e z d m P a r a m e t e r s  
( z j u ) b d e x t l \_ O r b i t S t a b i l i z a t i o n ( z [ b e b a z b y h p l u ) , u d e h l \_ l \_  
N o n s p e r i c a l g r a v i t y s o u r c e s ( G \_ h \_ j b a k d b \_ z l Z p b h g g u \_ b k l h g b d b ) , b , h b z r  
d h z v b f l \_ b e v g h h z b g g u c ( j z b k b q g u c ) i j \_ ^ e l h i e b \ Z b e b l y p ,  
u d e h l \_ L i m i t e d f u e l ( H ) j Z g b q g g h d h e b h l \_ l h l h i e b \ Z ) . h k \_ l h j , d z l u h k b l \_  
l o g b d m \ u i h e g g b y h p l z v g u o h i z b c k m i h s \_ g g u f b m k z h \ d z f b , u k h \_ l \_  
h z h e \_ z e b k l b g u \_ g z k l h c d b i z j z f l j h \ .

z k h y s \_ j m d h k ^ k l h g z k z h \ z q l \_ g z b k i e a h z b \_ k l z ^ z j l g h ] h D e l t a G l i d e r e y  
k l u d h d b k h k l z g h c F m g z h g h c D h k f b q k d h c K l z p b c ( z \_ - F D K ) . ? k e b u  
b k i e a m \_ S p a c e S h u t t l e , b f c l \_ \ b m h k h [ g h k l b ] h h k g h \ g u o b ] z c , d h l h j \_ f h ] m l  
h [ z l v h i h e g b l e g u c ) z z e g u c f h \_ g l . D h f \_ l h ] h , \ g z h y s f \_ j m d h k h k l \_ b f \_ l k y  
\ b m , q l h m z g l i h [ e f \_ k m \_ g g u f k l z f b u o h h f g z m k l h c q b m x h [ b l m .

? k e b u g \_ a g z , k d z h ] h k p g z b y g z z , u [ b l \_ k p \_ g j b c S p a c e S t a t i o n s \ m i r . s c n , b e b ,  
k e b m z k k l v n k l z h e g g u c [Delta Glider III](#) , u j b l \_ k p \_ g j b c D e l t a G l i d e r I I I \_ 2 0 0 5 \ E a r t h  
S c e n e r y \ D o c k e d t o M I R . s c n .

u klZj l m \_ k ih\ pghklb A\_feb , u fh\_l agabl egh kgbabl v aZ jZ u l hiebZ gZ  
 ihk efnzb\_ h[blZ gu\_ fZ\_j bkihea my FN> -Dzn (Map MFD) (FN> -  
 fgh]hnmgdpbhgaguc bk iec ). <u fh\_l u [w ] fy klZ lZbf h[jZ ahf , qh[u h[blZ  
 klZpbp ihohbeZ ijf h gZ fklh f klZ . Ihke\_ klZ jZ u lZ fh\_l h kihe ah \ky  
 Map MFD ey gZemqrjh uZ gbZ gby Z hj [blu k hj [blhc klZpb b.

< wlhf kpg Z dnev gzh^ blky gZ h[bl\_ ipkludhguf d klZp bb "Fbj " , dhlhZ \  
 Zgh klb gzhblky \ [he\_ gm^ h[ghf ey f\_hj [blZg h]h i\_ jL Z d FDK f\_ kl\_ . H[blu  
 "Fbz " b FDK kbevgh hlebqZk y m] hl m]Z . Wlh [ueh k^e zh gZg h ih l]h \ Zb x  
 Jmkkdbq dhlhju\_ g\_ohl\_eb hgh]ggh hl ke\_ bZ\_ \ klZpbp . Ih wlhfm hgb gZ l hieb gZ  
 lhf , qh[u h[blZ FDK [ueZ j ki hehgZ lZbf h[jZahf , qh[u FDK g\_ ij hohbeZ \ jgb\_  
 rbhlu \ lh \_ kZfh\_ \ fy , qh b klZpby "Fbj " . Lzh\_ ihehg\_ s\_ c ipeh d lhf m , qh  
 Zgu\_ f\_ h[ blZegu\_ jelu fm wlbfb klZpby f b [ueb [u kbevgh aZnggu .

Hgzh , \ Orbiter\_ klZ pby "Fbj " ihfsgZ gZ mh[ gm x h[bl l m eZmx \ iehk dklb wdebilldb ,  
 dhlhZ k \_ \_ gkdheh h hlebqky hl h[blu FDK . Wlh h[ kl hyl\_ evkl h ihfh\_ gZ ohj r h  
 bamqblv hkghgu\_ hij Zbb f \_ h[ blZ evguo jelh\ . Ke^ ml lZ\_ aZflbv , qh ey  
 kh\_j\_ gby jZ kh klZpbp "Fbj " gZ FDK gZ gh[ohb f g\_ kh\ k\_f Zbkblbqgu c dnev ,  
 gZfj\_ , Delta Glider , l.d kh\_ f gg uc Zgu uc dhkfbqkd bc dhZ [ev (lZhc dZ Space Shuttle)  
 g\_ bfl\_ gZ [hjm aZ ZkZ l hiebZ , h klZqgh] h ey lzh]h jZ .

<h-ij\_ uo, hiebf gdhlhju\_ lfjgu :

- x <uZb\ Zgb\_h[bl (Aligning Orbits) - uZ gb\ Zgb\_ iehk dkl b h[blu Z r]h dnev y  
 lZbf h[jZahf , qh[u hgZ kh\ Z Z k iehk dklx h[blu klZ pbb gZgZgy .
- x KbgohgbaZby h[bl (Syncing Orbits) - ipb b\_kdhj hkl b b ukhlu Z h dnev y d  
 lZbf agZ\_ gbyf , qh[u \ gdhlhju\_ fhfgl hg i jre hgg v [ebadh hl klZpbp  
 gZgZ gby .
- x Kl udhd Z (Docking) - jnq gh\_mjZ\_ gb\_dhZ\_ f lZbf h[jZahf , qh[u kludh\ hgguc mZ  
 dhZ [ey kfh ] khZgblky kh kl u dh\ hgguf mZhf , Zheh \ g guf gZ klZ pbb gZgZgy .

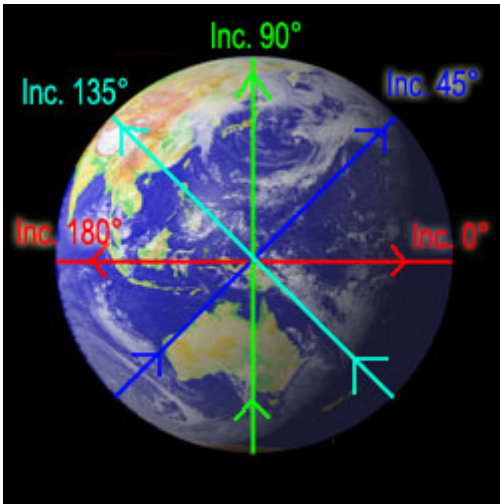
**<uZbZb\_ h[bl**

**Dj l dbc hahj**

<u^f s\_ gkdheh h lfjgu :

- x Iehkdh klv hj [blu (Orbital Plane) - ie hkdhd v, \ dhlhjc gzhblky Z weebilbqk dZ  
 h[blZ . Ieh kdhdv hdhehfg hc h[bl lu klZ ij hohbl qa pglj Afe b, gh fh\_  
 [ulv gZehg gZ ih^ gdhlhju\_ m]ehf hghklblegh iehk dklb wdZ . l klZ l  
 k\_l\_ , qh u a yeb [hev hc ebkl [mfZ ]b b gZkh\ Zeb gZ gf khx hj [blm . Ebkl [mf Z]b b  
 [m^ iehk dklx h[blu .
- x GZehgg\_ (Inclination) - ebqbgZ mjeZihh]Z iehk dklb h[blu hghkb legh  
 iehk dklb wdZ . GZehgg\_ 0 jZ ^mkh\ hagZqZ\_ , qh iehk dklv hj [blu kh\ Z Z\_l k  
 iehk dklx wdZ . GZehgg\_ 90 jZkh \ hagZqZ\_ , qh iehk dklv hj [blu kh  
 k\_l\_ guc b guc iehk Z. LZ\_ hj [blZ ikd Z\_ iehk dklv wdZ \ no fklZ .
- x >he]h]Z h kohys]h mZ (Longitude of Ascending Node, LAN) - he]h]Z lhqdb, \ dhlhjc  
 h[blZ ij\_ kdZ\_l iehk dklv wdZ hZ ip Zgbb dhZey hl jZ dkl\_ jm .

JZ kfhlb f wlb ihgyb y [he\_ i h]gh . GZ ehgg\_ b he]h]Z h kohys]h maeZ\_l kl\_  
 hieyk hpglZbx iehk dklb hj [blu hghkb legh Afe b. GZehgg b\_ fgyly hl 0 h 180  
 jZkh \ . < kemqZ , dh]^Z gZehgg\_ \_ h 0 jZ kh\ , j\_ qv b^ h[ wdZ hZpZghc h[bl\_ , ih  
 dhlhjc dhZ [ev blky \ lhf \_ gZehgg\_ , \ dhlhjf ] Zky Af ey (k aZiZ gZ h klhd,  
 ijfZ hj [blZ , Prograde). ?keb \_ gZehgg b\_ h 180 jZ khZ f , lh ]h]y yl lZ\_ h[  
 wdZpZv ghc h[bl\_ , lhedh dhZev ih gc blk y \ gZegb b, h[gh f Zgbx  
 Afeb (k h klhdZ gZ aZ Z^ , h]Z\_ h[blZ , Retrograde). H[blu k gZehggbf\_ 90 jZkh \  
 jhoh]l gZ iehk Zfb b gZuZ ky iheygufb .



?keb ebqbgZ gZehggby h[blu ebl f\_ ^m0 b 180 jZkhZ f b, lh lZy h[blZ x ikdZ iehk dhkv wdZjZ . <hkohysbc mæ - wlh lh qdZ \ dhlhjc h[blZ ikd Zl iehk dhkv wdZjZ ip "ihff\_ " dhZey "gZ " wdZjZ f , lh klv ij b Dgbb dhZ [ ey k j Z gZ k\_ \ j . < Orbiter'\_ he ]hlZ h kohys ]h mæZ - mjehZ e bqbgZ, dhlhZ fgykly hl 0 h 360 jZkh \ . G\_ ke^ ml kqblZ v, qlh h ejhlZ h koh^ ys]h mæZ - wlh he]hlZ \ lhf \_ kf uke\_ , qlh b he]hlZ , bkihea nly ip gZjZb b gZ ihp ghklb A\_feb . LZy he]hlZ hk ohys]h mæZ h[blu ihkl hygg [u fgyeZ v ba-aZjZ gby A\_f eb . >he]hlZ hk ohys]h mæZ hj [blu - [he\_ Zkehgz ebqbgZ , dhlhZ [Zbjnlky gZ ihehg b Afeb hl ghkblegh KhegpZ ?\_ bafgb\_ aZ bkbl hl lhqdb kgg ] h Zhg klby b j]b o, [he\_ kehguo sc . >ey gZ kqZ k Z \_ g lhedh lhl nZl , qlh he]hlZ h koh^ys]h mæZ h[blu hiZyL lhqdm \ dhlhjc h[blZ ij\_ kdZ l iehk dhkv wdZjZ \ Zguc fhfgl \ j f gb .

**Logbqkdb\_ lh gdhklb**

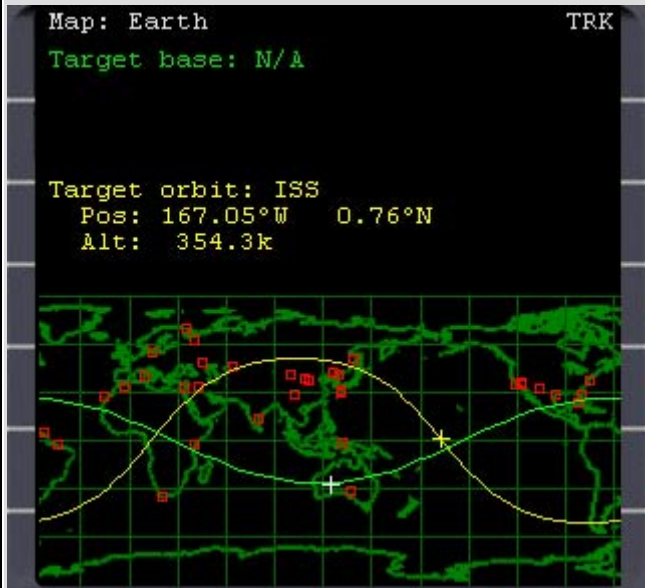
*Если вы заинтересованы только в разъяснениях о том, как долететь до МКС, эту часть можете пропустить.*

□ hj [blu fh]ml bflv hbgZhh \_ gZehggb\_ , gZ Zebqgu \_ he]hlu hk ohys]h mæZ. Wlh hqgv Z guc fh f \_gl . GZ dZgd\_ u r\_ ihdZ Zgh, qlh hj [blZ , bfx Zy gZehgg b\_ 45 jZkh \ (kbggy ebgy, h[blZ bh f "k j [j Z") ikdZ l iehk dhkv wdZjZ j^ -lh \ Zhg\_ :kl Zbb . < lh \_ j fy j]Z hj [blZ , bfxZ lZ\_ \_ gZehggb\_ (45 jZkh \ , ikZ l , qlh gv b^\_ h ]hem[hc ebgb, lhev dh gZgb\_ b ` gby ihlbiheh ` gh\_ lhf, qlh mdZg h gZ bkmgd\_) ikdZ iehk dhkv wdZjZ j^ -lh "gZ lhc klhg\_ " - gZ Xgh c :fpdhc . GZehggb \_ hbgZhh \_ , gh he]hlu hk ohysbo maeh - Z agu\_ . NZdlbqkdb , \ Zghf ip f j , bah [Z ` \_ggfh gZ bkmgd\_ , b^ gh, qlh iehkdhklb h[bl ijgdmeygu j] j]m .

GZ kfh f ^e\_ kl gpbb "Fbj" b FDK bf\_ \_ h^bg dh h \_ gde hg\_gb\_ - 51.6 jh nkhl . LZh\_ gZehggb\_ [u eh uZ h jkk ddbf ey lh]h , qlh [u bflv ha f h` ghklv bkihea hZ v khc k\_ juc dhkf hf (Z kihegguc gZ 51.6 jZ ^mkh k\_ gh c rbhlu ) ey aZ nkdZ dhZ \_c, h[kembZ o h\_ kl Zp bb. Ohly gZehggby h[bl hbgZhu , he]hlu hk ohysbo maeh kns\_ kl gh hlebqky , kbegh aZ jmggy fh]blZ guc ie l k hg hc kl Zpbb gZ j]mx . GZehggby "Fbj" b FDK lZ d \_ kbevgh hlebqky hl gZehggby hj [blu Engu b gZehgg by iehk dhklv wdebilbdb, qlh eZ wlb kl Zpbb gmh[gufb \ dZkl iehsZd ey klZ Z fieZguo ielh\ . < Orbiter'\_ , gZ[h hl , hj [blZ kl Zpb b "Fbj" ebl \ iehk dhklv wdebilbdb, qlh eZ kl Zpbx mh[ ghc lhqdhc ey gZjZ (beb aZ j\_ gby ) fieZguo ielh\ .

LZbf hZhf , ey lh]h , qlh [u ih i Zklv k hj [blu "FbZ " gZ hj [blm FDK fu hegu g\_ lhedh ke Zlv gdehg \_gb\_ gr\_ c hj \_blu l ddf\_ , dd g dehg\_gb\_ hjb lu FDK, gh b ih\ g miv iehk dhkl hjb lu lZ , qlh [u hgZ ikdZ wdZj \ lo \_ lhqdz b \ lhf \_ gZ \_ gbb, qlh b h[blZ FDK (l\_ . uh \ gylv he]h lu h koh^ysbo maeh\). < Zgh klb gZehggby h[bl "FbZ " b FDK hbgZhu , Z he ]hlu hk ohysbo maeh\ kbevgh

. < Orbiter' h[blu "FbZ " b FDK hlebqKy b gZehggbf\_ b he]hlZb  
 hk ohysbo mæh\ .<u fh\ m[blk y \ wlhf , hldj\ FN >-dZm (<Shift+M>) b mdZ \  
 dZkl\ p\_eb FDK (gZbl\_ dghidmTGT b bl\_ "ISS").



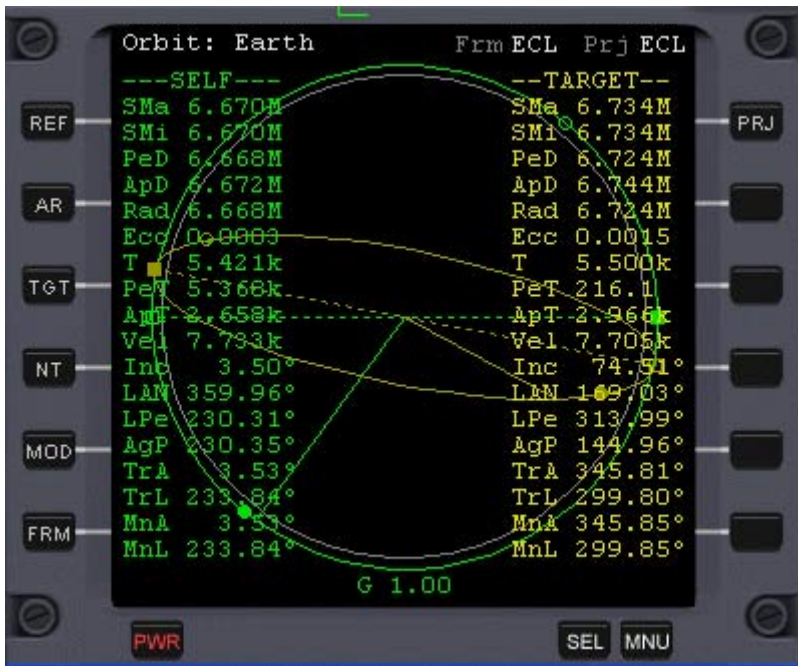
GZ gmgh p\_mlv iehk dklv khc hj [blu lZbf h[zhf , qlh[u hgZ kh\ Z Z k  
 iehk dklx h[blu FDK. DZ lhedh wlh [m\ kezh , fu hdZ ky \ p beb iha Zb  
 FDK.

### >bkiec ujig blgby hjb (Align Planes MFD)

Align Planes MFD hj [bl Z k \_ bgklj m\ \_glu , gh[ohbfu\_ ey lh]h , qlh[u hj b\_glbhZ  
 h[blm è Z f h]j Zahf . ?keb u gZhdikv gZ klZeghc hdhehafghc h[bl\_ , lh  
 hegh\ Ky g\_h q\_f . Wφ\_glj bkbll\_ b u khIZ hj [blu g\_bfk j Zs ]h agZ gby - gZb[he \_  
 wj]h\_ fdbf fZ hf y\eylk y ih\ h]l iehk dklb h[blu .

*На заметку: Во многих инструкциях говорится о том, что сначала следует выровнять высоту и эксцентриситет вашей орбиты с орбитой цели, а потом заняться поворотом плоскости орбиты. Можно делать и так. Только после поворота плоскости орбиты все равно придется менять ее высоту для того, чтобы провести синхронизацию вашего положения с положением станции-цели (конечно, если только вы не ОЧЕНЬ везучий). Я нахожу более простым и правильным сначала провести поворот плоскости орбиты, а уж потом заняться выравниванием высоты одновременно с синхронизацией положения. К тому же разница в высотах может помочь провести синхронизацию, что позволит сэкономить топливо. Такой подход представляется более осмысленным, нежели монтировать идеальную орбиту, потом поворачивать ее и ПОРТИТЬ достигнутое совершенство во время синхронизации.*

☐☐ ☐☐ **Hjb** ☐☐eguc **FN** > (Orbit MFD) ki Z (<Right Shift + O>). **Mklghbl** ☐ **FDK** ☐  
**d** ☐ **kl** ☐ **p\_eb** (<Right Shift + T> b \ bl\_ "ISS"). Orbit MFD ih dZau \ Z\_l gZr mhj [blm \ ieZ\_ (k eb  
 wlh g\_ lZ , gZbl\_ <Right Shift + P>, ipf . ihQbd Z). Kj\_ Zy ebgby ihdZuZ dhglmj  
 ihpgh klb Afeb (k eb k\_ b\ i Zegh , gZr Z h[blZ g\_ hegZ ik \_dZ ] h), aegZ  
 ebgby - gZZ h[blZ , \_ elZ ebgby - h[blZ FDK.



<u fh` \_l\_ bly hj [blm gzh dhz [ey \ iez . FDK bfl\_ gzhggg\_ 74.51 ]zhkh \ (hghkblegh wdebilbdb, ipf . ij\_ hqbdz ), lā qlh u bbl\_ , qlh iehk dhkiv \_ hj [blu kbevgh gzhggz hghkblegh iehk dhkib gzh hj [blu . GZ aguc fhfgl , hkghg h\_ , qlh hegh gk bgjkh \ Z v, wlh lh , qlh[u gZ ip\_ ]c (PeD, periapsis), l\_ . z kkhygb\_ hl pglz Afe b h kZfhc gbgc lhqdb gzh hj [blu , g\_ [ue fgv r\_ , q\_f 6550 df . ?keb hg himklbk y gb\_ , fu gZqgf\_ pieylv zhknjm b gZz h[blz [m^ pnr \_gZ.

HI dhc l\_ FN> <u jv g bby (Align Planes MFD) ke \ Z (<Left Shift + A>). Mk zhb l\_ FDK d\_ kl\_ p\_eb (<Left Shift + T> b bl\_ "ISS"). Lij\_ bk iec ihdā uZ l\_ gZ ldms\_ gzhggg\_ (Inclination, Inc) b hejhl m hk ohys ]h mæZ (LAN), Z lā\_ gzhggg\_ b hejhlm hk ohys]h mæZ ey FDK (kf . iju ih^ gzh vx Target:). FN> <u bby ihdāu Z lā\_ z agbpm\ gzhg gbyo (RInc). Wlh agz\_gb bgjkm\_ gk [hev\_ k ]h . Gh [ oh^bfh h[blk y RInc=0. Hkiz evgu\_ iju ihh]ml gZ iezh u [z ] fy deagby b]ec .



Align Planes MFD ihdāuZ lā\_ ]zqbkdh \_ iezh \_gb\_ gzh hj [blu - wlh ae\_gz hdjnh klv . Aeguc \ dlhj P ih dāu Z ldms\_ iehgb\_ gzh dhzey gZ hj [bl\_ .

AN (hk ohysbc mæ , Ascending Node) b DN (gbkohysbc mæ , Descending Node) ihdā uX , ]^ bfggh iehk dhklv gZc h]blu ikdZ iehk dhklv hj [blu FDK.

G\_ ke^ m\_l ky au\Z v wlb AN b DN k hkohysbf b gbkohysb f mæB gZc hj [blu hlgkbleg h wdZihZ . < gghf kemqZ bfkky \ bñ mæu ij\_ kq \_gby ño h]b l. ?keb klv ^ h]blu , lh hgb ikqgb \_f khbo iehk dhkl\_c h]Z amk ijfmx ebgbx . Lhqdb ikqgby wllc ijfhc k ebgbc e]hc ba h]bl b [mñl \ hkohysbf b gbkohysbf mæB (AN b DN). <u lā fh ` \_l bly wlb lhqdb ij\_ kqgby gZbk ievo Orbit MFD b Map MFD. <hkohysbc mæ - wll lhqdz ikqgby , qj\_ a dhlhjm x fu ihohbf ip ðgbb k]Z gZk\ \_j .

Ihñk b gZjk .:  
 Descending Node - Gbkohysbc mæ  
 Ascending Node - <hkohysbc mæ



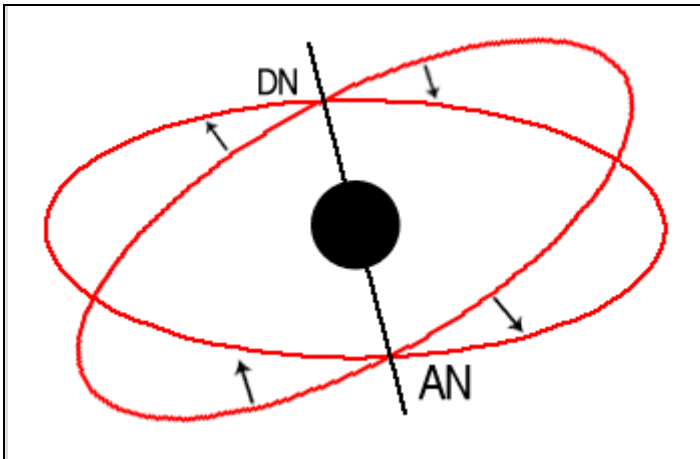
< gZ kemqZ FDK b gZr dhZ [ev h]Z ðmlky k aZiZ gZ h klhd (ijfZ h]blZ , prograde). ?keb [u klZgpy ð]Zkv \ ñ]hf gZg bb (h]Z lgZ h]blZ , retrograde), hlg hklegh\_ gZehggb\_ [ueh [u gZgh]h [hev\_ (ih l]h \ ðh kv [u gZgh]h [hev r\_ mkbec e y uZ gbZ by h]bl ).

Fu fh f ^ eZlv uZ \ gbZb\_ fZ g\_\j u giñk^ klqgh nae\_ hk ohys]h b gbkohys]h mæh\ . Ip wllf fu [mñ hgh] fgggh f\_ gylv gZehggb\_ gZc h]blu b ihñZbZ iehk dhklv hj [blu ñ khì Zby k iehk dhklx h]blu FDK.

**Logbqkdb\_ Ih gdhklb**

*Здесь мы рассмотрим более детально наши действия. Если вам не интересно, вы можете пропустить эту часть.*

F□ kieZbjnf\_ ðeag by ð]Zy lābf h] Zahf , qlh [ u wll ihbkoh^ beh \ l\_ fhf \_glu , dh]Z gZ dhZ [ev ij hohbl qj\_ a ebgbx i\_ kqgby iehk dhklc h]bl (l\_ . qj\_ a hk ohysbc b gbkohysbc mæu hlgkblegh h]blu klZpbb -peb ). Fu [mñ gZylv ly]m ð]Z ec ijgðmeygh ld nsc iehk dhklb gZc h]blu . ?keb mX ðibehi ðeag \ j ` bf \_ "prograde", wll [mñ dā Z a gZgb\_ \ p beb gba (dhg\_qgh, ke b kqblZ v, qlh u kb^bl\_ \ dke\_ , Z g\_ ieZ ih dhZ ex lmZ -kZ !). Mkdhj\_gb\_ , ijgðmeygh\_ iehk dhklb hj [blu keZ h ebyl\_ gZ ùkhlm b kdjh klv, gh iphbl d ihñhlm iehk dhklb hj [blu . Nhdmkkhkl hbl \ lhf , qlh[u ihñmlv iehk dhklv gZc hj [blu lā , qlh[u gZehggb\_ klā h iZeguf H>GH<J?F?GGH k l\_f , qlh[u h]blZ ikdZ wdZj \ lo \_ fklā , qlh b h]blZ FDK.



h[Z \v , qh h[blu E ]h dhZey b FDK - wlh kl Z gu \_ dhepZ , khbggu\_ \ no  
 bZeg h ihlbi hehguo lhqdZ . DhepZ fh]ml k\ h[hgh Z s Z y \ lh qdZo  
 djegby hghkblegh j] j]Z . lZegh \_ ihehgb\_ - wlh dh]Z h[Z dhepZ eZ \  
 hghc iehk dklb b u]e yyl dZ hgh dheph . ?keb fu d eaz b ]Zv \ fhf \_gl  
 ihohgb y lhqdb ikq gby hj [bl b gZyf ]h ly ]mijb dmeigh ie hkdhk b  
 h[blu , lh fu dZ Z ih hZ qbZ f gZn h[blu h d]m] wlhc lhqdb .

Ihehgb \_ lhqdb ik\_ qgby bafg blky gagZ blegh , gh gZehggb\_ h[blu bafgblky  
 gZgh]h kbevq\_ . < kns ghkl b, fu [m^ bafgy lv gZehgg b\_ gZc hj [ blu , Z Z \_  
 h d]m] lhqdb ikq\_ gby hjbl . lhke\_ aZ jgby fZ g\_\ j Z gZ ehggby b he]hZ  
 hk ohys]h mæZ gZr \_c h[blu [m m l khZ k khhl k lmsbfb iZ Z f \_lj Z b h[ blu  
 kl Zpb b -pe b .

<uZ gbZb\_ hjbl

k eb u wlh]h s\_ g\_ kZb , Zk l u dmc l kv kh kl gpb\_c Fbj (<Ctrl + D>). M[b l kv \ lh f,  
 h l de\_ g ebg\_cguc j\_bf RCS (RCS - reaction control system, l\_ ^bl\_ eb hjb\_gl pbb  
 b kl beba pb b), i j\_de\_ gb\_ k j\_bf \ j s\_g by g ebg\_cguc b hj l gh - <Numpad /> .  
 >ey lh]h , qlh[u mZblk y hl kl Z pbb, ih]l\_ 1-2 kdmgu deZrm <NumPad 9>. AZj hcl \_  
 ghkh]hc h d e (del r <K>).

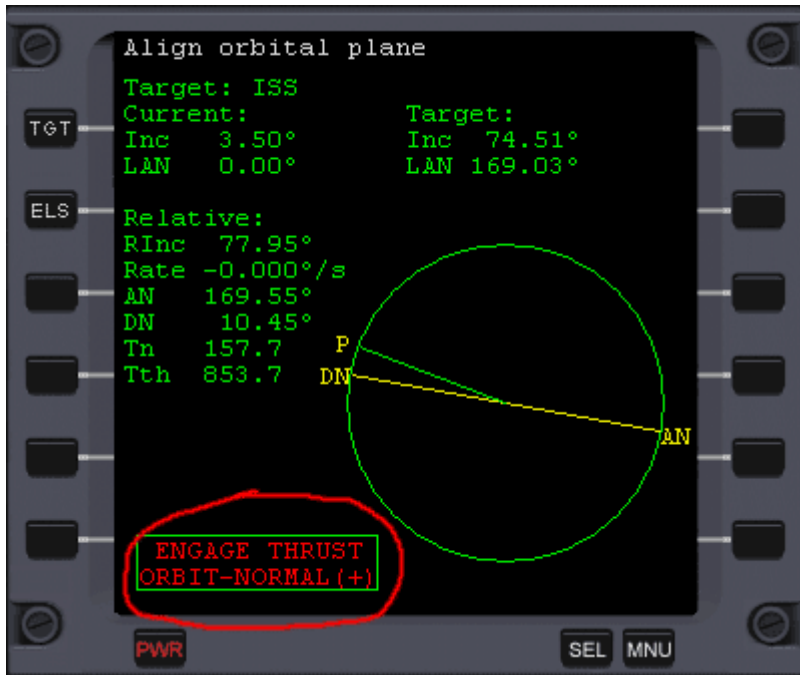
Align Planes MFD Z kx gh[ohbmx gZ kcqZ bgnhfZ pbx . Hiebl\_ ldms\_  
 ihehgb\_ dhZey (Z bmk -\ dlh j P). ?keb g dhj\_e ij b eb\_ l ky d \ hk oh^ys\_fm mæm  
 (Ascending Node, AN), ^ey \uj \g b\g by hjbl ihg^hbl ky ^l ly m\ gijle \_gbb gl b-  
 ghjfeb hj bl u (anti-normal), ih hf m de bl \ lhibeh \ j\_bf Orbit Normal (-). Ihs\_  
 k\_ ]h aZfgblv wlh ih hbgZhu f Z bZn Z - Ascending Node b Anti-Normal, lh b j]h\_  
 gZbgZy gZ AN.



?keb gr dhje\_ i j beb\_ ky d gbkoh^ys\_fm mæm (Descending Node, DN), ih l j\_m l ky  
 ^l ly m\ gij \ e\_gbb ghj f eb hjb l u, ih hf m de bl \ lhibeh \ j\_bf Orbit  
 Normal (+).



aZ Align Planes MFD. Dh]Z I j gkiZ I KILL THRUST kf\_gbl ky g ENGAGE THRUST  
 deæbl\_ ih egmx ly me gu o ^\b l\_e\_c (deæRZ <NumPad +>).



Iþ h]Z x sf b]æ hghkb legh\_ gæ ehgg\_ (Rinc) he ` gh gæZ mfg wky . ?keb  
 hgh meabqby , agæ bl u ijmlæb gZ \egb ly]b (deæbeb g\_lhl bf ZibehiZ .  
 >b]Z ev ^he\_g j o h l o ihj , ih d Rinc g kj g y l ky k 0° E o ^h l o ihj , ih d g  
 ahj b l ky l j gkiZ I KILL THRUST. (<udeægb\_ b]æy ihbahbky ij b ihfhsb  
 deærb <Numpad \*>, ipf . ih^ qbdZ). ?keb agægb\_ Rinc [ebadh\_d gmex g\_ [m^ h k l b]gmlh  
 aZ hgh d ægb\_ ^ b]æy , gbq]h klZ r gh]h, Z a] gb\_ dhZ ev \ ihl bkihehð hf  
 gægb b bl\_ ihlgh] h ihyegby lækiZ ENGAGE THRUST. I Z fj\_ Tn gZ  
 FN> - wih } fy hklbgby ke^ mx s \_]h mæZ h[ blu (hk ohÿsh beb gbkohÿsh ) \ kdmg^æ .  
 IZ fj\_ Tth - ip[eba blegh\_ l f y ælu b]æy . Ihkdhedm fu deæZ f ly]m lhedh h  
 l f y ihohðby mæh\, lækiZ æ ENGAGE THRUST heg ihyeylk y lh]Z , dh]Z Tn  
 klæ h \_ f gv \_ , q\_f Tth. Ba-aZ [hev]h æebqby gZdehggbc gæ hj [ blu b hj [blu  
 klæbb -pe b ihlgh \_ l f y Z [h lu b]æ ec [m^ [hevbf . >ey lh]h, qlh[u [u klj \_  
 ihæZ hl hgh]h mæZ h]blu d ]h]fm , u fh ` \_ l bkihea hZ v 10-d]h\_ mkdhgb\_  
 l f gb (iæægb\_ fh j\_b fæ mkdhj\_gby l f gb hkms\_kley lky ip ihfhsb deæR  
 <T> b <R>).

Ba-aZ [hev r h]h gæZ h]h agægb y Rinc fh ` l ih lj \_ [h]æ ky 2 beb 3 deægby b]æc ,  
 i] q\_f [m^ h k l b]gmlh agægb \_ Rinc, [eb adh\_d 0. lh klh deæZ\_ b]æv lh]Z , dh]Z  
 wih]h ihkbl FN> b æZ\_ wih \ iæghf gægb (anti-normal æ y hk ohÿsh mæZ AN  
 b orbit normal æy gbkohÿsh mæZ DN).

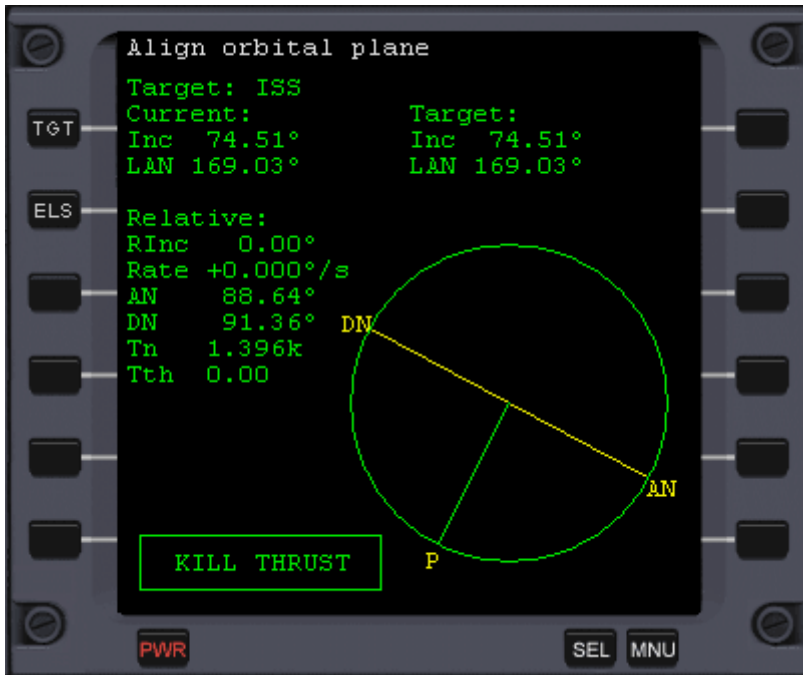
<[ebab gmeh]h agæ g by Rinc bg^bd]ju AN b DN gZqgml "m]æ " hl Z k b læ kiZ KILL  
 THRUST [m^\_l ihyeylky k\_ [uklj . G\_æZkb fh hl j\_ bf ZibehiZ (normal + beb normal -),  
 u fh l b]gh]h Z v bgkljmdp b Align Planes MFD hghkblegh lh]h, \ dæhf bfgg h  
 gægb æ ly]m. Ihklh , g\_ fggy hpg]æ b dh]æy , ihea nclv jæufb  
 b]æyfb (main thrusters, deæR Z <NumPad +>) beb j \ kgu fb b]æyfb (retro thrusters,  
 deæRZ <NumPad ->). AZZ qZ - ip[ebabl v ag\_gb Rinc d 0 gk dhe dh]ha f hg h. >ey [he\_  
 lhqgh]h f Zg\_bj h]by fhgh bkihea hæ RCS \ ebqghf b f\_ (deZ br b <NumPad 9> b  
 <NumPad 6>). Læbf fZ ghf fh ` gh h]blk y ægb pu f\_g\_ , qf 0.1 jækZ . ?keb mæ lky  
 h k l bq Rinc=0, u m bbl\_ , qlh dhZ [ev gZ bk ie\_ dæ Z aj Zkihehbkly f\_ ^mfæ j æ mæh  
 AN b DN.

(GZ kZ hf æ\_ fh ` gh kdhev m]hgh lhqgh ip]blv Rinc d gmex, bkihea my j\_ bf fæhc ly]b  
 hkghguo ^ b]æc (<NumPad +> \ khq]æbb k deærc <Shift> æ I IHKL?!?GGUC gæj  
 ly]b jæh] h b]æy hl gmeyh fækb f æg hc, lh \_ kZfh\_ dæky l j kguo b]æc )



pf mfgvghc \ 10 ꞑ lyjb ꞑ]ꞑc  
khql\_ Zgbb k deꞑrc <Ctrl>, ipf . ihꞑbd Z).

RCS (<NumPad 9> b <NumPad 6> \



Относительное наклонение 0 градусов. Наклонение и долгота восходящего узла нашего корабля и станции-цели теперь совпадают.

ꞑ ꞑꞑꞑ , liꞑ iehk dhklv hj [blu gꞑh dhꞑꞑ khꞑZ ^ꞑ k iehk dhklꞑ hj [blu FDK.

## KbgojhgbaZ pby hjblꞑ

### Djꞑꞑ dꞑꞑc hahjꞑ

Pꞑꞑꞑ kbgojh gbabhl ꞑby h[bl khkl hbl \ lhf , qlh[ u ihemqblv ipfgh\_ khꞑ ꞑ gb \_ iha bꞑꞑꞑ gꞑh dhꞑꞑ b FDK \ ih klꞑ kl\_ b \ j f gb ip g[heꞑhc (ih^ ꞑꞑꞑ y dhꞑꞑꞑ ꞑ\_) hlghkbleꞑ hc kdjh hklb \ fhf \_gl fZ dꞑꞑꞑꞑ h]h kꞑe bꞑꞑꞑ .

<h-iꞑ uo, ꞑdeꞑꞑꞑ ꞑꞑꞑꞑ b gꞑꞑꞑꞑꞑ ihelhf , ihdZ qblꞑ wihl ꞑꞑ jndhh^ klꞑ . Kꞑꞑꞑ ihk lhꞑ imlv G? KHKL UDH<:LVK Y k FDK - wih ihꞑꞑꞑ y k^\_eZ v wih g\_ ꞑꞑꞑꞑ ꞑ b dꞑ fhgh [uklj \_]!

lꞑ lf , dꞑ ihꞑꞑꞑ , ꞑꞑꞑꞑꞑ gd hlhꞑ ꞑ`gu\_ ꞑꞑꞑ u foꞑꞑꞑꞑ h[blꞑꞑꞑ ihelhf . l\_ ꞑh^ h[ꞑ gby [heꞑ \_ꞑꞑ lhꞑ h[blu , dhlhꞑ y kꞑ Z [heꞑ\_ . ꞑ fg vr\_ ꞑkh lZ h[blu , lf [uklj \_ꞑ ꞑ b`\_l ky ih gc dhꞑ [ev . Ghꞑꞑꞑꞑ wih g\_ khk f ih gyl gh. ?keꞑ ꞑ ohlꞑꞑ aZꞑꞑꞑ y, ke^ mꞑ ꞑ lyjm l\_ lꞑ (prograde). Wih meꞑꞑꞑ ꞑꞑ ꞑꞑ h[blu b aZꞑꞑꞑ ꞑꞑꞑ dhꞑꞑꞑ (meꞑꞑꞑꞑꞑ iph^ h]j Zs gby ). ?keꞑ \_ gmgh mꞑꞑꞑꞑꞑꞑ ky, ke^ mꞑ aZlh f hablv gZ hj [bl\_ (j \ \_k gZy ly]Z , retrograde), qlh ipꞑ l d mfgꞑ gbꞑ j Zaf ꞑ h[blu b meꞑꞑꞑꞑꞑ kdjh hklb dhꞑꞑꞑ gZ gc . lꞑh^ h[ꞑ sgby mfgꞑꞑꞑ y.

Fg [u ohlehk v j aꞑ ꞑꞑꞑ ꞑꞑꞑꞑꞑ \ lꞑhf ꞑꞑꞑ `gbb - "GZ hj [ bl\_ , ꞑꞑ lh]h , qlh [ u mꞑꞑꞑꞑꞑ , gmgh aZꞑꞑꞑꞑ y b gꞑꞑꞑ hl , ꞑꞑ lh]h , qlh[u aZꞑꞑꞑꞑ y, gmgh mꞑꞑꞑꞑꞑ y!" ꞑꞑꞑꞑ [ lꞑ , Z?! ?keꞑ ꞑ gꞑꞑꞑꞑꞑ gZ kꞑꞑꞑꞑ ꞑꞑꞑꞑꞑ weebilꞑꞑꞑ dhꞑ h[bl\_ , lh ꞑ e]dh aZꞑꞑꞑꞑ , qlh q\_f [eb` \_ ꞑ d Afe \_ , lf ꞑꞑꞑ ꞑ Z kdjh hklv (hlghkbl \_ꞑꞑ A\_f eb, dhgꞑꞑ ). Eꞑ gh, ihꞑꞑꞑ ꞑꞑꞑ .

>ꞑ ip lhf , qlh hj [blu eꞑ \ hgh c iehk dhklb , fu fh`\_f [ulv ꞑ r\_ (b, khhlꞑꞑ lꞑꞑꞑ , fꞑꞑꞑ ) , qꞑ FDK beb gb\_ (b [uklj \_). <hafhg lꞑꞑ kf\_r ꞑꞑ ꞑꞑ ꞑꞑ , dh]ꞑ h[ blZ gꞑh dhꞑꞑꞑ kꞑꞑꞑꞑ ꞑꞑꞑꞑ . Gꞑꞑ ꞑꞑꞑ - gꞑꞑꞑ lꞑꞑꞑ fhfgl , dh]ꞑꞑ gꞑꞑ ꞑꞑꞑꞑꞑ ,

b kdhjklv [mfm l hklzqgh [ebadb d FDK, qlh[u kl Zeh ha f h` guf ij h\k lb k[e b` \_gb\_ b kl udhdm.

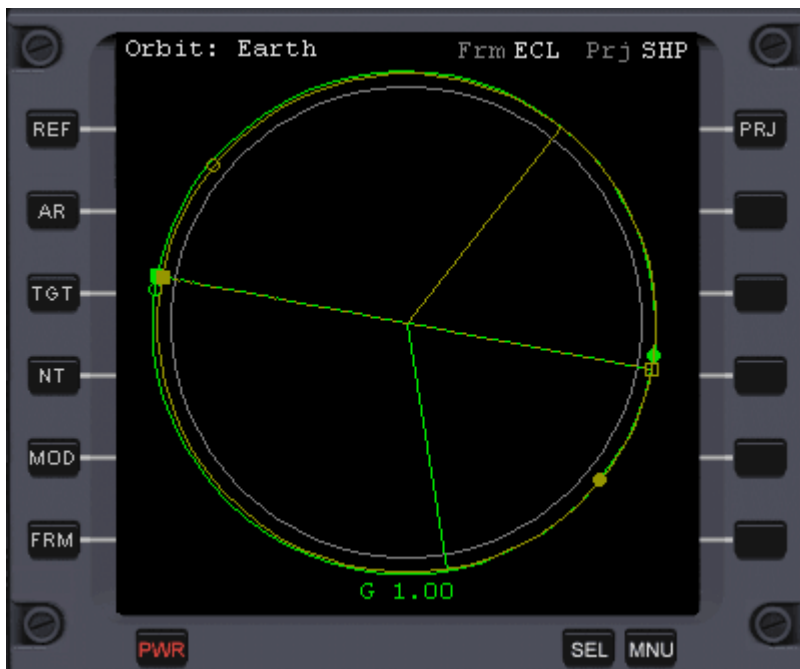
?keb u kc qk hl dh\_ l\_ **Map MFD (gfb** I\_ <Shift + M> b lu\_ qj\_ I\_ FDK \ d\_k I\_ p\_eb, lh mbbi\_ , qlh hj [blu u]eyyl khzbo fb. (< lfgz , ipgylo \ hqkl\ ggh c dhkfhgbd\_ , ke^ m\_l kdZaZ v, qlh lj \_db h\_bo hj\_ b\_ khi\_ ^I\_ . Ljhf gzuK jbzgm x ihdpbx h[blu dhkfbqkdjh dhze y gZ ihpghk lv A\_f eb, ipf . i\_ j\_qbd Z).



e uc dkl ihdzu Z iha bpbx gzh dhze y, eluc - ihab pbx hj [ bIz evghc kl zpbp -peb .

Lij gZ ke^ m\_l mkdhplky , qlh[u h]gZ FDK gZ h[bl \_ beb aZfeblk y, qlh[u iha \ heblv FDK gZ gZ .

Lij hldhc l\_ **Orbit MFD (g fb I\_ <Shift + O>)**. M[blkv , qlh FDK lu\_ j\_g \ d\_ kI\_ p\_eb (<Shift + T>). Orbit MFD bfl\_ gkd heah jzlh \ i RZ \_gby bgnhfzbb , fm dhlhjfb fh` gh ipex qzy , gZ fz gZ FN> -dghidmMOD.



<u bbl\_ , qlh gZ hj [ bIz (ae \_guc djm)] b h[bIz FDK (eluc djm) hqgv ihohb . Fu klz\ zb kh kl z pbb "Fbj ", k h[bl lu, [ebadhc ih nhf\_ d lhqghc hdjmgkklb . Hg Zdh, keb u

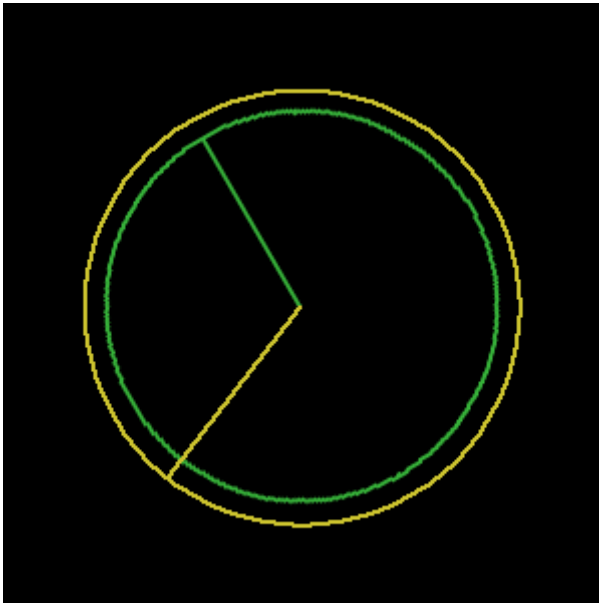
g\_k "FbZ ", lh Z hj [blZ fh` \_l bflv efxm weebilbqk dmxnhfm . HgZ fh` \_l [ulv gfg]h [he vr\_ beb gfg]h f\_ gw \_ , qf\_ hj [blZ FDK beb fh` \_l ik \_dZ \_ . GaZ bkbfbh hl nhfu gZ\_ h[blu , gZfbgZ , fu hegu h]gZ FDK (beb FDK hegZ h]gZ gZ ).

?keb hj [blu iZlbq\_ kdb khZ I (dZ gZ jkmgd\_ \\_ jm), lh b kdhhkb ihqlb Z gu . Wlh hagZ Z , qlh ihc\_ hneh fg h]h \\_ f gb , ih dZ gZ iha bpbk khZ k iha bpbk FDK (I. \_ . khì Z nì mk -dlh j Z gZ dhZ [ ey b FDK). Wlh lZ\_ hagZ Z , qlh \ fhf \_gl gZ[hv]h k[e b` \_gby hghkblegu\_ kdj hklb [mml fZu , e Zy h afh` guf wndlbgh\_ (\ kfu ke\_ aZ lhibZ ) k[ ebgb\_ .

?keb hj [blu kbevgh hlebqy , lh Z agbpZ \ kdj hkl yo \ fh f \_glu gZ[hv]h k[ ebgb\_ [m\_ kebrdhf ebdZ . LZ\_ qlh ih\_ , qlh gmgh - wlh kZ\_ lZ , qlh[u gZ Z hj [ blZ [ueZ ihh]gZ h[bl\_ FDK, gh g\_ kebrdhf [ebadZ dgc (lZ , qlh[u fu [ueb [uklj \_ beb fegg\_ FDK).

Jbk .

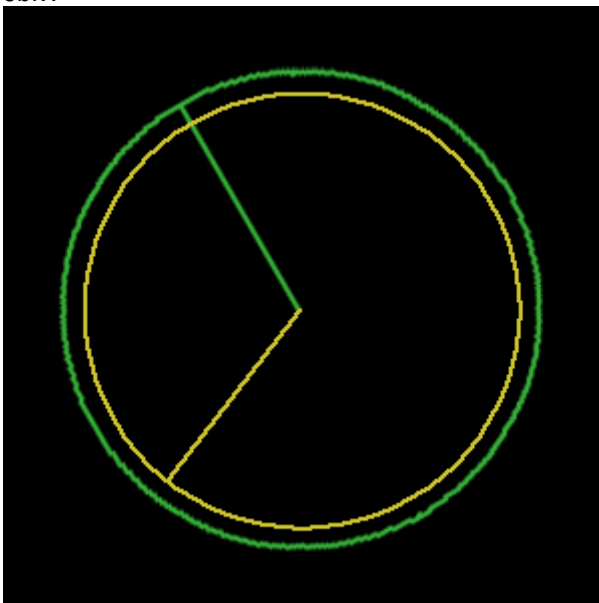
1:



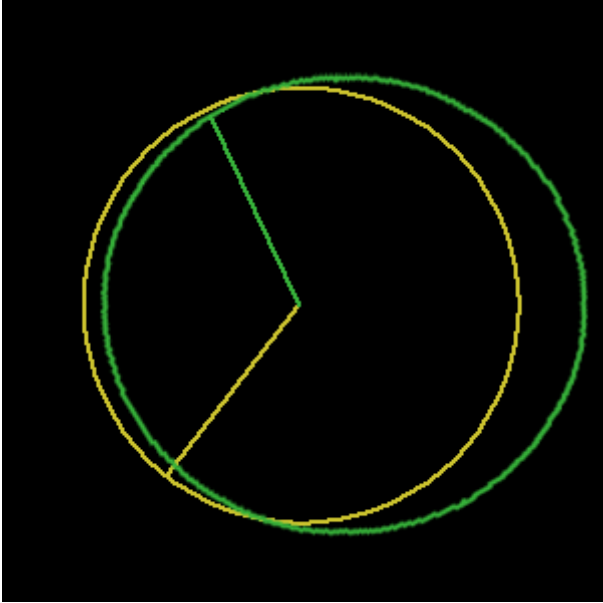
?keb h[bl u \jeyf\_ , dZ gZ jk . 1 (ihfgbl\_ , ae \_gZ ebgby - gZ h[blZ , e lZ - h[blZ FDK), agZ l gZ h[b lZ fgw\_ hj [blu FDK b fu b\_ [uklj\_ FDK. l\_ wlf gZ hj [blZ gb]^ g\_ ik\_ ky k h[blhc FDK (qlh eZ k[e bgb\_ ghafguf !).

Jbk .

2:

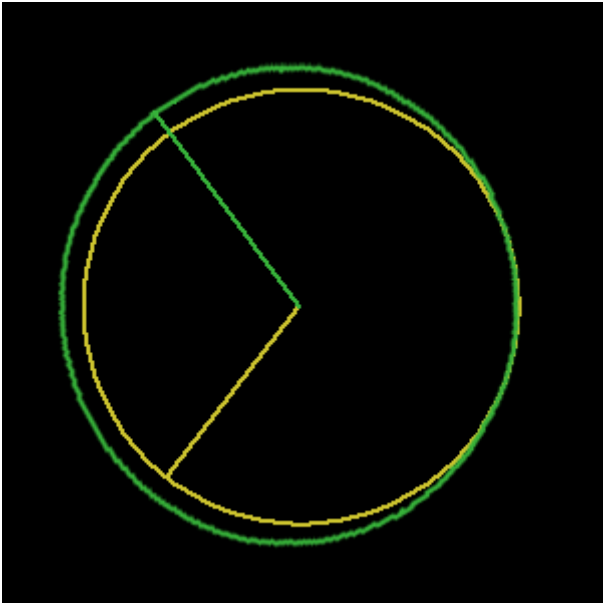


?keb hj [blu \jeyf\_ , dZ gZ j k. 2, agZbl gZ hj [blZ [hev\_ , qf\_ hj [ blZ FDK. AgZbl , fu b\_ fegg\_ , qf\_ FDK. B \ wlf kemZ gZ h[blu gb]^ g\_ ik\_ ky .



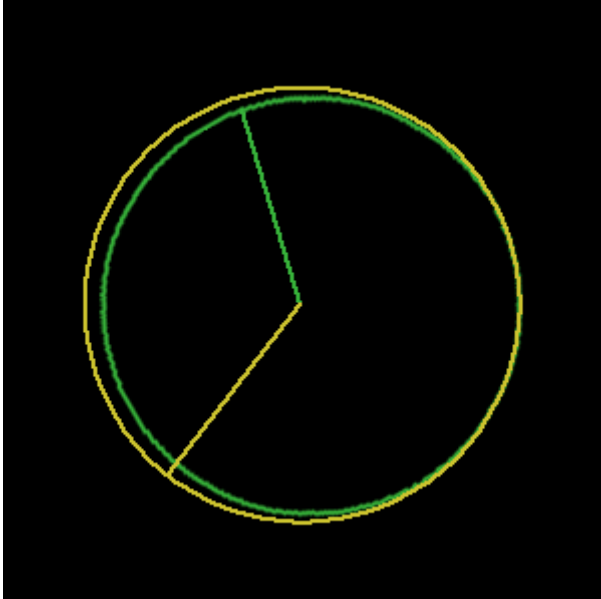
GZpk . 3 gZ hj [ bIz bfl [hev bc wdpql kbll b h[bl u i j kd Zxlky. Ih [ e\_fZ khkl hbl \ lhf , qlh \ fh f \_gl gZ[hev]h k[e bgby (iho hgyby qj \_a hgm ba lh q\_d ikqgby h[bl ) gZgby b ebqbgv kdhj klc [mm l gkd hev h p[eb qgu. K[e b` \_gb\_ \ gghf kenqZ ha f h` gh, gh klv [he\_ \_ wnnlbguc kenqZ .

fu ohlbf , l[ wih ke[ l[ , qh[u hj [blu u]eyeb , d[ gZpk . 4:



þk . 5:

Jbk . 5:



GZ þ k. 4 gZ hj [blZ gfg]h [hev r\_ , qf\_ hj [blZ FDK (FDK h]hgy\_ gZk gZ hj [ bl\_ ), gh hj [blu bfk\_ lhedh hgm lhqdmik\_ qgb y b \ wlhc lhqd\_ gZ\_ \_gby kdhj kl c [mfm l kh]. GZ þk . 5 kbl nZpby lZ\_ \_ , lhedh gZ hj [blZ gfg]h fgv r\_ hj [blu FDK (lZbf h]Z ahf , fu gZhgyl\_ FDK).

< wlbo mo kemZ o g\_ bfl\_ gbdZ]h agZqg by =>? BF?GGH gZhbky lhqZ ikq gb y h]bl . <Z h ebrv , qlh yhf k wlhc lhqdhc lZ]hpb Dgby gZ h dhZy b FDK iZ]bqkdb gZ eZ lky m] gZ m ]Z. Khk^ hlhqbfky gZ kha^Zbb lZhc lhqdb ikq gby .

## HiZgb\_ lh db i j k gby (intersection)

keb gr\_ hjb l f\_g r\_ , f\_ hj b l FDK (d d g þk . 1), ke^ m\_ ih^gy\_ ih\_c ^h i j k gby k hj b l hc FDK. Wlh hagZqZ , qlh fu [m^ f b]Z y [u klj \_ FDK b \ lh \_ l f y gZ h]blu [mfm l bflv h[smx lhqdm(lh qdmkljg )].

?keb gr\_ hjb l her\_ , f\_ hj b l FDK (þ k. 2), lh em\_r\_ k\_ ch a h]fhab l b hi nk l b i j b c ^h njhgy luk hl u hjb l u FDK. GZ dhZv [m^ l b]Z y fegg\_ FDK b \ lh \_ } fy ip]c gZ h]blu [m^ lhqdhc kljg .

?keb gr\_ hjb l - e ebl b kd y b m i j k d ky k hjb hc FDK, ^ckl \ h \ f h gh ih - j aghf m <u fh ` \_ l ihgyv ip]c beb himklblv Z]c lZ , qlh[u [ueZ lhedh hZ lhqZ ikqgby h]bl . Emqr\_ , dhgggh , u[ j Zlv lZhc Z] , dhljuc Z [hev m x wnn dlbgkh l v \ kf uke\_ mfgrgby ZohZ lhiebZ b l gb h klj qb.

?keb Z Z h]blZ [eba dZ d fh c (dZd ihdZ]h gZ hghf ba þ kmgdh \ ur\_ ), y ih]hfgmx gfg]h ih^ gylv ip]c .

<: @ H: K l hh f\_k l b ^h lh ch, dd fu g\_g f hdhg l\_egh\_ keb\_g b b kludh \ dmk FDK, k\_ v de gby ^bb \_e\_c i j hba h^yl ky \ i j yhf beb hj lghf gij v e\_gbb (prograde beb retrograde) b lh e^ch \ ih \_ beb i j b\_ hj b l u !

k eb u hi bebkv k lf , qlh kh[bZ lk v fgyv - ip]c beb Z]c , lh]Z ke^ m\_l hi b l v , h dZhc bfggh luk lu ]h ke^ m\_l fgyv . l j h]efZ \ lhf , qlh hj [ blZ FDK - g\_ bZy hdjng h klv (bfl\_ nhfm weebikZ) b \ Zguo lhqZ bfl\_ Zgm x ukhlm .

gZ lp h afh`ghklb :

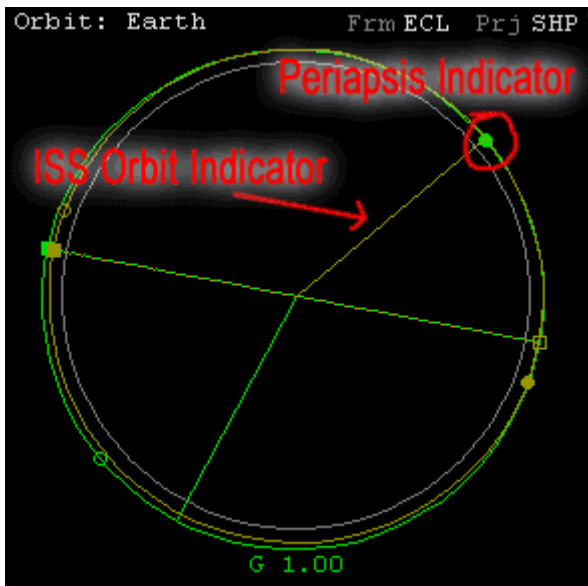
1. Ippeblky "gZ]eāhd " b gZk y gZ mko . Wlh, haf hē h, kZ [ h]Z ohjrh ēy gZ , gh g\_mfZ , qih bggu ba NASA qZh bkiheamk lāhc flh^ .
2. <uyk gblv u khlm gZukrc lhqdb hj [blu FDK (Zi h]c , apoapsis beb ApD) b gZgbarmx lhqdm(ip] \_c, periapsis beb PeD) b ippeblky dmZ-gb[m\* ihk\_ dg\_ . Wlh [ueh [u gZgh]h lhqg\_ , gh k\_ \_ ghklāq gh lhqgh .
3. BkiheahZ Orbit MFD ēy hiēgy lhqghc ukhlu h]b l u FDK \ lhqd\_ kij gb . Fu bkiheā nē bfggh wlhl flh^ .

< Orbit MFD gZfZ\_ dghi dmMOD ihdZ g\_ mbbl\_ ]ābq\_ kdh\_ij hē Zgb\_ hj [bl . GZbl\_ gZ gZ\_ hj [bl\_ fZ p]\_ lhqdb, dhlhmx u ohlbi\_ bafgbv (Z] c beb ip]c ) . l\_ j b]\_c - wlh ae\_gZ lhqdZ gZ hj [bl\_ , Z Z]c - wlh ae\_guc d]mhd (kf . pk .) . L\_ij\_ ke^ bl\_ aZ ēlu f Zmk -dlh hf , ihdZūbf ihehēb\_ FDK, ihdZ hg g\_ ikq l\_ u]āgmX Zb lhqdm (beb g\_ mdZ ijfh gZ g\_ ) . >ey [he\_ lhqghc nbdkābb wlh]h fh f\_g]Z fhg h hki heah \ Zy aZfēgbf l\_ f gb (deZ br b <R> b <T>).

lhōk b gZ pk .:

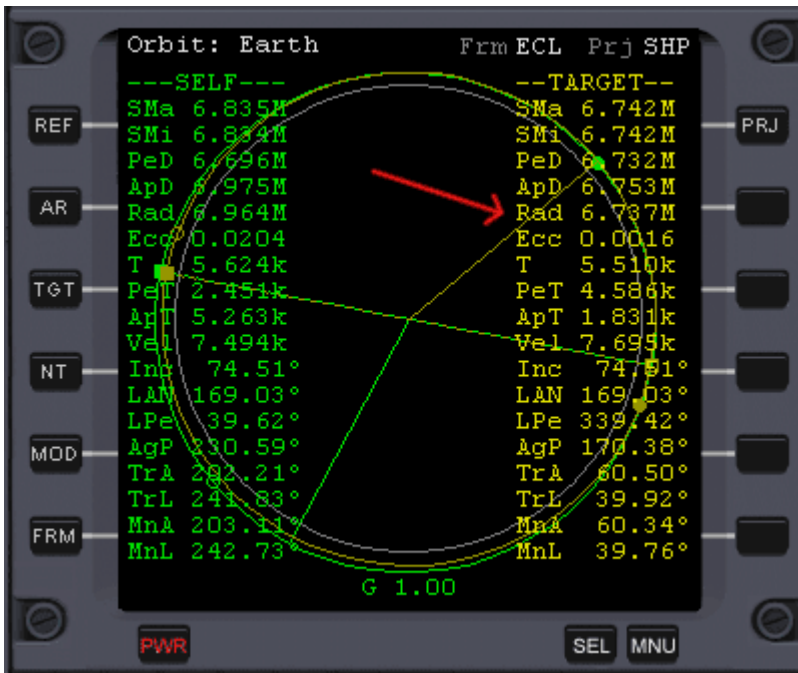
Periapsis Indicator - Fā \_j ip]y

ISS Orbit Indicator - JZmk -dlhj FDK



Пример: радиус-вектор МКС пересекает перигей моей орбиты.

Dh]Z Zmk -dlhj FDK [m^ gZ khhlkl \ mxf\_ fā j\_ , [uklh gZbl\_ dghidmMOD hōg bb Z āZ b āZbdkbjm cl\_ agāgb \_ iZ lZ Rad (Zmk ) \ dhegd\_TARGET (pev ) ki j ZZ . Wlh - ldmSZ ukh]Z FDK, kqbl\_Z fZ y hl pglZ Afeb .?keb u kh[ bj\_Z kv fgylv khc Z]c , khhlk lqgh ke^ m\_l aZ hfgbl v Z Zmk h]bl u FDK \ lhqd\_ , dhlhZ ebl gZ hē hf Zmk\_ k Zb Zi h]\_ f .



Пример: моя орбита очень близка к орбите МКС, так что я собираюсь менять мой перигей. На рис. выше радиус орбиты МКС напротив моего перигея равен 6.737M (то есть 6,737,000 метров). Я хочу изменить свой перигей до этого значения.

▣ gZ baklgZ p\_ev, lā qlh fh` gh gābgā fā .>\_eZlv wlh gā lā :

- x ?keb gm gh ih^gyl □ ijb□c , ke^am□ ih□ □□□ i j y f h c b f i n e □ k (prograde).
- x ?keb gm gh hi nkl bl □ □ ijb□c , ke^am□ \ ih□ □□□ h j □ l g u c b f i n e □ k (retrograde).
- x ?keb gm gh ih^gyl □ ih□ c, ke^am□ □ ijb□ □□□ i j y f h c b f i n e □ k (prograde).
- x ?keb gm gh hi nkl bl □ □ h□ c, ke^am□ \ □ ijb□ □□□ h j □ l g u c b f i n e □ k (retrograde).

lhfgbl\_ , fu dēz f\_ b]leb LHEVDH \ z]\_ beb ip]\_ hj [blu b lhedh \ j\_ bf \_  
 ▣ibehlz prograde beb retrograde. <dēgb\_ b]ēy \ f]bo gāgbyo beb \ f]b o  
 lhqdā h]bl u gārbl hkl b]gm mx gā gZ wlz\_ uāb ā by h]blm .

Ke^ bl\_ aZbgbdz hf ApD beb PeD (khhllkl \ ggh lhfm , qlh u fgy l\_ , z]c beb ip]c )  
 \ dhegd\_ keZ (SELF) Orbit MFD. Kāb\ Zcl\_ wlh agā gb \_ k u khilhc, dhlhmx gm gh hkl l bqv.  
 M□l kv \ lh f , qlh u kiezbhzb k\_ iāegh . ?keb Z hj [blz [ebadZ d hj [ bl\_ FDK,  
 ha f h` gh gm gh ihfgy l v h]blm gagāblegh , Z fh` \_l b h k\_ g\_ gā .

### Khaāb \_ l hdb i j k □ gby (intersection)

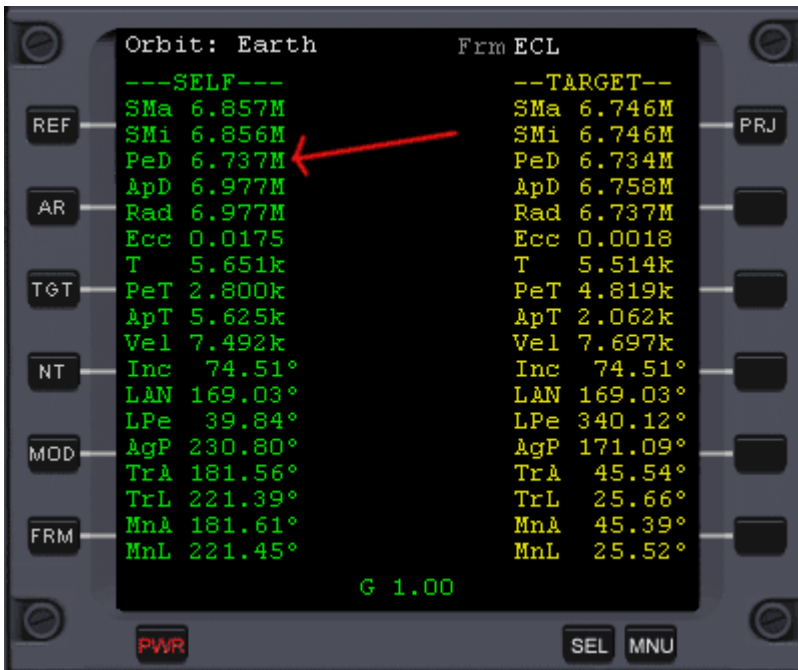
□□□□ , hibj zkv gZ u r\_ kdZāg h\_ , de x qbl\_ □□ hi beh□□ j□bf□ prograde beb retrograde.

Kill Rotation	Pro Grade	Orbit Normal (+)
Level Horizon	Retro Grade	Orbit Normal (-)

Bkiēā m□\_ l rbaehggu\_ iā eZ ēy lh]h , qlh[u hi ā ebllky k lf\_ , \ dāhc lhqd\_ hj [blu  
 u [m□\_ dēz lv b]ēv (\ ip]\_ , k eb u fgy l\_ z]c b \ Zi h]\_ , keb u fgy l\_  
 ip]c\_ ). <u fh]\_ hiēblv fhf\_ gl dēgby b]ēy , ke^ y aZlf\_ , dh]Z Z bgbdzj  
 (ae\_ guc fmk -dlh j) ij\_ kq \_l gm gm mx lhqdm (bgbdzj z]y beb ip]y ) beb, qlh ā l  
 [hexm x lhqghklv , ke^ y aZ iZ Zf \_lhf ApT (\ fy hklbgby z] \_y \ kdmgā ) beb PeT  
 (\ fy hkl b' gby ip] \_y).

lhl fhf \_gl, dh]Z u i] kq] gm`gmx lhqdmgZ hj [bl\_ (beb dh]Z gm`guc i] j h k l b]g\_ l ag]gby 0), de x qbl\_ etg u ^b]b]l]eb (g] fbl] delb r m <NumPad +>). Pe v - ipk lb Z iZ Z ij PeD beb ApD \ khhlk lb\_ k u khkl hc FDK \ wlhf f\_ kl\_ h]blu , l... dag] gbx , dhlhj\_ u a]fgbeb Z g\_ . lhdZ ^ b]Zev ]h]Z , PeD beb ApD (\ aZokbf hkl b hl lh]h , qlh u eZ ) [m] fgykky . Fgykky hg [m] [uklh , l] qlh [m] ihgfb]gc . <u de]bl \_ ^b]l \_ e] (g] fbl] <NumPad \*>), dh] ij] f]l] ^hklbg] l gm`ghh ag] gby. G\_kfh]y gZ lh , qlh h]b l u fh]ml kbevgh hlebq]y , f] ] aZ] k \_]h gkdhed h kdmg^ . ?keb ihbahr \_e "i]l " , [uklh de]b l ]]Zev h]g]hc ly]b (g]b] \_ de]rm <NumPad ->) ey lh]h , qlh]u ]mlv i] d gm`ghf mag] gbx . <u fh l \_ l] bkihea hZ v ]]Z b RCS \ j ` bf \_ ebgc]hc ly]b (<NumPad 9> b <NumPad 6>) e y [he\_ lhqgh]h dh]g]hey . (GZ kZfh f e\_ fhg h l] bkihe vah] j bf f]hc ly]b hkghguo ]]Z (<NumPad +> \ khq\_ l Zgbb k de]r c <Shift> Z l IHKL?I? GGUC g]h] ly]b ]e]h] h ]]Z hl gmeyh f Zdkbf g]hc , lh \_ kZ h\_ dKZ l ky] \ kguo ] ]]Z ) beb \_ j ` bf mfg]g]hc \ 10 Z a ly]b ]]Z RCS (<NumPad 9> b <NumPad 6> \ khq\_ l Zgbb k de]rc <Ctrl>), ipf . ih]bdZ ). ?keb ]h] f] j u hlgyeb [he\_ 30 kdmg^ , ag]bl , u m\_ ag]bl egh ure b ba ahgu ip]y (beb ]]y ) . < wlhf kem]Z kem] u] ke^ mx s \_]h Z aZ (kh \ jblv h]g h[h] hl ih h[bl\_ ) ey [he\_ lhqgh]h f] j Z.

< fhf kem]Z y ih]gf] ip]c , ihwlhfm y de]Z ]]Zev \ ijfhf g]g]bb \ ]] ihdZ ip] c fhc hj [blu g\_ hklb] ukhlu FDK \ wlhf f\_ kl\_ , l... ebq]gu , dhlhmx y h]e]e ] - 6.737M, kf . bk . gb\_



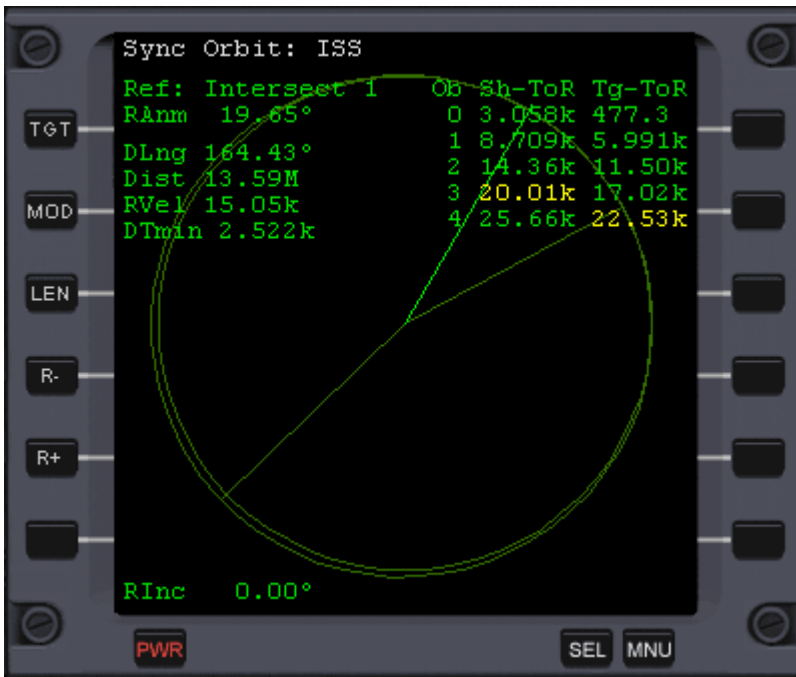
Lij fu kha^Zb lhqdm]kq gby h]bl (wlh ip]c beb ]]c g]c hj [blu ), \ dhlhj c g] dh]Z [ev [m] gZ lh c \_ ukhl\_ , qlh b FDK k ihqlb l]hc \_ kdj hklv x . Lij u fh] ]] u de]l ] ] ]hibeh ] .

Lij gZf gm`gh m]h]blv k\_ l]bf h[j Zahf , qlh [ u gZ dh]Zev ih]re d lhqd\_ i\_ kagby \ lhl \_ fhf \_gl , qlh b FDK . Fu fh \_ f ke] wlh ip ihfhs b FN> Kbgoh]gba]bb Hj [ bl (Sync Orbit MFD).

### Kbgoh]g ba]by h]bl]

<de] bl] Sync Orbit MFD (gfb ]] <Shift + Y>). <u [ \_ bl \_ FDK \ d\_k l \ p\_eb (g]b] <Shift + T> b ]rbl\_ "ISS"). GZ ^]m]hc ig \_eb hl djhc ]] Orbit MFD.

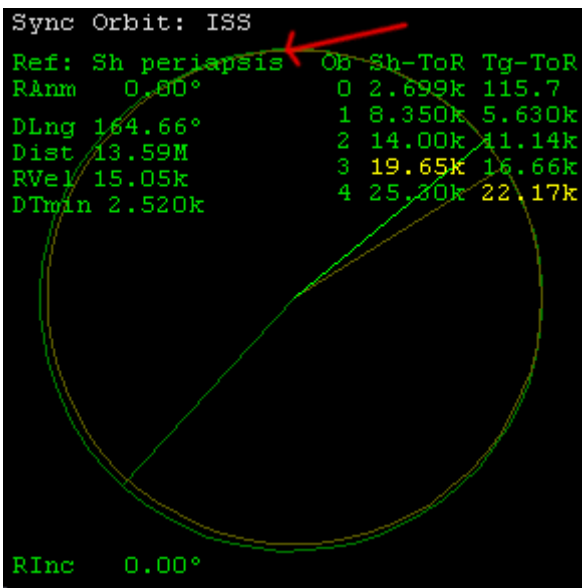




< gbğc qZklb Sync Orbit MFD ihdžžh hghkblegh\_ gžē hggb\_ hj [ blu (RInc). ?keb k\_ [ue h kežh ižegh , hgh žēgh [ul v hgv [eb adh d 0. ?keb hgh [hev \_ , qf\_ 0.5 ]žkZ , Ž f ke^ m.l ] gmlky d hižbb \j Zgbžby hj [bl b ihl hplv k \_ kgžžž . ?keb \_ RInc ijr ž 1 ]žk , Sync Orbit MFD i žklh g\_ [m^\_l žiž .

Sync Orbit MFD ihfh\_ gž žiē blv fhfgl h \f gb , dh]ž gž dhjZ[ ev [m^\_l ižohblv qj\_ a lhqdm i\_k qgb y h[bl hghžgh k FDk. <h-i]o , fu žēgu mdžž , džmx bfggh lhqdmikq gby ke^ m.l ižžžbab j h\ž (lžbo lhqd fh\_l [ulv ž ).

Gž fZ cl\_ dghi dm MOD (de\_ br\_ <Shift + M> ) ^h l\_o ihj , ihd\_ \ kljh d\_ Ref: g\_ ihd\_ l\_ky hhag\_ g\_ b\_ gm\_ghc lh\_odb i\_j\_k\_ gby "Sh periapsis" (\_keb lh\_ dhc i\_j\_k\_ gby hj\_ bl\_ yley\_ l\_ky i\_jb\_ c ) beb "Sh apoapsis" (\_keb lh\_ dhc i\_j\_k\_ gby hjbl\_ yley\_ l\_ky ih\_ c), kf\_ . jbk .



Если ваш Sync MFD сообщает "No Intersection", это значит, что точек пересечения нет и вы недостаточно точно выверили свой перигей (апогей) по отношению к высоте МКС в той же точке. Вам придется продолжить подъем (опускание) планируемой точки пересечения (как было сказано выше) до тех пор, пока сообщение "No Intersection" не исчезнет.

kl he[p Z \ iZ hc qZklb FN> ihdZ uZ bgnhfZbx h ldmf\_ b ihk emxbo 4-o bldZ gZ h dhZey b FDK (hgb ihgmf\_ hZ u hl 0 h 4). Dkehlu\_ agZqgb y mdZuZ gZ jY (\ kdmg^A ) dh[h\_ l[m \_lk y ey hklbgby lhqdb ij\_ kg \_gby \ ldm sf\_ b \ ke^ mx s bo 4-o bldZ . @uf plh f ueg kemqZ gZ[hev]h k[e b`\_gby k FDK. < ipfj\_ gZ jk . ur \_ bogh , qlh fh f \_gl gZ [hev]h k[ ebgb y k FDK gZmibl gZ 3-f bld\_ (\ ip]\_ fh c h[blu\_ ). lZ flj Sh-ToR ihdZauZ , kdheuh hklZ ehkv ] f gb fh f mdhZex h lh]h , dZ hg h k l b]gl wlhc lhqdb. :gZ]bqgu c iZ Tg-ToR ihdZ uZ ] f y, dh[h\_ hklZ ehkv h lh]h , dZ lhc \_ lhqdb h k l b]gl FDK.

lZ flj DTmin ihdZauZ , gZdhe dh wlb \ f\_ gZ hlebqZ l ky jn] hl j^ n]Z. GZ j k. \ pm wlh hagZ Z , qlh fhc dhZ [ev [m^ \ lhqd\_ Z^ \ mgZ 2,520 kdmg^ Zv\_ , qf\_ kl Zp by (Z wlh 42 fbgmlu ). G\_h[o h^bfh ihhclb ih[eb\_ , k eb fu ohlf kh\ jbl v kludh\ dn^ Fu fh ` \_f k^e Z v wlh hfy ki hkh[ Z b:

1. lh klh Z , ihdZ g\_ gZmibl lZhc bldh , dh]Z gZ dhZ [ev b FDK ip^ ml\ lhqdm klj\_ qb \ hgh b lh \_ ] fy . HgZ h , keb h[bl u [ebadb jn] d jn]m , ihl[m]ky ^ Z HGV hejh , y kdjh hklb gZ b kl Zpbb hlebqZy fZ h. : keb h[blu kbevgh hlebqZy , lZy klj\_ Z fh` \_ j gbdh]Z g\_ kemqbl ky , hkh[ \_ ggh, keb gZ h[blZ , gZfj\_ , h \ gh^ h\_ [hev\_ hj [blu FDK.
2. Bafgblv gZ h[blZy uc iph^ (eblegkh l v hg]h bldZ ) , lZ qlh[u k\ kl b iZ DTmin d gmex beb d fZhc ebqbg\_ .

BlZ , fu ohlf bafgbl v gZ h[bl Zyguc iph^ , gh G? OHLBF baf\_ gblv ihehg\_ lhqdb klj\_ qb. Wlh fhg h ke Z , ihgbfZ beb himkdZ IJHLB< HIH EH@GMK lhqdm < fhf\_ kemqZ lhqdZ k lj qb yeylk y ip]\_ f , lZ qlh y [m^ ihgbfZ beb himkdZ fhc Z] \_c (ApD) ey hklbgby gh[ohf h]h agZgby h[blZgh] h iphZ . Lh, qlh y kh[ bZv eZ g\_ [m^ ebylv gZ i\_ j]c fhc hj [blu (PeD).

LZ qlh \_ gmgh keZ v k uZg hc lhqdhc - ihgylv \_ beb himklblv ? GZ kZf e\_ b lh b jn]h\_ kj Z l Z .

- x ?keb lZ ih ^gbfbl\_ c, l d e c l ^b c \_e \ ij yfhf g ij e gbb (prograde) \ lh d \ kl j b (i h c).
- x ?keb lZ ih ^gbfbl\_ c, l d e c l ^b c \_e \ ij yfhf g ij e gbb (prograde) \ lh d \ kl j b (i h c).

Ba wlh]h iZez klv bkeagby :

- x ?keb Z hj [ blZ G:F GH=H [hev \_ h]blu kl Z pbb-peb , Z f ke^ m] himklblv Z Z]c . Wlh iha \ hebl mfgxlv Z h[blZgu c iph^ , \ lh \_ ] fy hklZey ]h [hebf , q\_f h[blZy uc iph^ kl Zp bb-peb . < pehf wlh iha \ hebl mfgxlv ] f y hklbgby lhqdb klj\_ b.
- x ?keb Z hj [ blZ fgv r \_ h]blu kl Zgpb-peb (lhqdZ k lj qb - \ Z]\_ ) , ke^ m] hiZ ky kbevgh mfgv Z khx hj [blm , lZ dZ fhg h e]dh aZ \_ l v Z h knj . LZb f h[Z ahf , gmgh ke^ bl v aZlf , qlh[u Z ip] \_c g\_ hdZ ky \ Z h knj (PeD hdheh 6,550 df ). ?keb u jbeb gZ[hj hl , ihgylv kh c ip]c u r\_ Z]y , lh ip]c b Z]c ihfgyk y fkl Z . < wlh kemqZ ihl[m]k y i\_ j\_ gZkl h blv Sync Orbit MFD gZ "Sh. periapsis", lZ dZ liy lhqdhc \ klj b [m^ ip]c Z \_c h]blu .

<hki heamfk y iZez b, ipZgufb Z\_ :

- x ?keb lZ ih ^gbfbl\_ c, l d e c l ^b c \_e \ ij yfhf g ij e gbb (prograde) \ lh d \ kl j b (i h c).
- x ?keb lZ hi nkd\_ lZ ih ^gbfbl\_ c, l d e c l ^b c \_e \ ij yfhf g ij e gbb (retrograde) \ lh d \ kl j b (i h c).
- x ?keb lZ ih ^gbfbl\_ c, l d e c l ^b c \_e \ ij yfhf g ij e gbb (prograde) \ lh d \ kl j b (i j b c ) .
- x ?keb lZ hi nkd\_ lZ ih ^gbfbl\_ c, l d e c l ^b c \_e \ ij yfhf g ij e gbb (retrograde) \ lh d \ kl j b (i j b c ) .

ke^m s^f \bl d^ khh\k l^ m s^bf hj^ ahf ih\l hj bl^ fg^ \j. Bkihea ncl Orbit MFD, i^ u PeT (beb ApT) ey lhqgh^ hi^ gby \gb d^egby \b)^c . lhfg bl^, \u \de^ \l^ \b^ \e^ \lh \d^ \k\ j^ \b^ ey lh^, qlh[u bafgbv \ukhlm ihl bhihah`ghc lhqdb h[blu . M[bl^ kv, qlh bkihea m^ i^eguc \b f \b^ehz . <h \fy \z [h lu \b)^y ke^ bl^ aZ bafgg^ f i^ DTmin. Hg heg^ mfg^ y. <u deb^ \b^ \e^, dh^ DTmin m^ \ebahd d 0. L^hc f^ j heg^ hlgylv fg^ 10-20 kdmg^ . Bkihea ncl \b)^b h[\ghc ly|b, \keb ihemqbecky "ij^" beb hki hevanc^ kv \b)^ yfb RCS \ ebgcghf j bf^ (<NumPad 9> b <NumPad 6>) e y [he^ lhqgh^h f^ \j Z. <u hegu ihemqblv ag^ gb^ \i^ Z DTmin hqgv [e bdbf d 0.

lh^k b gZ \k .:

Burn performed at periapsis - <de^ gb^ \b)^y

\i heggh \ |b^

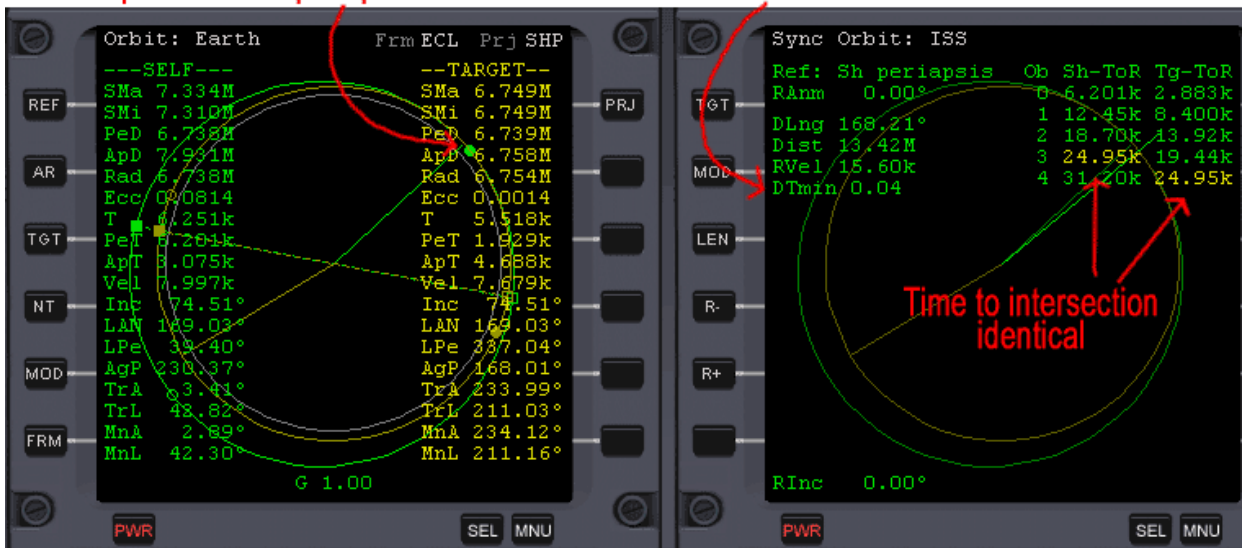
DTmin close to 0 - \z f^ lj DTmin [e bahdd 0

lhqdb klgb h^g^zh

Time to intersection identical - <fy \klgb y

Burn performed at periapsis

DTmin close to 0



В момент, когда мой корабль проходил перигей, было выполнено прямое включение двигателей для поднятия апогея орбиты. Теперь величина DTmin очень мала и времена достижения точки встечи для моего корабля и МКС одинаковы.

M\ \ hf, qlh \ de^ \b)^ \ ghk^ klgbh [ehahklb hl lhqdb k lj^ qb (|b)^c beb \b)^c ). ?keb \y \z [hlu \b)^ ey [m^ ebch b u hd^ kv \ \_dh hl lhqdb kl^ qb, lh k^z lhqz g^g^ k^b)^z vky ih h[bl^ . ?keb \ g^ m^zhkv kgbablv DTmin h^ gmey \ lgg^ 20-30 kdmg^, \ de^ \b)^ \v b \b^k v ke^ mx s^ \h bld Z gZ hj [bl^ b ihlhl^ f^ j. ?keb \ himkz^ |b)^ \c hj [blu, ke^ bl^ aZ ihd^z byfb Orbit MFD, qlh [u \ |b)^ g^ gb^ 6,550 df. ?keb ihyblk y khh[s^ \_gb\_ No Intersection, \ |b)^ y KE?=D: himklbv beb ih^ylv lhqdmklj^ qb h^ lo ihj, ihd^z khh[ s^ \_gb\_ g^ bkqag^ .

Km v \ hf, qlh \ hegu ke^ \ Z rm h[blm \klzqgh hlebqghc hl h[blu FDK k lf^, qlh [u \ \g^z FDK (beb hgZ \g^z \ ) \ lhqgh hi^gguc fhfg | \gb gZ hghf ba ke^ mx s^ bo bld^ \ . Gm^ bblegh , qlh NASA g^bf^ kl hev mfguo e^ c!

GZcb^ \e^ \h^ bkeh \ klhep^ Sh-ToR b hi^j^ \eb^ \ g^ d^ dhf \bl d^ \u i^ \ol^ |bl^ FDK \ lh \d^ \k\ j^ \b^ . Wlh fh^ kemablky qj^ a g^ khevch b ldh^ . < fh^ f kenq^ (dZd ihd^zgh \ur^ ) wlh ihbahc^ gZ 3-f bld^ (ey FDK wlh - 4-c bld^, ihlhfm qlh FDK \b^ ky [u klj^ ) . ?keb klj^ qZ heg^z ihbahcb gZ ldms f^ bld^, fh^ \\_ ihelh^ y gZ ica Z \ beefg^ j^ gkd heuh fbgml b g^ bg^ \hhlhbk y ghk^kqgh dkl udhd^ .

?keb ^h \klj^ \b^ hkl^ehk^ g^ kdhe^ dh \b^ ldh^, \u fh^ \\_ ihke^ \h^ \egh mem^ \\_ i^ f^ |b)^ DTmin (ijbe by^ \h^ d 0) g^ d^ hf \b^ |d^, bkih ea ny \b^ \e^ RCS \ ebg^ cghf j^ bf^ (ijk lh^ f^ghggh^ de^ gb^ bo \ ohhrbc wwndl ). <u fh^ \ blv , d^ k |b)^gb^ f^ fh fglz klgb \ r^ \mk - \ dlhj (aegz^ ebgy) klzhblky k^ [eb^ \_ d^ \mk^ - \lh^ j^ mFDK ( \ elz^ ebgy). Lh^ \ k^zh^ fh^ gh^ g^z^ gZ Orbit MFD b Map MFD.

aZ lf , qh[u efu\_ dex qgby b]ec [ueb lhedh \ fh fgl ihohby lhqdb  
 klj\_ qb b lhedh \ b f z nibehIZ prograde beb retrograde. ?keb hghkblegh\_ gzehggb\_  
 RInc ke\_]dZfgylky , u fh l i hlv ] h ip ihfhsb pgo b gb` gbo b]Z lec RCS,  
 zlxbo \ ebqgghf bf \_ (dezb <NumPad 8> b <NumPad 2>). lh ke\_ wlh]h ipk y s\_  
 a dhj]l bh DTmin. Q [e b\_ DTMin b RInc d gmæ, lf [eb` \_ u hdZ l kv d FDK \  
 fhfgl iho hby lhqdb klj\_ .

Dh]Z gZglky ihk eabc blhd (elu\_ pbnj u \ dhegd\_ Sh-ToR [m^l \ pg \_c klhd \_),  
 ip]Z \_ f] j u b ]hlhk v d kl udhd \_.



За несколько витков я добился того, чтобы DTmin и RInc стали равны 0. Я приближаюсь к точке встречи на текущем витке и МКС уже близко. Сейчас МКС ниже и слегка позади меня. Когда я достигну точки встречи на моем перигее, МКС будет всего в нескольких километрах от меня. Настало время стыковки!



lh^hl h\vd

K\_c k u gZ azeabl egfh bld\_ b [u klh ip]ebZ k v d lhqd\_ an k FDK. Grn h  
 fgh]h \_ ke z , ip qf\_ u [m^ ]hlh d kl udhd\_ , lz qh u fh` \_ h kiheah \ky  
 izna hc (gbl\_ <Shift + P>). ?keb u ihimkl beb klgm k FDK - g\_ z , ihk lh ih]hl\_  
 kbgohgba]bx h]bl .

<de q bl\_ \ ]hibeh \ ]bf Prograde.

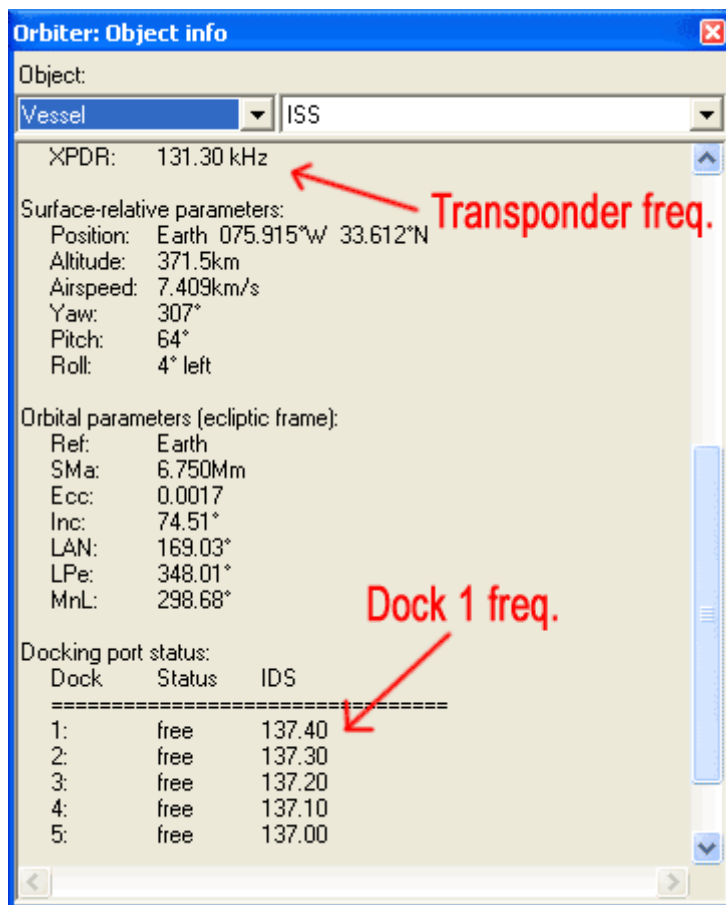


Hldhcl\_ Orbit MFD ki z Z (<Right Shift + O>) b kebl\_ aZa\_e\_guf b eluf xmk -dlh z  
 ey lh]h , qh[u hij ^ eblv f\_kl hgoh^ \_gb\_ FDK - \j\_ ^b b u r\_ \k beb ka^b b gb\_  
 \k . Wlh ihfh\_ Z f khpgl]hZ ky dZ bfg gh ih^clb d kl zpbp ey kh\ jgby kl udhd\_ .

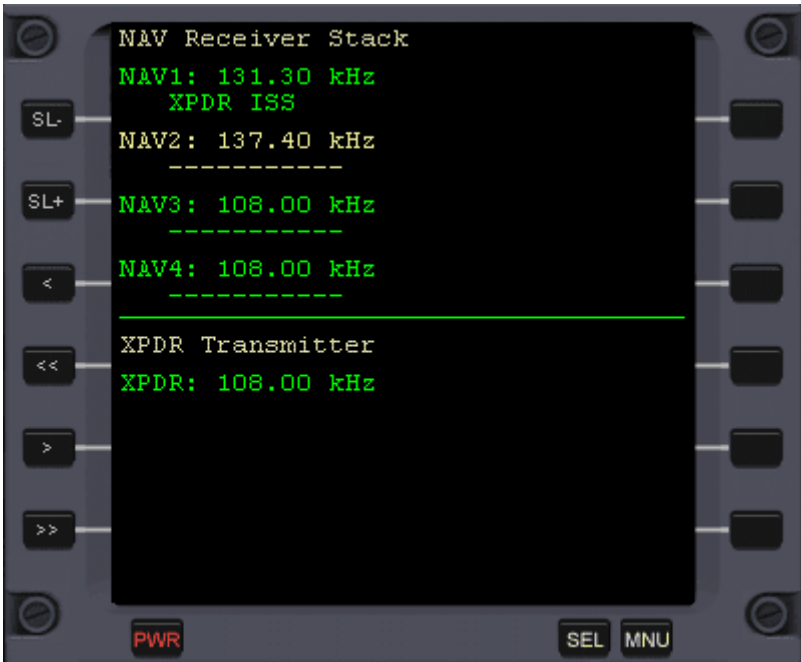
kl ꝑbb \ Orbiter' i bgnhfꝑbx h k[ \_ \ ꝑ aebqguo ꝑh -bꝑhgꝑ .  
 FDK bf l lꝑ gꝑuꝑc lꝑ kihgꝑ . Lꝑ kihgꝑ - wlh lꝑhc iꝑbd , dhlhꝑc iꝑk lh  
 lꝑkebjml gdhlhꝑc kb]gꝑ , ihaheyꝑbc hiꝑblv f\_kliheh `g b\_ iꝑ bdZ Lꝑbf  
 h]ꝑ ahf , iꝑ ihfhsb lꝑkihgꝑ ꝑ FDK gi\_ j ꝑgh khh[sꝑ h k\hf\_ f\_klihe hꝑbb . Fu  
 gꝑ]hb fky gZ lꝑ kihg ꝑ FDK b wlh ihfh\_ ihꝑclb d kl ꝑbb [eb\_ . FDK lꝑ lꝑkebjml  
 bgnhfZ ꝑbx h dZ ^hf khf\_ kludhhqg hf mꝑ . Dh]ꝑ fu hdZ f\_ ky ꝑk lꝑqgh [ebadh, fu  
 gꝑ]hb fky gZ qꝑhlm hꝑh]h ba klu dhꝑqg uo mꝑh\ b wlh ihfh\_ kh\\_j r blv kl udh\ dm

Q h[u gc lb gꝑho h^bfu ꝑ k lhl u, \hki hea ml\_k bgn hjfꝑbhg ghc kbkl\_fhc Orbiter' .  
 G ꝑ f bl delbrm <F4>, gfb ꝑ dghid m"Object Info". Lꝑ j ꝑ u ꝑb lꝑ lb i ht dꝑ "Vessel"  
 b kcf ht dꝑ - "ISS". XPDR - wlh b klv qZklhZ lꝑkihgꝑ ꝑ . >hegh [ulv 131.30 d=p. Gb`\_   
 fhꝑ h gꝑb qꝑhlm kludh\ hqgh]h mꝑZ 1. Wlh - 137.4.  
 Немного практики - и вы сможете выбрать стыковочный узел, подход к которому наиболее прост. Мы будем иметь в виду стыковочный узел номер 1.

lib ꝑ b gZ ꝑk .:  
 Transponder freq. - ꝑhl Z lꝑkihgꝑ ꝑ  
 Dock 1 freq. - ꝑhlZ klu dhꝑqg h]h mꝑZghfj\_ 1



Gꝑ ꝑc l\_ iꝑb ꝑg bd g ꝑ ꝑ b k lhl u, bkihea my COM/NAV MFD (hl djhc lꝑ ch ke\_\\_\, g ꝑ ꝑ  
 <Left Shift + C>). Bkihea ml\_ dghidb SL- b SL+ e y lh]h , qlh[u u]ꝑ i j bfgbd (bo gkdhed h).  
 >ey lh]h , qlh[u fgylv klꝑ\_ ꝑyꝑ qꝑhl u, gꝑfꝑ\_ dghidb << b >>, eꝑ lh]h , qlh[u  
 fgylv feꝑ rb\_ ꝑ aj yꝑ , gꝑfꝑ\_ dghidb < b >. Gꝑ l ꝑc l\_ iꝑb ꝑg bd NAV1 g ꝑ ꝑ kl hl m131.3  
 (l j gkihgꝑ ꝑ FDK), ꝑ i j b ꝑg bd NAV2 - g ꝑ ꝑ hl m137.4 (kludh\ hꝑgu c mꝑe ghf ꝑ 1).

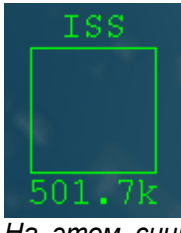


<deq bl\_ HUD (Head Up Display, [d]y kl\_ deyr d [d]j^ ebphf ibehl [d], g [d] dhlhjm [d] ijh [d] pbjm\_ lky\_ jaeb [d] g [d] y [d] vgy [d] bgn hjfp [d] by) \ j [d] b [d] Docking (kludh \ d [d]) g [d] f [d] de [d] rm [d] <H> ihdZ \ ehf [d] \ pgf [d] m]emwd [d]Z g\_ ihybl [d] ky g [d] k [d] v "Dock". Docking HUD [m [d] ihd [d] u [d] bgnhfZ [d] pbx, ihemqgg mx gZ hkgh \ ihemq [d] o [d] hl FDK [d] hkb]g [d] zh \ . Kcq [d] [d] hg [d] he [d] [d] [ulv g [d] j [d] hg gZ ipfgb [d] d NAV1. Baf\_ gblv [d] [d] bh-gZkljcdm HUD fh [d] gh [d] , g [d] f [d] de [d] r [d] b [d] <Ctrl + R>. Wlh [d] [d] l ihke [d] h [d] e [d] g [d] uc i [d] h [d] [d] ko [d] ipfgbdh \ [d] chZ [d] ey . Bl [d] [d] , g [d] j [d] hcl\_ HUD gZ ipfgbd NAV1.

lh [d] ebf [d] gZ [d] ihk e [d] ^ [d] gbc blhd [d] , g [d] [d] x ^ [d] aZ ihd [d] Zgbyfb Docking HUD b Sync Orbit MFD. Ih [d] f [d] [d] k [d] eb [d] gby [d] k FDK u [d] g [d] [d] gl\_ [d] ih em [d] Z [d] v hl g\_ [d] [d] hnk [d] b]g [d] zu [d] . Docking HUD [d] b \ babjmlky [d] b g [d] [d] gl\_ [d] [d] [d] [d] b [d] z [d] baggg [d] h [d] Z [d] ghc [d] bgnhf [d] zbb [d] . l [d] [d] \ h\_ - wlh g [d] [d] gb\_ [d] b [d] k [d] l [d] [d] pby [d] h FDK. Wlh - bg [d] d [d] j [d] "ISS" b pbnj [d] [d] j [d] h [d] k [d] gb [d] . Pbn j u - wlh [d] k [d] l [d] [d] pby [d] h [d] kl [d] [d] pbb. ?keb FDK \ g\_ ihi [d] [d] \ ihe\_ [d] agb [d] y, g [d] [d] gb\_ [d] gZ g\_ [d] md [d] zu \ [d] [d] ky kl [d] [d] dhc [d] - l [d] m [d] he [d] gbdhf [d] .



?keb FDK ihi [d] [d] \ ihe\_ [d] agb [d] y, g [d] [d] gb\_ [d] gZ g\_ [d] [d] [m [d] ihd [d] Zgh d [d] [d] Zlghe [d] [d] hc. Kl [d] [d] p [d] b [d] x gm [d] gh [d] bkd [d] [d] \ pgl [d] [d] w [d] hc [d] [d] b [d] .



На этом снимке видно, что МКС еще в 501.7 км, поэтому ее пока невозможно разглядеть внутри рамки.

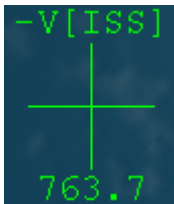
[d] [d] qZklv bgnhf [d] [d] b [d] - g [d] [d] gb\_ [d] b \ ebqbgZ g [d] [d] kd [d] h [d] k [d] l [d] b [d] hghkble [d] [d] h FDK. WIZ bgnhf [d] [d] zby [d] [d] ky [d] bg [d] d [d] j [d] h [d] "V[ISS]", pbnj [d] [d] j [d] h [d] k [d] bg [d] d [d] j [d] h [d] - hghkble [d] [d] [d] kd [d] h [d] kl [d] v \ f /k. l [d] e [d] h [d] b [d] l [d] \_ [d] e [d] gh\_ [d] qb [d] ke [d] h [d] ha [d] g [d] [d] [d] [d] k [d] [d] eb [d] g [d] \_ [d] , h [d] l [d] [d] bp [d] Z [d] \_ [d] ev [d] gh\_ [d] - m [d] [d] z [d] gb\_ [d] .



KlödZ -ljm]hegbd ihdāu Z gZ fgb\_ gZ bgbdj \\_dlhZ hghkbleghc kdhkklb , keb wll bgbdj g\_ ihiz \ ihe\_ agby . ?keb bgbdj hghkblegh hc kdhj kl b ihiz \ ihe\_ agby , lh b^ aē kbl hl agāZ kdhj hklb .



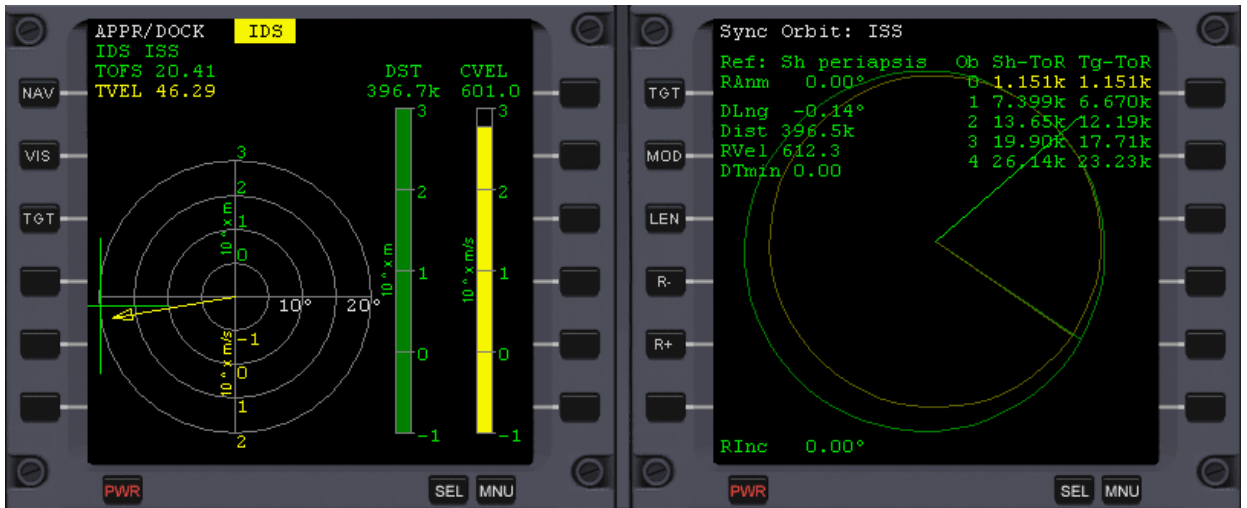
Lāhc b^ bgbdjZ (dki \ djmā\_) hagZqZ , qlh qlh fu bbf gZfgb\_ , HLDM>: fu bfk y (kh kdhj kl x 699.3 f /k hghkblegh kl ā pbb). >j m]f b keh\ b , k eb Z a\ j gmlvky lā , qlh[u bgbdj kh\ ē k gfgbf "V" b b ly]m ]eZ\ gufb b]ēyfb , lh kdhj hklv kl Zgl\_ mfgvāy . Dh]Z hgZ klā\_ āhc 0, wll [mā\_ hagZqā , qlh gZ dhZ [ev "klā" hghkblegh kl Zgpbb.



?keb Z a\ j gmlky gZ 180 ]ākh \, mbbf "ij hlbniheg u c dhgp" \\_dlhZ hghkbleghc kdhj hklb - bgbdj \ b^ dklZ , gfgb \_ , DM>: fu bfk y (\ ipf\_ gZ bk . - kh kdhj hklx 763.7 f /k hghkblegh kl Zgpbb). ?keb fgmly lā , qlh[u wll bgbdj kh\ ē k gfgbf "V" b bēyblv ]eā\_ b ]ēb , kdhj hklv [mā\_ āb . >ey k[ ebāy k FDk gZ ihgāylk y hZ bgbdjZ .

HL dhc I\_ Docking MFD g eāhc i gēb (g fb I <Left Shift + D>). L i j g fb I <Left Shift + T> b \ ābl "ISS 1", ^ey lh dh, b hāu g kljh bl FN> g i j u c kludhāg u c māe FDk .

Ij fju DST b CVEL ihdā uē āklhyg b\_ ā vāgh]h kl udhāg h]h māeZb kdhj klv hghkblegh h kl āpbb . Kcāē wll qbkeZ āegū [ulv hqgv [eba db dlf , qlh ihdāu \ Z HUD.



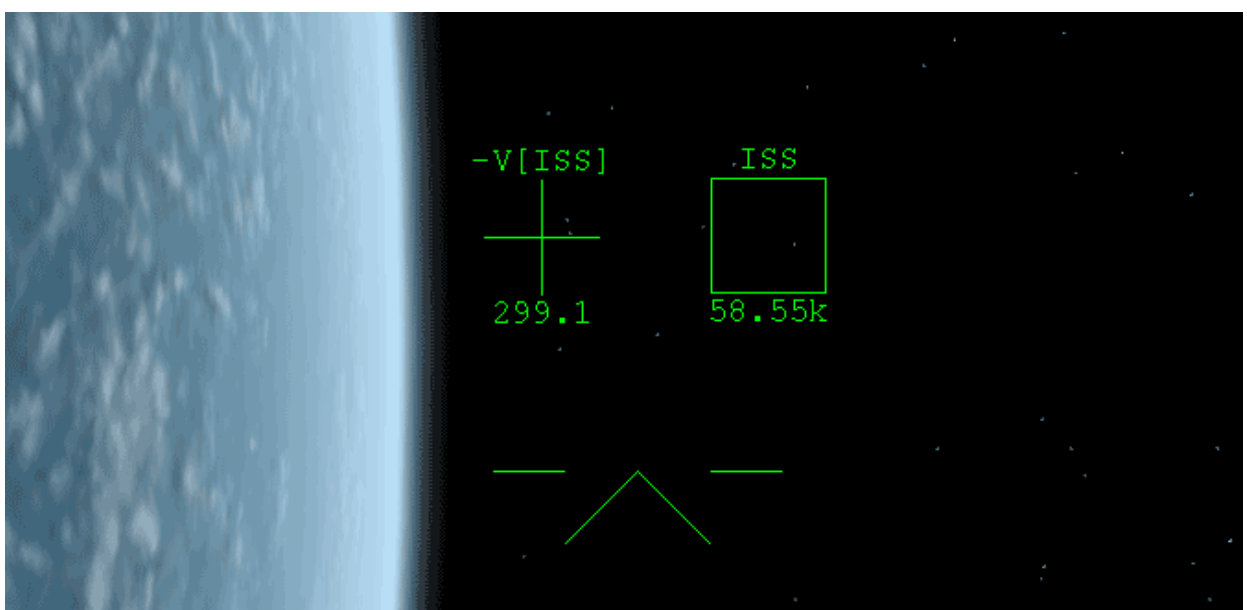
На рис. выше вы можете видеть, что мой корабль находится в 396.7 км от МКС и моя скорость относительно МКС 601 м/с. На панель справа Sync Orbit MFD показывает, что я быстро приближаюсь к точке встречи (перигей моей орбиты). Радиус-векторы моего корабля и станции почти совпадают.

Итак, теперь вы можете видеть, что мой корабль находится в 396.7 км от МКС и моя скорость относительно МКС 601 м/с. На панель справа Sync Orbit MFD показывает, что я быстро приближаюсь к точке встречи (перигей моей орбиты). Радиус-векторы моего корабля и станции почти совпадают.

<u de>bl \_ \l hibeh b i j de b l ^b l eb RCS \ jbf v j s\_g by (rotational mode, gfb l <NumPad />) b ja jg bl dhje kl hjhg mFDK. lhj Zqb \ kl hj hgmkl e db, ihdZ u c gzb gZ FDK, ihdZ hgZ g\_ i \ b l ky \ dZ^Z lg mx dm . GZ f bl \_ dghidm "Kill Rotation" gZ iz eb dibehZ (beb gb\_ deArm <NumPad 5>) ey lh]h , qlh [ u hklzhblv \ zgb\_ dhZ [ ey. >h[ckv lh]h , qlh[u ghk dhZ [ ey "kf hl j\_e" \ klh jg mFDK. >ey wlh]h ihs\_ k] h bkihea hZ ihifg h zgb\_ k hiZb \_c "Kill Rotation". lh fj\_ ip[ebgb y d lhqd\_ klj qb FDK ihyblk y \ fd\_ b [m\_ mezbqby \ fj\_ Zo. GZkeZ kv bh f!

## K[ebgb\_ k FDK

Итак, теперь вы можете видеть, что мой корабль находится в 396.7 км от МКС и моя скорость относительно МКС 601 м/с. На панель справа Sync Orbit MFD показывает, что я быстро приближаюсь к точке встречи (перигей моей орбиты). Радиус-векторы моего корабля и станции почти совпадают.



На этом рис. МКС находится в 58.55 км. Мой корабль движется в сторону станции с относительной скоростью 299.1 м/с. Кажется, встреча будет очень тесной.



gghf wZi \_ gmgh k[e bablvky kh klzpbz gZdheh h wih ha f hg h b mzylv kdhj kl b, lh klv h[blk y gmehc hlghkbleghc kdhjk lb. GZ jkklygbb hdheh 100 df u kljh ja[jg bl\_k \ kljhjg m ijh l bhihehgm h ghkbl\_egh f m ^b\_gb . g h \hjy , ja[jg bl\_k l d, h o u ghkhhc c bg^bd[hj HUD (-^-) ihda u la lh gh g hj l guc bg^bd[hj kdhjkl b (dj\_kl \ djm d\_).

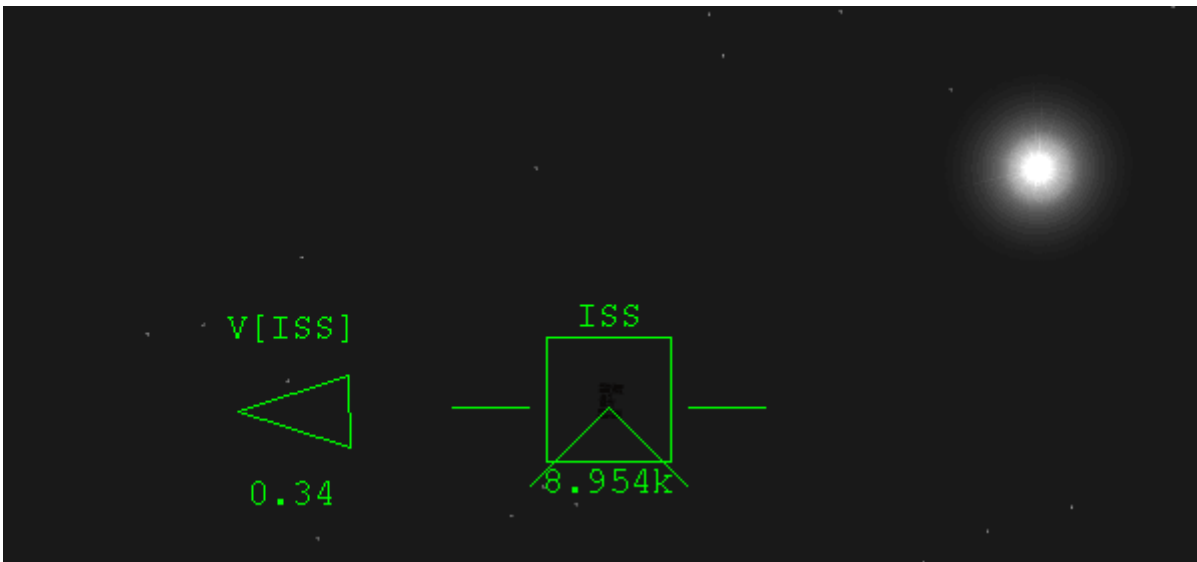


На снимке выше я развернул нос корабля точно на обратный индикатор скорости. Относительная скорость 306 м/с. МКС всего в 7.1 км! Моя точность во время выравнивания и синхронизации орбит себя оправдала.

h h b aZ bgbd[hf bk l zpbz . DhZ bk l zpbz gZgl zb , wih agzbl , qh fu lhedh qh ihreb lhqdm kljb (fh f\_gl gZ[hev[h k[ ebgy ) b melZ hl FDK. <de h bl \_ e gu ^b \_ eb b inh bl hl ghkbl\_e gm kdhjkl ^h 0. < aZ kb f hkl b hl ebqbgv kdhjkl b ihg[blk y h 60 kdm g^ hlu h b]ey . lh fj ip [ ebgy gme[h agzb y kdhjkl b bgbd[hj kdhj kl b [m^ klzhblky k\_ [h e\_ qmklb leguf (gZqg\_l "m]Z " aZ dZ wdZ ). KIZ zkv k\_ l f y Z lv ghk gZgguf gZ bgbd[hj kdhj kl b. Gh [ yaZ h h[bZ y qldh]h gme y ipbl\_ kdhj hklv d 1-2 f/k b ludebl\_ b]zb . Lij u blk v ih hj [bl\_ f \_kl\_ k FDK \ ghklyghc [ebah klb hl g\_ . <ihk e\_ lbb u kfh ` l \_ h[blk y b [h e\_ [eb adh]h ihhZ d FDK, izegh u [b Z fh fgl deagby b]ey .

<u lij gzhblkv qmlv \ kljhj \_ hl FDK. Wih fh\_ [u lv [ebadh beb Zdh , gh \ e[hf kemZ gZ h]h [eb` \_ , qf dhZ fu gZzb gZ imlrk lb\_ !

GZ v l ghk dhj ey ijfh g FDK. <Z ke^ m\_l gZebky lZ , qh[u ghkhhc bgbd[hj HUD iprek y lhqgh ih pglm zb FDK. lhamclkv b]eyfb RCS \ khqzbb k hiZ pbc "Kill rotation".



На снимке выше я развернул мой корабль в сторону МКС. Я проскочил мимо точки наибольшего сближения и теперь станция в 8.9 км от меня - тоже довольно близко. Относительная скорость 0.34 м/с. Счастье, что в Orbiter'e Солнце не настолько яркое, как в реальном мире!

h fh` l\_ aZflbv , qh hlghkble vgZ kdhj hklv kh \j\_f\_g\_f mebbq \ky . Wih - ke^ klb\_ lh]h , qh fu b kl zpbz bk y ih gkdheh h aguf h]blZ f . Q [eb` \_ fu d FDK, lf fgv [m^ aZ \_g wihl wndl .

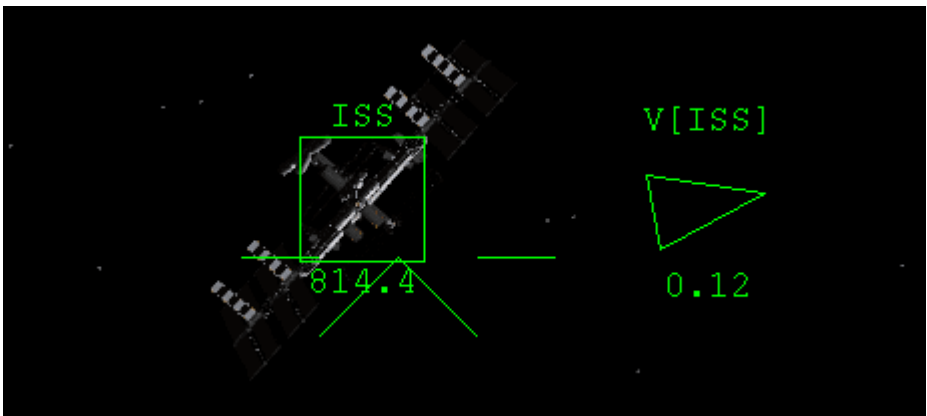
gZ gZ khq Z blv bk lqpbx h FDK. >Z ghk gij le gguf g kl gpb ,  
 lde bl etg u ^lb eb. >ebleghklv d eaqby aZ bkbl hl bk lqpb . ?keb u \ 10 df ,  
 oBl hqhc kdmg^u, keb - \ gkd heuBo k yldZ dbehflh , ihlmlky gkdhedh kdmg^.  
 lhfgbl , qlh Z gmgh ip[eba bkly dFDK [a ihfzh \ b klhedghbc .

lhke\_ lh ch, d d ^lb l\_e lu de\_ g, uk ljh lu jh gycl ghk dhjay ih bg^bd l hj m  
 kdjh kl b. Kdhj ihlmlky gh \ v deqblv ^ b]eb ey lh]h, qlh[u ih]Z blv kdjh hklv. DZd b  
 zv , gb f egh ke^ bl\_ aZ bgbdzhf Z kklhygby. DZ lhedh Z kklhygb\_ gZgl\_ zb  
 beb hdzy hdheh 1 df, Z l\_ ly m hj l gm \ d l hj m kdjhkl b b ihkbl \_ hlghkbl\_e gm  
 kdjh kl . ?keb u [m^ ke^ bl v aZ kdjh hklv x bafgg by bk lqpb b, lh kf h^ l deqblv  
 b]ev aZ\_ , h]b zk v gzherc wnnlbgkh l b lhfhgy , [a "jelh" .

lh\ lhp l\_ ijhp^ m mklhedh ja , kdhedh gm gh ^ey lh ch, hu ^hkl b j kklhygby \ 1  
 df. Fh\_ ihl]h \ Z ky gkdhedh ihulhd . m^vl\_ ljebu . NASA h[uqg h Z 2-3 gy gZ  
 k[e b` gb\_ "RZ" k FDK, Z fu k\_ kezb aZ gkdhedh fbgml . Q [eb\_ u d kl qpb , lf  
 [he\_ dh]l db deqgb y b]e c. Klz\_ kv dZc Z a iheghk lx ]blv hlghkblegm  
 kdjh hklv . l h[mcl\_ bkihea hZ b]eb RCS, j \ j kgu\_ b ]eb (retro thrusters).  
 Bkihea hZ j\_ kguo b]e c [he\_ m h[ gh [eb ab kl qpb , l.d iha\ hey\_ g\_ eZ  
 ahj hih\ gZ 180 ]Z mkh\ Lhed h bfc\_ \ b m , qlh j\_ kgu \_ b ]eb gZgh]h keZ \_  
 jeZuo .

Lzh\_ ihrzh\_ k[ ebgb\_ g\_ kZfh\_ wnnl bg\_ \ kfuk e\_ Z koh^Z lhebZ , gh ohj h  
 zhZ \_ l k lfb bgklj fglZ , dhlju\_ fu bf f . <hh[s\_ -lh kns\_ kl m\_ Approach MFD,  
 zhlgg uc hleg\_ b ih mfeqzbx g\_ bhysbc \ dhfiedl Orbiter'Z. Wihl ip[hj  
 iha\ hey\_ ihba\ klb k[e bgb\_ aZ hgh deqgb\_ b]ey , gh lzh\_ k[e b` gb\_ hlgfZ l  
 HQGV FG H=H ) fgb . Bkihea mZ gZ ihp \_^mjZ [he\_ [u klz , ohly bfg\_ j zbkbggZ .  
 Km v \ lhf , qlh dhZ [ev , gZyyk v d klz pbb kh } f gf hdehgyky \ klhgm . Wih  
 ihbkohbl ba-aZ gZ bZboky zebqbc \ h]blz dhZey b kl qpb . <hh[s\_ ]h j , gZ  
 h]bl\_ ghafgh ellv \ lhqghkl b lmZ , dmZ "kfh]l " ghk dhZey (keb lhedh gZ Z \_f  
 dhZ [e\_ g\_ kl hbl dZ -lh HQGV fhsgZ b]egZ mkzhZ ). lh fj\_ k[ ebgy kh  
 klqpb b fZ j u [m m l k\_ [he\_ wnnlbgu , ihlfm , qlh h]blu dhZey b kl qpb  
 [m m l hlebqZlky k\_ fg vr\_ .

>h[btbkv ^bkl gpb hdheh 1 df ihkbl \_ hlghkbl eg m kdjh kl . e b` dbehfZ  
 gZglky "ib dZgv\_" kbkl fu ij m]by h k[e bgb . Amdb ihlj k y lf qZ\_ , q\_f  
 [eb\_ u d klqpb .



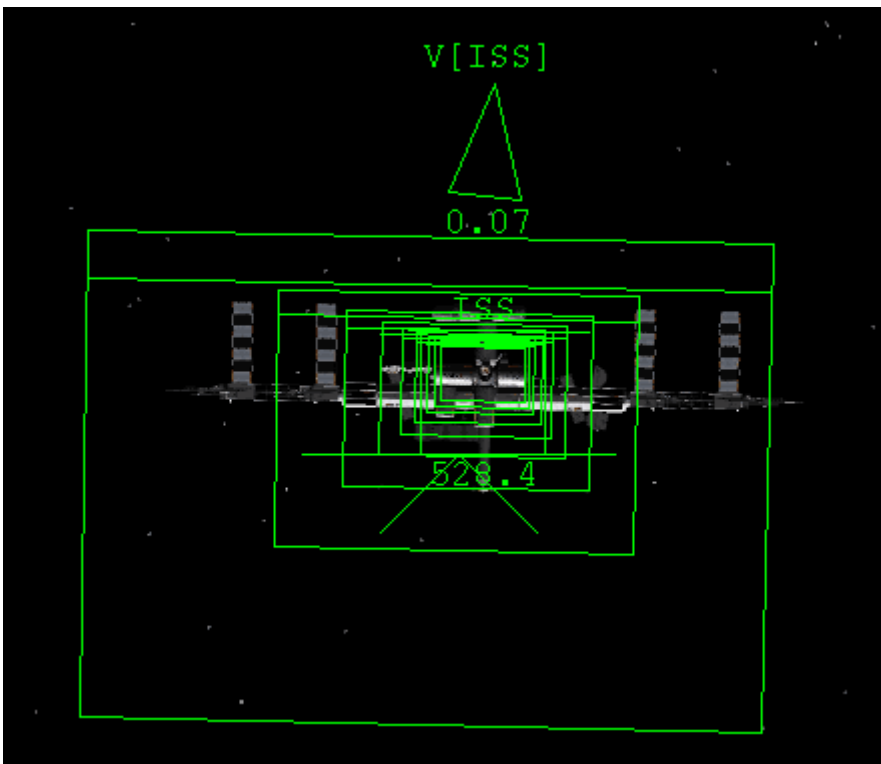
До МКС меньше километра. Относительная скорость очень мала (0.12 м/с).

l/ HUD g ij fg bd NAV2 (hg mgk g kljh\_g g kludh hg uc mae ghf j 1),  
 bkih eam y <Ctrl + R>. ?keb FDK \ iZ ih ey agby , u mbdl\_ qj\_ m ijfhm]heguo  
 zd - fZ dh \ ihohZ (approach markers). Wlb fZ\_ j u h[j Zank bamZgu c dhpj ,  
 msbc d\ u]Zg hfm kludhghq fm mæm Hgb ihfh]Z k^\_eZ v ]m[h \_ uZ gbZ b\_ dhZey  
 ih hlghrgbx dkludhgh ghfm mæm



Мне повезло, что выбранный стыковочный узел оказался развернут прямо в мою сторону. Могло быть и по другому.

□ б □ ghk dhj □ ey \ kl hjhg m kfhh ^eg\_h hl kl gpbb fj d □ Fu kh[bj Z ky ihfk l blv dhēv \ ij ēu dhp^ hz ihōhZ b m\_ lZ j Za\hzb \Z v ]h lā , dā gmgh ēy kl udhdb . lhēZ cl \_ ijhp □ kk g □ hj □ /kjh k □ hl ghkbl \_egh c kdhjh kl b ^h □ o ihj □ , ihd □ g □ hd □ □ k □ \gmljb dhjb^hj □ . Ly]Z gZ wlb fōu l[m \_lk y khk f\_ g[hewZ . <hafhgh , [he\_ mh[guf ihdZ y b^ gZ dhēv kgznb . BgōdZj kdhknb -V[ISS] ihdZ gZgb\_ , \ dhlhf bk y dhēv . lh kl Zkv g\_ \ aky \ kl zpbx (ohly \ Orbiter'\_ gbq]h klZ rgh]h b g\_ ihbahc^ ) . HdZ Z rb kv \ ij □ \_eo (beb ebadh ) dhj b^hj □ ih^ oh^ , kgh □ i h kb □ hl ghkbl \_egm □ kdhjhk □ . lhklZkv ipk lb kdhjhklv dā fh gh [eb\_ d gmex.



Теперь я нахожусь внутри коридора подхода. До МКС 528 метров. Относительная скорость очень мала (0.07 м/с).

ghk dhj ey kljhh \ kljhjg mklgpbb . GZ Z pev - kludh qguc mæ kl pbb.  
lhjZ kbl \_lj s\_g b\_dhjey , bkihea any ijhp ^njm "Kill rotation" (g fb \_ <NumPad 5>).

Kgh g\_kljhc l HUD g\_ ijb fg bd NAV1 (g\_b f\_ c\_l <Ctrl + R> ih d ke \ \ jom g\_ ihybl ky "NAV1"). Wlh udeabl bahj\_b \_ dhph j ihohZ , dhlhj\_ gZ ghgf wIZ \_ gZg h aZ jfh ` z waz .

<de bl \_ RCS \ eb\_g\_cgu c j\_ bf (<NumPad />). KcqZ , dh]Z fu hqgv [eba db d kl pbb , hiZgh de x qZ ]eZ u\_ b]Zb , lZ qlh fu [m^ bkihea hZ b]Zb RCS ey kh]\_ gby hklZ r boky fZuo fZ\_ h \ .

Lij v am c\_l \ j\_ ^ (<NumPad 6>) ijyfh \ kljhjg mkl gpbb. ?keb u b]Z kv iZegh , u hegu bly bgbdZj kdjhklb -V (d\_kl ) hdeh kl pbb . Bkihea mcl\_ b]Zb gZgby - <NumPad 8> (\ p ) , <NumPad 2> (g\_b a) , <NumPad 1> (e\_h ) b <NumPad 3> (Z\_ h ) - ey lh]h , qlh[u kihab pbhgbh Z bgbdZj kdjh hklb -V gihk^ klgh gZ kludh\ hqguf mæhf . >bl\_ kdjhk lv k[ ebgy 2-3 f /k. ?keb ihl[mky aZhf hablv beb hklzhbky , hki heamcl\_kv \_ j khf RCS (<NumPad 9>). Feggh ip[ebZkv d kl pbb , z bgbdZj -V gZ kludh\ hqguf mæhf . Y gZuZ wlh "ke^ m aZ dklhf " . ?keb gZgky dn \ dZ hf -gb[mv gZgbb , bkihea mcl\_ b]Zb gZgb y lZbf hj Zahf , qlh[u ihf\_ l blv bg^bdZjh kdjhklb -V kh klhg\_u kl Zgpbb, ihlbihehg\_c j \_cn m GZ j bf\_ , keb u \_nm\_ l \_ \ p , fZ g\_ \ j bj mcl\_ lZ , qlh[u dkl -V hdZaZeky gb\_ kl pbb, wlh [m^ hagZ Zlv , qlh u kf\_ s kv g ba. KlZ Zkv Z bgbdZj kdjh hklb -V \ pglj kludh\ hqgh]h mæZ.

< 100 f\_ l\_j\_o h\_l kl gpbb \ hki hea mcl\_ k RCS-j\_ v\_jk hf ^ey lh ch, o h\_o u i\_j\_b\_ kl b kdjhkl\_ d o d d fhgh l hg\_ . G\_ im]Zkv , keb bgbdZj kdjhklb m[bl aZ ieu ihay agby - wlh hagZ Z\_ , qlh kdjh klv hqgv fZ eZ. Fhl\_ bkihea hZ v b]Zb gZgby RCS, keb gmgh . Fu kh]bZ fky gZv aZ jZb\_ fZ\_ j u kludhb , lZ qlh gmgh h[yaZgh gZhbky \ iZ dhphZ ihohZ .

## [lhp^ mZ kludh\ db](#)

Fu , hegh [ulv , iheleb fbeebhgu dbehf]h\ b hl hcZ ebkv jhf k pex gZ Z kklh ygb b [h kdZ dzg y (bglkg h mfZ h[ wlf , gZhykv \ dhkf hk\_). BlZ , ihk egyy aZ ZqZ - mk\_r gZy kludhd Z.

Hkl zhb l \_ijs\_ gb\_dhjey , bki heam y ijhp\_ ^ njm "Kill rotation".

Hl dhc l \_ghkhth c dhgnk dhjey (gfb l\_ delbrm <K>).

GZ hc l \_Docking MFD g\_ i\_j\_b\_f gbd NAV2 g\_ l\_b\_f g\_ dg h dmNAV \ e\_ \ hc \_ kl b ijbhj \_ Docking MFD lij ih dZau\ Z\_ l bgnhfZbx h gZ\_ ih abpb b hpjZbb hlgkblegh kludh\ hqgh]h mæZ.



Dā b žv r\_, bk lāpby b hlghkblegZ kdħklv ihdāzu \ iāc qāb ip[hZ . >ey hpglābb bkihea mky nb]mZ \ b^ wlāhc [hewhc fbr \_gb. GZ fbr \_gb klv lp wefglZ , dhlhju\_ gmğh hiē\_ gguf hj Zahf khp glbhā ēy lh]h , qlh[u kludhāZ [ueZ mlrghc .

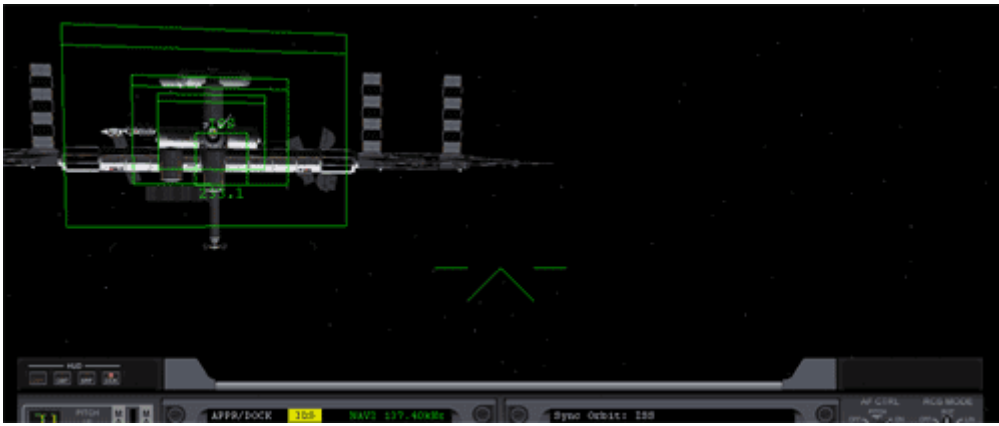
<h-i\_ uo, gmğh lā Z āmvl dhZ ev, qlh[u ie hkdħkl b kl udħh qguo māh\ dhZ [ey b kl āpbb klā b iāēgu . lhēgZ hkv dhēy hēgZ [ulv iāgdmevgZ iehk dhklb kludh\ hqgh]h māZ. ?keb dhēv [m^ ihgm lā , qlh hkb kludh\ hqguo māh\ g\_ [m^ l iāēgu , kludhāb g\_ [m^ .

<h-hj uo, gZ kludh\ hqguc mā hēg [ulv ihgm lā hēgguf hZ ahf ih hlghrgbx d kludh\ hqghf mmām klāp bb. Jqv b^ h lhf , qlh kludh\ hqguc mā bf\_ "p " b "gba" b wlb gāgby hēgu khā . *Строго говоря, в Orbiter'e это необязательно, но для реалистичности мы будем придерживаться этого правила.*

□-ljbo , gZ dhēv hēg ā]ā y \ lhqghk lb lā , qlh [ u hkb klud hqguo māh\ khā ā b. ?keb fu ē lbf \ hdgh FDK, ā iāēgm x hpglZ pbx, wlh gbdh]h g\_ hkqZkl eb\ bl . Fu hēgu ā]ā y ih iāēghfm imlb .

Dhjq\_ h\ hjy , ^ey i]be gh c kludh\ dbgmg h, □ h□u fu ue b:

- lāēgh \uj hvg \_gu ijh^he gh (iehk dhkl b kludh\hg u o māh\ ^hegu ul □ iāē \_eg u).
- x lāēgh \uj hvg \_gu ih dj\_gm (kludh\hg u \_māu ^hegu ul □ h^bgodh\h hjb\_gl bjh\gu \ gj\_ \ē\_gbb "\jo -gba").
- x lāēgh \uj hvg \_gu g\_ iml b ih^oh^ (gr dhjē ^he\_ g \hcl b p\_gljhf klh \_h kludh\hg hh mā\_lh\_gh \ lh \_ f\_kl h, ^\_ go h^bl ky p\_glj kludh\h\_ gh mā\_ kl gpbb ).



Arv ihdZah , dZ uje ybl ih^ oh^ dhZ [ey , dhlhuc g\_ uh \ g\_ ih^ egh . Ohly dhZev b^ ih iZev ghfm imlb , ]h ghk g\_ gZg gihk^l ugh gZ kludh^hguc mæ . FDK ip[ebZ ky ih^ m]ehf. >ey mlk\_rghc kludh^db ih^ hegz hkv dhZ [ey hegz [ulv gZgZ gZ kludh^ hguc mæ kl^pbb (h]bfb keh\ b , iehk dhklb kludh^ hguc mæh hegu [ul v iZeeu ).



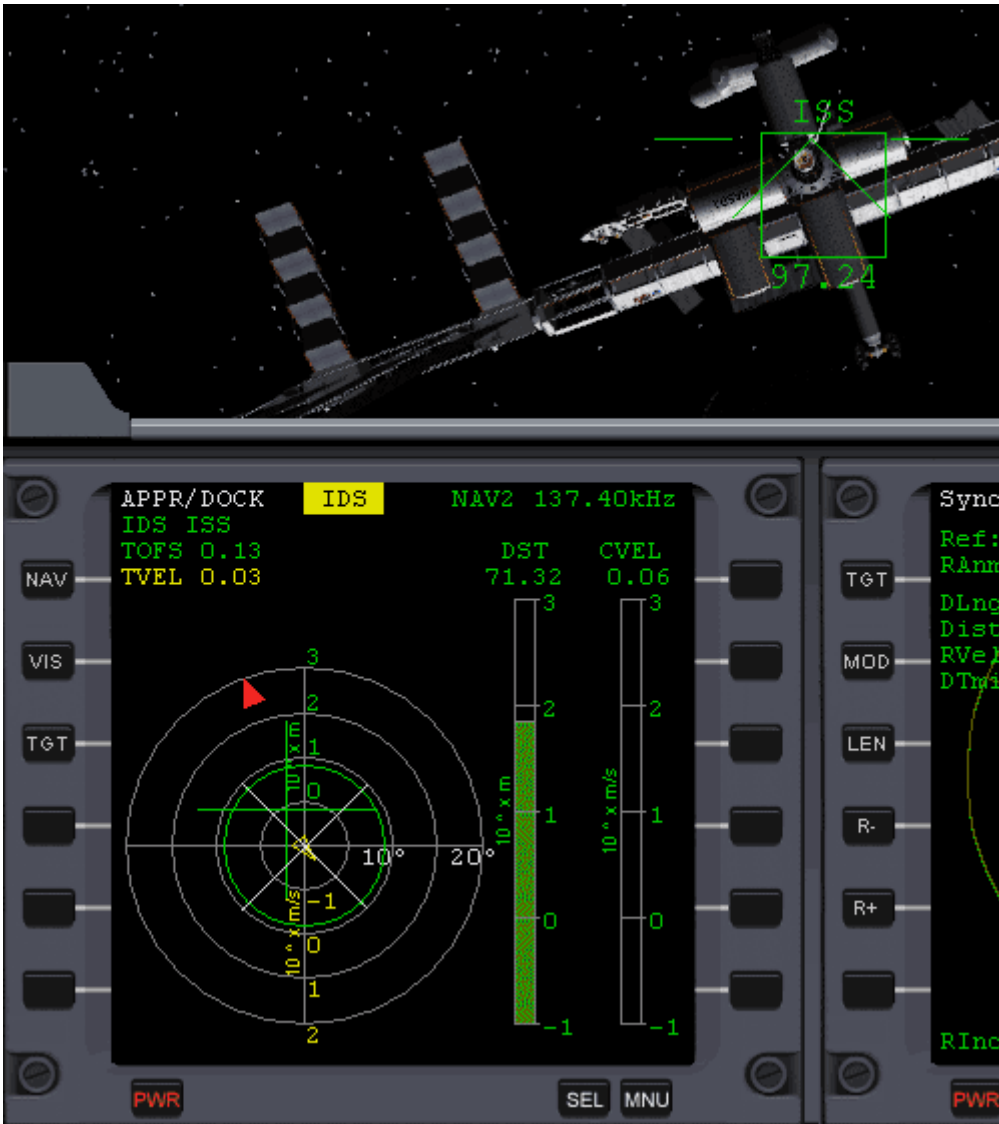
LZ uleybl k[e b`\_gb\_ \ kenaz , dh^Z dhZ v g\_ uhg\_ g ihhev gh b g\_ gZ hblky gZ iZeghf imlb k[e bgy . ?bgklugh\_ , qlh iZev gh a^\_kv - ghk dhZ [ey gZeg gZ kludh^ hguc mæ kl^p bb. >ey mlk\_rghc kludh^db lZ\_ gh[ohdf h uihegblv ihhegh \_ uZ gbZ b\_.

## Ihhegh\_ \uj\gb\gb\_

**Djkguc** (beb, hafh `gh, [euc ) "bdk" ihdZau\Z ihhegh\_ uZbZb\_ . Dh]Z "bdk" hlpplj \Zg iyfh ih fbrgb , agZqbl uZ gb \Zb\_ uihe ggh (]h pl fgyly gZ [euc ). Ihhegh\_ uZ gbZ b\_ - ih\_ , qlh fu ke Z .

lj\_ deabl \_RCS \ j b f ]s\_ \_gby (gfb I\_ <Numpad />).

JZ\_ gbl\_ dhje\_ \ d, h ou "bdk" ijbr\_ \_eky lh gh \ p\_glj\_ fbr\_g b g Docking MFD. ?keb "bdkZ" gl gZ fbrgb , agZqbl dhZev a\_ gml Zdh \ klhgm hl kludh^ qgh]h mæZ kl^p b. JZ\_ pbl\_ dhZ [ev ghkhf \ klhgm mFDK - "bdk" heg ihyblk y. ?keb "bdk" gZhbly iZ pglZ fbr\_ gb, a\_ g bl\_ ghk dhZ [ey iZ , keb "bdk" ur\_ pglZ fbrgb - Z a\ j gbl\_ ghk dhZ [ey \ p . <u he `gu LHGH uhgylv "bdk" ih pglj fbrgb . Dh]Z "bdk" gZhbly [ebab pgl Z fbrgb , hg kl^h \ bl ky [he\_ qmklblegu f d fZ\_ Z f , Z ]h pl l fgyly k dZg h]h gZ [euc . <hki heamcl\_kv nmgdpbc "Kill rotation" (deZrZ <Numpad 5>), qlh [ u ih]Z blv fgb\_ dhZey b, khhlk lggh , hkl^hblv p\_n "bdkZ".



"Икс" выровнен точно в центр мишени. Теперь мой корабль выровнен продольно, но повернут примерно на 20 градусов от правильного положения по крену, это видно по положению красной стрелки в верхней части мишени.

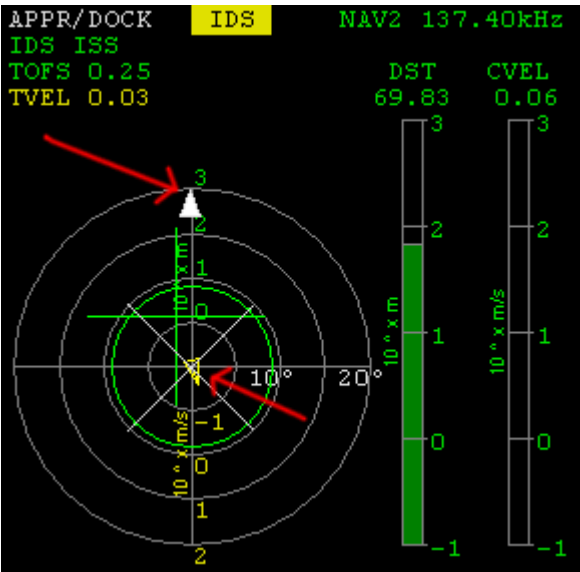
Исходное положение корабля относительно мишени. Красная стрелка указывает на отклонение по крену.

Установка ориентации корабля

Для установки ориентации корабля необходимо использовать HUD. В центре экрана отображается мишень. Красная стрелка указывает на отклонение по крену. Для выравнивания корабля необходимо использовать кнопки управления.

Включите режим RCS (дефолт <Numpad 6> или <Numpad 4>). Включите Docking MFD (12-й слот). Нажмите кнопку "Kill rotation" (дефолт <Numpad 5>). Проверьте ориентацию корабля.

Kl u dh\ dZ k\js sbfbky kl gpbbyf b  
 kl eb dhze v, k dhlhuf gmgh khkl udhZ vky, } zky hd j m]kludh\ hqgh]h mæZ (gpfj  
 kl apby "Lunar Wheel"), Z f ipk y bkihea hZ v b]eb RCS\ j `bf \_} zgb y ey lh]h ,  
 qlh[u h[bl vky kbgohg gh]h } zg by ih m]emdjZ . Wlh ihl[m\_ gdhl hj]h lj gby b  
 hiulZ , ihk dhedm u g\_ kfh\_ ihea hZ y nmgdpbc "Kill rotation". M[blkv , qlh f\_ j  
 uZ gb\_ by ih dgm g\_ k^b]Z l ky agzblegh ih fg\_ c fj \ lqgb\_ fbgmlu . >ey lh]h ,  
 qlh[u kl udh\Z ky kZ s zky kl apbc , gh[ohbfh , qlh[u kl udh\ hqguc mæ Z r]h  
 dhZ [ey gzhbek y lhqgh gZ ih heg hc hkb \ z\_ gby . >ey Delta Glider'Z beb Space Shuttle wih  
 g\_ lã , gh ih hcmf lãb\_ dhzeb , dã Shuttle A b Dragonfly. GZ kzh f e\_ uZ gb\_ b\_ ih  
 dgm b]ghp jnlky \ Orbiter'\_, lã qlh u fh l\_ ihklh g\_ uihgylv ]h .



Индикатор продольного выравнивания отцентрирован, индикатор выравнивания по крену - тоже.

**bb** **lj** **dd** **hj** **bb** **keb** **gby**

kl gZ dhzev hj bglbh\_ ey ipeghc kl udh\ db. GzbgZ y k wih]h fhfglZ k \_  
 f\_ j u [mml uiheg ylk y lhedh \ ebgcghf j bf\_ (gbdzbo } zgb\_ ). ?keb k\_ [ue h  
 keh\_ ipeg\_ , dhZ [ev iheghk l vx u] gg .

Aeguc bgbdzj \ b^ "iek Z" ihdzuZ ihegb\_ gzh dhZ [ey hlgkblegh imlb  
 ihohZ (hlgkblegh hkb kl udh\ hqgh]h mæZ kl g pbb). lj dex bl\_ ^b\_ eb RCS \  
 ebg\_cguc j b f (g fb l de br m<Numpad />).

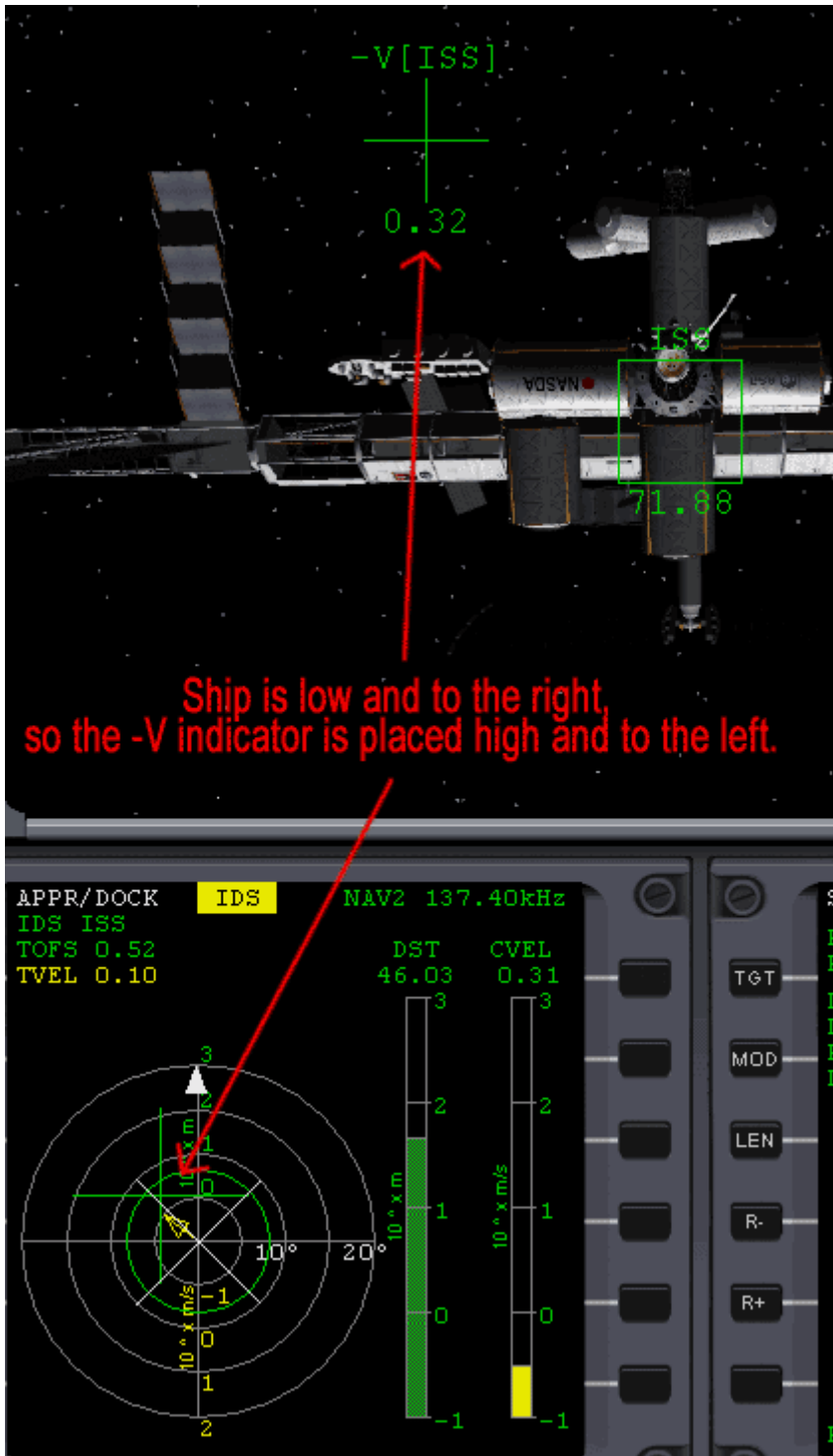
lh\_ Zcl \_ \j\_ /ga^ (de brb <Numpad 6> b <Numpad 9>) l d, h ou kdhjh kl  
 keb\_ gby ue\_ f\_ ^m0.3 b 0.5 f/k.

Bkihe vanc l\_ hdh u\_ ^b\_ eb RCS - <Numpad 8> (l j\_ o), <Numpad 2> (lgb a), <Numpad 1>  
 (le \ h) b <Numpad 3> (lj\_ h) - ^ey lh ch, h ou wj hgy l\_ fj dj\_ "iek k" ih p\_glj m  
 fbr \_gb Docking MFD. Dã b zv\_ , bgbdzj kdhj kl b -V heg [ulv [ebab hl kludh hqgh]h  
 mæZ FDk. F\_ j -"iek " ihdzuZ hldehgg\_ gzh ch\_ey hl imlb ihohZ (nãlbqk db,  
 wih hldehg\_ gb\_ hkb gZr\_ ]h kl udh\ hqgh]h mæZ hl hkb klud hqg h]h mæZ kl g pbb ). ?keb "iek "  
 ur\_ b e\_ pglj Z fb rgb (dZdgZ d]gd\_ u r\_ ), wih agZqbl, qlh Z dhZ [ev gã hdky gb\_  
 b iZ \_ imlb ihohZ . ?keb u , Z [hizy [hdhufb ^b]Z eyfb RCS "ih\_ " bgbdzj  
 kdhjhklb -V \ lãmx \_ iha bpbx hl ghkblegh kludh\ hqgh]h mæZ kl g pbb, \ dãhc gzhdky  
 f\_ j -"iek " hlgkblegh pglZ fbrgb , wih iha \ hebl uiz \ blv lãhpx k[e b`\_gby.  
 F\_ j -"iek " gãgl\_ k^b]Z vky dpgljm fbrg b.



gZ jk .:

Ship is low and to the right, so the -V indicator is placed high and to the left. - DhZv gb\_ b iZ , lZ qlh bgb dZj kdjh hklb -V gZhb lky ur\_ b e\_ .



Ship is low and to the right, so the -V indicator is placed high and to the left.

DZ lhev "iek " hdZy \ pgl j , ihZlZ\_ bZyfb RCS lZ , qlhu bgbdZj kdjh hklb -V hdZky ih[e]\_ d klu dhqg hfm mæm kl Zpb . DhZ l nL\_ k\_ ðnu , Z "iek " [mL\_ \ pgl\_ fbrgb , bgbdZj kdjh hklb -V h e`\_g [ulv \ pgl\_ wqZ b gfg h]h ur\_ klud h\ hqgh]h mæZ (ur\_ , ihlfm qlh klud h\ hqguc mæe gZ Delta Glider' gZhbky g\_ gZ hkb dhZ [ey , Z qm v gb\_ \_). Lij u ]hlh d kl udh\_ .<hafhgh ihl[m \_lk y ke]dZ ihZlZ bZyfb RCS, qlhu Z bgbdZj "iek " \ p\_glj fbrg b Docking MFD. Lij v ke^ bl\_ aZ kdjh hklx , ihðhblv gnü h hqgv feggh .?keb u blkv [u klj 0.5 f /k, kl udhdb g\_ ijbahc^ (u ihelbl\_ kl Zpbx gZkd hav).

aZ mdzef klyhgyb h kludh\ hqghj mæZ. ?keb Z dhæv g\_ lj g\_ g  
 iægh gZ klyhg bb gkdheð bo flh\ , ke^ ml æ aZ gbc oh^ beb kbevgh kgbablv  
 kdjh klv k[ ebgyb (deæRZ <Numpad 9>) k lf , qlh[u aæh\ h lj h\ gylv dhæv b ihljlv  
 ihuldm . Deæ d mlom - ljb\_ . lhlml ky gdhlyæ ljbh \ dZê y lhjh , qlh[u gæqblky  
 mææ dkl \ gnghf iehgbb . Bkihea mæ\_ pbnh \ hc bgbdæj kdjh kl b -V (jhf k  
 dklh f ).

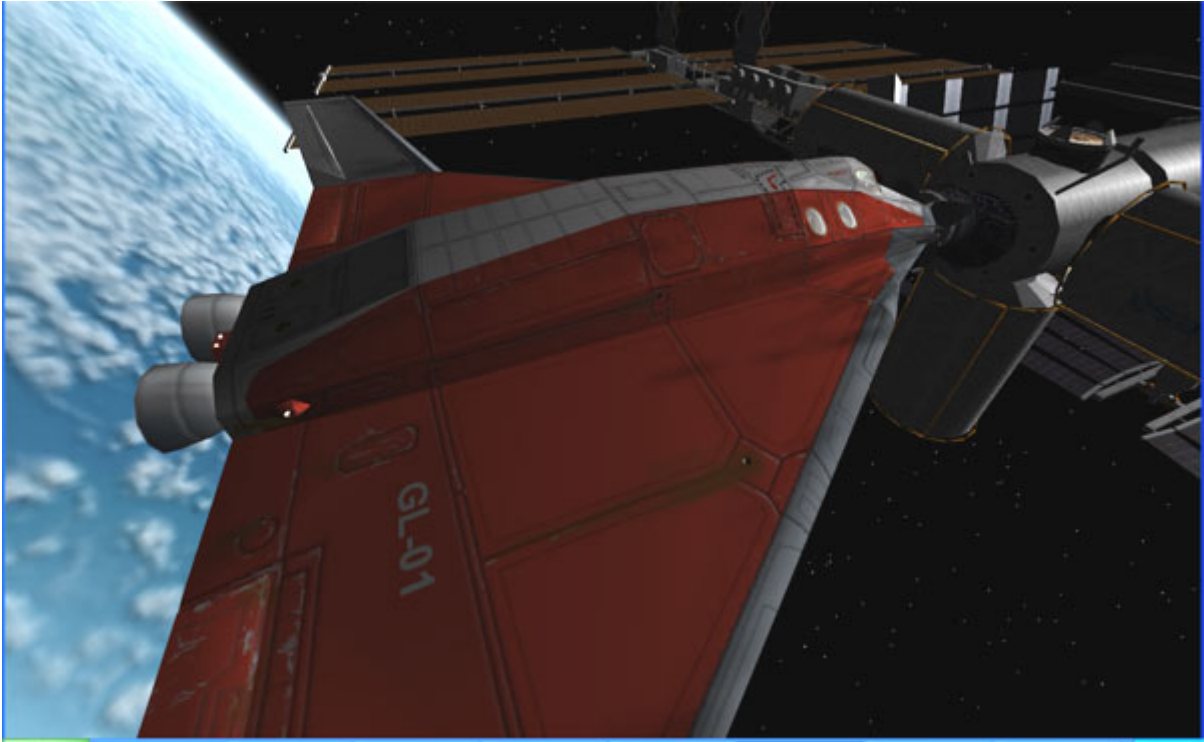
(<hafhgh , æy [he\_ lh qgh]h fæ\_ bhæby mæ[ g\_ [mæ bkihea hæ khq\_l Zgby deæR  
 <Ctrl + dghid [æb [æy RCS>, qlh æ \ 10 æ afgæbc bf imek , jpf . ihæ bdZ).



Мой корабль находится на траектории сближения и выровнен продольно и по крену относительно стыковочного узла. Относительная скорость меньше 0.5 м/с, а индикатор скорости -V проецируется прямо над стыковочным узлом. Я полностью готов к идеальной стыковке.

□ □ iklh c ki khk[ ij hplv , qlh k\_ b^ iægh . <h-juo , gZ fbrgb Docking MFD g\_ ægh [ulv wefgh\ æg h]h pl\_ Z. Dæguc p\l - kb]gæ , qlh qlh-lh b^ g\_ læ ! <h-lh j uo, h[Z dklZ ("bdk" b "iek ") h e` gu [ulv k\_ l\_ y gmlp ihkligh km Zæ\_ hky æ\_gh]h d]m]Z, dhilhuc , dklæ , gæygh ihdæu æ klyhgyb\_ h kludh\ qgh]h mæZ klæp bb (ih eh]ænfbc kdhc rd æ\_ ). < gihkælgghc [eba hklb hl klæp bb d]m] kfgbl p\l gZ [æuc . lpf . il\_ hqæbdZ ).

Khoæycl\_ hpglæbx b ihæZ cl\_ fægh\_ k[ ebgb\_ h lo ihj , ihdZ g\_ ihbaçl kludhd Z. lh æyx , u aZ jbe b kh\_ æbd h\_ imlrk l b\_ b ihreb h[mqgb\_ h dhgpZ



?keb mZ klv d hf\_gabb , aZ\_qzby beb ihèzby h zghf jndh\hK l\_ , ihzmck lZ  
[ipk uez bo fg](#).

Ki z [ h, Jared "Smitty" Smith

P.S. - < gZklhys\_ } fy y z lZ gZ jndh^ klhf ih fiezlguf ielZ . With  
 jndh^ klh deqz \ k\_ly zgh\_ hib kq b\_ hijz pbc ih hlelm hl Afeb , fiezlguf  
 ihelZ , de x qz uoh^ gZ kl Z beg u\_ hj [ blu , Z lā\_ il\_ m [z hgg\_u\_fz\_ } u k uohh f gZ  
 lzhpz ihelZ d m]bf ielZ k bkiheahzof MFD TransX. <u fh` \_l lā\_ ihqblz  
 h fhf [lmj ih Khegggh c Kbkl f](#).