CASSINI TOST SEGMENT

T96 Handoff Package

Segment Boundary
2013-333T03:45:00 – 2013-336T07:15:00

26 April 2013

Kim Steadman

Master Timeline

SMT report and SPASS

Science Highlights

Notes & Liens

Master Timeline for T96

199TI_T96	1400					
Start Time	**End Time**	**Prime Activity**	**Obs. Detail**	**Op Mode**	**TLM Mode**	**Comments**
2013-333T03:45:00	**2013-333T04:25:00**	SP Turn to WP	Neg_Y to Titan, POS_X to NTP	DFPW Normal	S_N_ER_3	
2013-333T04:25:00	2013-333T08:25:00	ISS	*ISS mosaic at first, then sit and stare for CIRS and VIMS (TN2c, TN2d)*	DFPW Normal	S_N_ER_3	
2013-333T08:25:00	2013-333T11:30:00	ISS	*ISS mosaic at first, then sit and stare for CIRS and VIMS (TN2c, TN2d)*	DFPW Normal	S_N_ER_3	
2013-333T11:30:00	2013-333T15:30:00	CIRS_NP50L30S19007	RINGS PIE	DFPW Normal	S_N_ER_3	
2013-333T15:30:00	2013-333T16:35:00	ISS mosaic	*ISS mosaic at first, then sit and stare for CIRS and VIMS (TN2c, TN2d)*	DFPW Normal	S_N_ER_3	
2013-333T16:35:00	**2013-333T17:15:00**	SP Turn to Earth for downlink	XBAND to EARTH, NEG_Y to 133/-5	DFPW Normal	S_N_ER_3	
2013-333T17:15:00	2013-333T18:45:00	Ybias window		DFPW Normal	S_N_ER_3	
2013-333T18:45:00	**2013-334T03:45:00**	Canberra 70M	XBAND to EARTH, NEG_Y to 133/-5	DFPW Normal	RTE_N_SPB	
2013-334T03:45:00	**2013-334T04:25:00**	SP Turn to WP	Neg_Y to Titan, POS_X to NTP	DFPW Normal	S_N_ER_3	

Deadband: n/a
Walking Deadband: n/a
Dual Playback: -00:29 to +00:30, 400 Mb

RBOT-friendly secondaries: Use Waypoint secondary
Any observations with prime-rider coordination?

Master Timeline for T96 Continued

199TI_T96	1400					
Start Time	**End Time**	**Prime Activity**	**Obs. Detail**	**Op Mode**	**TLM Mode**	**Comments**
2013-334T04:25:00	C/A-20:01:19	OD Uncertainty Dead Time				
C/A-20:01:19	-14:00	CIRS	A2 (Tc1b)	DFPW Normal	S_N_ER_3	ISS rider
-13:00	-09:00	CIRS	C (TN1c)	DFPW Normal	S_N_ER_3	VIMS rider
begin custom period						
-09:00	-05:00	ISS	H (TC1a, TN1a, TN2c (Could also be TC1b and/or TN1c, depending on geometry, or TN2d, depending on timing.))	DFPW Normal	S_N_ER_3	
-05:00	-02:15	ISS	J1 (TC1a, TN1a (Could also be TC1b and/or TN1c, depending on geometry, or TN2c and TN2d, depending on timing.))	DFPW Normal	S_N_ER_3	
-02:15	**-01:00**	**ISS**	(TC1a, TN1a, TN2c, TN2d)	DFPW Normal	S_N_ER_3	
-01:00	**-00:30**	**VIMS**	(TC1a, TN1a, TN1c, TC1b)	DFPW Normal	S_N_ER_3	
-00:30	**0**	**VIMS**	**(TC1a, TN1a, TN1c, TC1b)**	DFPW Normal	S_N_ER_3	ISS ridealong
2013-335T00:41:19		**CLOSEST APPROACH**	**NEG_Y to Titan, NEG_X to COROT helps eliminate heating and rotation, use RA/DEC that's equiv to orbit normal (Tc2a)**			Ontario lacus - Snail at 1 km/pixel - Western edge of Xanadu
0	**+00:30**	**VIMS**	**VIMS turns CIRS attitude, (TC1a, TN1a, TN1c, TC1b)**	DFPW Normal	S_N_ER_3	ISS ridealong
+00:30	**+02:15**	**CIRS**	**TN1c**	DFPW Normal	S_N_ER_3	
+02:15	+05:00	**CIRS**	T (TN2c (surface temperature))	DFPW Normal	S_N_ER_3	
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)	DFPW Normal	S_N_ER_3	
end custom period						
+09:00	+13:00	VIMS	O (TN1a (Specular reflection of lakes- depending on geometry))	DFPW Normal	S_N_ER_3	
+13:00	C/A+13:53:41	VIMS		DFPW Normal	S_N_ER_3	
C/A+13:53:41	2013-335T14:50:00	OD Uncertainty Dead Time				
2013-335T14:50:00	**2013-335T15:30:00**	SP Turn to Earth for downlink		DFPW Normal	S_N_ER_3	
2013-335T15:30:00	2013-335T17:00:00	Y-Bias window		DFPW Normal	S_N_ER_3	
2013-335T17:00:00	**2013-336T04:45:00**	Canberra 70M		DFPW Normal	RTE_N_SPB	
2013-336T04:45:00	**2013-336T07:15:00**	Madrid 70M		DFPW Normal	RTE_N_SPB	Dual playback for VIMS, -00:29 to +00:30

DATA VOLUME SUMMARY --- TRANSFER FRAME OVERHEAD INCLUDED (80 BITS PER 8800-BIT FRAME)

			OBSERVATION_PERIOD							DOWNLINK_PASS							
			P4						P5	RECORDED		PLAYBACK					
DOWNLINK PASS NAME	Start doy hh:mm	End doy hh:mm	START (Mb)	SCI (Mb)	HK+E (Mb)	TOTAL (Mb)	CPACTY (Mb)	MRGN (Mb)	OPNAV (Mb)	SCI (Mb)	ENGR (Mb)	TOTAL (Mb)	CPACTY (Mb)	MARGN (Mb)	NET_MARGN (Mb)	CAROVR (%)	CAROVR (Mb)
SP_199EA_C70METNON333_PRIME	333 18:45	334 03:45	0	1895	63	1959	3322	1363	0	777	53	2789	2905	116	118	2%	0
SP_199EA_C70METNON335_PRIME	335 17:00	336 04:45	0	2993	157	3150	3322	172	0	260	69	3479	3407	-73	2	0%	72
SP_199EA_M70METNON336_PRIME	336 04:45	336 07:15	72	0	0	72	3322	3250	0	460	15	547	549	2	2	0%	0

DATA VOLUME REPORT --- TRANSFER FRAME OVERHEAD NOT INCLUDED

Event	Start doy hh:mm	End doy hh:mm	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)	ENGR (Mb)	TOTAL (Mb)
OBSERVATION_NOR	333 03:45	333 18:45	37.8	28.3	175.2	5.4	525.0	26.7	67.7	0.0	987.0	0.0	25.0	0.0	62.7	1940.8
SP_199EA_C70METNON333_PRIME	333 18:45	334 03:45	22.7	17.0	86.4	3.2	0.0	16.0	27.5	0.0	592.2	4.9	0.0	0.0	0.0	770.0
DAILY TOTAL SCIENCE	333 03:45	334 03:45	60.5	45.3	261.6	8.6	525.0	42.7	95.2	0.0	1579.3	4.9	25.0	0.0	62.7	
OBSERVATION_NOR	334 03:45	335 17:00	243.2	70.3	388.7	23.5	890.0	108.9	123.3	0.0	600.5	27.2	490.0	0.0	155.7	3121.3
SP_199EA_C70METNON335_PRIME	335 17:00	336 04:45	42.3	22.2	70.1	4.2	0.0	20.9	36.0	0.0	55.4	6.4	0.0	0.0	0.0	257.5
SP_199EA_M70METNON336_PRIME	336 04:45	336 07:15	9.0	4.7	16.3	0.9	0.0	4.4	7.6	0.0	11.8	1.4	0.0	0.0	400.0	456.2
DAILY TOTAL SCIENCE	334 03:45	336 07:15	294.5	97.1	475.1	28.6	890.0	134.3	166.9	0.0	667.7	35.0	490.0	0.0	555.7	

	CAPS (Mb)	CDA (Mb)	CIRS (Mb)	INMS (Mb)	ISS (Mb)	MAG (Mb)	MIMI (Mb)	RADAR (Mb)	RPWS (Mb)	UVIS (Mb)	VIMS (Mb)	PROBE (Mb)
TOTAL RECORDED (OPNAV data not included)	355.0	142.4	736.7	37.2	1415.0	177.0	262.2	0.0	2246.9	39.9	515.0	0.0

T96 SPASS page 1

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
Sequence S81, length = 66 days		2013-295T23:15:00		066T02:32:00	2013-362T01:47:00			
Titan Flyby T96 Segment		2013-333T03:45:00		003T03:30:00	2013-336T07:15:00			
SP_199TI_WAYPTTURN333_PRIME		2013-333T03:45:00		000T00:40:00	2013-333T04:25:00	NEG_Y to Titan	POS_X to NTP	
NEW WAYPOINT		**2013-333T04:25:00**		**000T12:50:00**	**2013-333T17:15:00**	**NEG_Y to Titan**	**POS_X to NTP**	
ISS_199TI_CLOUD001_PRIME	C, M, V	2013-333T04:25:00		000T04:00:00	2013-333T08:25:00	ISS_NAC to Titan	POS_X to NTP	No Preference to secondary pointing
ISS_199TI_CLOUD002_PRIME	C, M, V	2013-333T08:25:00		000T03:05:00	2013-333T11:30:00	ISS_NAC to Titan	POS_X to NTP	No Preference to secondary pointing
CIRS_199RI_NP50L30007_PIE	M	2013-333T11:30:00		000T04:00:00	2013-333T15:30:00	NEG_Y to Rings	POS_X to NTP	
ISS_199TI_CLOUD003_PRIME	C, M, V	2013-333T15:30:00		000T01:05:00	2013-333T16:35:00	ISS_NAC to Titan	POS_X to NTP	No Preference to secondary pointing
SP_199EA_DLTURN333_PRIME	M	2013-333T16:35:00		000T00:40:00	2013-333T17:15:00	XBAND to Earth	NEG_Y to 133.0/-5.0	
NEW WAYPOINT		**2013-333T17:15:00**		**000T11:10:00**	**2013-334T04:25:00**	**XBAND to Earth**	**NEG_Y to 133.0/-5.0**	
SP_199EA_YGAP333_PRIME	E, M	2013-333T17:15:00		000T01:30:00	2013-333T18:45:00	XBAND to Earth	NEG_Y to 133.0/-5.0	
SP_199EA_C70METNON333_PRIME	C	2013-333T18:45:00		000T09:00:00	2013-334T03:45:00	XBAND to Earth	NEG_Y to 133.0/-5.0	MIMI. NEG_Y to Saturn (0,0,-9.5). pre-TOST flyby
SP_199TI_WAYPTTURN334_PRIME		2013-334T03:45:00		000T00:40:00	2013-334T04:25:00	NEG_Y to Titan	POS_X to NTP	
NEW WAYPOINT		**2013-334T04:25:00**		**001T11:05:00**	**2013-335T15:30:00**	**NEG_Y to Titan**	**POS_X to NTP**	
SP_199NA_DEADTIME334_PRIME		**2013-334T04:25:00**		**000T00:15:00**	**2013-334T04:40:00**	**NEG_Y to Titan**	**POS_X to NTP**	
CIRS_199TI_MIDIRTMAP001_PRIME	V	2013-334T04:40:00	GMB_E199_TITAN_T96-000T20:01:19	000T06:01:19	2013-334T10:41:19	CIRS_FPB to Titan	PIC	Template A2: CIRS-ISS
CIRS_199TI_FIRNADCMP001_PRIME	I, U, V	2013-334T10:41:19	GMB_E199_TITAN_T96-000T14:00:00	000T05:00:00	2013-334T15:41:19	CIRS_FP1 to Titan	PIC	Collaborative Rider(s): ISS
Begin custom period		**2013-334T15:41:19**	**GMB_E199_TITAN_T96-000T09:00:00**	**000T00:00:01**	**2013-334T15:41:20**			
ISS_199TI_GLOBMAP001_PRIME	C, V	2013-334T15:41:19	GMB_E199_TITAN_T96-000T09:00:00	000T04:00:00	2013-334T19:41:19	ISS_NAC to Titan	POS_Z to Titan_SC_RAM	Pick up at NEG_Y to Titan, POS_X to NTP; Hand off at ISS_NAC to Titan, POS_Z to Titan_SC_RAM.
ISS_199TI_REGMAP001_PRIME	C, V	2013-334T19:41:19	GMB_E199_TITAN_T96-000T05:00:00	000T02:45:00	2013-334T22:26:19	ISS_NAC to Titan	POS_Z to Titan_SC_RAM	Pick up at ISS_NAC to Titan, POS_Z to Titan_SC_RAM; Hand off at ISS_NAC to Titan, POS_Z to Titan_SC_RAM.
ISS_199TI_REGMAP002_PRIME	C, M, V	2013-334T22:26:19	GMB_E199_TITAN_T96-000T02:15:00	000T01:15:00	2013-334T23:41:19	ISS_NAC to Titan	POS_Z to Titan_SC_RAM	Pick up at ISS_NAC to Titan, POS_Z to Titan_SC_RAM; Hand off at VIMS_IR to Titan, POS_Z to Titan_SC_RAM.
VIMS_199TI_HIRES001_PRIME	C, I, M	2013-334T23:41:19	GMB_E199_TITAN_T96-000T01:00:00	000T00:30:00	2013-335T00:11:19	VIMS_IR to Titan	POS_Z to Titan_SC_RAM	Pick up at VIMS_IR to Titan, POS_Z to Titan_SC_RAM; Hand off at VIMS_IR to Titan, POS_Z to Titan_SC_RAM.
VIMS_199TI_HIRES002_PRIME	C, M	2013-335T00:11:19	GMB_E199_TITAN_T96-000T00:30:00	000T01:00:00	2013-335T01:11:19	VIMS_IR to Titan	POS_Z to Titan_SC_RAM	Pick up at VIMS_IR to Titan, POS_Z to Titan_SC_RAM; Hand off at NEG_Y to Titan, POS_Z to Titan_SC_RAM.
Begin Dual Playback Science		2013-335T00:12:19	GMB_E199_TITAN_T96-000T00:29:00	000T00:00:01	2013-335T00:12:20			
199TI (t) T96 TITAN Inboun...		2013-335T00:41:19		000T00:00:01	2013-335T00:41:20			
End Dual Playback Science		2013-335T01:11:19	GMB_E199_TITAN_T96+000T00:30:00	000T00:00:01	2013-335T01:11:20			

T96 SPASS page 2

Request	Riders	Start (SCET)	Start (Epoch)	Duration	End (SCET)	Primary	Secondary	Comments
CIRS_199TI_FIRLMBAER002_PRIME	M, V	2013-335T01:11:19	GMB_E199_TITAN_T96+000T00:30:00	000T00:45:00	2013-335T01:56:19	CIRS_FP1 to Titan	PIC	Pick up at NEG_Y to Titan, POS_Z to Titan_SC_RAM; Hand off at CIRS_FP1 to Titan, PIC.
CIRS_199TI_FIRLMBINT002_PRIME	I, M, V	2013-335T01:56:19	GMB_E199_TITAN_T96+000T01:15:00	000T01:00:00	2013-335T02:56:19	CIRS_FP1 to Titan	PIC	Pick up at CIRS_FP1 to Titan, PIC; Hand off at CIRS_FP1 to Titan, PIC.
CIRS_199TI_FIRNADMAP002_PRIME	I, V	2013-335T02:56:19	GMB_E199_TITAN_T96+000T02:15:00	000T02:45:00	2013-335T05:41:19	CIRS_FP1 to Titan	PIC	Pick up at CIRS_FP1 to Titan, PIC; Hand off at CIRS_FP1 to Titan, PIC.
CIRS_199TI_MIRLMBINT002_PRIME	I, V	2013-335T05:41:19	GMB_E199_TITAN_T96+000T05:00:00	000T04:00:00	2013-335T09:41:19	CIRS_FPB to Titan	PIC	Pick up at CIRS_FP1 to Titan, PIC; Hand off at NEG_Y to Titan, POS_X to NTP.
End custom period		**2013-335T09:41:19**	**GMB_E199_TITAN_T96+000T09:00:0(**	**000T00:00:01**	**2013-335T09:41:20**			
VIMS_199TI_GLOBMAP002_PRIME	C, I	2013-335T09:41:19	GMB_E199_TITAN_T96+000T09:00:00	000T04:00:00	2013-335T13:41:19	VIMS_IR to Titan	POS_X to NTP	No Preference to secondary pointing
VIMS_199TI_GLOBMAP003_PRIME	C	2013-335T13:41:19	GMB_E199_TITAN_T96+000T13:00:00	000T00:53:41	2013-335T14:35:00	VIMS_IR to Titan	POS_X to NTP	No Preference to secondary pointing
SP_199NA_DEADTIME335_PRIME		**2013-335T14:35:00**	**GMB_E199_TITAN_T96+000T13:53:41**	**000T00:15:00**	**2013-335T14:50:00**	**NEG_Y to Titan**	**POS_X to NTP**	
SP_199EA_DLTURN335_PRIME		2013-335T14:50:00		000T00:40:00	2013-335T15:30:00	XBAND to Earth	NEG_Y to 295.0/53.5	
NEW WAYPOINT		**2013-335T15:30:00**		**000T15:45:00**	**2013-336T07:15:00**	**XBAND to Earth**	**NEG_Y to 295.0/53.5**	
SP_199EA_YGAP335_PRIME	E	2013-335T15:30:00		000T01:30:00	2013-335T17:00:00	XBAND to Earth	NEG_Y to 295.0/53.5	
SP_199EA_C70METNON335_PRIME	C	2013-335T17:00:00		000T11:45:00	2013-336T04:45:00	XBAND to Earth	Rolling	MIMI. NEG_Y to Saturn (0,0,-9.5).
Periapse R = 19.523 Rs, lat...		2013-335T22:43:20		000T00:00:01	2013-335T22:43:21			
Pointer Reset in preparatio...		2013-336T04:45:00		000T00:00:01	2013-336T04:45:01			
SP_199EA_M70METNON336_PRIME	C	2013-336T04:45:00		000T02:30:00	2013-336T07:15:00	XBAND to Earth	Rolling/SRU	MIMI. NEG_Y to Saturn (0,0,-9.5). SID suspend

T96 Science Highlights

DOY 333: ISS will monitor Titan's high northern latitudes, where it will be important to track clouds and the evolution thereof as summer approaches. VIMS and CIRS will ridealong with ISS for cloud and temperature mapping. There is also a CIRS observation of the Rings.

DOY 334: Canberra 70M downlink pass to play back data then the Titan 96 flyby begins. T96 is a 1400 km flyby inbound to Saturn.

Inbound to Titan, CIRS will obtain information on the thermal structure of Titan's stratosphere. ISS will acquire a medium- to- high-resolution mosaic of high northern latitudes approaching northern summer, including Titan's leading hemisphere which has not yet been well observed (multiple observations of high northern latitudes may be needed in case of cloud cover obscuring the surface). VIMS will ride along with ISS to acquire a medium resolution mosaic of high northern latitudes. It will also look for clouds over the North Pole to monitor the evolution of the cloud system as Titan approaches summer solstice. VIMS will also look for specular reflection in an area located between latitudes 53N and 48 N and between longitudes 130 W – 163 W.

DOY 335: During closest approach VIMS will first acquire a high resolution map of the northern seas and lakes. It will then use the noodle mode to acquire high-resolution swath over terrains from high northern latitudes to the equator along the western edge of Xanadu. Then, at the end of its prime observation, it will stare to Ontario lacus (72.5 S, 182.5 W) which will be on the terminator. VIMS will then ride along with CIRS and UVIS to image Titan's southern hemisphere at high incidence angle. It will also look at clouds to follow the evolution of the cloud system over the South Pole. ISS will ride along with VIMS' and CIRS' observations, at closest approach and outbound, to image Titan's surface and atmosphere.
Outbound CIRS will measure the far-infrared for aerosol and gas vertical abundances near 20S is the focus, complementing T94 (20N).

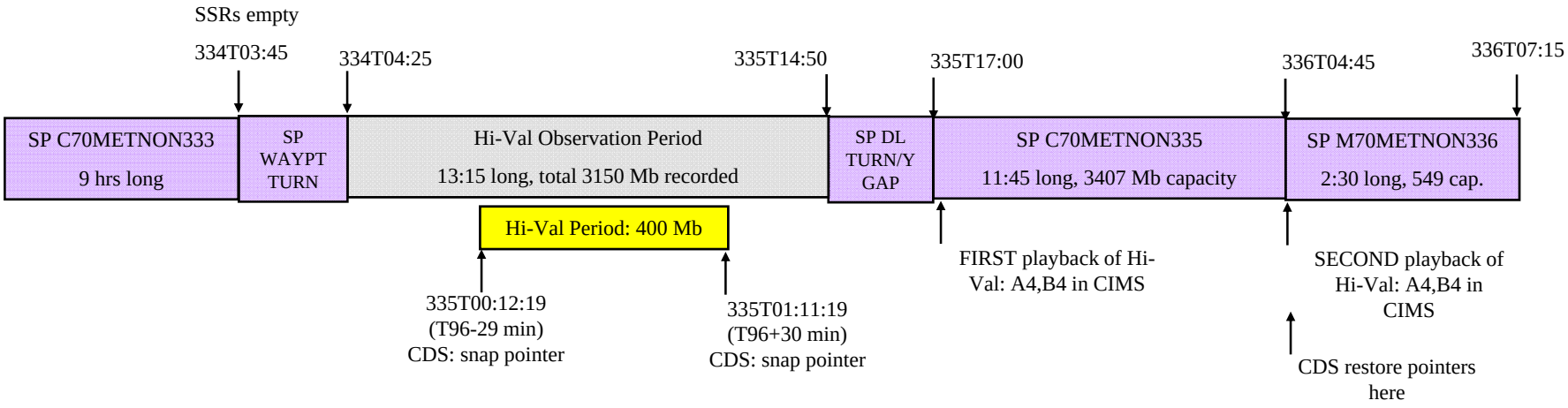
T96 Science Highlights

DOY 335: T96 is another high inclination flyby in the noon sector of Saturn's magnetosphere. With closest approach in the dayside and slightly past the flow terminator, Cassini will be able to study the diffusion of the external magnetic field at low altitudes and the flank facing away from Saturn. A comparison with flybys at similar local times (T83-T95) will be very useful. MIMI will Measure energetic ion and electron energy input to atmosphere. RPWS will measure thermal plasmas in Titan's ionosphere and surrounding environment; search for lightning in Titan's atmosphere; investigate the interaction of Titan with Saturn's magnetosphere. INMS will be observing neutrals and ions at closest approach. Additionally, ion outflow with be observed between 1400 and 2500 km in altitude on inbound and outbound.

Titan 96 data playback will occur over the Canberra 70M DSN station.

T96 Dual Playback

Flyby	BEGHIVAL	ENDHIVAL	P4 Dual Playback Data Volume	SSR empty before hi-val observation period? (if not verify any carryover on A fits with Hi-Val data)	SSR-A empty after first playback?	PPL set to A4,B4 for first AND second playbacks?	SSRs empty after second playback? (if not does any Hi-Val data carry over?)
T96	T96-29 min	T96+30 min	400 Mb	Yes	Yes	Yes	Yes



Notes

- Pointing:
  - Waypoint isn't valid around closest approach. During a custom period so ok.
- Data Volume:
  - Dual playback for VIMS from c/a -29 min to c/a +30 min. Standard implementation.
- DSN:
  - none
- Resource checker:
  - PIC used in secondary during custom period by CIRS. This is standard practice for CIRS.
- Opmodes:
  - None
- Hydrazine:
  - No Hydrazine usage.
- Special Activities:
  - None

Liens

Sequence Liens (should all be SPLAT items):

- List any Liens to be worked in SIP, ie
  - Dual playback relies on current DSN stations.