

SOP 2.13

Title

Ground Year-End-Rollover Procedures for STS-~~116/133/42A-1~~ULF5

Purpose

To define the ground procedures required when Space Shuttle mission operations occur during the rollover from one calendar year to another. A procedure was developed at the direction of the Shuttle Program to support a contingency scenario that might require flying a Shuttle over the end of a year.

~~The generic procedure was specifically modified for STS-116/12A.1 to accommodate the 8-10 hr delay in performing the onboard YERO procedure because the YERO event occurs near or during crew sleep.~~

Participants

Every Flight Control position logged into an MCC workstation monitoring space shuttle data during a shuttle mission occurring over a year end rollover is a participant in this procedure. Listed below are the participants who are critical for the successful completion of this procedure.

*GC	FD	ISS FD
COMMAND	CAPCOM	ISS GC
DFE	INCO	
COMM TECH	GNC	
FSM	FDO	
ODRC	NAV	
GPO	TAO <u>DYNAMICS</u>	
DPS	TAO	

General

For any STS mission that might fly over the end of the year, the prime (mission) MCC workstation activity assigned to the flight should have a defined reference year (current year). This activity's reference year will be redefined to the new year shortly after rollover as part of this procedure. All Shuttle Front End Processors (FEPs), Trajectory servers, and Command servers assigned to this flight activity will be reconfigured after the update. This activity change will not affect the ISS FCT, if a joint mission, because their applications do not use the reference yearis parameter. ~~All Shuttle users, however, will use this updated activity.~~

Just prior to the year end rollover, the Shuttle team will logoff their workstations while ISS users will drop all Shuttle displays. The Shuttle team is divided into four groups or tiers to ~~faciliate~~facilitate the logoff process. The first tier consists of all Shuttle controllers except Shuttle FCR, Shuttle MPSRs, ~~and OST~~and OST controllers. (Note: One of the SSP MER

workstations monitors SSP MER servers 1, 2, and 3, and does not need to logoff.) The second tier consists of all Shuttle MPSR controllers except NAV and TAO. The third tier consists of all Shuttle FCR controllers. The fourth tier consists of ~~NAV~~of NAV, TAO, and OST controllers. Shortly after the year end rollover, the prime workstation activity will be modified with the new reference year, and shuttle servers and front end equipment will be recycled and initialized in the new year. The Shuttle team will logon in the reverse order in which they logged off.

Once the Shuttle ground equipment has been reconfigured, the ~~Crew will execute the onboard YERO procedure. YERO, ORB OPS, onboard GPCs will be IPLed so that GPC time will match the MTUs and begin counting up with GMT day 001.~~

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~~Note: If necessary, For STS-116/12A.1, the onboard reconfiguration will can be delayed 8-10 up to 24 hours. For STS-116, to prevent conflict with crew sleep periods or other priority tasking for the crew. this was the plan because the YERO event would have occurred occurs near or during crew sleep. For this case. For cases where the YERO event would interrupt crew sleep, to avoid an alarm at YERO (TIME MTU), the GPCs will would be forced to internal time to avoid an alarm at YERO (TIME MTU) before prior to crew sleep.~~

Reference launch time will be redefined to 00 hours on January 1 of the new year in both the ground and onboard software, and this will reset MET to 00 days and 00 hours. FAO will create a new Flight Plan database and set the launch date/time to correspond to YERO. This will reset MET to 0/00:00. FAO will adjust the planned activities so that every activity from YERO on will "move forward" from the new 0/00:00 MET. It will be transparent to the crew as all changes will be made during the replan process and they should not have to change out pages onboard other than the nominal morning mail ritual.

Note: No critical mission phase should be scheduled to occur near the end of a year or during the execution of these procedures.

~~For STS-116/12A.1, a~~ second activity will be assigned to the flight (sim mode) ~~a few~~ approximately three hours before the YERO event. It ~~should will~~ have a defined reference year that is the current year. This activity and its Trajectory server, however, will not be recycled to the new year so that FDO and NAV can monitor the onboard state vector during the ~~extended~~ period that the prime mission activity and the onboard system will be out-of-sync (i.e., ground GMT day 1 of ~~2007- the new year~~ while onboard GPC GMT day 366 of ~~2006 the old year~~). This activity will also have a Shuttle Command server available so that in a contingency (e.g., onboard reconfiguration gets delayed for an additional extended period) ~~state~~ vector commands could be uplinked to the Shuttle. Only workstations pre-approved may log on to this activity.

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~~Tests to verify orbiter onboard procedures and MCC operational impacts of running across the year-end rollover were performed with the SMS and SAIL facilities in October/November 2004 and March 2005 using the STS-114 OI-30 software. Summaries of the test accomplishments, operational impacts, and procedural workarounds are described below. The ground YERO procedures are~~

presented in the next section. (Note: 2004 was a leap year so December 31 was day 366 for the Oct/Nov tests and day 365 for the March test.)

Background

An STS-116/12A.1 test with MCC and SAIL was conducted on October 25, 2006 as part of flight specific testing of the flight software and training for the STS-116 flight control team. Another training exercise, an integrated YERO sim with the SMS, was conducted on November 16, 2006 to give the STS-116 FCT additional training in these procedures. The results of this test and sim are briefly summarized in paragraph F below.

A. Onboard - The onboard GPC's continue to count up to day 366, 367, etc., whereas but the master timing unit (MTU) resets to day 001. The MTU also resets at the end of days 366, 375, and 376. When the MTU resets to day 001, the GPC wills default to internal time and continue running independently from the MTU time. The flight crew performs the Orbit Ops YERO procedure CR 93160B Year End Roll Over (YERO) Reset, implemented as a flight patch in OI-32 and as a source change in OI-33, provides the capability to adjust the GPC timing information, including the trajectory information, to the new year. When the GPC and MTU times differ by more than 364 days on a simplex transition from OPS 2 to OPS3, the time information in the PASS is corrected as part of OPS3 initialization. Since no changes were made to the BFS software, updates to specific timing information in the BFS are done via uplink. The crew will perform the YERO, ORB OPS procedure which will adjust time-related information in the GPCs to the new year.

to IPL the GPCs and resync the GPCs to MTU time. The onboard should be in OPS 2 during rollover. It is preferred that the orbiter be docked to the ISS for this procedure, but it is not required; that is, the shuttle could be free flying. Once the GPCs have been IPL'd, several commands (RNP, GPS delta time, etc.) must be uplinked from the ground so command capability is required for this procedure. In addition, the orbiter weight must be updated (via a dummy PEG7 burn command) because the orbiter weight defaults to a pre-launch I Load value during the IPL process. Note: The total onboard procedure takes about 1.5222 hours, and the shuttle is in free drift during most of this time.

B. Trajectory
1.) Trajectory Server (TRS) - Two activities will be used to support the YERO event. The prime activity, i.e. the mission activity, will reset the year at the time of rollover. Following rollover, the TRS continues to count to 366, etc., but shows the time as 001 on many displays. To accommodate the onboard GPCs which are reset to MTU time, the TRS is taken down and brought back up in the new year, with liftoff defined as 0 hrs on January 1 of the new year. This resets MET on the ground, and it should will match the onboard MET. If there is a problem mis-compare with the ground and onboard METs, IPLing the GPCs, the liftoff time can be adjusted in the ground software TRS to make it's MET match the onboard MET.

The secondary ("Monitor") activity will be configured will be activated several hours prior to the rollover event. The onboard YERO steps may be delayed up to 24 hours and the secondary activity will remain in the launch year to monitor onboard state vectors and

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provide a capability to update the onboard state vector if needed until the onboard steps are completed.

2.) Other Trajectory Applications: The secondary activity will be configured to the launch year and will be used to monitor onboard telemetry following the YERO event.

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There are known issues with ~~During the first test with SAIL, the~~ deorbit and entry processors when ~~could not planning over the~~in the launch year for events occurring in the new year. A workaround was developed ~~during the test which is~~ to build an ephemeris in the new year in TSA (FDO's offline tools) and compute deorbit targets. These targets are then input into the TRS ephemeris which is anchored in the old year. ~~Another problem is that~~ Additionally, entry planning vectors cannot be sent to GSFC over the new year if deorbit and landing occur early on January 1. The workaround to this problem is to define a second workstation ("Planning") activity with its own TRS and FEP and initialized a day before expected landing. This activity would ~~be based on the~~ be defined with the new year in the activity definition, and normal deorbit planning could occur and provide the entry acquisition planning data for shipment to GSFC. ~~This activity would be be utilized~~ configured and these activities completed on days prior to the YERO event; the activity ~~and would be taken~~ down terminated at latest three hours before the YERO event.

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3.) State vector commands cannot be built in the prime activity during the "mixed" configuration (ground in new year, onboard in launch year). The vector timetag required would be in day 366 to match the onboard GPC time, but the command server has a requirement to support times only within +/- 180 days of current time. This restriction applies to any command with a time in it designed to match the onboard GPC day 366. However, a state vector command with day 366 can be built in the secondary activity.

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4.) Times displayed via GENX displays will show inconsistent formatting (either displayed as Day 366 or Day 1) depending on how each particular time field is defined.

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(Note: These processor problems did not occur in the 10/25/06 test with SAIL.)

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C. Command - Command testing was performed with uplink encryption and time authentication enabled. The command server is initially brought up in the old year. After YERO occurs, the server is recycled and brought up in the new year. Timing authentication/command encryption were successfully restored. Checkpoints taken pre-rollover could not be used to restore the server after rollover occurs as they overwrote the reference year. To better coordinate the uplink of multiple commands in a timely fashion and in the proper order post YERO (YERO Part 2, step 8), these commands were announced on the Flight loop.

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There was a minor problem with the FDO/GPO burn command display during the March test. After the YERO recycle of the ground equipment, the PEG command display showed a burn TIG of GMT day 366 instead of day 1. The HEX data of the command was checked, and it contained the correct time for the day 1 burn. The command was successfully uplinked to the Orbiter (SAIL) and interpreted correctly by the onboard software as day 1. The problem seems to be

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~~limited to this display as the FDO/GPO state vector command display correctly showed the time as GMT day 1 when a vector command was built post YERO.~~

- D. Telemetry, Real-Time/Dumps - ODRC will stop and restart their data line just prior to YERO once the downlink FEP is taken down for recycle. Data not recorded in ODRC during the recycle can be played back into ODRC from the MCC Consolidated Communications Recording Facility (CCRF) or dumped from the on-board recorders. After the ground has recycled for GMT YERO, data should be retrieved from ODRC by using GMT and not MET.
- E. MCC Facility ~~— A facility test was conducted during the actual YERO event in 2007 to 2008 to investigate the behavior of the system. No significant issues were identified during the GMT YERO event and no issues were identified during the local time YERO event. However, to ensure a clean facility after the YERO event, all Shuttle equipment will be recycled/rebooted; this must be done once only at GMT rollover. While the MCC equipment is recycling, the MCC/Consolidated Communications Recording Facility (CCRF) and the White Sands Complex will record any Shuttle downlinked data for later retrieval, if required. Because no test was performed to see how the Servers and other Shuttle MCC equipment and applications would behave when their internal clocks rolled over to a new year, MOD decided the safest course of action was to recycle all the Shuttle equipment. This will be done twice: once at GMT rollover and then again at local rollover. While the MCC is recycling, the MCC/Consolidated Communications Recording Facility (CCRF) and the White Sands Complex will record any Shuttle downlinked data for later retrieval, if required.~~
- F. ~~Another MCC/SAIL YERO test was conducted on October 25, 2006. This Network Interfaces - T tests included conducted with external interfaces, including with GSFC, KSC, MSFC, and MILA, showed no significant issues with interactions with external facilities. There were some issues with exchange of trajectory information between the MCC and external facilities; additional details are in the TRS Section (Section B), and adequate workarounds to these issues exist. Overall the test was a success.~~

~~A few anomalies were noted. FDO could not build a state vector command in the prime activity during the "mixed" configuration (ground in 2007, onboard in 2006). The vector timetag was day 366 to match the onboard GPC time, but the command server has a requirement to support times only within +/- 180 days of current time. This restriction applies to any command with a time in it designed to match the onboard GPC day 366. During the November 16th sim, however, FDO was able to build a vector command with day 366 in the second activity which was successfully uplinked to the vehicle (SMS). Another problem noted during the October test was some FDO and NAV GENX displays showed day 365 as day 0. Because there are about 40 of these displays, they cannot be fixed and certified in time for STS 116/12A.1. This problem will be fixed in a future update and is not an issue for STS 116. The flight controllers just need to be aware of the problem so they know how to interpret the time on the affected displays.~~

Procedures

The ground procedures to accommodate flying over the end of a year are listed in the table below. The steps in the “GMT YERO minus” blocks must be executed before the end of the year. The post YERO times in this procedure are approximate and are based on the results of testing. The Command Server and Trajectory Server steps, though listed separately, may be executed in parallel because they generally involve non-conflicting processes. When all ground steps through the “GMT YERO + 55 mins” block have been completed, the ground is “Ready” for the main part of the onboard YERO procedure to begin. There is no need to wait ~~till~~until GMT YERO + 60 mins. ~~For STS 116/12A.1, YERO occurs near or early in crew sleep. Consequently, the main onboard YERO procedures will be executed the next morning. Note: The onboard procedure takes about 45 - 60 minutes to complete, and, if not docked to ISS, the shuttle is in free drift during most of this time. The onboard procedure takes approximately 1.5 ??? hours to complete.~~

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GMT Year End Rollover Procedure

For any STS mission that might fly over the end of the year, the prime (mission) MCC workstation activity assigned to the flight should have a defined reference year (current year). This activity's reference year will be redefined to the new year shortly after rollover. This activity change will not affect the ISS FCT, if a joint mission, because their applications do not use the [reference year](#) parameter. As a result of performing this YERO procedure, reference launch time will be redefined to 00 hours on January 1 of the new year, and MET will reset to 00 days and 00 hours.

MCC Facility - ~~Because a test was not performed to see how the Servers and other Shuttle MCC equipment and applications would behave when their internal clocks rolled over to a new year, MOD decided the safest course of action was to~~ [To ensure a clean facility after the YERO event, recycle all the Shuttle equipment will be recycled/rebooted.](#) This must be done ~~twice: once~~ [once only](#) at GMT rollover, ~~and then again at local rollover.~~ While the MCC equipment is recycling, the MCC/Consolidated Communications Recording Facility (CCRF) and the White Sands Complex will record any Shuttle downlinked data for later retrieval, if required.

Note: References to [YERO, Parts 1-3, in this procedure are to the](#) Onboard YERO procedure in Orbit OPS [are included in this procedure.](#) There are occasional callouts to specific steps of that procedure. ~~For STS-116/12A.1, the Onboard YERO Part 1 procedure will be performed before crew sleep and outside the timeline specified below in the ground YERO procedure.~~

GC will announce and coordinate the ground reconfiguration steps on the Flight loop while FLIGHT will lead and coordinate the onboard reconfiguration.

~~Prior to the start of this procedure (at ~ YERO - 3 hrs) the FSM will configure a secondary activity with a reference year in the activity definition; the reference year will be the launch year.~~

Step	Lead or Participants	Action	Notes
Before crew sleep GMT YERO – 1 hour (5:00 pm CST)			
<u>1</u>	<u>DPS (?)</u>	<u>Provide MET delta values for MTU adjust</u>	Needed for <u>Required for -YERO, Step 1, ORB OPS ORB OPS</u>

24	FD	Poll FCT for a GO for YERO, Part 1, Step 1, ORB OPS	YERO, Part 1, ORB OPS Step -1 must be completed before the end of the year. (Add step 2 Step 2 (required if YERO occurs during crew sleep) – must be completed before the end of the year
32	Crew	Crew performs YERO, Part 1, STEP 1, ORB OPS.	Takes approximately 15–205.10 (?) minutes.
43	FCT	Report as each step is completed.	YERO, Part 1, ORB OPS adjusts the MTU MET, realigns the IMUs, and YERO, Part 2, ORB OPS (if required), takes the GPCs to internal time.
GMT YERO – 1 hour (5:00 pm CST)			
54	FD	Direct FCT to gather data and FDO team to to initiate in preparation for preliminary pre-YERO system configuration. YERO.	FDO team collects trajectory data while FCT reviews system TMBUs to determine what will be needed after YERO and FDO team prepares trajectory system and verifies that the secondary monitor activity and associated TRS and FEPS are ready to support.
65	FCT	Inform FD when data gathering complete and ready for a Shuttle CMD command server checkpoint. FDO reports when preliminary pre-YERO system configuration and Monitor secondary activity verification are complete.	All data collected and positions are ready for a Shuttle Command server checkpoint. Traj system and Monitor secondary activity are ready
GMT YERO - 30 mins (5:30 pm CST)			
76	GC	Take Shuttle Command Server checkpoint after receiving “GO” from FD.	Hold inputs during checkpoint process. The checkpoint is taken for archive purposes.
988	GC	Turn off Vector Autocue with FDO concurrence.	Hourly vectors will not be sent out automatically until after the Trajectory server TRS is recycled following the YERO event.
GMT YERO - 25 mins (5:35 pm CST)			

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1099	GC	Announce that all Shuttle controllers except the FCR, MPSRs, and OST should drop command displays, logoff the SSP command manager, and logoff their workstations.	Tier one users (SSP MER, SPAN, CSR, etc.) should logoff. All Tier one workstations should be logged off by YERO - 20 minutes.
1400	ISS FD	Instruct all ISS flight controllers monitoring SSP displays to drop all SSP displays and SSP command managers until notified to recall them.	Displays left up could show stale or erroneous data while servers are recycled.
GMT YERO - 20 mins (5:40 pm CST)			
121+	GC	Announce that all Shuttle MPSR positions (except NAV and TAO) should drop command displays, logoff the SSP command manager, and logoff workstations.	Tier two users should logoff. All Tier two workstations should be logged off by YERO - 15 minutes.
1322	FDO	Have TAO begin <u>final</u> Pre-YERO TRS trajectory <u>system</u> configuration.	FDO should turn ephemeris and VAT mirrors off.
GMT YERO - 15 mins (5:45 pm CST)			
1433	GC	Instruct all Shuttle FCR controllers to drop command displays, logoff the <u>logoff the</u> SSP command manager, and logoff their workstations until directed to log back in following YERO.	All Shuttle FCR positions should logoff. All Tier three workstations should be logged off by YERO - 10 minutes.
1544	FD	Inform ISS FD that access to <u>ISS</u> Command Manager will be locked.	ISS FCT already logged into <u>ISS Command</u> Command <u>ISS Command</u> Manager will be able to build commands. Only new logons will be prevented.
1655	GC	Instruct COMMAND to lock access to the <u>SSP and ISS</u> Command Managers.	The Command Managers is <u>are</u> locked to prevent inadvertent logon activity during the <u>Shuttle</u> Command Server recycle.

1766	GC	Take checkpoints on the Shuttle downlink and Ground to Ground FEPS prior to deconfiguring and deallocating them.	
GMT YERO - 10 mins (5:50 pm CST)			
187	FDO	Verify that TAO and NAV have completed all pPre-YERO actionssystem configuration	Checkpoint in new year is available to initialize the mission TRS after YERO
1987	GC	Instruct TAO, NAV, and OST controllers to drop command displays, logoff the SSP command manager, and logoff their workstations until directed to log back in following YERO.	All Tier four workstations should be logged off by YERO - 5 minutes. All Shuttle controllers on the prime activity should be logged off by now.
1819	GC	With FD concurrence, force off any Shuttle workstations still logged into the prime mission activity.	Workstations on the <u>secondary</u> activity are not involved in this procedure and should remain logged on. <u>FSM will have a list of authorized users of the secondary activity</u>
GMT YERO - 5 mins (5:55 pm CST)			
1920	GC	On FD go, deconfigure and deallocate (disconnect) the Shuttle command and trajectory servers and all Shuttle FEPS utilized on the prime mission activity.	GC coordinates with the OST to perform these actions. The <u>Shuttle cCommand</u> and <u>trajectoryTRAJ</u> servers will be rebooted after YERO in preparation for the new year reconfiguration.
2021	GC	Stop and start the ODRC data lines after data has stopped flowing through the downlink FEPS in preparation to configure and pick up the new year.	
~ GMT YERO + 1 min (6:01 pm CST)			
2122	GC	Coordinate the reallocation of the Shuttle ground equipment.	GC coordinates with OST to perform these actions.

		A. FSM modify the prime workstation activity to reflect the new reference year.	
		B. FSM reallocate the Shuttle FEPs.	OST configures the FEPs for the new year.
		C. FSM reallocate the SSP <u>Command</u> server after reboot is complete.	Server is rebooted to ensure it comes up clean (all data and input from previous year are gone).
		D. FSM reallocate the trajectory <u>TRAJ</u> server after reboot is complete.	Server is rebooted to ensure it comes up clean (all data and input from previous year are gone).
~ GMT YERO + 2 mins (6:02 pm CST)			
<u>2223</u>	GC	After the workstation activity has been modified by FSM (Step 21A <u>22A</u>), announce that OST, TAO, and NAV may log in to workstations.	Tier four positions may log in to their workstations and await the completion of SSP command <u>CMD</u> and trajectory <u>TRAJ</u> server reboots and re allocations and FEP reallocations before continuing with configuring their equipment.
~ GMT YERO + 7 mins (6:07 pm CST)			
<u>2324</u>	GC	After SSP CMD <u>command</u> server reallocation is complete (Step 22C , <u>21C</u>), have COMMAND configure the server with the new year.	COMMAND should perform whatever initialization steps are required.
<u>2425</u>	GC	After TRAJ <u>trajectory</u> server reallocation is complete (Step 22D , <u>21D</u>), give FDO a "GO" to initiate Post-YERO TRS reconfiguration <u>reconfigure TRS for Operations in New Year</u>	FDO coordinates with TAO & NAV to perform this action. A. TAO restarts the TRAJ-TRS server from Baseline checkpoint , verifies the new year has been picked up, and defines L/O as January 1, 0 hours of the new year (P80) . B. TAO & NAV defines L/O as <u>January 1, 0 hours of the new year</u> and configures the server <u>TRS</u> for mission support.
<u>2526</u>	FDO	Notify FD that TRAJ server <u>TRS</u> configuration has begun.	

2627	GC	When ODRC sees data flow post YERO, they will run a plot to determine time gap and coordinate playback of any data not received in ODRC in realtime.	
~ GMT YERO + 10 mins (6:10 pm <u>CST</u>)			
2728	GC	After the <u>Shuttle</u> command server has been configured by COMMAND (23Step 24), instruct COMMAND to unlock access to the <u>SSP and ISS</u> Command Managers.	
2829	GC	Announce that all Shuttle FCR positions can log back in to the prime mission activity and the <u>SSP</u> Command Manager. The controllers are not yet authorized to call up trajectory displays. <u>Note: Step 28B can be delayed for STS-116 because the O/B YERO IPL will not occur until crew morning.</u>	This step is performed after the FEPs and <u>SSP CMD-command</u> server have been reallocated and reconfigured. Tier three positions can log into the prime mission activity. <u>A. FCT should build Commands and TMBUs as required.</u> <u>B. A series of commands will be required in YERO, Part 2, step 8 to establish the new year ephemeris onboard, to update the O/B vector, GPS time reference, and to restore sensor bias terms.</u> <u>C. FDO should turn on the VAT mirror so the <u>Trajectory server</u> <u>TRS</u> can be configured.</u>
2930	FD	Inform ISS FD that access to <u>ISS</u> Command Manager has been unlocked.	ISS controllers, not already logged on the <u>ISS</u> Command Manager, may now -logon.
~ GMT YERO + 15 mins (6:15 pm <u>CST</u>)			

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3031	GC	Announce that all Shuttle MPSR positions can log back in to the prime mission activity and the SSP Command Manager. The controllers are not yet authorized to call up trajectory displays.	Tier two positions can log into the prime mission activity. The TRAJ server-TRS is still being configured so traj displays based on ground data should not be called up (data could be stale or erroneous). FCT should build Commands and TMBUs as required. FCT should build Commands and TMBUs as required.
~ GMT YERO + 20 mins (6:20 pm CST)			
3132	GC	Announce that all positions can log back into the prime mission activity and the SSP command manager. The controllers are not yet authorized <u>yet authorized</u> to call up trajectory displays.	Tier one positions (SSP MER, SPAN, CSR, etc.) can log into the prime mission activity. The TRSTRAJ server is still being configured so traj displays based on ground data should not be called up. This data could be stale or erroneous.
~ GMT YERO + 35 mins (6:35 pm CST)			
3233	FD	Poll FCT for Shuttle CMD <u>command</u> server checkpoint. Note: This step is performed here for STS-116 because the O/B YERO procedure is delayed until crew morning. Otherwise, the checkpoint is taken in step 36 because some YERO commands can only be built after the TRAJ server has been configured, and it would be good to get these commands on the checkpoint.	Capture commands and new configuration on checkpoint.
~ GMT YERO + 45 mins (6:45 pm CST)			
3334	FDO	As soon as Trajectory team is ready, take Trajectory Server-TRS checkpoint.	The TRAJ-trajectory server has been configured. FDO should run PSAT and DOPS. A checkpoint is taken to preserve the data. FDO should turn ephemeris mirrors on.
~ GMT YERO + 50 mins (6:50 pm CST)			
3435	FDO	Inform FD that the TRAJ server-TRS is configured and users can call up trajectory displays.	Global trajectory data is now available, including Deorbit Opportunities and TDRS Acquisitions.
3536	GC	Turn on Vector Autocue and send out planning set.	
~GMT YERO + 55 mins (6:55 pm CST)			

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37	FD	FD notify ISS FD that Shuttle trajectory data is now available.	ISS FD announces to the ISS FCT team authorization to recall Shuttle displays. Ground reconfiguration is complete.
~GMT YERO + 60 mins or when ready to proceed w/ <u>YERO, ORB OPSO/B procedure</u>			
38	FD	Poll FCT for a GO for to proceed with <u>YERO, Part 2, ORB OPS</u>	Part 2 has the crew do a simplex transition from OPS 2 to 3. IPLs the GPCs after the MCC servers and FEPS are recycled. The complete on-board procedure takes about 1.5 hours.
39	DPS, PROP, GNC Crew	Perform <u>YERO, Part 2, ORB OPS, Steps 3-10C33</u> .	<u>Takes approximately 15 minutes. See onboard procedure, Orbit Ops, p. FS 1-3.</u>
40	FCT	Report to FD as each YERO step is completed.	Assists FCT in maintaining situational awareness so they can be prepared for their steps.
42	FD	Orbit portion of the YERO procedure is complete. The BFS steps (Part 3) will be executed next.	The BFS is configured now so the FCT would not have to contend with configuring it for YERO in the midst of an emergency deorbit.
BFS Configuration			
<u>4541</u>	FCT	<u>YERO, ORB OPS, Steps 11C-24 (3)</u> YERO, Part 3, step 313 : Coordinate BFS Command uplinks w/ INCO on the FD loop	Uplinks are coordinated on FD loop so they are uplinked in assigned order. Uplink RNP <u>dataMatrix Time</u> , GPS <u>Delta-SOP Time Adjustment</u> , Dummy PEG Targets (WT) and TDRS vectors; Orbiter vector and IMU parameters, if required. <u>Takes approximately 15 minutes.</u>
<u>4642</u>	FCT	Report to FD as each step is completed.	Assists FCT in maintaining situational awareness so they can be prepared for their steps.
<u>4743</u>	FD	<u>YERO, ORB OPS, Entry portion of YERO, Step 24, ORB OPS the YERO procedure is complete.</u>	This completes the onboard YERO procedure.
<u>44</u>	<u>GC</u>	<u>Coordinate with FDO of termination of secondary activity</u>	

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Local Year-End Rollover Procedure

<u>Local YERO – 30 mins (11:30 pm)</u>			
1	FD	Direct FCT to prepare for local YERO.	FDO team collects trajectory data while FCT reviews system TMBUs and collects data that may be needed after local rollover.
2	GC	Turn off Vector Autocue with FDO concurrence.	Hourly vectors will not be sent out automatically until after the Trajectory server is recycled following the local YERO event.
3	FD	Poll FCT for Shuttle CMD server checkpoint. Take checkpoint.	Hold inputs during checkpoint process. Checkpoint will be used to restore server after local YERO event.
<u>Local YERO – 25 mins (11:35 pm)</u>			
4	GC	Announce that all Shuttle controllers except the FCR, MPSRs, and OST should drop command displays, logoff the SSP command manager, and logoff their workstations.	Tier one users (SSP MER, SPAN, CSR, etc.) should logoff. All Tier one workstations should be logged off by 11:40 pm.
5	ISS FD	Instruct all ISS flight controllers monitoring Shuttle displays to drop those displays until notified to recall them.	Includes SSP command managers, SSP command and trajectory displays. Displays left up could show stale or erroneous data while Shuttle servers are recycled.
<u>Local YERO – 20 mins (11:40 pm)</u>			
6	GC	Announce that all Shuttle MPSR positions (except NAV and TAO) should drop command displays, logoff the SSP command manager, and logoff their workstations.	Tier two users should logoff. All Tier two workstations should be logged off by 11:45 pm.
7	FDO	As soon as Trajectory team is ready, take Trajectory Server checkpoint.	Hold inputs during checkpoint process. Checkpoint will be used to restore server after local YERO event.
8	FDO	Have TAO begin Pre-local YERO TRS configuration.	FDO should turn VAT and ephemeris mirrors off.
<u>Local YERO – 15 minutes (11:45 pm)</u>			
9	GC	Instruct all Shuttle FCR	All Shuttle FCR positions should

		controllers to drop command displays, logoff the SSP command manager, and logoff their workstations until directed to log back in following local YERO.	logoff. All Tier three workstations should be logged off by 11:50 pm.
10	FD	Inform ISS FD that access to ISS Command Manager will be locked.	ISS FCT already logged into ISS Command Manager will be able to build commands. Only new logons will be prevented.
11	GC	Instruct COMMAND to lock access to the SSP and ISS Command Managers.	The Command Managers are being locked to prevent inadvertent logon activity during the SSP Command Server recycle.
12	GC	Take checkpoints on the Shuttle downlink and Ground to Ground FEPS prior to deconfiguring and deallocating them.	
Local YERO — 10 minutes (11:50 pm)			
13	GC	Instruct TAO, NAV, and OST controllers to drop command displays, logoff the SSP command manager, and logoff their workstations until directed to log back in following local YERO.	All Tier four workstations should be logged off by 11:55 pm. All Shuttle controllers should be logged off by now.
14	GC	With FD concurrence, force off any Shuttle workstation still logged into prime mission activity.	Workstations on the second activity are not involved in this procedure and should remain logged on.
Local YERO — 5 mins (11:55 pm)			
15	GC	On FD go, deconfigure and deallocate (disconnect) the SSP command and trajectory servers and all SSP FEPS utilized on the mission activity.	GC coordinates with the OST to perform these actions. The SSP Command and TRAJ servers are rebooted after local YERO to give a clean machine for the “new year” reconfiguration.
16	GC	Stop and start the ODRC data lines after data has stopped flowing through the downlink FEPS.	
Local YERO + 1 min (12:01 am)			

17	GC	Coordinate the reallocation of the Shuttle ground equipment on the prime mission activity.	GC coordinates with the OST to perform these actions.
		A. FSM reallocates the Shuttle FEPs to the prime activity.	OST configures the FEPs for the new year using the checkpoint taken in step 12 above.
		B. FSM reallocates the <u>SSP</u> Command server after reboot is complete.	Server is rebooted to ensure it comes up clean.
		C. FSM reallocates the TRAJ server after reboot is complete.	Server is rebooted to ensure it comes up clean.
~Local YERO + 2 mins (12:02 am)			
18	GC	Announce that OST, TAO, and NAV may logon their workstations.	Tier four positions may logon their workstations and await the completion of <u>SSP</u> CMD and TRAJ server reboots/reallocations and FEP reallocations before continuing with configuring their equipment.
~Local YERO + 7 mins (12:07 am)			
19	GC	After the <u>SSP</u> command server reallocation is complete (17B), have <u>COMMAND</u> configure the server from checkpoint.	<u>Command</u> restores the Shuttle <u>Command</u> server from the checkpoint taken in step 3 above.
20	GC	After TRAJ server reallocation is complete (17C), give FDO a “GO” to initiate Post Local YERO TRS reconfiguration.	FDO coordinates with TAO to perform this action. TAO logs onto workstation, configures the server for mission support, and restores the TRAJ server from the checkpoint taken in step 7 above.
21	FDO	Notify FD that TRAJ server configuration has begun.	
22	GC	When ODRC sees data flow post local YERO, they will run a plot to determine time gap and coordinate playback of any data not received in ODRC in realtime.	
~Local YERO + 10 mins (12:10 am)			
23	GC	After the <u>SSP</u> command server has been restored by	

		COMMAND (19), instruct COMMAND to unlock access to the SSP and ISS Command Managers.	
24	GC	Announce that all Shuttle FCR positions can log back into the prime mission activity and the SSP Command Manager. The controllers are not yet authorized to call up trajectory displays.	This step is performed after the FEPs and SSP CMD server have been reallocated and configured. Tier three positions can log into the prime mission activity. A. FCT should review their commands and TMBUs. B. For STS 116 (YERO delayed onboard), a series of commands will be required in YERO, Part 2, step 8 to establish the new year ephemeris onboard, to update the O/B vector, GPS time reference, and to restore sensor bias terms. C. FDO should verify the ephemeris and data configuration of the TRAJ server and turn on the mirrors.
25	FD	Inform ISS FD that access to ISS Command Manager has been unlocked.	ISS controllers, not already logged on the ISS Command Manager, may now log on.
~Local YERO + 15 mins (12:15 am)			
26	GC	Announce that all Shuttle MPSR positions can log back into the prime mission activity and the SSP Command Manager. The controllers are not yet authorized to call up trajectory displays.	Tier two positions can log into the prime mission activity. The TRAJ server is still being checked so trajectory displays based on ground data should not be called up (data could be stale or erroneous). FCT should build commands and TMBUs as required.
~Local YERO + 20 mins (12:20 am)			
27	GC	Announce that all positions can log back into the prime mission activity and the SSP Command Manager. The controllers are not yet authorized to call up trajectory displays.	All Tier one positions (SSP MER, SPAN, CSR, etc.) can log into the prime mission activity. The TRAJ server is still being checked so trajectory displays based on ground data should not be called up (data could be stale or erroneous).
~Local YERO + 25 mins (12:25 am)			
28	FDO	As soon as Trajectory team is ready, take Trajectory server checkpoint.	The TRAJ server has been restored. A checkpoint is taken to preserve the data and to have a checkpoint past

			the local YERO. FDO should turn the VAT and ephemeris mirrors on.
29	FDO	Inform FD that users can call up trajectory displays.	Global trajectory data is now available. This includes Deorbit Opportunities and TDRS Acquisitions.
30	GC	Turn on Vector Autocue and send out planning set.	
31	FD	FD notify ISS FD that SSP trajectory data is now available.	ISS FD announces to the ISS FCT team authorization to recall Shuttle displays.
-Local YERO + 30 min (12:30 am)			
32	FD	Poll FCT for SSP CMD server checkpoint. Take checkpoint.	Hold inputs during checkpoint process. A checkpoint is taken to have a checkpoint past the local YERO.
33	FD	Local YERO procedure is complete.	