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Gravity Probe B Relativity Mission

S0892, Rev. A

Mission Planning Timeline Products Guide

January 30, 2004

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1. Purpose

This document summarizes the information contained in various Timeline Products published by the Mission Planning Team for distribution to the operations team.

2. Related Documents

2.1. P0810 – Space Network and Ground Network Scheduling Procedures Users' Guide
2.2. P0813 – MOC Create SPC Load File
2.3. P0815 – MOC Update Templates (.spc) and Tasks (GREAS)
2.4. P0825 – MOC Use STK to Predict Orbital Events

3. Acronyms

AOS	Acquisition Of Signal
CSTOL	Colorado-enhanced Systems Test and Operations Language
DOY	Day of Year
DSMC	Data Services Management Center
GMT	Greenwich Mean Time
GN	Ground Network
GP-B	Gravity Probe - B
GREAS	Generic Resource Event & Activity Scheduler
GSV	Guide Star Valid
ITF	Integrated Test Facility
LM	Lockheed Martin
LOS	Loss Of Signal
MET	Mission Elapsed Time
MOC	Mission Operations Center
RE	Responsible Engineer
SMA	S-band Multiple Access
SN	Space Network
SPC	Stored Program Command
SSA	S-band Single Access
SSC	Service Specification Codes
STK	Satellite Tool Kit
SU	Stanford University
SV	Space Vehicle
SWSI	Space network Web Services Interface
TDRSS	Tracking and Data Relay Satellite System

4. Product Description

4.1. Confirmed SN/GN Contact Schedule

The confirmed SN/GN Contact Schedule is a listing of the space and ground network contacts that have been requested and granted from the DSMC. Information in this product aids ops personnel in configuring the spacecraft to transmit telemetry to the ground and receive commands from the MOC. The schedule also alerts team members to periods covered by realtime telemetry (generally via TDRSS coverage) as well as scheduled times for onboard memory dumps (ground network contacts). An example and summary of a Confirmed SN/GN Contact Schedule is shown below:

```
** SN/GN Contact Schedule Report          13    5     6     7     8     9    10    11
** Generated on: 2004014232801                                                                                    12

##  Station  Load    Track AOS           Track TOS           Track LOS           Dur.    Band  ConfigCodes   Orb  Pod  Track Activities
--  -------  ------- ------------------- ------------------- ------------------- ------  ----  -----------   ---  ---  --------------------------------------
01  TDW-FWD  001PING 2003:341:02:08:00                 --    2003:341:02:28:00   20m00s  SSA   H83/I76/T51    0    D   Aft_SRE_B_Oscillator_Power_On (100%/04s)
                                                                                                                       ECU_GHR_Heaters_A_B_ON (100%/32s)
02  275-AFT  001PING 2003:341:02:30:00                 --    2003:341:02:51:00   21m00s  SSA   H83/I76/T51    0    D   gn2xx_Fwd_GSS_Power_On (44%/08m45s)
03  TDE-FWD  001PING 2003:341:02:53:00                 --    2003:341:03:06:00   13m00s  SSA   H83/I76/T51    0    D
04  171-FWD  001PING 2003:341:03:11:00                 --    2003:341:04:06:00   55m00s  SSA   H83/I75/T50    0    D
05  275-AFT  002PONG 2003:341:04:08:00                 --    2003:341:04:43:00   35m00s  SSA   H83/I75/T50    0    D
06  AGS-S1   002PONG 2003:341:04:53:21  2003:341:04:58:01   2003:341:05:05:24   12m02s   --    --             1    --
07  171-FWD  002PONG 2003:341:05:15:00                 --    2003:341:05:40:00   25m00s  SSA   H93/I95/T90    1    D
08  TDE-AFT  002PONG 2003:341:05:45:00                 --    2003:341:06:30:00   45m00s  SSA   H93/I95/T90    1    D   Realtime_Commanding_for_IOC_003 (19%/11m22s)
09  AGS-S1   002PONG 2003:341:06:31:15  2003:341:06:34:11   2003:341:06:40:00   09m00s   --    --             2    --
10  171-FWD  002PONG 2003:341:06:35:00                 --    2003:341:07:15:00   40m00s  SSA   H93/I95/T90    2    D
11  TDE-AFT  002PONG 2003:341:07:20:00                 --    2003:341:07:50:00   30m00s  SSA   H93/I95/T90    2    D
12  SGS-S1   002PONG 2003:341:07:59:40  2003:341:08:05:48   2003:341:08:12:21   12m41s   --    --             3    --
13  171-FWD  002PONG 2003:341:08:22:00                 --    2003:341:08:57:00   35m00s  SSA   H93/I95/T90    3    D
14  TDE-AFT  002PONG 2003:341:09:02:00                 --    2003:341:09:46:00   44m00s  SSA   H93/I95/T90    3    D
15  275-FWD  002PONG 2003:341:09:51:00                 --    2003:341:10:36:00   45m00s  SSA   H93/I95/T90    4    D
16  TDE-AFT  002PONG 2003:341:10:41:00                 --    2003:341:10:53:00   12m00s  SSA   H93/I95/T90    4    D
17  WGS-S1   002PONG 2003:341:11:03:02  2003:341:11:10:22   2003:341:11:14:23   11m21s   --    --             5    --
18  275-FWD  002PONG 2003:341:11:24:00                 --    2003:341:12:14:00   50m00s  SSA   H93/I95/T90    5    D
19  TDE-AFT  002PONG 2003:341:12:19:00                 --    2003:341:13:05:00   46m00s  SSA   H93/I95/T90    5    D   GPS_SideA_B_PowerOn (100%/37s)
                                                                                                                       Aft_SRE_A_Oscillator_Power_On (100%/04s)
                                                                                                                       Aft_SRE_A_Power_On (100%/01m42s)
                                                                                                                       ECU_A_Power_ON_RT7 (100%/05m02s)
                                                                                                                       SRE_Init_Auto_Start_of_Forward_SRE_A (100%/47s)
                                                                                                                       SRE_Init_Auto_Start_of_Forward_SRE_B (100%/47s)
20  275-FWD  002PONG 2003:341:13:10:00                 --    2003:341:13:50:00   40m00s  SSA   H93/I95/T90    6    D   Turn_On_SRE_A_B_Electronics (100%/19s)
21  TDW-AFT  002PONG 2003:341:13:55:00                 --    2003:341:14:17:00   22m00s  SSA   H93/I95/T90    6    D   ECU_Vent_GHR_line_to_space (100%/05m27s)
```

Callouts: 1 → ##, 2 → Station, 3 → Load, 4 → Track AOS

1. **##**: the scheduled contact number (listed chronologically and reset each day).

2. **Station**: the ground station or TDRSS satellite in contact with GP-B. Ground network stations are identified by a five-character alphanumeric code with the first three characters signifying the ground station– AGS (Poker Flats, Alaska), SGS (Svalbard, Norway), and WPS (Wallops Island, Virginia) are the primary ground stations and MGS (McMurdo, Antarctica) is available by contingency. The last two characters for ground stations are always 'S1'. Space network stations are identified by number and include either a '-FWD' or '-AFT' to identify whether the forward or aft GP-B antenna is in contact with the TDRSS satellite. Naming conventions for the TDRSS satellites available to GP-B are as follows:
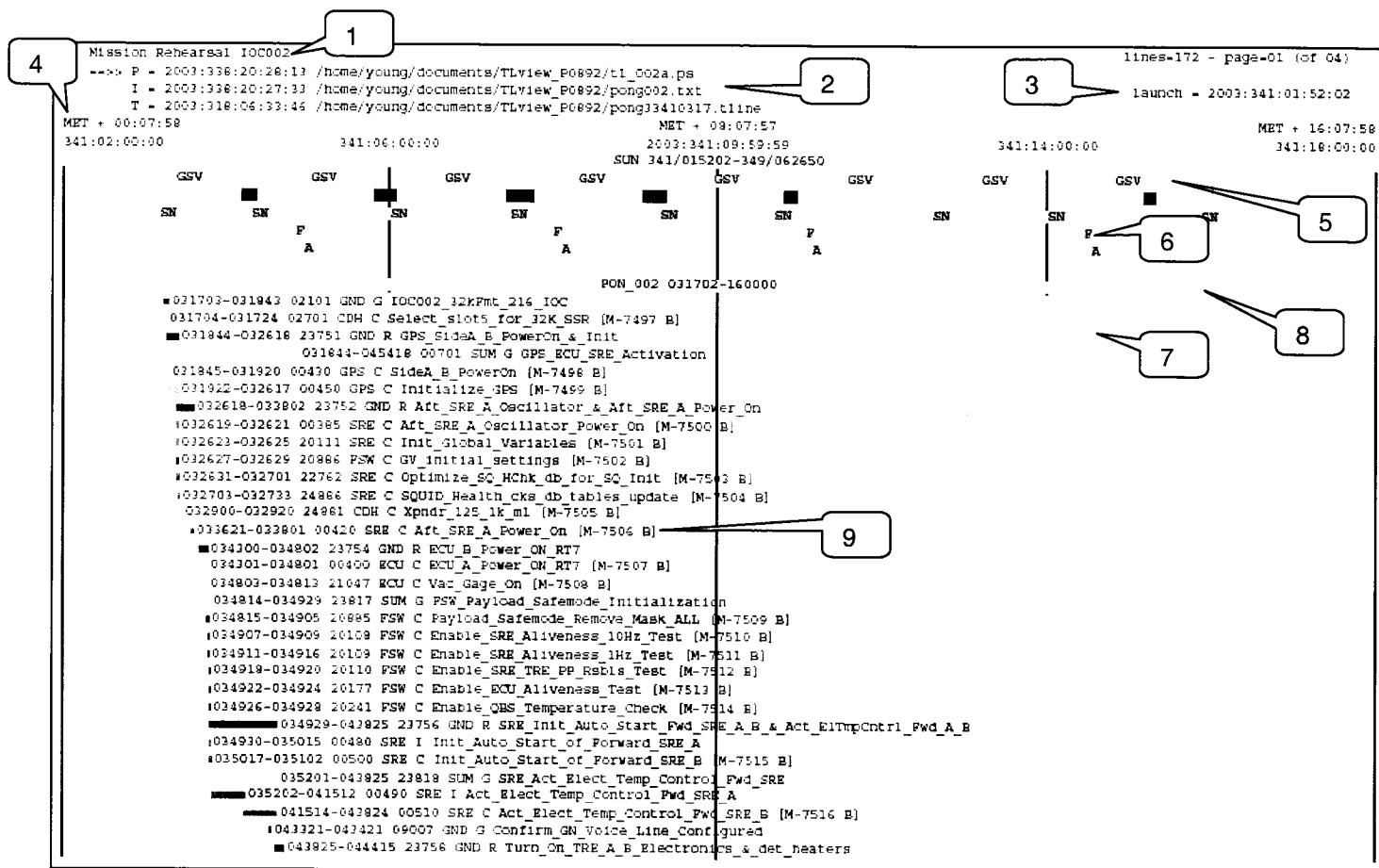
Number	Name	ID
TDRS 3	TDZ	275
TDRS 4	TDE	041
TDRS 5	TDW	174
TDRS 6	TDS	047
TDRS 9	--	171

3. **Load**: the PING or PONG load running during the contact.

4. **Acquisition of Signal (AOS)**: time in DOY/HH:MM:SS (GMT) that GP-B begins communicating with the SN or GN station. For SN contacts, GP-B transmitters are operated via realtime (CSTOL) commands. Transmitter operations during GN contacts are performed by preloaded (SPC) commands.

5. **GN Antenna Transition (TOS)**: time in DOY/HH:MM:SS (GMT) that an antenna transition must occur for GP-B to remain in contact with the GN or SN station. For all primary ground stations (AGS, SGS, WGS) the antenna is transitioned from forward to aft, while MGS contacts require an aft to forward transition.

6. **Loss of Signal (LOS)**: time in DOY/HH:MM:SS (GMT) that communication is terminated.

7. **Duration**: length of the contact (AOS to LOS) in mm:ss.

8. **Band**: the frequency band and access (single or multiple) of the contact service (SN only).

9. **SN Service Specification Codes**: codes used when scheduling SN contacts to specify service details such as data rate, coherent/non-coherent service, transponder selection, etc. Each SN contact includes forward service for vehicle commanding from the MOC (Axx, Hxx, or Dxx), return service for telemetry downlink (Bxx, Ixx, or Exx), and tracking service for ephemeris update (Txx). See P0810 for a full description of SN Service Configuration Codes.

10. **Orbit Number**: the Comments field for GN contacts lists the orbit number in which the contact takes place.

11. **Pod**: the Pod machine used for scheduling the contact and to be used for delivering telemetry data (Pods D and E in the SU MOC or Pod G in the LM ITF).

12. **Track Activities**: the R-tasks to be executed in the course of the contact. If more that one R-task is scheduled for a contact, then the first R-task will be aligned with the rest of the contact information and each of the subsequent R-tasks will be positioned on their own lines. (Note: see section 4.2 for a description of R-tasks).

13. **Time Stamp**: time in YYYYDOYHHMMSS (GMT) that TISI was opened when producing the confirmed contact schedule – used for version (update) control.

4.2. TIMELINEviewer Timeline Chart

The mission timeline is composed of a series of command loads that are generated by the Mission Planning team using command and event scheduling software (GREAS). A post processed GREAS schedule serves as the input to the TIMELINEviewer.tk script, which creates a graphical display of all scheduled commands and relevant on-orbit events. This includes commands intended to be executed by the spacecraft (C-tasks), database update events (D-tasks), events requiring realtime commanding (R-tasks), ground commands inserted to assist realtime ops personnel identify important events (G-tasks), all scheduled SN and GN contacts, and any significant orbital events. An example and summary of the TIMELINEviewer output is shown below:

```
Mission Rehearsal IOC002                                                          lines-172 - page-01 (of 04)
-->: P - 2003:338:20:28:13 /home/young/documents/TLview_P0892/t1_002a.ps
     I - 2003:338:20:27:33 /home/young/documents/TLview_P0892/pong002.txt                launch - 2003:341:01:52:02
     T - 2003:318:06:33:46 /home/young/documents/TLview_P0892/pong33410317.tline
MET + 00:07:58                                        MET + 09:07:57                                      MET + 16:07:59
341:02:00:00              341:06:00:00               2003:341:09:59:59            341:14:00:00              341:18:00:00
                                                     SUN 341/015202-349/062650

        GSV         GSV         GSV         GSV         GSV        GSV         GSV         GSV         GSV

     SN         SN          SN          SN          SN         SN          SN         SN          SN
                        P                       F                      P                       F
                        A                       A                      A                       A

                                          PON_002 031702-160000

 031703-031943 02101 GND G IOC002_32kPmt_216_IOC
 031704-031724 02701 CDH C Select_slots_for_32K_SSR [M-7497 B]
 031844-032618 23751 GND R GPS_SideA_B_PowerOn_&_Init
               031844-045418 00701 SUM G GPS_ECU_SRE_Activation
 031845-031920 00430 GPS C SideA_B_PowerOn [M-7498 B]
  031922-032617 00450 GPS C Initialize_GPS [M-7499 B]
 032618-033802 23752 GND R Aft_SRE_A_Oscillator_&_Aft_SRE_A_Power_On
 032619-032621 00385 SRE C Aft_SRE_A_Oscillator_Power_On [M-7500 B]
 032623-032625 20111 SRE C Init_Global_Variables [M-7501 B]
 032627-032629 20986 FSW C GV_Initial_settings [M-7502 B]
 032631-032701 22762 SRE C Optimize_SQ_HChk_db_for_SQ_Init [M-7503 B]
 032703-032733 24966 SRE C SQUID_Health_cks_db_tables_update [M-7504 B]
 032900-032920 24961 CDH C Xpndr_125_1k_m1 [M-7505 B]
 033621-033801 00420 SRE C Aft_SRE_A_Power_On [M-7506 B]
 034300-034802 23754 GND R ECU_B_Power_ON_RT7
 034301-034801 00400 ECU C ECU_A_Power_ON_RT7 [M-7507 B]
 034803-034813 21047 ECU C Vac_Gage_On [M-7508 B]
 034814-034929 23817 SUM G FSW_Payload_Safemode_Initialization
 034815-034905 20885 FSW C Payload_Safemode_Remove_Mask_ALL [M-7509 B]
 034907-034909 20108 FSW C Enable_SRE_Aliveness_10Hz_Test [M-7510 B]
 034911-034916 20109 FSW C Enable_SRE_Aliveness_1Hz_Test [M-7511 B]
 034919-034920 20110 FSW C Enable_SRE_TRE_PP_Rsbls_Test [M-7512 B]
 034922-034924 20177 FSW C Enable_ECU_Aliveness_Test [M-7513 B]
 034926-034929 20241 FSW C Enable_QBS_Temperature_Check [M-7514 B]
        034929-043825 23756 GND R SRE_Init_Auto_Start_Fwd_SRE_A_B_&_Act_ElTmpCntrl_Fwd_A_B
 034930-035015 00480 SRE I Init_Auto_Start_of_Forward_SRE_A
 035017-035102 00500 SRE C Init_Auto_Start_of_Forward_SRE_B [M-7515 B]
        035201-043825 23818 SUM G SRE_Act_Elect_Temp_Control_Fwd_SRE
        035202-041512 00490 SRE I Act_Elect_Temp_Control_Pwd_SRE_A
        041514-043824 00510 SRE C Act_Elect_Temp_Control_Pwd_SRE_B [M-7516 B]
 043321-043421 09007 GND G Confirm_GN_Voice_Line_Configured
 043825-044415 23756 GND R Turn_On_TRE_A_B_Electronics_&_det_heaters
```

1. **Event Title:** the title of the event (sim, mission rehearsal, etc.)
2. **Directories:** the print directory (P = …) gives the location of the saved postscript file containing the TIMELINEviewer output, the input directory (I = …) locates the '.txt' file that serves as the input for orbital events and SN/GN contacts, and the .tline directory (T =…) specifies the location of the .tline file produced by CommandGen. The times listed before the print and input directories, in YYYY:DOY:HH:MM:SS (GMT), give the file creation times which can be useful for version control.

3. **Launch Date:** the launch time in YYYY:DOY:HH:MM:SS (GMT).

4. **Time Scale:** the mission time given in both GMT and MET. The upper time scale (MET) tracks time (HH:MM:SS) in relation to the input launch time (see 3 above). The lower time scale (GMT) is given as YYYY:DOY:HH:MM:SS.

5. **Orbital Events:** shows the time and duration of periodic orbital events, including the following:

   SUN: the spacecraft is in sunlight (solar arrays producing power)
   GSV: guide star valid – HR8703 is visible to the science telescope
   SAA: the spacecraft is inside the South Atlantic Anomaly

6. **SN and GN Contacts:** shows the times and durations of scheduled space and ground network contacts. TIMELINEviewer allows easy comparisons between SN coverage periods and commands or events requiring realtime telemetry. GN passes are divided into periods of forward and aft antenna coverage, and should line up with corresponding transponder and memory playback commands in the scheduled load.

7. **Contact Shading:** highlights the SN and GN contact times.

8. **PING/PONG buffers**: gives the times and durations of scheduled command loads. The two on-board command buffers (PING and PONG) store and execute scheduled commands (SPCs). During execution of the commands stored in one buffer, the 'idle' buffer is uploaded with the next SPC load.

9. **Scheduled Commands**: shows the times, durations, and task type of all scheduled commands and events, in time sequence. As the main part of the TIMELINEviewer display, this graphical representation of the command sequence allows easy understanding of high-level events taking place on the spacecraft and on the ground. An example of a command listing is as follows:

```
                           GREAS ID    Task Type
                             ┌─┴─┐       ┌┴┐
        033621-033801  00420  SRE  C  Aft_SRE_A_Power_On  [M-7506 B]
        └──────┬──────┘     └─┬─┘     └────────┬────────┘ └───┬───┘
           Start and End     Subsystem      Task Name        SPCP Used &
            Time in           Code                            Start Index
            HH:MM:SS
             (GMT)
```

- The time period listing gives the scheduled time of execution of each command or event.
- The GREAS ID is the unique number assigned to each task scheduled in GREAS and can be used when referencing individual commands or events.
- The subsystem code identifies the 'owner' of the task – the possible codes are:

ACE	Attitude Control Electronics
ATC	Attitude and Translation Control
CDH	Command & Data Handling
ECU	Electrical Control Unit
FSW	Flight Software
GND	Ground
GPS	GPS (Global Positioning System)
GSS	Gyroscope Suspension System
SCE	Shutter Control Electronics
SCI	Science
SRE	SQUID Readout Electronics
SUM	Summary of Upcoming Events
TCS	Thermal Control System
TRE	Telescope Readout Electronics

- The task type identifies the type of command or event – possible types are:

C	command to be executed by the spacecraft (SPC)
I	in-works (informational) commands used as placeholders and redundant tasks (which are denoted by the task name suffix '_ST')
D	database update requiring Parameter Generation
G	ground task used for descriptions, reminders, verifications, etc.
R	realtime event requiring ground execution of CSTOL commands
S	command utilizing a relative start time as opposed to an absolute start time such as a GPS coefficient update
A	command tasks using processor A (no realtime commands allowed)

- The task name is a descriptive name to identify the command or event
- The information in square brackets, '[]', gives the SPC Processor used to execute the on-board command (A through F), as well as the start index within the SPC. This information is also available (as described above) in the .tline file.

4.3. '.tline' Command Generation Output

After the command schedule has been built in GREAS, the GREAS output is sent to Command Generation software to create the command load that is uploaded to the spacecraft. In addition to filtering out all commands and events that are of type I, G, or R, this software also performs constraint checking and may adjust command timing accordingly. After CommandGen has been run successfully, there are many products available to view the (possibly updated) command sequence that will be uploaded for execution. One of the most useful CommandGen outputs is the .tline file. The .tline lists the sequence of commands that are executed on-board (all C,D,S,A tasks) including information about processor usage, displays the original task sequence as built in GREAS and input to CommandGen, lists those scheduled commands that are flagged as possibly hazardous either on board the spacecraft or in the telemetry and command ground system, displays all 'I-tasks' that were omitted from the load, and lists any commands that were either time shifted or un-schedulable. A .tline example and summary follows:

```
Information included herein is controlled under the International Traffic in
Arms Regulations (ITAR) by the U.S. Department of State. Export or Transfer of
this information to a Foreign Person or foreign entity requires an export
license issued by the U.S. State Department or an ITAR exemption to the license
requirement prior to the export or transfer.


                    Date: 364:2003-22:40:03
                    User: young
        GREAS MTL Input File: pong002.txt
        Timeline Duration: 12.7167 Hours                              ┌───┐
        Timeline Start: 07-Dec-2003 03:17:00      ───────◁           │ 1 │
        Timeline Stop: 07-Dec-2003 16:00:00                          └───┘
            SPC Buffer: pong
    Buffer Start Index: 7497
        Cmd. Gen. Version: 1.7
                Database: gpb_3_4_2                       ┌───┐
    Cmd. Template Location: /projects/spc/2_5_unofficial_20031103/  │ 2 │
        Execution Time: 0:01:35                          └───┘

Processing Parameters:
UTC_TAI_Delta: 32         Spcp_A_Max_Dur: 60         Max_Size_Tag: 7496
Max_Plan_Dur: 86400       Task_Dur_Exp_Max: 1800        Max_Size_Data: 52500
UL_Rate: 2000                 Task_Separ_Min: 1      Start_Tag_Ping: 1
Max_Load_UL_Time: 120         Max_ExpDur_Delta: 10       Start_Data_Ping: 1
VT_Drift: 0                   Max_Command_Size: 50
```

	Start Time	Stop Time	Task Name	MxCmdSz	ID	SPCP	Main Index	SPC Index	Stop Index	Duration
	341:2003-03:18:45 (124039157)	341:2003-03:19:20 (124039192)	GPSC00_SideA_B_PowerOn		430	B	7498	7594	7610	35
	341:2003-03:26:23 (124039615)	341:2003-03:26:25 (124039617)	SREC00_Init_Global_Variables		20111	B	7501	7620	7630	2
	341:2003-03:26:27 (124039619)	341:2003-03:26:29 (124039621)	FSWC00_GV_initial_settings		20866	B	7502	7631	7647	2
	341:2003-03:29:00 (124039772)	341:2003-03:29:20 (124039792)	CDHC00_Xpndr_125_lk_ml		24681	B	7504	7659	7672	20
	341:2003-03:36:21 (124040213)	341:2003-03:38:01 (124040313)	SREC00_Aft_SRE_A_Power_On		420	B	7505	7673	7691	100
	341:2003-03:48:03 (124040915)	341:2003-03:48:13 (124040925)	ECUC00_Vac_Gage_On		21047	B	7507	7969	7974	10
	341:2003-03:48:15 (124040927)	341:2003-03:49:05 (124040977)	FSWC00_Payload_Safemode_Remove_Mask_ALL		20885	B	7508	7975	8003	50
	341:2003-03:49:18 (124040990)	341:2003-03:49:20 (124040992)	FSWC00_Enable_SRE_TRE_PP_Rsbls_Test		20110	B	7511	8012	8015	2
	341:2003-03:49:22 (124040994)	341:2003-03:49:24 (124040996)	FSWC00_Enable_ECU_Aliveness_Test		20177	B	7512	8016	8019	2
	341:2003-03:50:17 (124041049)	341:2003-03:51:02 (124041094)	SREC00_Init_Auto_Start_of_Forward_SRE_B		500	B	7515	8052	8082	45
	341:2003-03:52:02 (124041154)	341:2003-04:15:12 (124042544)	SREC00_Act_Elect_Temp_Control_Fwd_SRE_A	20	490	B	7516	8083	8128	1390
	341:2003-04:15:14 (124042546)	341:2003-04:38:24 (124043936)	SREC00_Act_Elect_Temp_Control_Fwd_SRE_B	20	510	B	7517	8129	8174	1390

Callouts: 3, 4, 5, 6, 7, 8, 9, 10

.tline page 1

1. **General File and Load Information:** the heading gives pertinent file information such as time of creation (Date), Mission Planner who created the file by running CommandGen (User), input schedule file from GREAS (GREAS MTL Input File), as well as the versions of CommandGen (Cmd. Gen. Version) and the MSS Database (Database) used and the directory containing the SPCs used to build the load (Cmd. Template Location). The load information included in this heading includes the start and end times (GMT), the load duration in hours, and the selected command buffer (PING

or PONG). The Buffer Start Index is determined by the selected buffer – PING starts at Index 1, PONG starts at Index 7497.

2. **Processing Parameters**: this section displays the CommandGen parameters used to constrain various characteristics of the command load, such as maximum task and timeline durations. The default parameter values have been carefully selected and are taken into account when building the mission timeline. They should only be changed when absolutely necessary and after approval from the Timeline Committee. The following table describes the Processing Parameters:

Parameter	Description	Resolution	Default Value	Valid Range
UTC_TAI_Delta	If set, will override the value used for leap seconds. Leap seconds are used when converting UTC time to TAI(atomic) time	Seconds	32	Integer N N>=0
Max_Plan_Dur	If set, will override the value used for the maximum duration of a timeline	Seconds	86400	Integer N N>0
UL_Rate	If set, will override the value used for the uplink commanding rate	Bits per second	2000	Integer N N=125 or 2000
Max_Load_UL_Time	If set, will override the time used for the uplink time window (i.e. the maximum time during a real-time pass that can be utilized for uplinking an SPC load file)	Seconds	180	Integer N N>0
VT_Drift	If set, will override the value used for oscillator drift	Seconds	0	Any Integer value
Spcp_A_Max_Dur	If set, will override the value used as the maximum time for a task executing with SPCP-A	Seconds	60	Integer N N>0
Task_Dur_Exp_Max	If set, will override the value used as the maximum time allowed for a task executing in-line (SPCP-M) or with SPCP-A thru F	Seconds	1800	Integer N N>0
Task_Separ_Min	If set, will override the value used as the minimum task separation time	Seconds	1	Integer N N>0
Max_ExpDur_Delta	If set, will override the value used as the maximum time difference between a task's duration and the expire command value	Seconds	10	Integer N N>=0
Max_Command_Size	If set, will override the value used for allocating processor usage for overlapping command tasks. When two command tasks overlap, CommandGen checks the size of the largest command within each of the overlapping tasks. If none of the commands are larger than the set value, the overlap is allowed, and the command tasks are distributed to separate processors. If any of those command tasks contain a command larger than the set value, then only the first command task is scheduled.	Bytes	50	Integer N N>0
Max_Size_Tag	If set, will override the value used for the maximum size of a buffer's (ping or pong) TAG array	Integer index value	7496	Integer N N>0
Max_Size_Data	If set, will override the value used for the maximum size of a buffer's (ping or pong) DATA array	Integer index value	52500	Integer N N>0
Start_Tag_Ping	If set, will override the value used as the starting index value for the SPC TAG array (i.e. – the starting DATA index for the ping buffer)	Integer index value	1	Integer N 0>N>=max size of TAG array
Start_Data_Ping	If set, will override the value used as the starting index value for the SPC DATA array (i.e. – the starting TAG index for the ping buffer)	Integer index value	1	Integer N 0>N>=max size of DATA array

3. **Task Start and Stop Time**: shows the time period necessary for the execution of each command, given in GMT (DOY:YYYY-HH:MM:SS) on the upper line, and translated to vehicle time on the lower line (in parentheses).

4. **Task Name**: the unique task name used throughout the mission planning process, including subsystem code and task type (as explained above).

5. **MxCmdSz**: this column displays the size (in bytes) of the largest command within a command task. A listing of this parameter is only available for command tasks that have overlapped other command tasks and been allocated to a processor after being checked against the Max_Command_Size processing parameter.

6. **GREAS ID**: the unique number assigned to each individual task when scheduled in GREAS.

7. **SPC Processor**: this field lists the on-board processor selected to execute the corresponding command. There are six SPC processors (labeled A – F) dedicated to executing Stored Program Commands.

8. **Main Index**: the index of the PING/PONG buffer corresponding to each SPC.

9. **SPC Start / Stop Index**: indices of the on-board processors corresponding to the start and stop of each SPC.

10. **Duration**: command duration in seconds.

```
341:2003-14:32:10      341:2003-14:32:43    CDHC00_Xpndr_A_to_B_PB_Restart        15    9005   B    7575      8259        8280        33
(      124079562)       (     124079595)
341:2003-14:38:11      341:2003-14:38:49    CDHC00_PB_Stop_Xpndrs_OFF                   9006   B    7576      8281        8303        38
(      124079923)       (     124079961)
341:2003-15:39:59      341:2003-15:45:00    FSWC00_Idle_05_minutes                     20240   B    7577      9808        9810       301
(      124083631)       (     124083932)
341:2003-15:45:01      341:2003-15:46:01    FSW800_Branch_to_PING_or_PONG              99999   H    7578      7578        7586        60
(      124083933)       (     124083993)


Original Pool
-------------
ORBG00_GPB_in_Sunlight
ORBG00_Guide_Star_Valid
POWG00_002
GMDG00_IOC002_32kFmt_216_IOC
CDHC00_Select_slot5_for_32K_SSR
SUHG00_GPS_ECU_SRE_Activation              11
GMDR00_GPS_SideA_B_PowerOn_&_Init
GPSC00_SideA_B_PowerOn
GPSC00_Initialize_GPS
GMDR00_Aft_SRE_A_Oscillator_&_Aft_SRE_A_Power_On
SREC00_Aft_SRE_A_Oscillator_Power_On
SREC00_Init_Global_Variables
FSWC00_GV_initial_settings
SREC00_Optimize_SQ_HChk_db_for_SQ_Init
CDHC00_Xpndr_125_1k_ml
SREC00_Aft_SRE_A_Power_On
GMDR00_ECU_A_Power_ON_RT7
ECUC00_ECU_A_Power_ON_RT7
ECUC00_Vac_Gage_On
SUHG00_FSW_Payload_Safemode_Initialization
FSWC00_Payload_Safemode_Remove_Mask_ALL
```

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11. **Original Pool**: lists the initial task sequence as built in GREAS and input to CommandGen. The original task pool should include all commands to be uploaded to the spacecraft, as well as all tasks filtered out by CommandGen (G, R, I tasks).

```
CDHCOO_PB_Stop_Xpndrs_OFF
ORBGOO_GPB_over_South_Atlantic_Anomaly
FSWCOO_Idle_05_minutes
FSWZOO_Branch_to_PING_or_PONG



Hazardous Command Warnings                    ┌──┐ 12 │
                                              └──┘
--------------------------
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Heat_Pulse_Heater (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Heater_Win_3 (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Heater_Win_4 (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Cryo_Pump (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Flow_Control (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Flow_Meter (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Gif_12 (2 instances) is hazardous ON-ORBIT AND ON-GROUND
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Gif_34 (2 instances) is hazardous ON-ORBIT AND ON-GROUND
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Gyro1_3_01 (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Gyro2_4_01 (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Plumbing (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Prs_Sen_Line (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Qbs (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Vac_Shell (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Win_1 (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Hsp_Win_2 (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Qbs_Heater (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Uv_Lamp_15_V (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Uv_Lamp_30_V (2 instances) is hazardous ON-ORBIT
ECUCOO_ECU_A_Power_ON_RT7 Experiment_Control_Unit Uv_Lamp_5_V (2 instances) is hazardous ON-ORBIT
```

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12. **Hazardous Command Warnings**: an extensive listing of commands and command parameters that are labeled as hazardous for use either in the ground command and telemetry system, on board the spacecraft, or both. This listing is meant to alert Mission Planners and Responsible Subsystem Engineers that hazardous commands have been scheduled. REs must certify that all possibly hazardous commands are safe prior to uploading the command load.

```
SRECOO_Aft_SRE_A_Oscillator_Power_On High_Level_Discrete HLD (1 instances) is hazardous ON-ORBIT AND ON-GROUND
SRECOO_Aft_SRE_A_Power_On High_Level_Discrete HLD (1 instances) is hazardous ON-ORBIT AND ON-GROUND
SRECOO_Aft_SRE_B_Oscillator_Power_On High_Level_Discrete HLD (1 instances) is hazardous ON-ORBIT AND ON-GROUND



Task Warnings                          ┌──┐ 13 │
-------------                          └──┘
SRECOO_Aft_SRE_A_Oscillator_Power_On                        341:2003-00:20:34
Start Time of task has been delayed

SRECOO_Init_Auto_Start_of_Forward_SRE_A                     341:2003-00:34:29
Start TIme of task has been delayed


Non-Allocated Tasks                    ┌──┐ 14 │    MxCmdSz   Start Time
-------------------                    └──┘       -------   ----------
ORBGOO_GPB_in_Sunlight                                      341:2003-01:52:02
Task Start time is prior to timeline start


ORBGOO_Guide_Star_Valid                                     341:2003-03:03:54
Task Start time is prior to timeline start
```

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13. **Task Warnings**: a listing of tasks that were moved or altered by CommandGen in order to satisfy constraint checking. The action taken by CommandGen is listed below the task name. Note that the GREAS schedule will no longer reflect the proper execution time for these tasks.

14. **Non-Allocated Tasks**: a list of tasks that CommandGen was unable to schedule (or filter), and the reason those tasks were not inserted in the sequence. Only type C or D tasks listed in this field are relevant (non-allocated G, R, or I tasks can be ignored).

4.4. TDRS Designations Chart

TDRS Designations.txt provides of table of pertinent TDRS identification and status information. An example and summary of a TDRS Designations Chart is as follows:

DesigID	SIC	Common ID	Pre-Launch ID	Location (12/03/03)	SWSI ID	CSC	Comments
8302602	13969	TDRS-1	TDRS-A	48.5584			Supports Antarctica
		TDRS-2	TDRS-B	(Lost)	N/A		Lost
8809102	19548	TDRS-3	TDRS-C	275.6754	275	6	TDZ (no SMA)
8902102	19883	TDRS-4	TDRS-D	40.7167	TDE/TES	2	(no SMA)
9105402	21639	TDRS-5	TDRS-E	174.3405	TDW/TW7	1	(no SMA)
9300302	22314	TDRS-6	TDRS-F	46.8711	TDS/TES	5	(no SMA)
9503502	23613	TDRS-7	TDRS-G	171.2101			Testing
0003401	26388	TDRS-8	TDRS-H	170.9639	171/TW7	4	Degraded SMA
0201101	27389	TDRS-9	TDRS-I	150.8914			Will replace TDRS-8 as 171
0205501	27566	TDRS-10	TDRS-J	151.2937			

1. **DesigID**: identification code used for Two Line Element (TLE) query on NASA/GSFC Orbital Information Group's web site.
2. **SIC**: spacecraft catalog number
3. **Common ID**: TDRS identification based on order of launch.
4. **Pre-Launch ID:** TDRS identification based on order of manufacturing.
5. **Location (mm/dd/yy):** west longitude of satellite as of specified date.
6. **SWSI ID**: identification code used for scheduling of satellite in SWSI (Note: TES is a code that allows for a handoff from TDE to TDS or vice versa for a given contact period. Similarly, TW7 is a code that allows for handoffs between TDW and 171)
7. **CSC**: Communication Services Controller assigned to the satellite as of date specified in Location column.
8. **Comments**: pertinent information on the status of the satellite.