

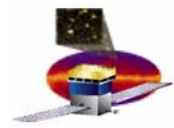
# GLAST Large Area Telescope:

## Electronics, Data Acquisition & Instrument Flight Software

### Flight Software II

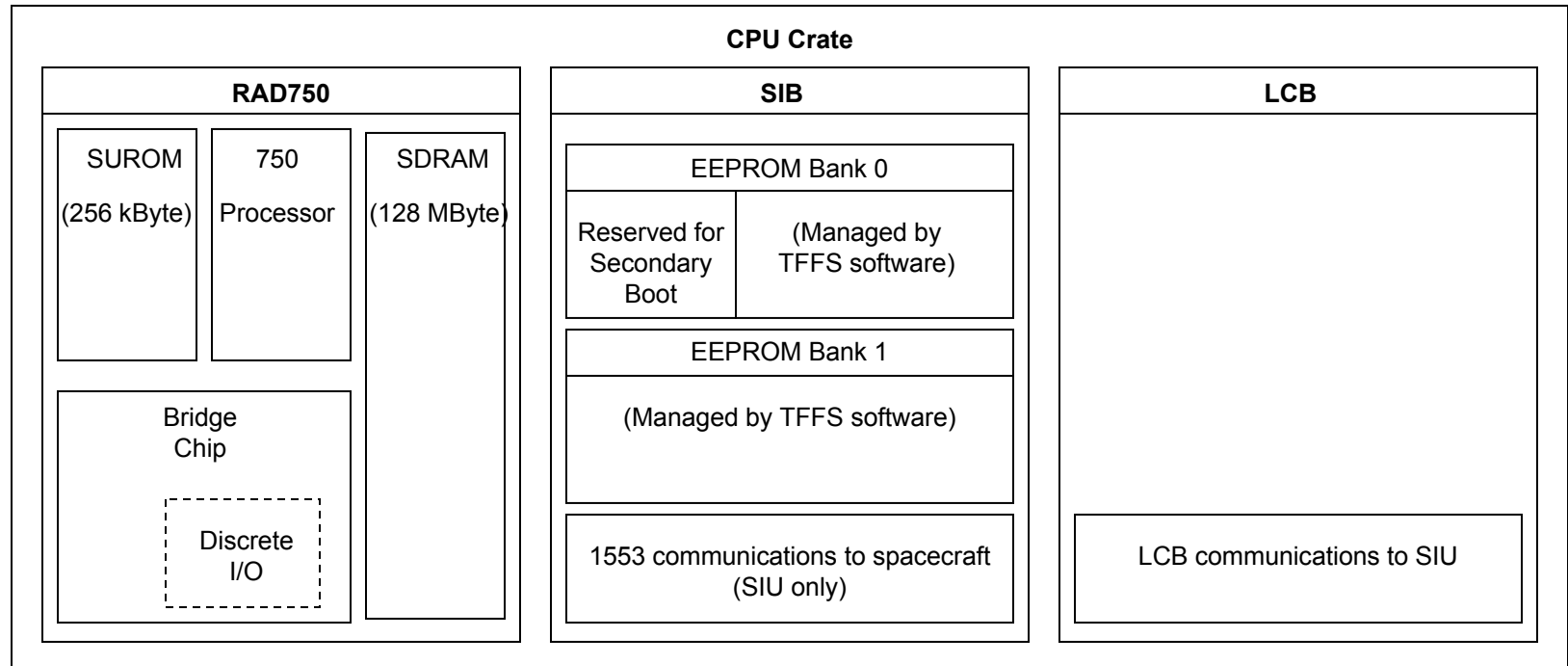
**Dan Wood**  
**Naval Research Laboratory**

**dwood@xip.nrl.navy.mil**  
**(202) 767-2839**

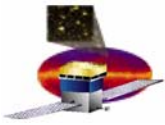


# Boot

- **Boot Document: LAT-TD-001806-04**
- **Boot Resources:**



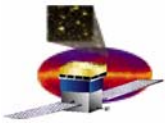
- **Boot Proceeds In Two Stages**
  - **Primary Boot (from on-board SUROM)**
  - **Secondary Boot (from EEPROM on SIB board)**



# Primary Boot

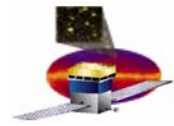
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- **CPU Reset from SUROM**
  - Run EMC initialization procedure
  - Set initial watchdog timeout
  - Map out SDRAM, SUROM and PCI I/O spaces
  - Enable processor L1 caches
  - Disable interrupts
- **Memory Test SDRAM**
  - Memory test (all 0's, all 1's, checkerboard) (runs from ROM/cache)
- **Start Primary Boot Shell (now using RAM resources)**
  - Configure PCI bus
  - Configure 1553 device (SIU) or LCB device (EPU)
  - Go into command loop (→)
    - Initial command timeout for automatic start
    - Poll for new commands
    - Send housekeeping telemetry
    - Reset watchdog timer

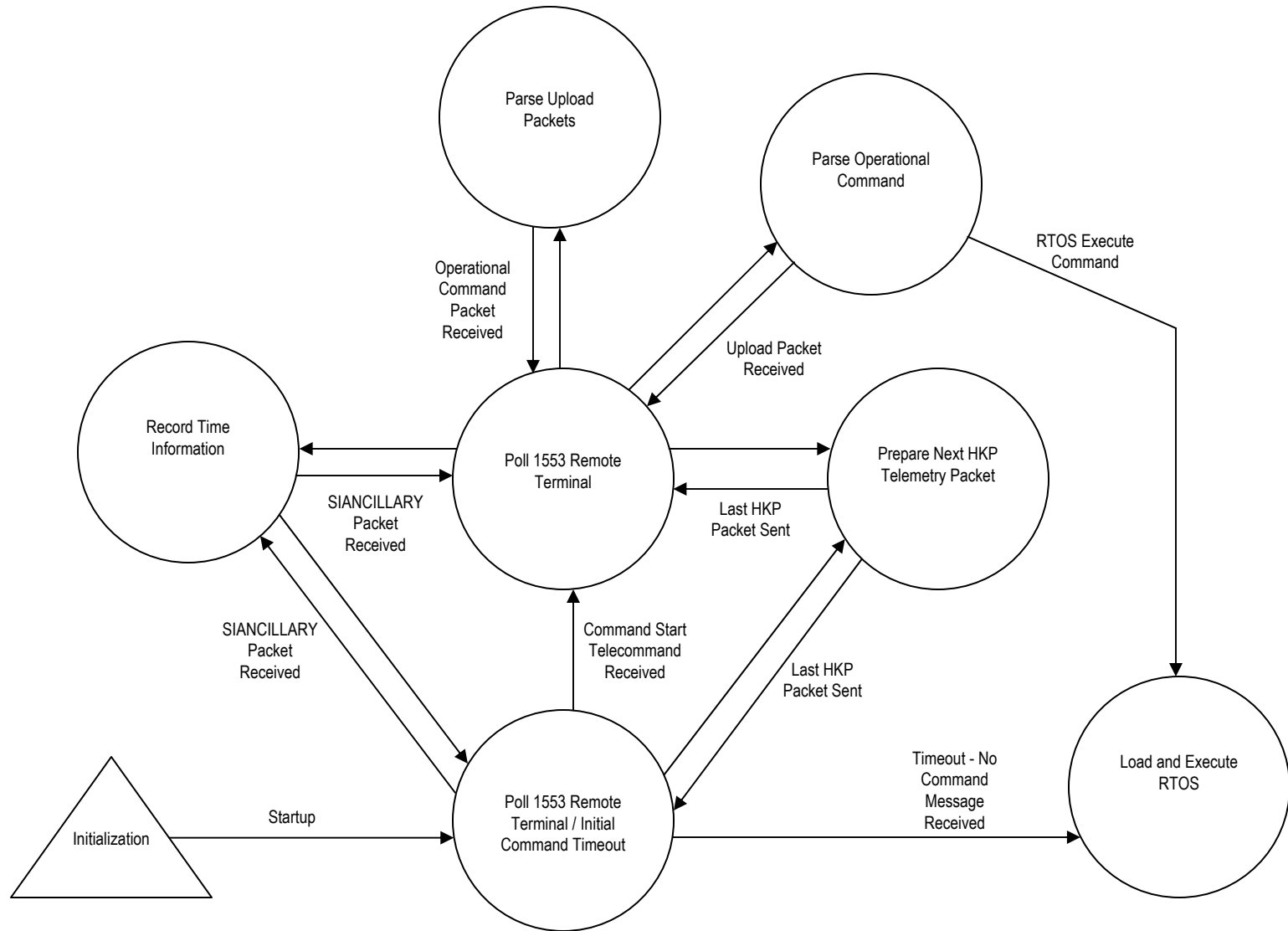


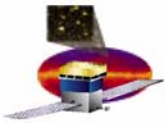
# Primary Boot Memory Map

Purpose	Start Address
Boot Stack	0x00000000
Boot Diagnostics Region	0x0000FF80
Second Stage Boot RAM Module 0	0x00010000
Second Stage Boot RAM Module 1	0x00020000
VxWorks RTOS Load Region	0x00030000
File Upload Buffer	0x00200000
Boot Program Data Variables	0x00300000
I/O Output Buffer	0x00320000
I/O Input Buffer	0x00321000
Boot Memory Heap	0x00322000
LCB Input Ring Buffer	0x00400000
EEPROM Boot Region	0xC0800000
SUROM	0xFFF00000



# Primary Boot Command Processing





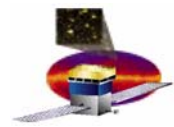
# Primary Boot Commands

## • Operational Commands

APID	Function Code	Description
0x640	0	Boot Start. Removes the primary boot code from the initial timeout and allows further operational telecommands or file uploads for the primary boot code to take place.
	1	Boot Reset. Forces a reset of the primary boot code into a known restart state.
	2	Boot Memory Dump Start. Start a dump of memory into the HKP telemetry by the primary boot code.
	3	Boot Memory Dump Cancel. Cancels a primary boot code memory dump that is in progress.
	4	Boot Error Dump. Dump the value of a queued error word by the primary boot code.
	5	Boot RTOS Execute. Begins execution of an RTOS image and the second stage boot process.

## • Upload commands

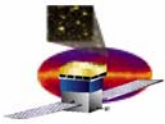
APID	Function Code	Description
0x641	0	File Upload Start. Announces the beginning of a new upload and provides total size and packet count.
	1	File Upload Cancel. Cancels an outstanding upload set.
	2	File Upload Commit. Writes the upload data to the final storage destination.
	3	File Upload Data. Actual file upload data packet string.



# Secondary Boot

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- **Secondary Boot Functions**
  - **Inflate (ZLIB algorithm) VxWorks image to prepared memory location**
  - **Branch to VxWorks entry point**
  - **Execute secondary boot script to run application code**
    - **Inflate (ZLIB algorithm) and link application code modules from EEPROM**
    - **Call application initialization functions**
  - **The system is running!**



# Boot Status

- **Development environment at NRL**
  - **Prototype version RAD750**
  - **JTAG programming environment**
  - **Engineering version SIB (access to 1553 and EEPROM)**
- **Boot Code Progress**

Code Block	Language	LOC estimated	LOC written	Comment
Reset and Exception Vectors	ASM	400	200	Estimate based on existing TCPU-603 code
Memory Test	ASM	100	0	Coded in ASM to carefully control memory accesses
Boot Shell	C	1000	0	Estimate based on ICM boot shell source code
1553 driver (polled)	C	400	400	Done (part of CO1553 package)
LCB driver (polled)	C	400	0	Analogous to 1553 polled mode driver
EEPROM driver	C	100	50	Estimate based on existing TCPU-603 flash memory driver
PCI driver	C	300	0	Estimate based on the BAE RAD750 PCI boot driver
CCSDS packet library	C	400	400	Done (CCSDS package)
Upload parser	C	1000	0	Estimate based on ICM memory loader
ZLIB file inflator	C	1700	1700	Done (ZLIB is public domain software ... just packaging)
Boot utilities	C	200	100	Take from OSKIT (FreeBSD) - ~100% code reuse
LAT utilities	C	400	350	Subset of package PBS (BSWP, SPIN) – 90% complete