KFRL Status/Future Plans

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KFRL Status/Future Plans Agenda

- **Action Item/Results**
- **Purpose**
- **Discussion Highlights**
- **Possible Future Use Summary**
- **Proposed System Capabilities & Functional Diagram**

KFRL Status/Future Plans

- **Action Item:** **Contact Mark Seibert to discuss future plans for KFRL utilization**
- **06/02/10** **The 21st Century Launch Initiative KFRL Use presentation was forwarded to Mr. Seibert.**
- **08/30/10** **As of this date, Mr. Seibert did not respond.**
- **08/25/11** **NASCOM Switches and Small Conversion devices were removed from MILA and are currently stored in CD&SC and could be re-purposed for future support.**
- **Results:** **No active response as of earlier this year.**
- **We will assume action is now <u>open ended</u>.**

KFRL Status/Future Plans

- Purpose: Establish rationale regarding asset portability with respect to the KFRL and maximize use of the system components beyond the Space Shuttle Program (SSP) timeframe.
  - The KFRL system contains near cutting edge equipment that is currently available for immediate post shuttle fly-out use and is compatible over broad areas of telecommunication environments.
  - Use of the KFRL components will easily leverage automation of telecommunication operations and provide other enhancements involving existing NASCOM segments and experimental ground communication services.
  - There are no attendant procurement costs associated with use of the KFRL other than re-interfacing it to existing or new telecommunications services and adding additional Comdec bit rate provision.
  - The KFRL, along with other related mission control assets such as serial encryption provided in the adjacent Secure Comm Vault, is ideally positioned for forward program modal use.

KFRL Status/Future Plans

- <u>Discussion Highlights</u>

The COMDEC, RT Logic Commutator/Decommutator, unit is the heart of the KFRL system. It provides the necessary encoding/decoding of the serial voice and digital data streams that provide the basis of the normal uplink/downlink telemetry services. The COMDEC is relatively new and has a life expectancy of supporting 100 + orbiter missions over a 12 year period. It is a modular system that could be retrofitted to support other serial bit rate forward command/return telemetry modeled programs. The COMDEC could also be retrofitted for IP.

The Communications Matrix Switch, Cornet Technology, performs data and analog line switching in a single chassis and supports high speed interfaces. It allows the switching functions to be programmed into scripts that can be enabled with the single push of a button. If the system experiences a power failure, it automatically reboots to its previous configuration without intermediate intervention.

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- Discussion Highlights

The Bit Synchronizers (Model 270), GDP Inc., includes eight independent channels with each channel capable of both TTL and RS-422 inputs and outputs for NRZ/BI Phase conversion. The units have programmable loop bandwidths from 0.5% to 1.6% and can perform frame pattern detection up to a 64-bit long pattern**.**

The Master Timing Source, Symmetricom XIi, was implemented into the KFRL system in 2010 to provide a more stable timing system. The system provides a wide range of time and frequency inputs and outputs. It syncs to the IRIG feed from the Launch Control Complex (LCC), but has its own clock should the IRIG fail. The device can be remotely managed via a HTML web based interface as well as SNMP. The XIi can function as a Stratum 1 NTP server.

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- Discussion Highlights – Current Facility Status

- **MILA**
  - **Forward and return link elements decommissioned.**
  - **KSC is currently without a telemetry station capable of uplink transmission and downlink reception.**
- **Communications and Tracking Labs 1 and 2**
  - **Both labs in the OPFs to be decommissioned post shuttle program**
  - **KSC will lose the capability to test and checkout vehicle RF systems at LC-39.**
- **Tel-IV**
  - **Low rate downlink capability only.**
  - **Does not and can not replace MILA or the C&T Labs.**
- **PDL**
  - **Side looking Radar was decommissioned post shuttle program**
  - **Is Wallops Island a possible use if needed?**

KFRL Status/Future Plans

- <u>Possible Future Use Summary</u>

  The KFRL system has a proven track record of solid performance and reliability. None of the previously described components has ever incurred a critical failure throughout continuous mission operation.

- The I/O design capability of this system makes it possible to use all or some of the components giving extreme flexibility to specific circuit throughput.

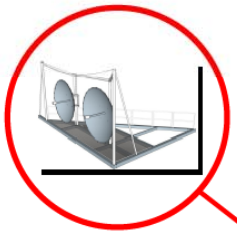
- Currently a serial system, it can be adapted to IP if required.

- The proximity of the KFRL to the ComSec vault and attendant hardware make for an ideal combination for virtually any forward/return link program.

- The KFRL and attendant subsystems represent a viable solution for POR implementation (see following slides)

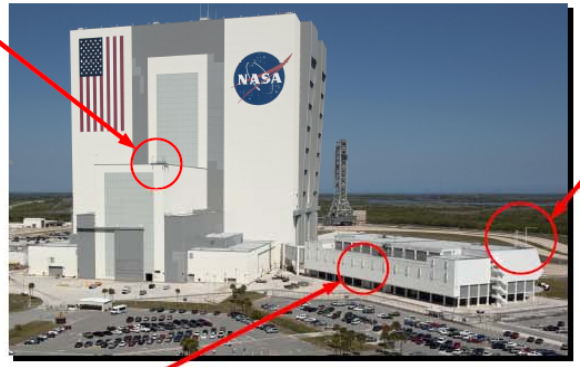
KFRL Status/Future Plans

Radio Frequency and Telemetry Station (RFTS)



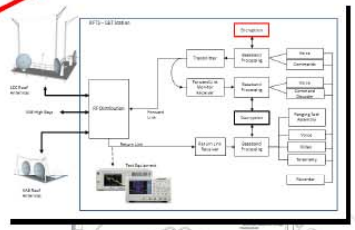
- Spacecraft/Launch Vehicle Radio Frequency (RF) Communications and Tracking (C&T) Test and Checkout Station
  - RFTS is the modernization and consolidation of the two existing Shuttle C&T stations
- RFTS performs test and checkout of all vehicle RF applications
  - UHF, S-Band, C-Band, GPS, Ku/Ka-Band, Beacons, Radar, Range, Audio and Video, etc…

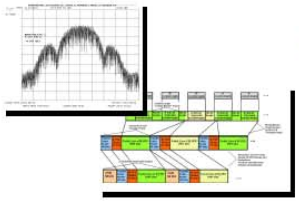
- RFTS provides re-radiating systems to perform testing activities where "Live Sky" is unavailable
  - FEIT, MEIT, End to End, TCDT, etc…

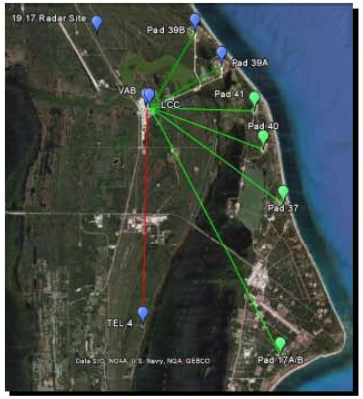


- RFTS provides Uplink and Downlink services for the Spacecraft/Launch Vehicle during processing, pre-launch and ascent.

- RFTS provides diagnostic capabilities for performing analysis, fault isolation and repair.
- RFTS provides recording and archiving of all RF systems data captured during processing, pre-launch and ascent.



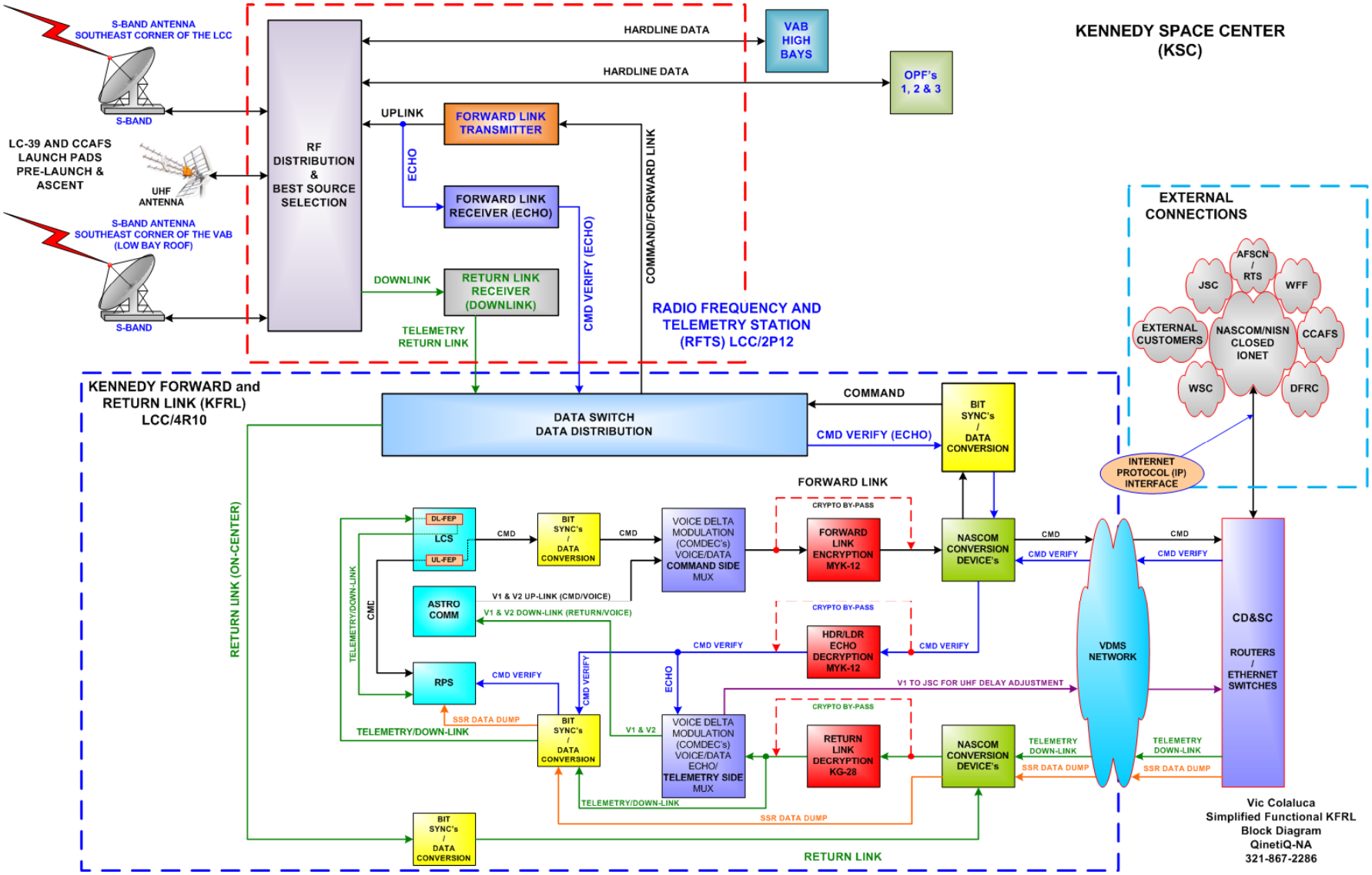




KFRL & RFTS Capabilities

- RF testing of vehicle and payload communications and tracking system (preliminary tested during STS-135)
- S-Band, Ku/Ka-Band and optical
- RF relay/re-radiation
  - LC-39 and CCAFS Launch Pads
  - TDRS and other communications satellites
  - Local KSC ground stations, Tel-4, Eastern Range
  - RF monitoring-Forward and Return Links
- RF Communications Pre-launch and during Ascent
  - Capability to provide full uplink commanding and downlink telemetry reception
  - Capability to track the launch vehicle during ascent from launch to loss of Signal (LOS)
- Processing of multiple full duplex S-Band channels simultaneously supporting multiple vehicles
  - Up to 4 S-Band channels between RFTS and the VAB high Bays
  - Up to 5 S-Band channels between RFTS and the LCC rooftop antennas

KFRL With RFTS Capabilities



Vic Colaluca
Simplified Functional KFRL Block Diagram
QinetiQ-NA
321-867-2286