

AFFTC-PA-12276



Mobile Telemetry Van Remote Control Upgrade

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AIR FORCE FLIGHT TEST CENTER
EDWARDS AFB, CA

DATE 17 May 2012

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REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
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1. REPORT DATE (DD-MM-YYYY) 17 May 2012		2. REPORT TYPE Public Release Briefing		3. DATES COVERED (From - To) 17 May 2012	
4. TITLE AND SUBTITLE Mobile Telemetry Van Remote Control Upgrade				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Richard Lightner and Michael Gilbert				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AND ADDRESS(ES) Air Force Flight Test Center Edwards Air Force Base, CA 93524				8. PERFORMING ORGANIZATION REPORT NUMBER AFFTC-PA-12276	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air Force Flight Test Center, 412 Test Wing Bldg. 1400, 307 Ea. Popson Ave. Edwards, AFB, CA 93524				10. SPONSOR/MONITOR'S ACRONYM(S) 412 TW/DRP	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release A: distribution is unlimited.					
13. SUPPLEMENTARY NOTES CA: Air Force Flight Test Center Edwards AFB CA CC: 012100					
14. ABSTRACT TM Van updated for Remote Control. Presentation consists of: AF Requirements, Scenario of Operations, Basic Design, Hardware and Software upgrades, Acceptance Testing, Mission support and Lessons learned.					
15. SUBJECT TERMS Telemetry System, Mobile, Remote Controlled, - L, S and C Band					
16. SECURITY CLASSIFICATION OF: Unclassified			17. LIMITATION OF ABSTRACT None	18. NUMBER OF PAGES 20	19a. NAME OF RESPONSIBLE PERSON 412 TENG/EN (Tech Pubs)
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPHONE NUMBER (include area code) 661-277-8615



Air Force Flight Test Center



War-Winning Capabilities ... On Time, On Cost

Mobile Telemetry Van Remote Control Upgrade

Presented at the May 2012
ITEA Workshop



U.S. AIR FORCE

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AFFTC-PA No.:12276

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Outline



- Overview
- Background
- Capabilities of Existing Telemetry Vans
- Advantages of Remote Control System Upgrade
- Summary



Overview



- Remote control of Telemetry Mobile Ground Support (TMGS) Van proposed to allow tracking of aircraft beyond limits of the fixed sites at Edwards Air Force Base (AFB) without daily “in field” support by O&M personnel
- Research conducted to discover how other ranges have implemented remote control of their TM Systems
- Information supplied by China Lake Naval Weapons Center (NWC) personnel provided valuable data for full-function remote control of telemetry tracking vans



Background



- TMGS Vans support Flight Test at Edwards AFB at remote locations as well as providing extra capabilities for heavy Telemetry (TM) mission support load near fixed sites
- Remote control capability from main TM site at Building 5790 currently allows support via TMGS Van at nearby C-15 Site, Plant 42 in Palmdale, and as far (tested to date) as FAA Radar Site Panamint Valley, California - 70 miles north of Edwards AFB
- Ability to control from central point allows O&M personnel to support multiple Air Force TM tracking tasks cost effectively, with fewer personnel
- Existing, L, S and C-Band capable versions of TMGS Vans are ideal for current and near future Air Force mission support requirements



TMGS 1 Van Located At Panamint Valley



USAF PHOTO: APPROVED BY 412TW/TENG SECURITY OFFICE



Satellite View of TMGS 1 Van Located At Panamint Valley FAA Radar Site



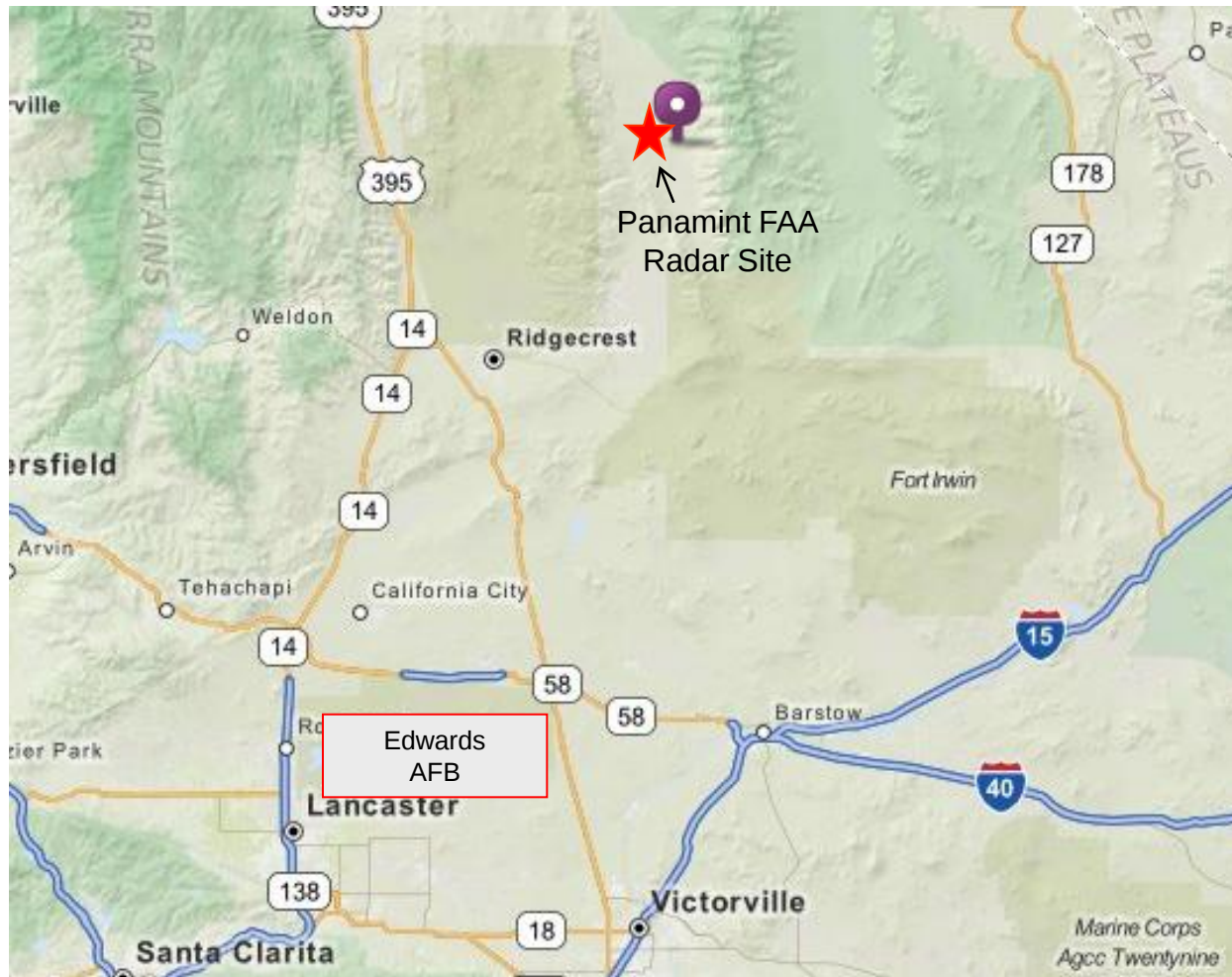
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PICTURE SOURCE: YAHOO MAPS

Satellite picture shows TMGS Van in position in fenced compound at FAA Radar site in the Panamint Valley



Location of Panamint FAA Radar Site Relative to Edwards AFB



PICTURE SOURCE: YAHOO MAPS

The Panamint FAA Radar site allows the testing to be conducted in a fenced site with on a federal installation which is partially manned. External power was made available. The distance is about 70 miles by “crow-flight “ from Edwards AFB in the northern part of the R2508 Complex



TMGS 1 Van Telemetry Equipment Racks Modified for Remote Operation



1 - Remote Control Equipment Items Added : Remote Control Spectrum Analyzer , 4 Channel Oscilloscope, Ethernet Switch, Analog Video Switch

2 - TMGS Van Equipment Items Modified for Remote Ethernet Control: VHF/UHF Radio, Signal Generator, RF Modulator, Antenna Control Unit, All RCB 2000 L-3 Receivers, Local Computer



TMGS 1 Van Comm Rack Modification



**Ethernet/RS 422 Converter Added to Digital Microwave System
For Remote Control of Radio**



New Remote Control Console at Building 5790



Dual Video Monitors

Dual PC Monitors

Remote ACU

Ethernet Switch &
Video Decoders

Rack Mount PC



USAF PHOTO; APPROVED BY 4121W/TENG SECURITY OFFICE



Ethernet Controlled Pan and Tilt 10:1 Zoom Cameras Monitor Remote Equipment and Provide Internal and External Safety/Security



USAF PHOTO: APPROVED BY 412TW/TENG SECURITY OFFICE

Ethernet controlled pan and tilt video monitor camera sends video of equipment front panel information to Building 5790 Remote Control Console

Similar camera in weatherproof housing mounts outside the TM van to monitor antenna operation and functions as safety and security monitor system in the field



Hardware and Software Description



– Equipment Power

- Server Technology CW-16V1-C20MX Ethernet Power Strips
- Controlled via Web Browser application

– Telemetry Receivers

- L3 Telemetry-East Model RCB-2000 (4 each)
- Controlled via vendor supplied Windows application

– Telemetry Antenna System

- TCS Model 1800 with ACU-M1 Antenna Control Unit
- Controlled via Remote ACU-M1 in Master-Slave configuration

– Spectrum Analyzer

- LP Technologies Model LPT-3000R Remote Spectrum Analyzer
- Controlled via vendor supplied Windows application



– Oscilloscope

- Agilent Model DSO-X 3024A
- Controlled via Web Browser application

– Vector Signal Generator

- Agilent Model N5182A Vector Signal Generator
- Controlled via vendor supplied Windows application

– Multimode Waveform Generator

- RF Networks Model SK10155-2
- Controlled via DOS (Telnet) Command Line Interface

– Video Switch

- Universal Switch Model VSU1-3224 Analog Video Router System
- Controlled via Web Browser application



– Internal and External Surveillance Cameras

- VIVOTEK Model PZ8111W Pan/Tilt/Zoom Network Camera
- Controlled via Web Browser application

– HVAC System

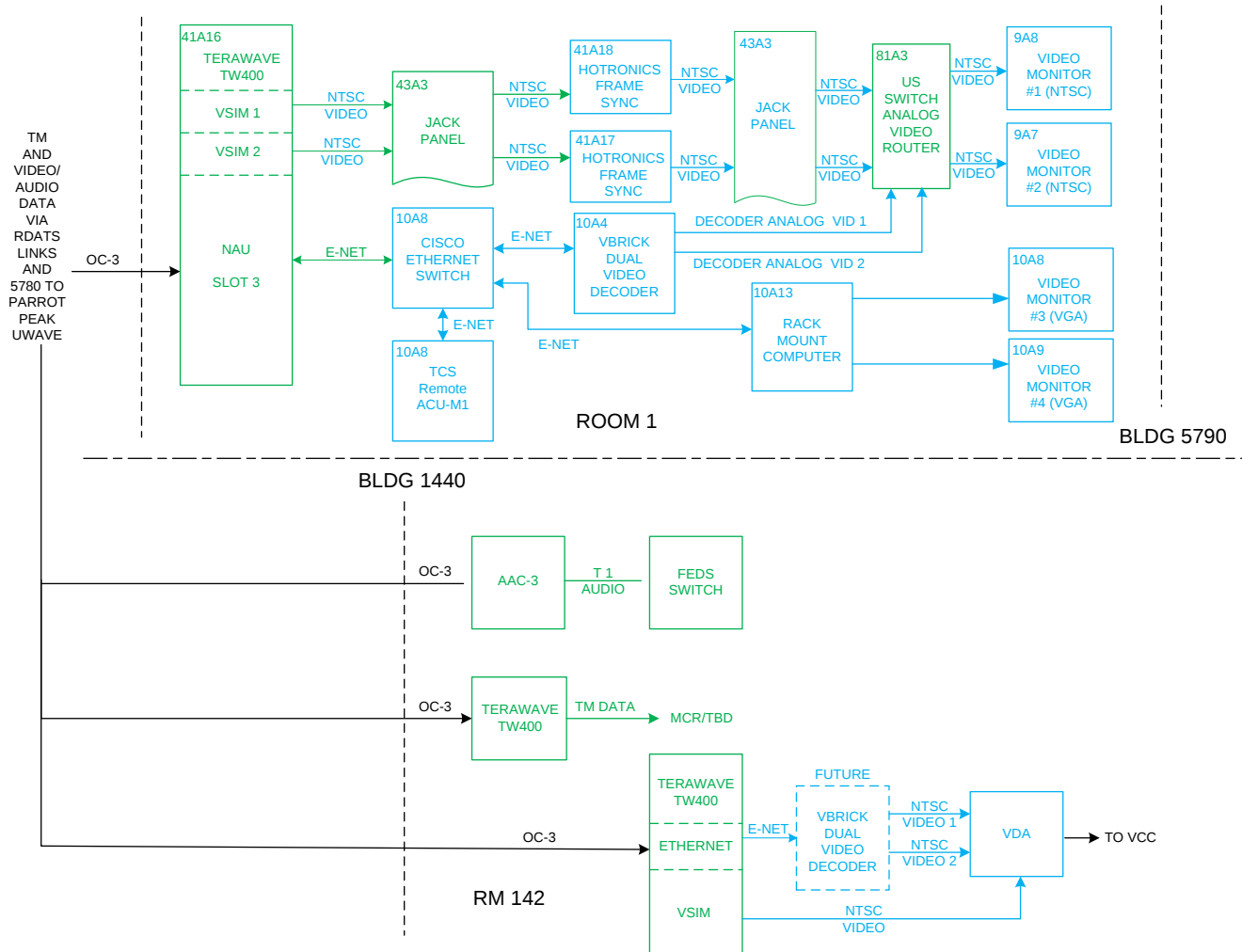
- Proliphix Model IMT550C Internet Managed Thermostat
- Controlled via Web Browser application

– VHF/UHF Radio

- Motorola Model URC-200
- Controlled via vendor supplied Windows application



Edwards Main TM Site Remote Control Block Diagram



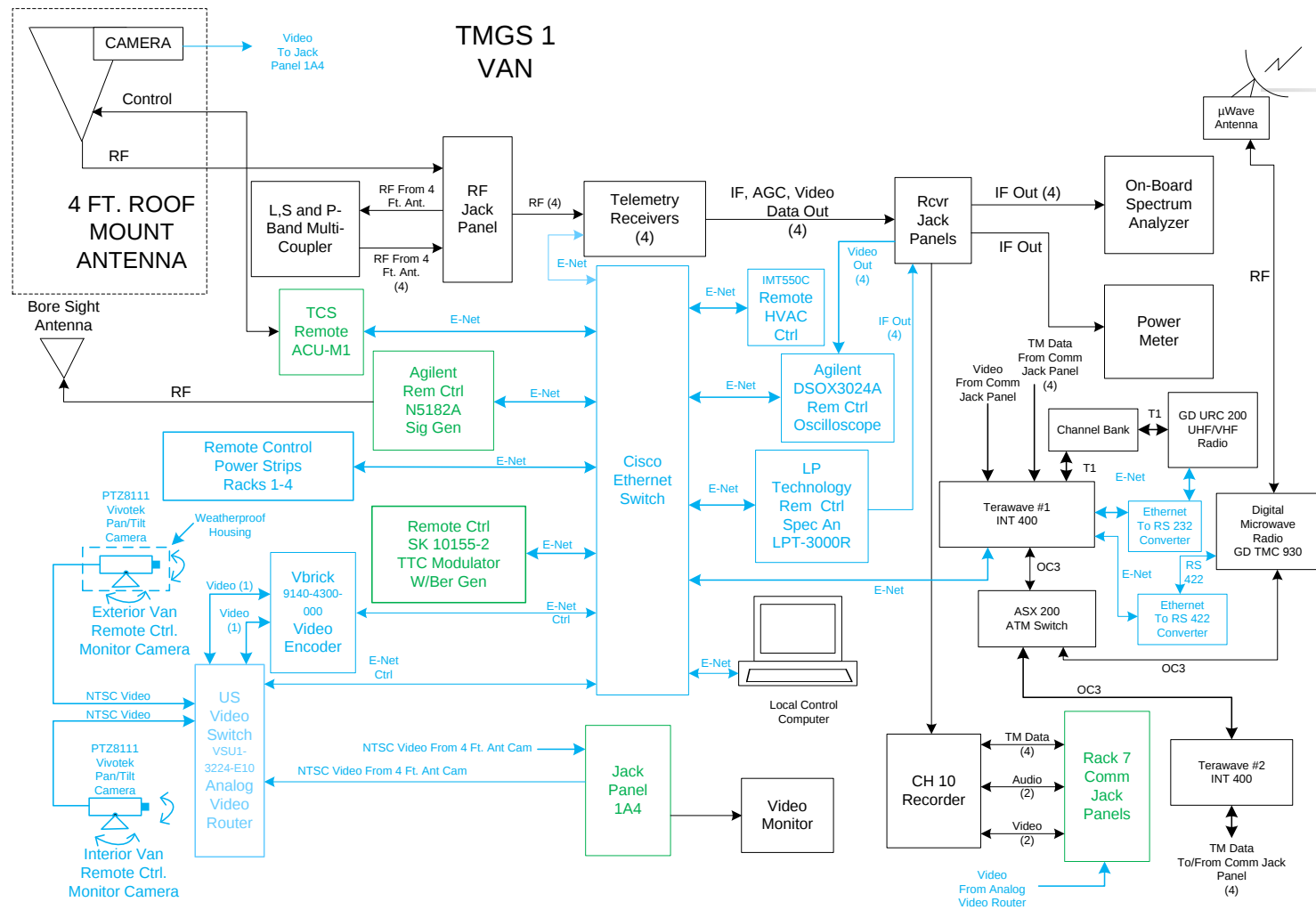
Legend: Black - Existing TM Equipment, Green - Modified Equipment, Blue – New Equipment for Remote



Edwards AFB TMGS Van Remote Control TM System Block Diagram



AFFTC



Legend: Black – Existing TM Equipment, Green – Modified Equipment, Blue – New Equipment for Remote



Telemetry Bands In Use at Present and For Immediate Future



- L, S-Band frequencies currently in use at Fixed, Mobile, and Remote Mobile TM sites for Edwards Flight Test Aircraft :

L-Band: 1435 – 1525 MHz

1755 – 1850 MHz

S-Band: 2200 – 2395 MHz

C-Band frequencies planned for near term:

4400 – 4940 MHz and 5091 – 5150 MHz



Summary



- Testing of Remote Control TM Van antenna has been very successful at Edwards C-15 site and Panamint Radar Site across L, S and C-Band frequencies of interest – ATP and ACP flights completed in March 2012
- Utilization of 4 Ft. Roof Mounted TM Antenna with control from main Building 5790 Telemetry Site allowed tracking of aircraft out beyond 70 miles from Van Antenna – actual range only limited by available comm link
- Bit-Error Rates and receiver Signal-To-Noise Ratios are within required limits
- Modifications of TMGS Vans 1 complete and TM Systems Commissioned
- Modification of remaining TMGS Vans 2, 3 and 4 in progress