



# **ROVER Capabilities Brief**

## **A2U ISR Innovations**

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# Disclaimer



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Home of Mr. Jon Tolliver, ex-USAF WWII Aviator. He managed to save his WWII aviation medals from the burned out wreckage.

Witch Fire

Witch Fire Damage – Home of Mr. Jon Tolliver (USAF Capt, Ret) – lost everything but his WWII medals when his home was destroyed



- **Wartime innovation of ROVER**
  - ROVER I (Air to Air link)
  - ROVER II (Air to Ground C-band link)
  - ROVER III (Multi-band link)
  - ROVER IV (Improved Antennas)
  - ROVER V (Handheld)
- **ROVER IV capabilities and description**
- **ROVER Support in Civil Emergencies**
- **ROVER V Handheld Capabilities**



# What is ROVER?



- **Remote Operated Video Enhanced Receiver**
  - Air Force answer to receive full motion video (FMV)
- **ROVER uses line of sight video downlink from a Variety of airborne platforms**
  - Unmanned Aerial System (UAS) and Advanced Targeting Pods (ATP)
  - Unencrypted - Analog and digital
- **Gives the view from above to the ground**





# Wartime Innovations

4 Days to test - 4 Weeks to combat



## ROVER



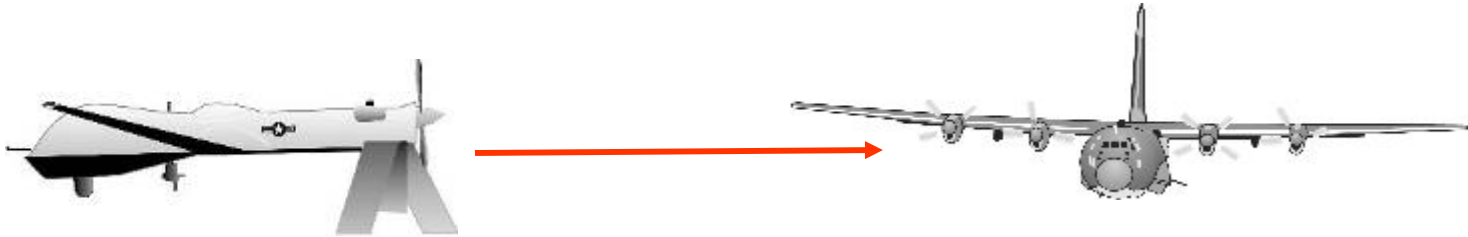


# History

## What is ROVER



- **ROVER I: Video air-to-air link in C-Band (Predator to AC-130)**

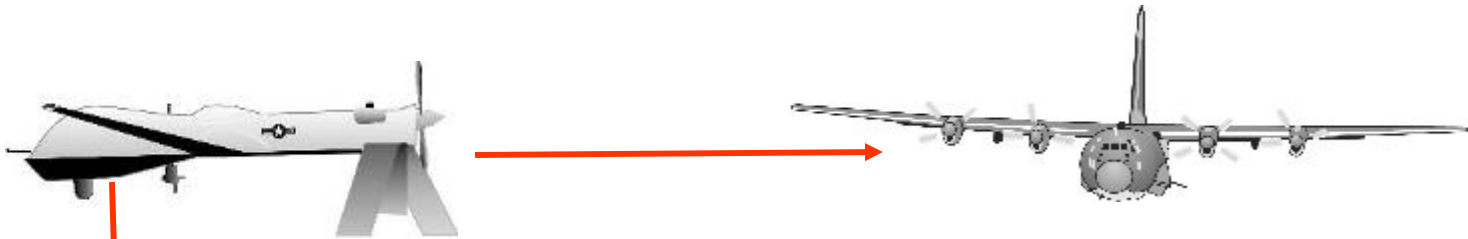




# History

## What is ROVER

- **ROVER II : Video air-to-ground downlink in C-Band (Aircraft to ground forward air controller)—C-Band only**

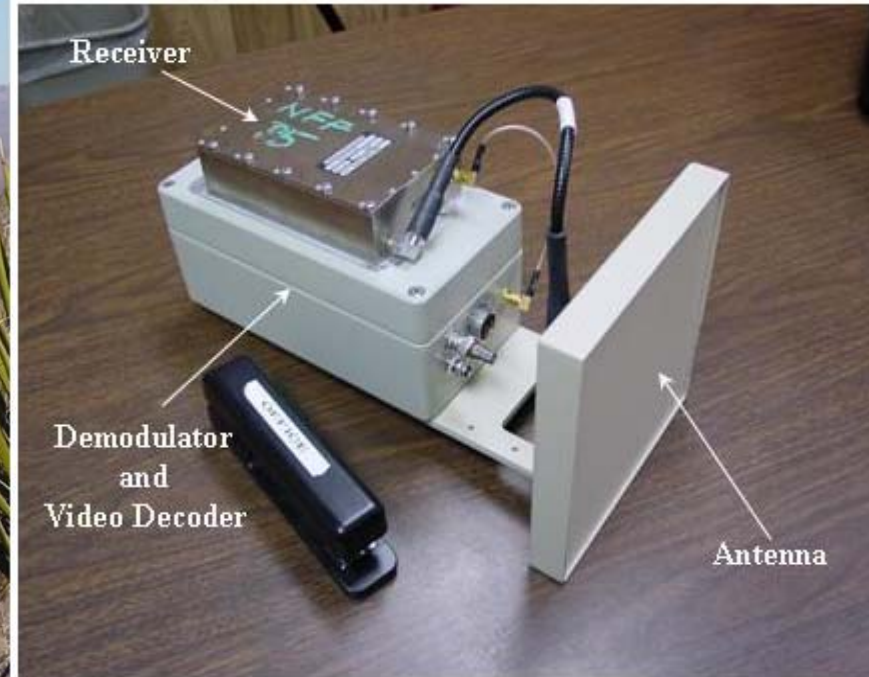


- **ROVER III – Multi-band receiver C/L/KU**
- **ROVER IV – adds new improved mini antennas and S-Band – better reception**





# First ROVER II



## A Pretty Neat Story:

On 17 Jan 02, CW2 Chris Manuel (Army Green Beret) pictured above, dropped in unannounced to visit 645 AESG. He said he'd spent the past 3 months looking in caves in Afghanistan, had 2 weeks off, and then was to return to do the same. He said his unit desperately needed access to Predator video to enable them to "see what was over the next hill" before putting his people at risk. Key players were assembled, the requirement was discussed with the contractor, and a solution was developed that day, right in the Big Safari office. Eight days later (23 Jan 02) the solution - shown above - was demonstrated at the Predator test facility at El Mirage. CW2 Manual deployed back to Afghanistan to put the ROVER into operations. The ROVER was credited multiple times for saving the lives of his unit and assisting in the killing or capture of enemy combatants.

Receiver and Antenna



# ROVER Development



- **Spiral development – quick and improved capability for the warfighter**
  - **ROVER III Model 100 (Sep 04)**
    - **Multi-band receive capability (C/L/Ku)**
  - **ROVER III Model 300 Enhancements (Nov 06)**
    - **Added interface for C-band tracking antenna**
    - **NTSC Monitor capability**
    - **DVR (TIVO) player capability**
    - **Improved battery life & added battery eliminator**
    - **SAASM GPS Interface**
    - **Upgraded C/L antenna to reduce interference**
  - **ROVER IV (Nov 07)**
    - **S-Band**
    - **Mini Antennas**



# ROVER

Full Motion Video directly to the Ground User



**Predator**



**SNIPER Pod**



**Litening Pod**



**P3**



**Raven**

**Pioneer**

**Pointer**

**AC-130**



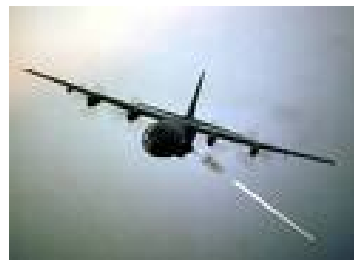
**Shadow**



**Hunter**

**Fire Scout**

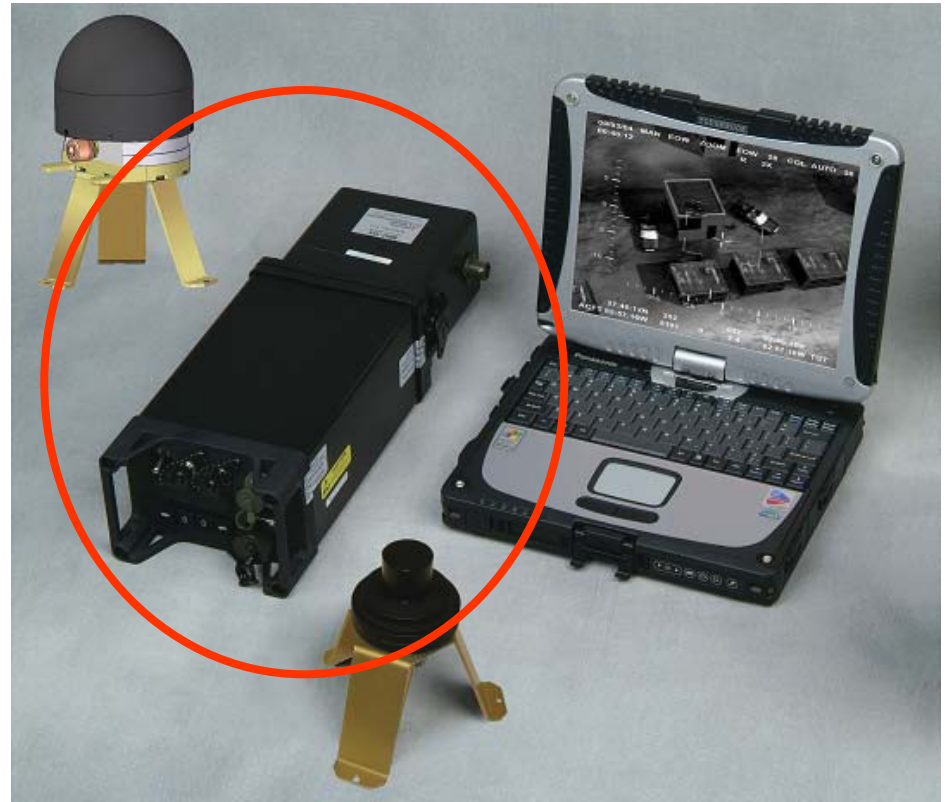
**Scathe View**





# ROVER IV Receiver

- **Size: 5.50 X 3.87 X 13.75**
- **Weight: 12 Lbs with Omni Antenna**
- **Power: 15.8 W**
- **BA-5590 battery**
  - **Battery Life: 12 Hrs**
  - **Compatible With Vehicle Radio Mounts**
- **Waterproof (3' Submersion)**





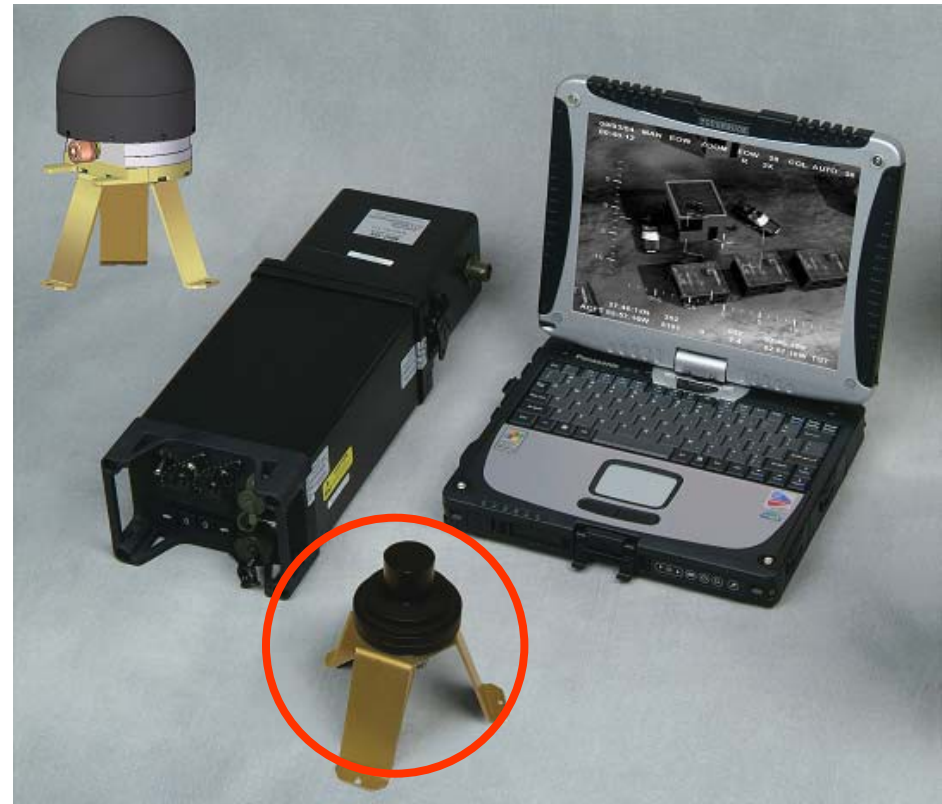
# ROVER IV Ku-Band Antenna

## *Ku-Band Omni Antenna Assembly*

*Ku-Band Omni  
Antenna*

*Ku-Band LNA (DC  
Power Supplied via  
RF Cable)*

*Mechanical  
Housing & Mounting*





# ROVER IV C/L/S-Band Antenna

## ***C/L/S-Band Omni Antenna***

***C/L-Band Omni Antenna  
C/L-Band LNA (DC Power  
Supplied via RF Cable)  
Mechanical Housing &  
Mounting***





# ROVER Laptop



## Panasonic Toughbook

- **Model CF-19**
  - Sunlight Readable Display
  - 2GB RAM
  - 80 GB Hard Drive
  - Dual Core Processor
    - Faster
    - Improved Battery Management





# ROVER Metadata



- **Lots of attention being focused on metadata over the past few years. There are lots of formats out there, but two main standards:**
  - **Key-Length-Value (KLV)**
    - **Controlled by MISB (Motion Imagery Standards Board)**
  - **Cursor on Target (CoT)**
    - **Controlled by MITRE**
- **ROVER supports and encourages KLV metadata over the link**
  - **ROVER 4s delivered with KLV capability**
  - **ROVER IIIs/eROVERs receive KLV capability with software upgrade**
- **L3 working on KLV to CoT translator application that runs on ROVER**





# ROVER Metadata KLV Plug-in



FalconView - LIMITED DISTRIBUTION -

File Edit View Map Overlay Tools Options Favorites Help

100% IN OUT

**Target 1 Location:**  
31.07958° N 97.83146° W  
Altitude: 0

**Target 2 Location:**  
31.07775° N 97.82486° W  
Altitude: 0

**Target 3 Location:**  
31.07773° N 97.82789° W  
Altitude: 0

**Rover III 01458 Location:**  
31.07596° N 97.825816° W  
Altitude: 4227

Air 3827

Prod 3927

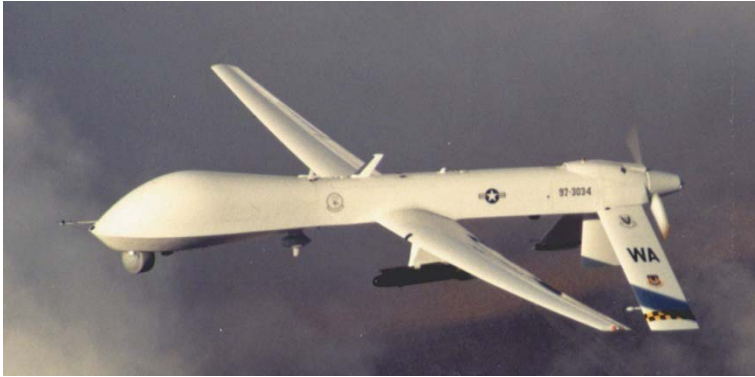
Rover III 01458

Press Esc or the Continuous Pan button to exit this tool

Equal Arc CIB 1 meter WGS84 N 31° 04.652' W 097° 49.560'



# Predator



**C-Band 455 Kb/sec**





# WESCAM/ROVER III E/O Video



***Ku-Band TCDL @ 10.71 Mb/s***



# WESCAM/ROVER III IR Video



***Ku-Band TCDL @ 10.71 Mb/s***



# ROVER III – Sniper Pod



***L-Band Video from LM's SniperXR Targeting Pod to ROVER III***



# ROVER Support to Crisis



- Ability to receive imagery from a variety of airborne platforms – Scathe View, Predator, Raven, P-3 ...
- Collect information in denied areas -
- Deployable, simple to operate



# AFCSO Fire Support







# ROVER and FalconView Support



**AFCSO ROVER Team**



**ROVER Video posted NORTHCOM website**



**Fire Fighter (Don Green) embedded with AFCSO Team**



**FalconView Training for State Fire Chief**



# ROVER 5

## Coming early 2009



**Handheld – smaller, lighter**  
**Two way Communications**  
**Transmit capability -L, S, C and Ku-bands**  
**Encryption Data Rates up to 10.71 Mbps in all bands**



# ROVER V test 26 Sept 08



- **Benefits**

- *2-way Whiteboarding Picture annotation*
- *Full backward ROVER Interoperability*
- *Easier to Pack*
- *PSP™-like Design*
- *Transmit/Receive*
- *Five Band Transceiver (UHF, L, S, C, Ku)*
- *Touch Screen Programming*
- *Integrated Antennas*
- *All Industry Standard Video*
- *2-Way Voice and Data*
- *Laptop connectivity*





# ROVER Test Center



Comparative size

Picture Annotations





# Katrina Innovation



- **FAA restricted use of UAVs – Imposed a UAV no-fly in airspace**
- **Result: 10 Evolution UAVs grounded**
- **Solution: ROVER Team innovated an HH-60/Evolution Solution**
- **Evolution mounted on HH-60 in order to provide streaming video on the ground**
- **Note: Innovation almost always requires duct tape**





# ROVER

## Revolutionizes the Battlefield



### ***Over 14 NATO and ISAF countries use ROVER***

- ***UK***            ***France***            ***Australia***            ***Germany***
- ***Norway***    ***New Zealand***    ***Canada***            ***Portugal***
- ***Italy***            ***Spain***            ***Sweden***            ***Belgium***
- ***Netherlands***



***85% of CAS mission done  
with ROVER in OIF***



# Questions ?



**There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.** For the reformer has enemies in all those who profit by the old order, and only lukewarm defenders in all those who would profit by the new order, this luke warmness arising partly from fear of their adversaries ... and partly from the incredulity of mankind, who do not truly believe in anything new until they have had actual experience of it.

– Niccolo Machiavelli