



# Spiral Development in Wartime



**LtCol Paul Hastert**





# The Problem

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- Can anyone tell me what you just saw?
- Machines understand coordinates – Humans understand maps and imagery
- The “Soda Straw” effect – Great view of the target, no idea what’s off to the side
- Profound need for Situational Awareness (SA) tool to help understand where the heck Predator is, and what the heck they’re doing



# Predator Data



## The Predator You See...



## The Predator You Don't

Ta+3637444To-11528023Tw891Sr3.714.99Se-  
22.34Fv1.71SI11014Sa+3639111So-  
11531557Sn2Cd20000823Ct175544Ir-0.95Ip-  
0.31Ih173.38Ic0Mn23Md0Mt0C10Pc0Iv0

Ta+385To-11536024Tw8983Sr5.47Sp218.64Se-  
14.95Fv11.55SI11024Sa+3639065So-  
11531546Sn2Cd20000823Ct175548Ip-  
0.33Ih173.73Ic0Mn23Md0Mt0C10Pc0Iv0

Ta+3634595To-11536021Tw85.43Sp218.99Se-  
15v11.55SI11028S39029So-  
11531539Sn2Cd20000823Ct175550Ir-0.34Ip-  
0.58Ih173.50Ic0Mn23Md0Pc0Iv0

Ta+3634577To-11536010Tw8r5.40Sp24Se-  
15.155SI11033638582So-  
11531529Sn2Cd20000823Ct175554Ir-0.37Ip-  
0.87Ih173.66Ic0Mn23Md0Mt0C10Pc0Iv0

## ESD

(Exploitation Support Data)



# Exploitation Support Data



- Developed “on the back of a napkin” during Operation Allied Force (Kosovo)
- Encodes aircraft and Sensor Point of Interest (SPI) coords, elevation, Field of View (FOV) etc.
- Transmitted at low data rate embedded in the NTSC “teletext” field; teletext rides in the blanking interval along with closed captioning



# Data Architecture - 2001



Video Feed

Decoder

Decoder

Decoder

*CAOC Floor*

PowerScene

ISR  
Manager

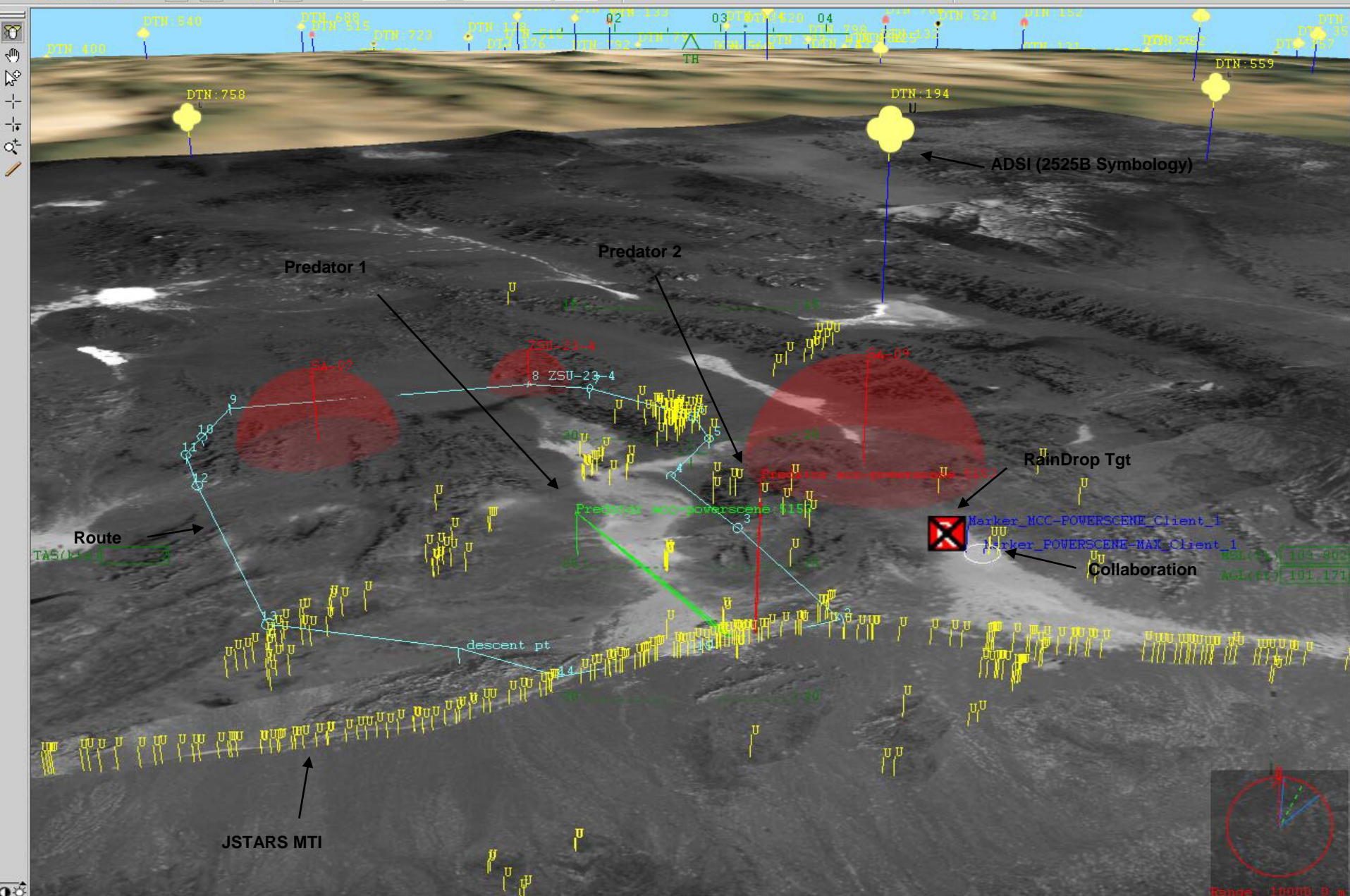
BattleScape



# Data Architecture 2001



- “Stovepipe” decoding, individual decoders for each individual computer displaying position
- One or two decoders – no ability to display any more Predators than that
- Decoders not secured – flashing lights and little buttons lead to “little fingers” screwing things up
- Predator position only displayed on the “Machine in the corner” – information is not in front of the people who need it in a tool that they know how to use







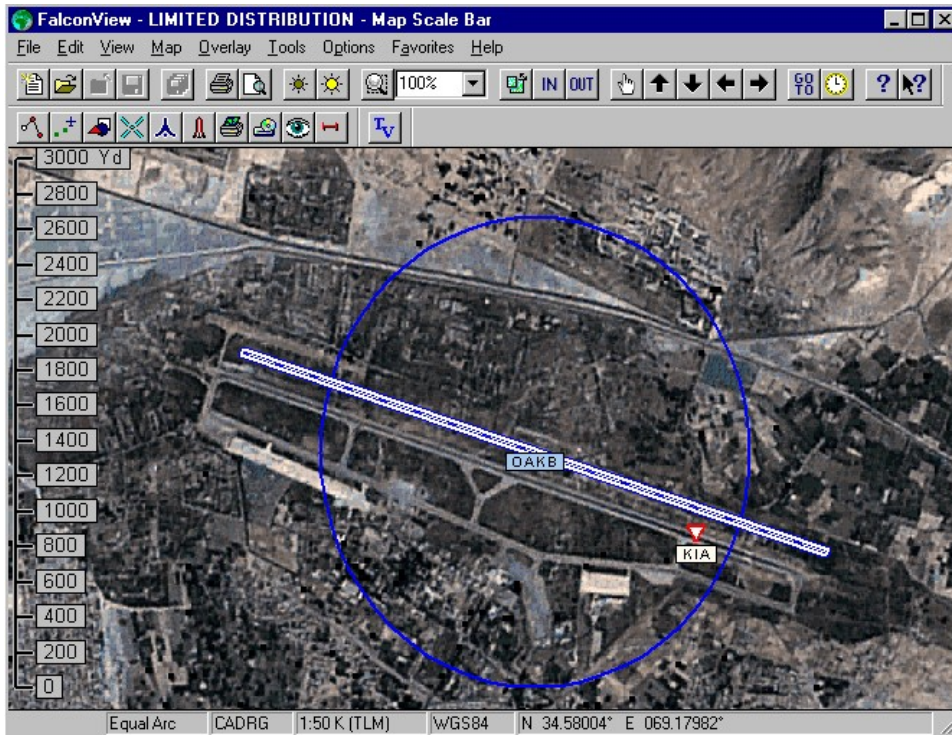
# Spiral 0 – “Predator View”



- Specialized version of PowerScene
- 3D view of battlefield using imagery draped on top of terrain
- Fails to answer fundamental questions:  
“Where’s the Predator? What’s it looking at?”
- Unfamiliar software, heavy “man in the loop”
- Stovepipe solution – Predator position displayed on one or two PC’s in the CAOC



22,000 copies across all four services and 25 Allied Nations. The de facto “Common Operating Picture”





# FalconView “GPS” Interface



- FalconView has always had ability to display standard GPS feed as moving map
- FalconView 3.2 added PLGR feed and broke out feeds into separate dynamic link libraries
- New ability to add additional “GPS” types to already fielded versions of FalconView
- AFCSO initiative to add feed to FalconView to act as 2D companion to 3D PowerScene



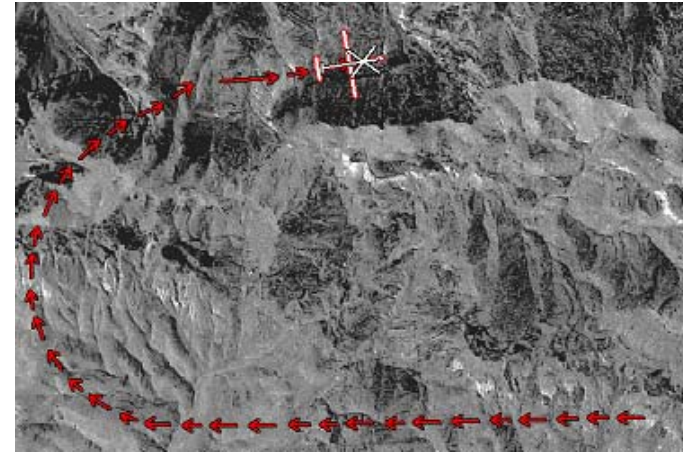
# Spiral 1 – July 2002



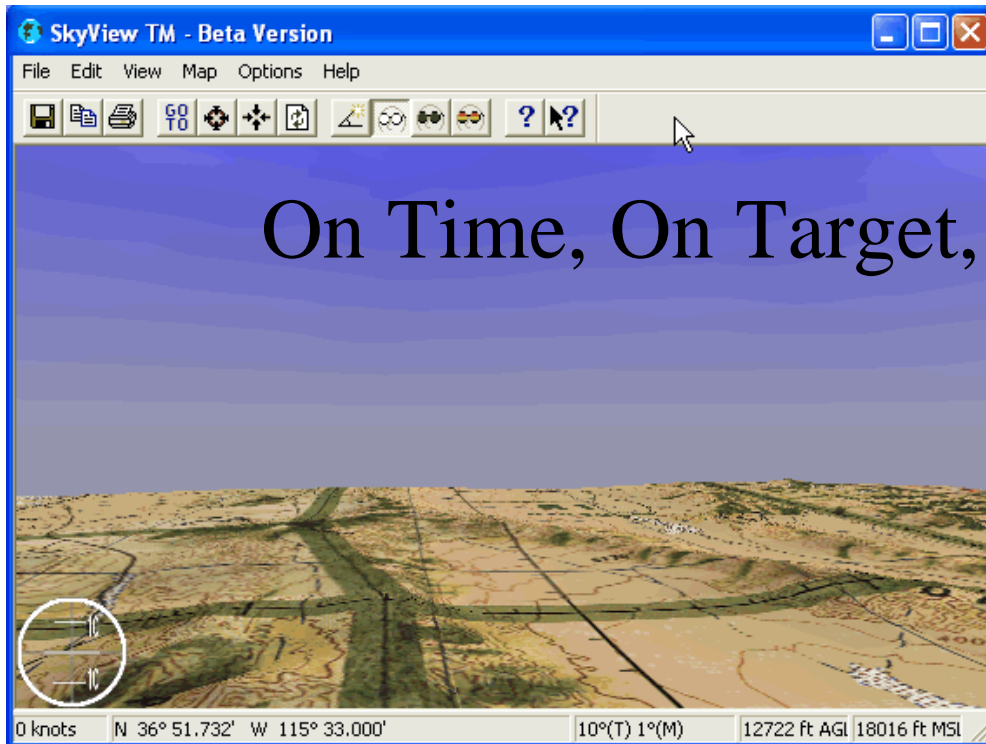
- First connection between Predator ESD and FalconView
- Uses existing GPS feed mechanism/interface
- Ability to display a single Position (aircraft or SPI) from a single Predator

**Slides  
From  
July 2002**

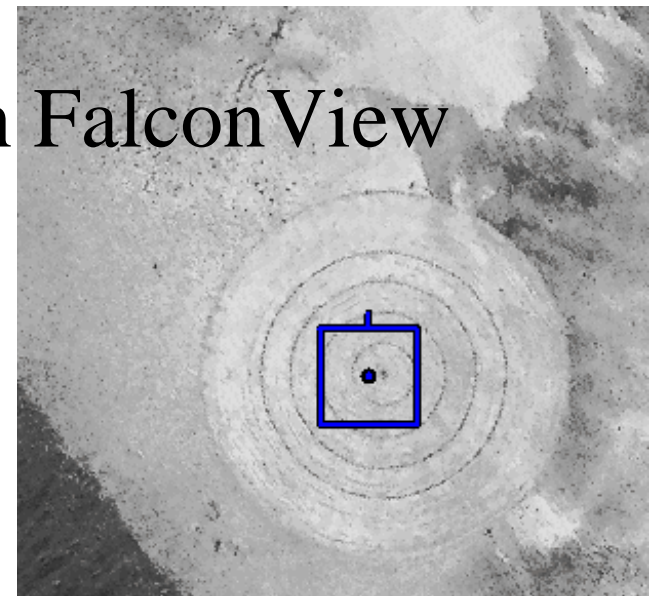
From <Self> To <NELLIS AFB>  
168°M/46.6NM



# Predator Feed for FalconView



On FalconView





# What is the Predator Feed?



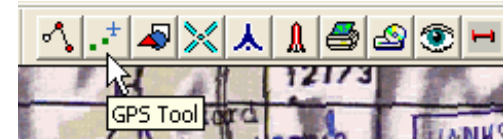
- Installable dll file (64kb) that works with FalconView 3.2 (or greater)
- Uses existing Moving Map Functionality
- Follow Sensor FOV Centerpoint or UAV Location
- Uses “ESD” Predator Position Feed to Serial Port provided by data recovery device to pull data from closed captions



# How Do I start the Feed?



- Start FalconView GPS Tool



- Click Connect Button



- Or...Just press “CTRL-Q” and FalconView will do everything







# Moving Map Toolbar



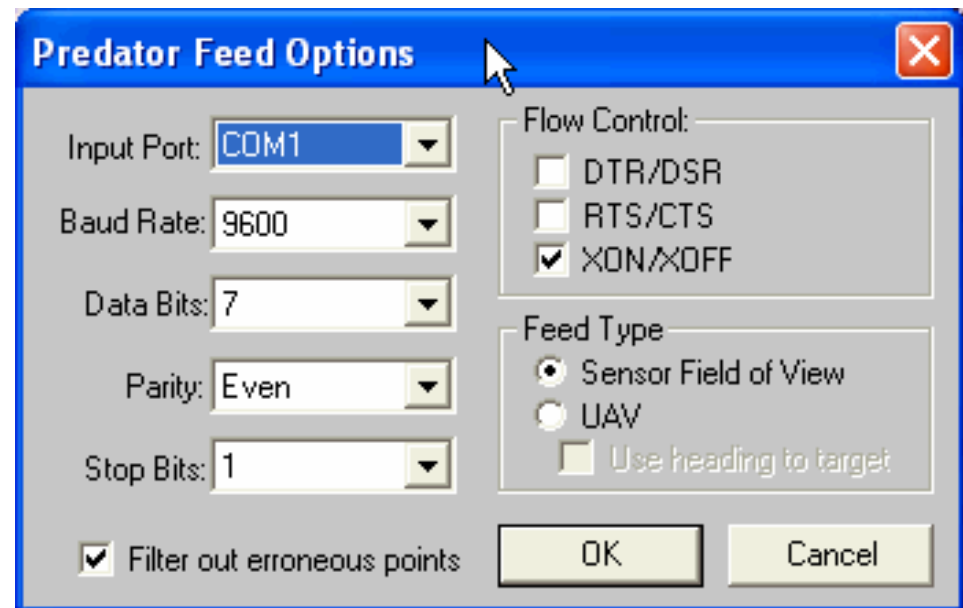
- Connect/Disconnect
- Predator Feed Options
- Auto Center on Predator Position
- Orient chart to match UAV Course / FOV Orientation
- Smooth Scrolling
- Turn On/Off Trail Points (breadcrumbs)
- GPS Options
- Course Displacement Indicator (CDI)
- Display Range and Bearing
- Coast Track to dead recon position of Boogie



# Predator Options Dialog Window



- If the feed works once then the only thing you should change is the “Feed Type” to switch between the UAV and the Sensor FOV!



Note: This is the only piece that is “Predator Unique”. Everything else is built into FalconView 3.2 and paid for by someone else



# Sensor FOV on 5M CIB



FalconView - LIMITED DISTRIBUTION - predator\_Sensor\_FOV.gpb

File Edit View Map Overlay Tools Options Favorites Help

100% IN OUT

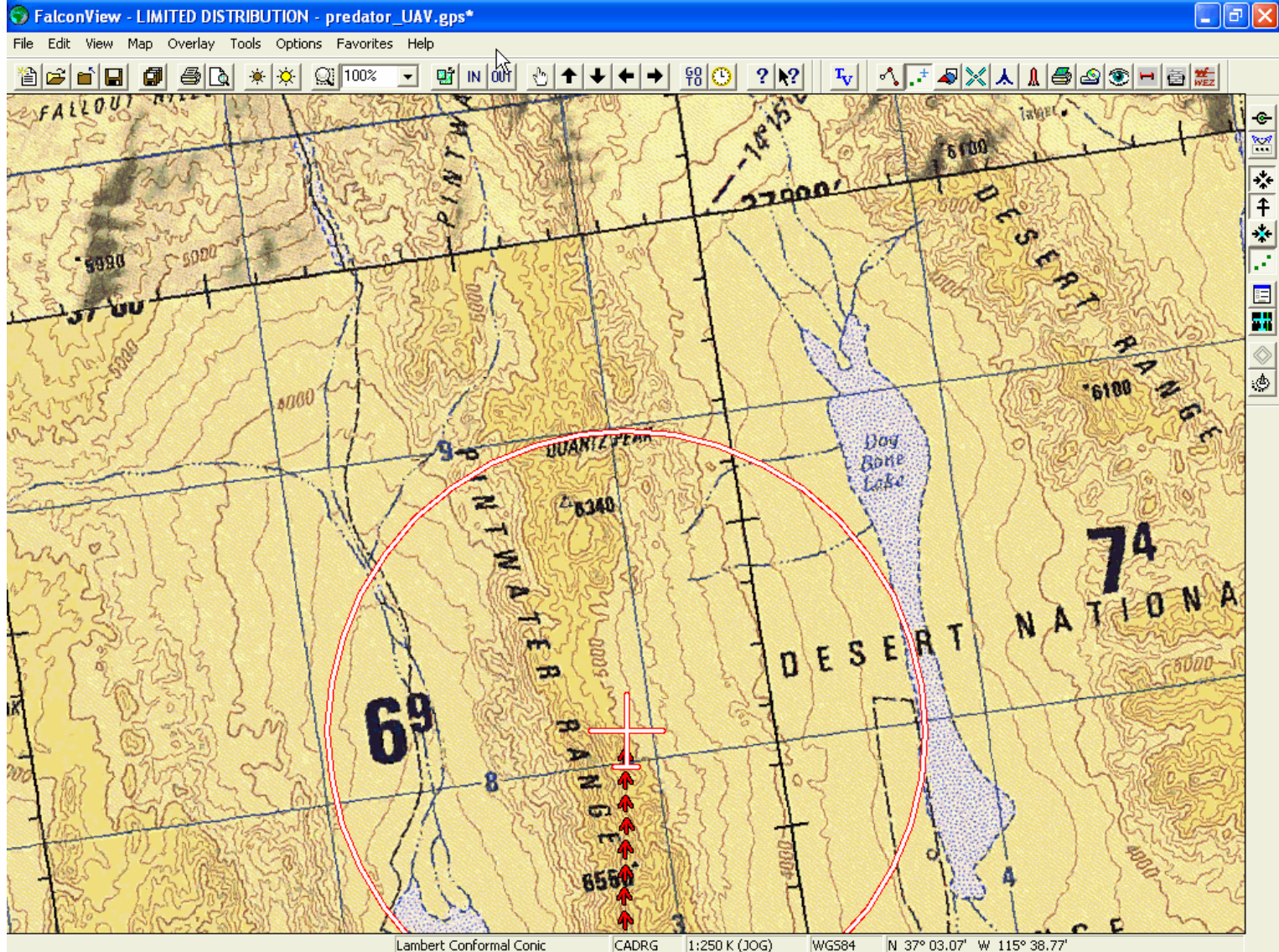
The main window displays a grayscale aerial photograph of a terrain. A blue square is overlaid on the image, representing the sensor's field of view (FOV). Concentric circles are drawn around the center of the square, indicating the range of the sensor. The terrain shows a mix of light and dark areas, possibly representing different types of vegetation or structures.

For Help, press F1

Lambert Conformal Conic CIB 5 meter WGS84 N 36° 57.145' W 115° 26.443'



# Predator Position on JOG





# Tying SkyView to Predator



FalconView - LIMITED DISTRIBUTION - SkyView1.svw

File Edit View Map Overlay Tools Options Favorites Help

100% IN OUT

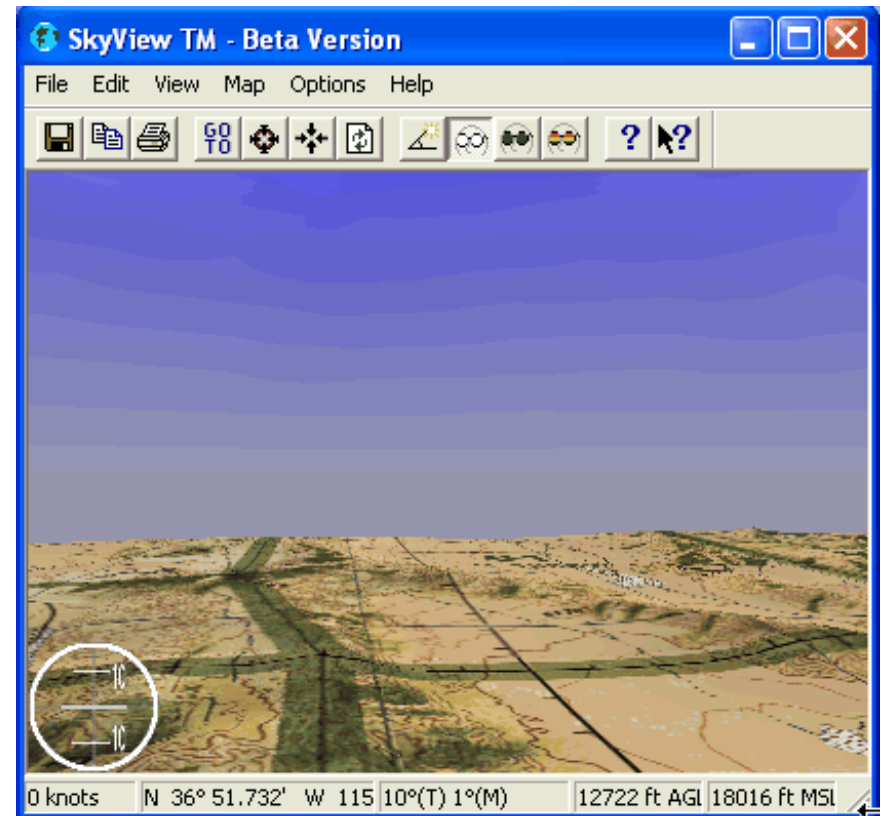
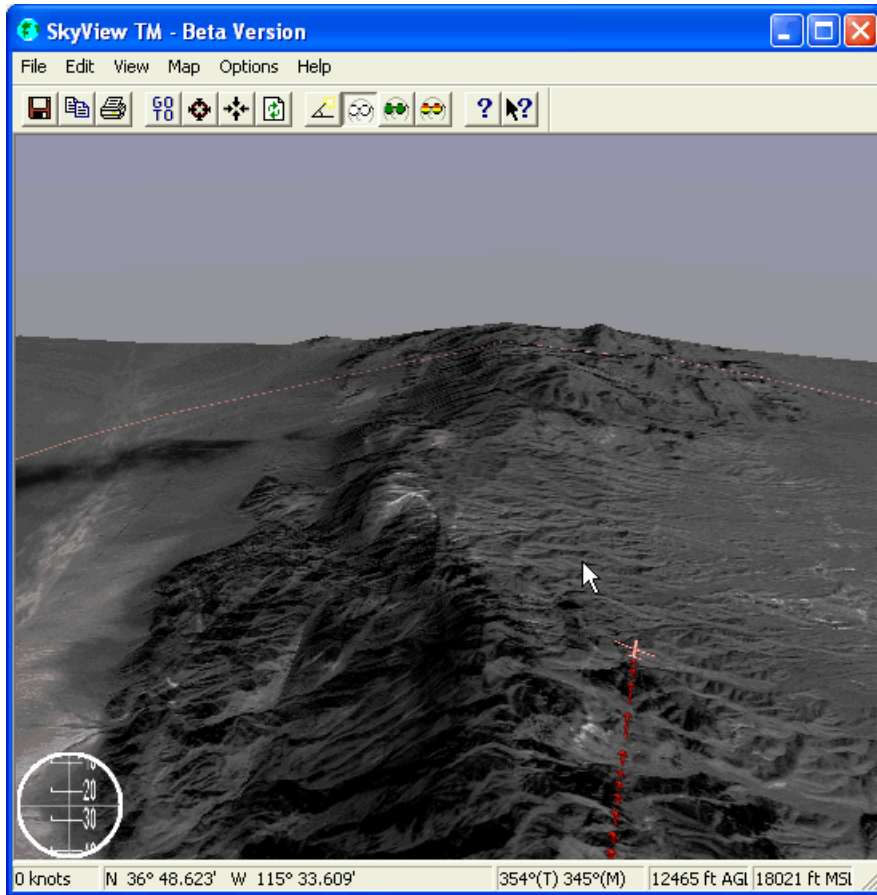
The map shows a topographic view of a desert region. A red circle highlights a specific area in the center-left. Within this circle, there is a point labeled '6340' with a crosshair. A red arrow points from a context menu to this point. The map includes contour lines, a grid, and labels for 'PINTWATER RANGELAND', 'QUARTZ PEAK', 'DESERT NATIONAL RANGELAND', and 'Day Bone Lake'. A 'Target' label is also visible in the upper right.

- Center Map
- Scale In
- Scale Out
- Get GPS Point Info...
- Enable 3D viewpoint tracking
- Get Map Info...

Ground Speed: 115 Kts, 231° Mag, 17978 ft (MSL) Lambert Conformal Conic CADRG 1:250 K (JOG) WGS84 N 36° 52.32' W 115° 33.80' (5617 ft)



# Predator/SkyView



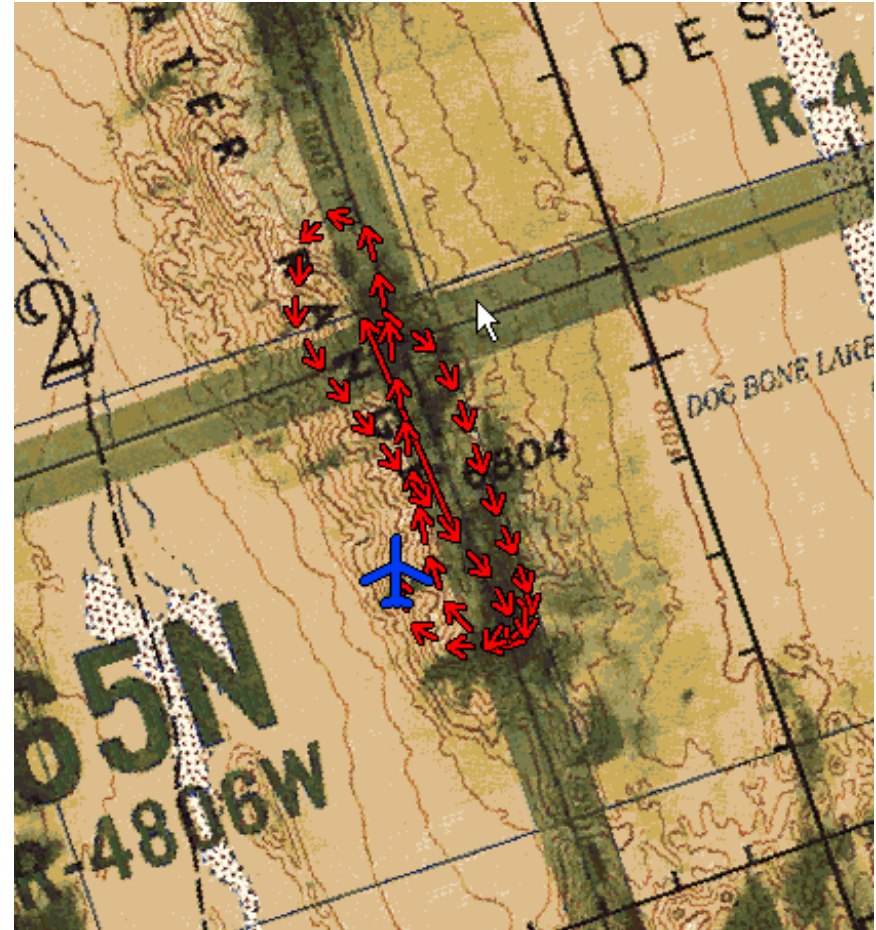
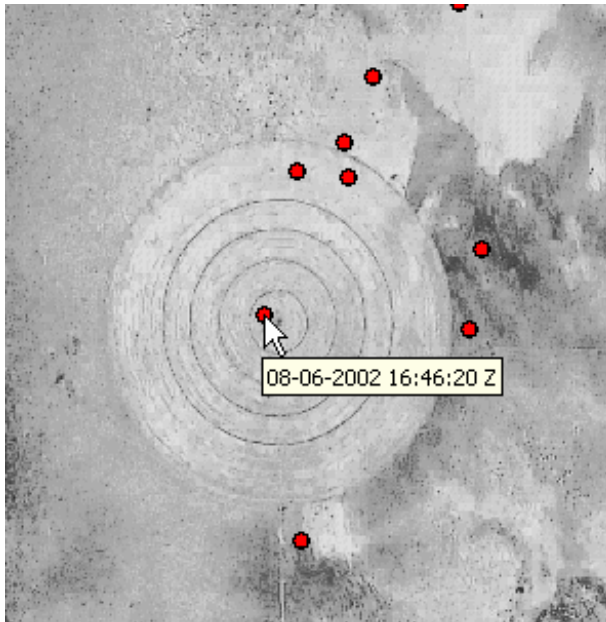
*Integrity - Service - Excellence*



# Recording Missions



FalconView Records Mission in Track file that can be reviewed / replayed at any time



**Back to  
today...**





# Data Architecture - July



Video Feed

*CAOC Skycab*

Decoder

Serial Splitter

Falcon View

Falcon View

Falcon View



# Spiral 1 Shortfalls



- Need to run serial cable to each individual PC where you want to display Predator Position
- Different floor areas require separate decoders
- FalconView can only display a single position at a time, need to manually swap video cables to switch between different aircraft/feeds



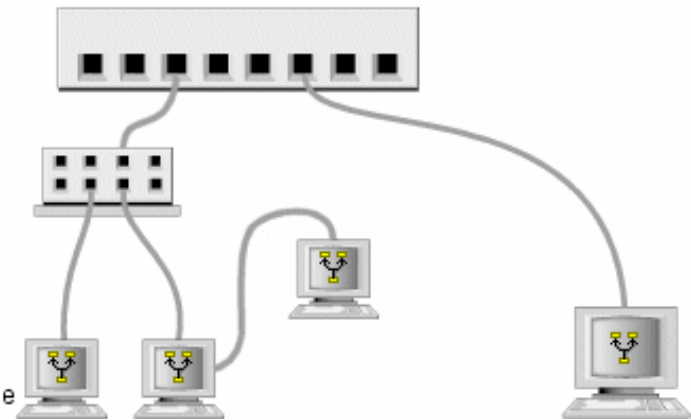
# HH-60 “Splitter” Program



- Program to take intertwined GPS and NRT Intel feed on a serial port and “Split” into two separate TCP/IP feeds



Splitter version 1.0.0  
Copyright © 2002 GTRC  
Georgia Tech Research Institute



- Also had intrinsic ability to take any serial feed and translate into TCP/IP to broadcast across the network
- Also developed “Network NMEA” feed to receive GPS feed across a network



# Spiral 2 – December 2002



- Leverage HH-60 Splitter program to broadcast ESD across a network



- Modify FalconView Predator feed to support TCP/IP feeds as well as existing Serial feed
- Relocate teletext decoders from CAOC floor (under Predator LNO's desk) to secure area



# Spiral 1 New Features



## *Splitter*

**Splitter [mainboot]**

Properties | Status

Input Source: Serial Port

Serial Port 0: Serial Port

Input Port: COM1

Baud Rate: 9600

Data Bits: 8

Parity: None

Stop Bits: 1

Flow Control:

- DTR/DSR
- RTS/CTS
- XON/XOFF

Close COM port

TACELINT (Threat) TCP/IP port number: 1234

NMEA (GPS) TCP/IP port number: 5678

All data port number: 6789

OK Cancel Help

## *New Pred Feed Options*

**Predator Feed Options**

Input Source: TCP/IP

TCP/IP Options

IP address : 192.168. 1 .121

Port number : 6789

Feed Type

- Sensor Field of View
- UAV
- Use heading to target

Filter out erroneous points

OK Cancel



# Data Architecture - December

Video Feed

Decoder

Splitter  
Program

*CAOC Skycab*

*CAOC Floor*

*ISRD*

Falcon View

Falcon View

Falcon View



# Spiral 2 Shortfalls



- FalconView can only display a single position at a time, need to swap TCP/IP input settings to switch between different aircraft/feeds
- Concern about “how much bandwidth is this using?”
- Growing awareness that there soon will be many more Predators



# Spiral 3 – February 2003



- Driven by input from Predator Community
- Add “MultiPredator” Tool to display both vehicle and SPI for multiple Predators
- Add SuperSplitter to translate serial to TCP/IP for multiple ESD (or anything else) feeds
- Add “Raindrop Launcher” to pass coordinates from FalconView to NG’s Raindrop point mensuration tool using “Machine to Machine interface

## FalconView TST Enhancement

RainDrop Launcher  
Predator Moving Map Feed  
MultiPredator Tool  
Super Splitter

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Atlanta, GA 30332-0415





# FV TST Enhancements



## Super Splitter

Transmitting Predator  
Position Information  
across the SIPRNET

The screenshot displays the SuperSplitter software interface, which is used for transmitting Predator position information across the SIPRNET. The main window shows configuration options for input and output, including TCP/IP settings, server names, and output permissions. A terminal window at the bottom displays a hex dump of data. A secondary window shows an event log with the following data:

Type	Server	Client IP	Time	Status
Info	S-8001	na	02/04 13:51:16	Idle
Info	Pred1	na	02/04 13:51:42	Listening
Info	S-8002	na	02/04 13:51:51	Idle
Info	Pred2	na	02/04 13:52:16	Listening
Info	Pred1:8001	127.0.0.1	02/04 13:56:07	Accepted
Info	Pred2:8002	127.0.0.1	02/04 13:56:07	Accepted

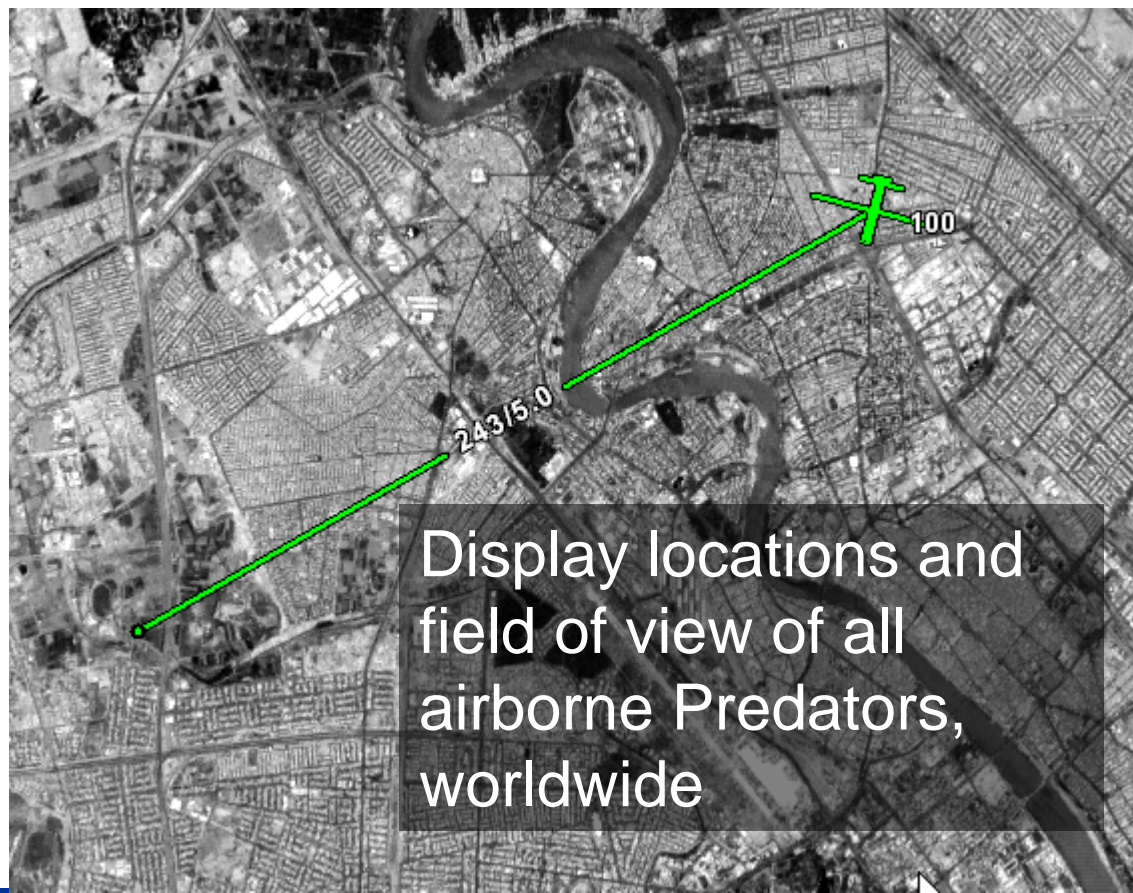
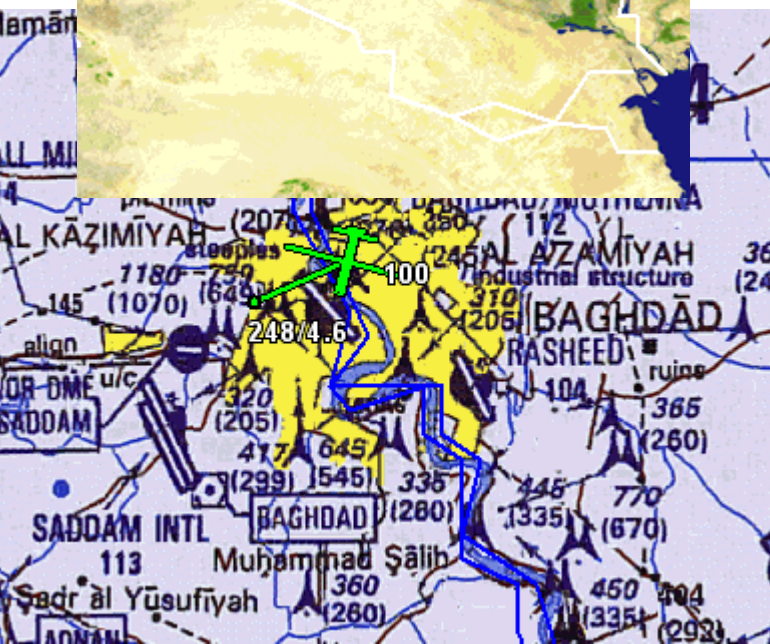
The interface also includes a Channel Guide (4000) table, which is currently empty, and various status indicators for server input/output Kbs and total input/output Kbs.



# FV TST Enhancements



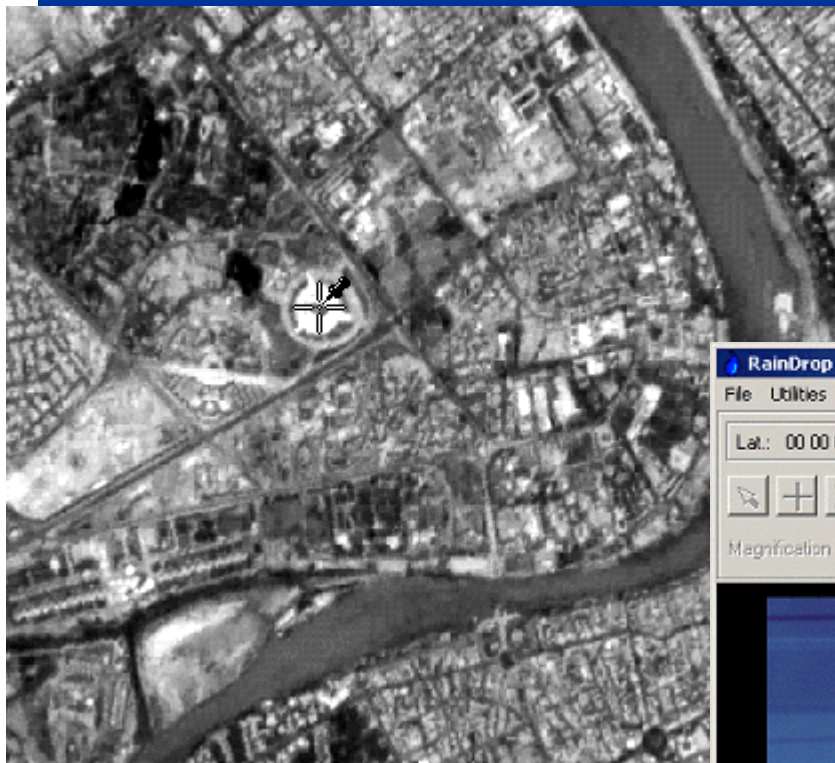
## MultiPredator Tool



Display locations and field of view of all airborne Predators, worldwide



# FV TST Enhancements

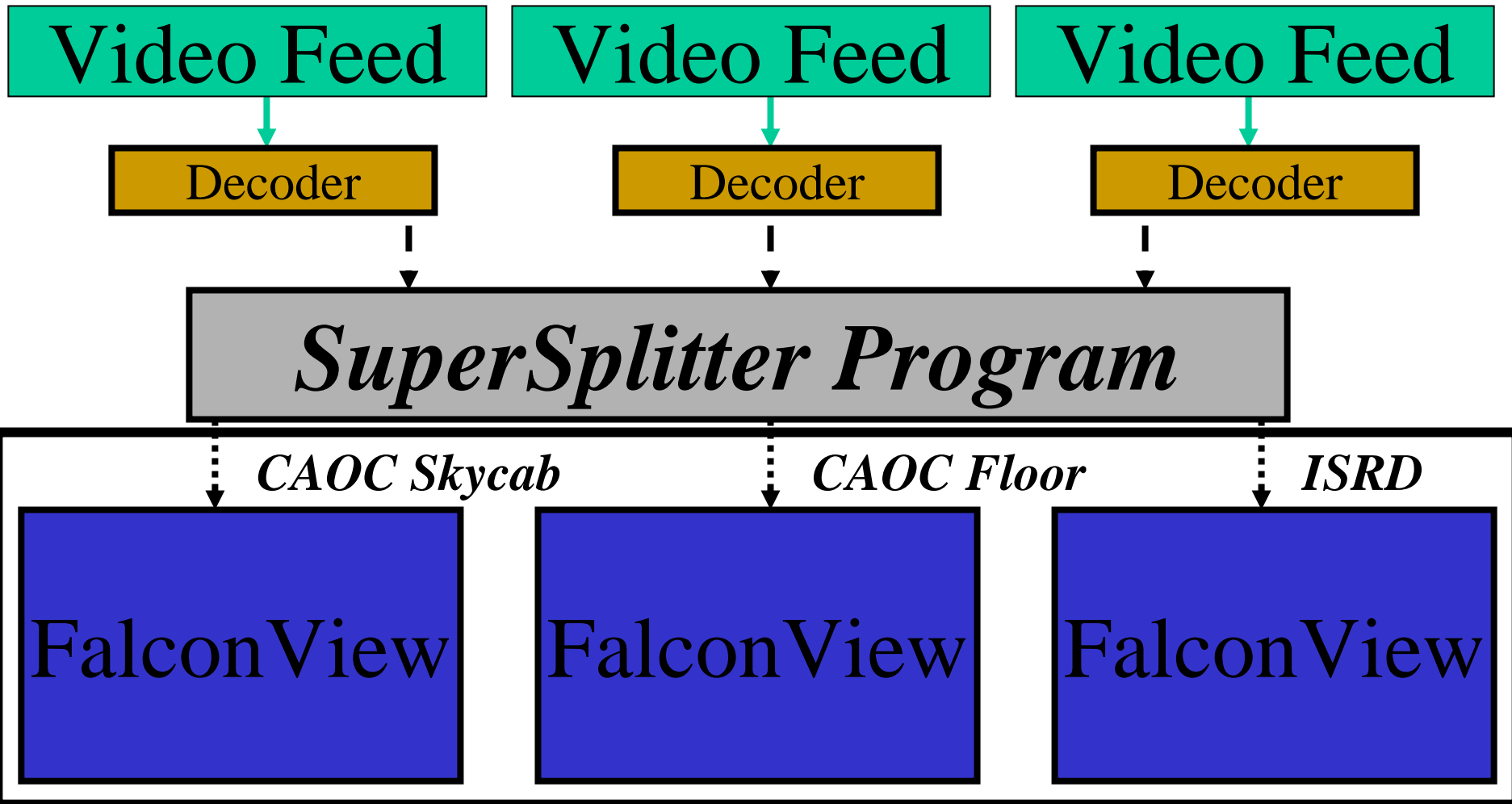


**RainDrop Launcher –**  
Machine to Machine Interface  
(M2MT) from FalconView to  
RainDrop Mensuration Tool



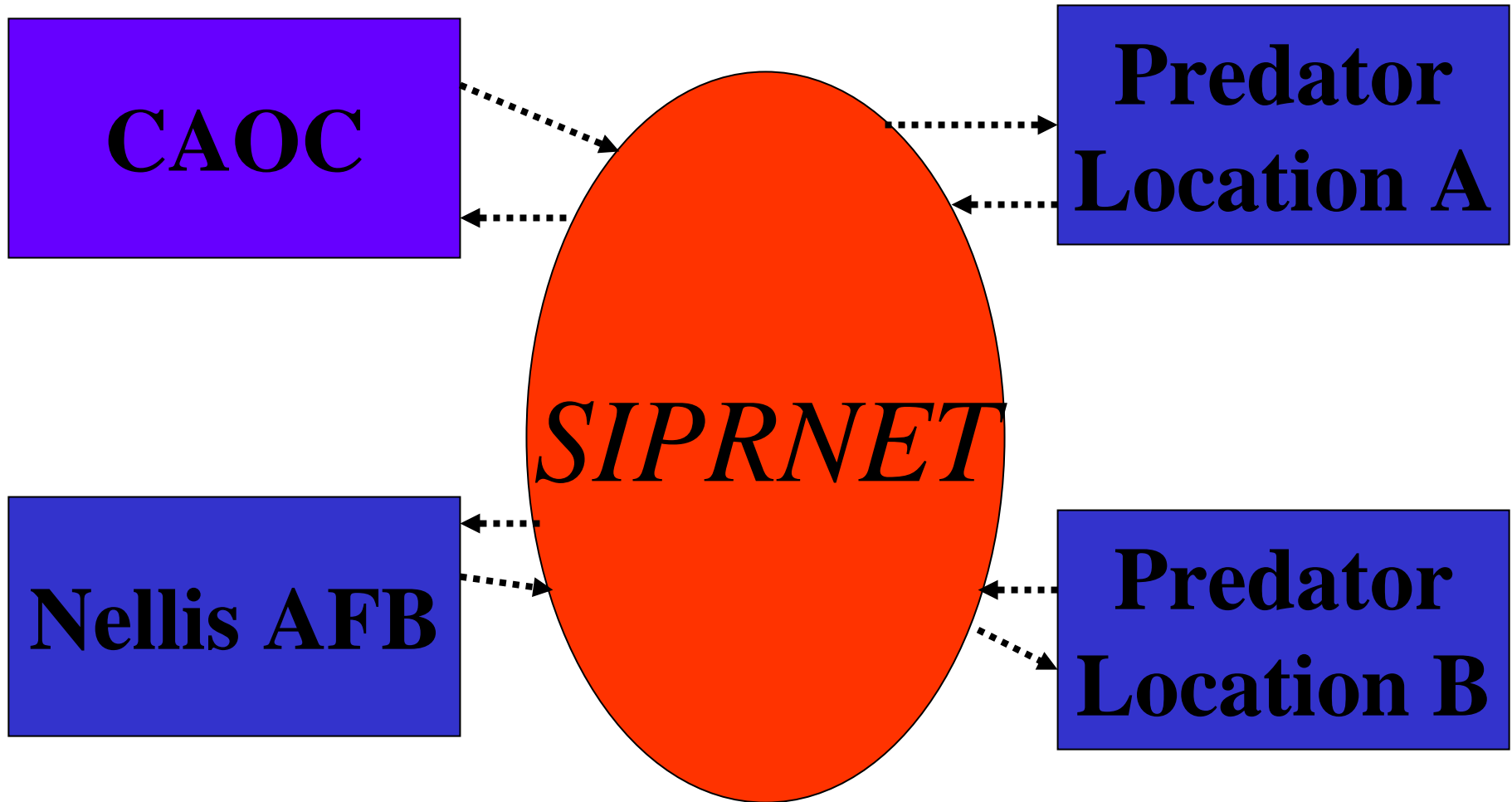


# Data Architecture – Feb 2003





# Data Architecture Continued





# Current Status – Today!



- Spiral 2 (Predator “GPS” feed) being fielded across DoD as part of PFPS 3.3.1
- Spiral 3 (MultiPred Tool) in use throughout the Predator community, GCS, Ops Cell, CAOC, Exploitation Cell, Fwd Locations etc.
- Additional applications beginning to connect to ESD TCP/IP stream from SuperSplitter
- Spiral 4 integrated into PFPS 4.0 (in test)



# “Real World” Spiral Development



- In Wartime you’ve got everything *but* time
- Need to rapidly develop and field a solution, even if it isn’t perfect
- Field an 80% solution or even a 50% solution until you can get feedback and determine what people really need
- If “spiraling” is just justification for continued funding it isn’t spiral development at all



# Lessons Learned



1. Listen to your customers
2. Just because it looks good in a demo doesn't mean it works
3. Find your "Alpha Geek"
4. Don't try to do everything at once
5. Plan to spiral within spirals
6. Be very careful when your developers start thinking they're smarter than the customer





# Lessons Learned



7. It's gotta be easy to use
8. Leverage off what people got and what people know how to use

# Questions?



**LtCol Paul Hastert**

<http://www.mission-planning.com>

[paul.hastert@pentagon.af.mil](mailto:paul.hastert@pentagon.af.mil)

[paul.hastert@af.pentagon.smil.mil](mailto:paul.hastert@af.pentagon.smil.mil)

APR 6 2003