



# STK for 9-11 Analysis

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June 3, 2002





# STK Modules Used

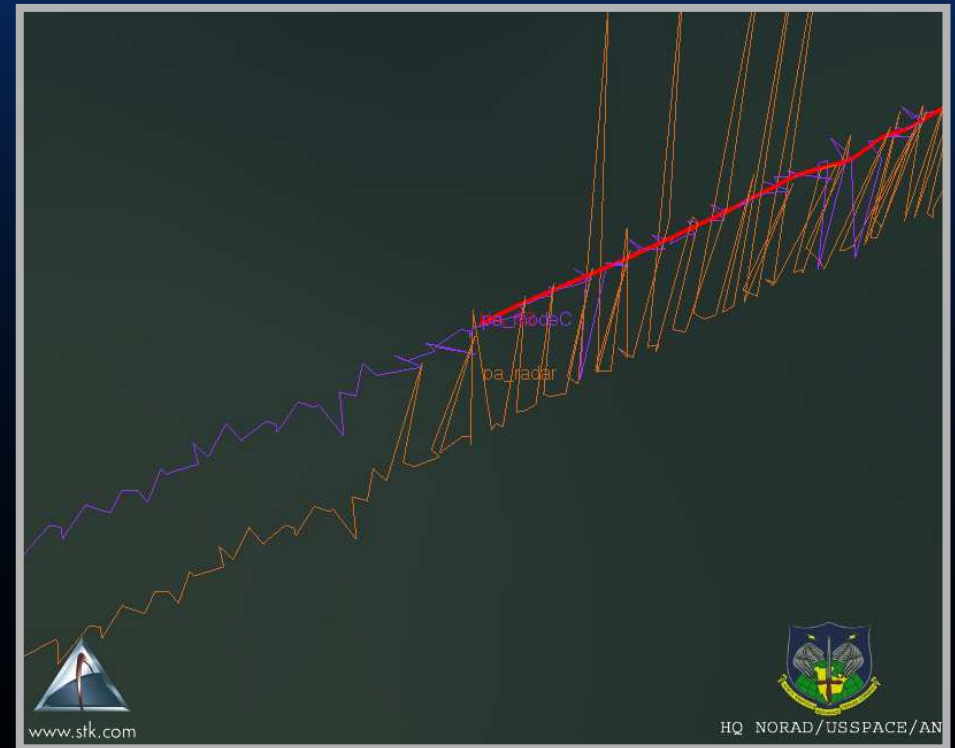


- STK Pro
- VO
- Connect
- Terrain

# Modeling Tasks - 1



- Aircraft Objects:
  - FAA radar data
    - hijacked airliners
    - NORAD interceptors
  - Perl scripting for Connect
    - Reduce/Smooth data
    - Create ephemeris files, generate STK aircraft objects
- Facility / Radar Objects:
  - 8 FAA radar sites
  - DTED level 1 terrain data





# Final Products for Internal Distribution



- Animated video clips for NORAD HQ use
  - Time-centric overview
  - World Trade Center attacks
  - Pentagon attack
  - Interceptor / hijacked airliners: time-to-target displays



# Movie-Making Techniques

Flight Path Editor - stored views

Path

Name	Color	Shown
otis	green	No
pent2	green	No
ry2	green	No
pent	green	No
ViewPath1	cyan	No
ry	magenta	No

Name:

Key Frames

Frame #	Time
1	11 Sep 2001 13:31:57.00
2	11 Sep 2001 13:32:27.00
3	11 Sep 2001 13:33:32.70
4	11 Sep 2001 13:33:52.70
5	11 Sep 2001 13:34:01.70
6	11 Sep 2001 13:34:12.70
7	11 Sep 2001 13:34:36.70
8	11 Sep 2001 13:35:09.70

Path Attributes

Follow path while animating

Type:

Auto-smooth path

Show Path

Color:

Show Up/Look Vectors

Scale:

Control Script

```
use Stk;
$verbose="VerboseOn";
$color="yellow";$x=0;$y=450;$font="Large";
$time="ON";$sleep_time=10;
$msgs=" ",
"08:40 EST : FAA notifies NEADS of possible hi-jacking of AA-11",
"08:43 EST : FAA notifies NEADS of possible hi-jacking of UA-175",
"08:46 EST : AA-11 impacts World Trade Center 1",
"08:52 EST : Interceptors Airborne from Otis",
"09:02 EST : UA-175 impacts World Trade Center 2",
"09:24 EST : FAA notifies NEADS of possible hi-jacking of AA-77",
"09:30 EST : Interceptors Airborne from Langley",
"09:37 EST : AA-77 impacts Pentagon",
"10:03 EST : UA-93 crashes in Pennsylvania");
$day="11 Sep 2001";
$time_line=(" $day 12:00:20",
"$day 12:40:00.00",
"$day 12:43:00.00",
"$day 12:46:00.00",
"$day 12:52:00.00",
"$day 13:02:00.00",
"$day 13:24:00.00",
"$day 13:30:00.00",
"$day 13:37:00.00",
"$day 14:03:00.00");
```

Start   Whole:  Source:

Elapsed time: 00:00:48 Remaining time: 00:00:00

For Help, press F1

Video source:

Audio source:

Output file name:

MPEG-1 640x480 30fps CBR 1150kbps

Stream type

Video only

Audio only

System (Video only)

System (Audio only)

System (Video+Audio)

AVI to MPG conversion using TMPGEnc Freeware



# Analyses Products

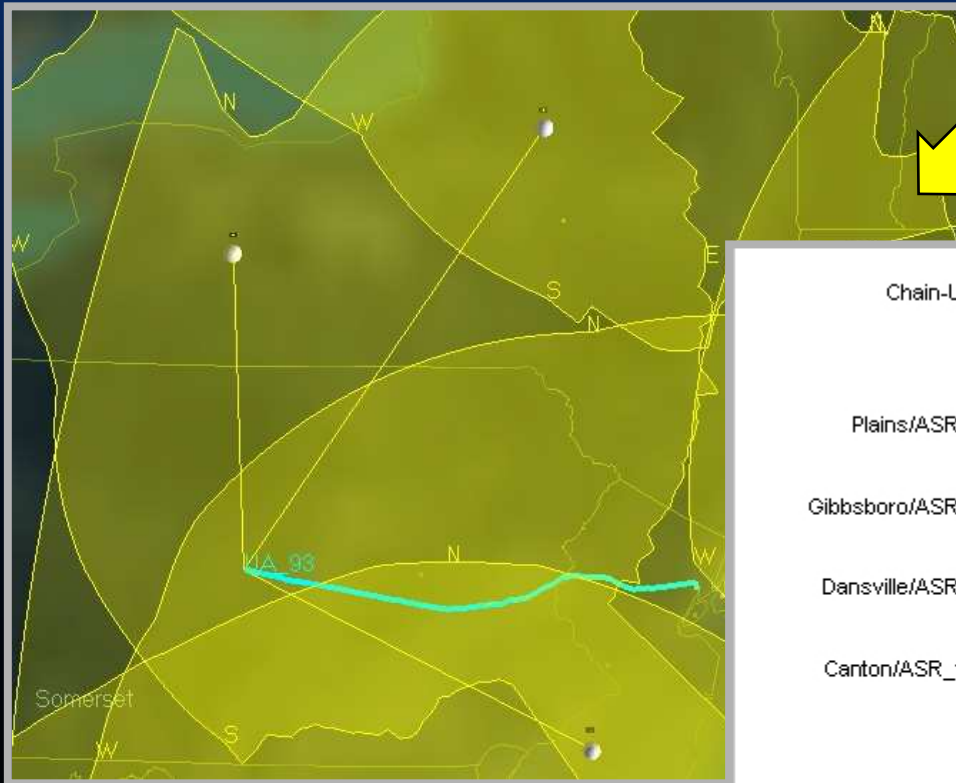


- Timeline examination and inter-agency response
- Terrain Masking relationship to loss of radar data
- Line-of-site between airliners analysis

# Visual Examination Tools

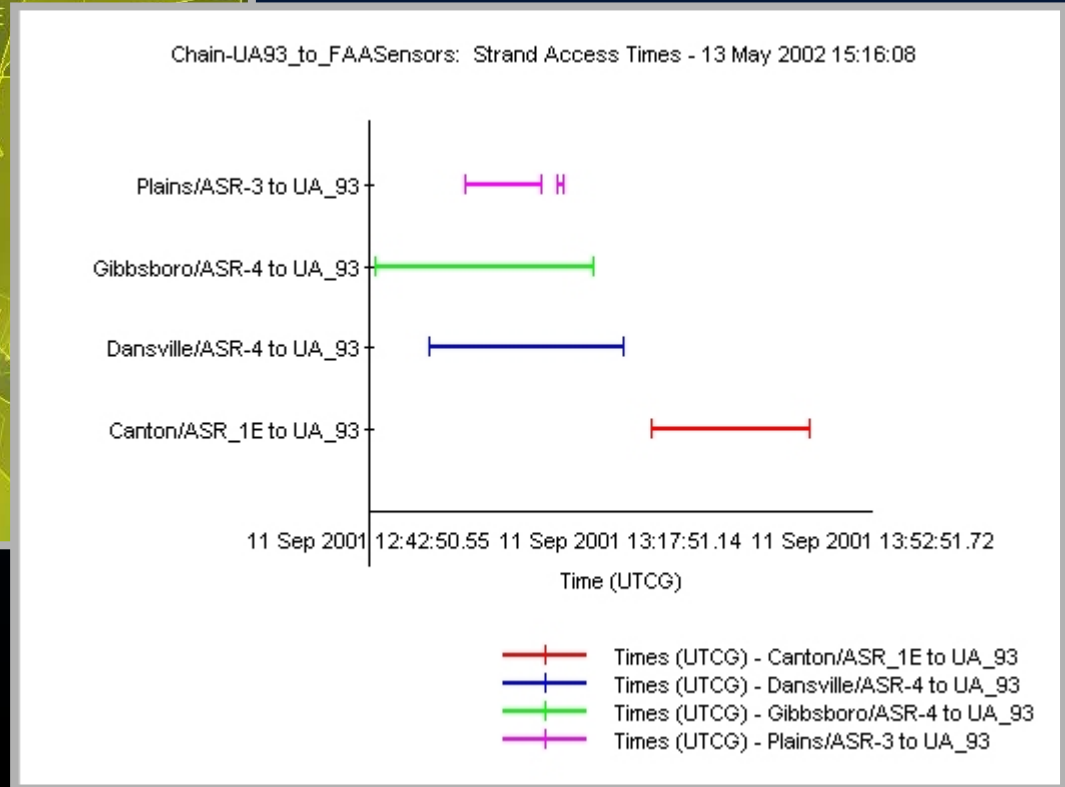


# Radar Access Calculations

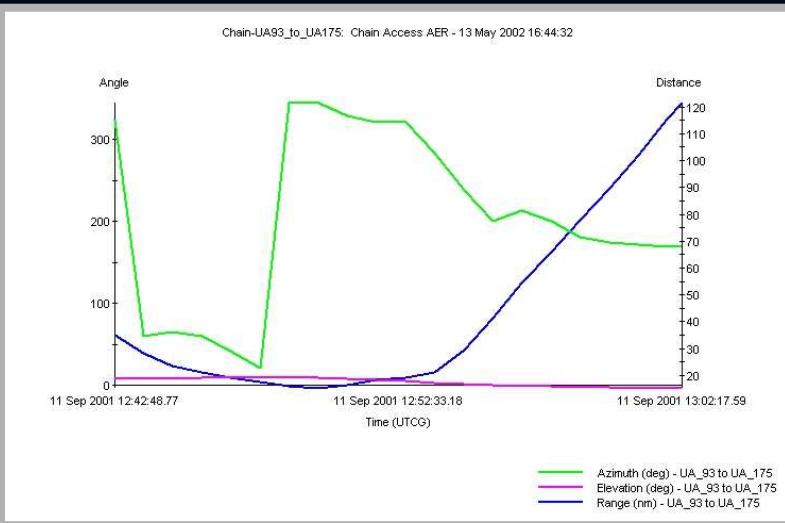
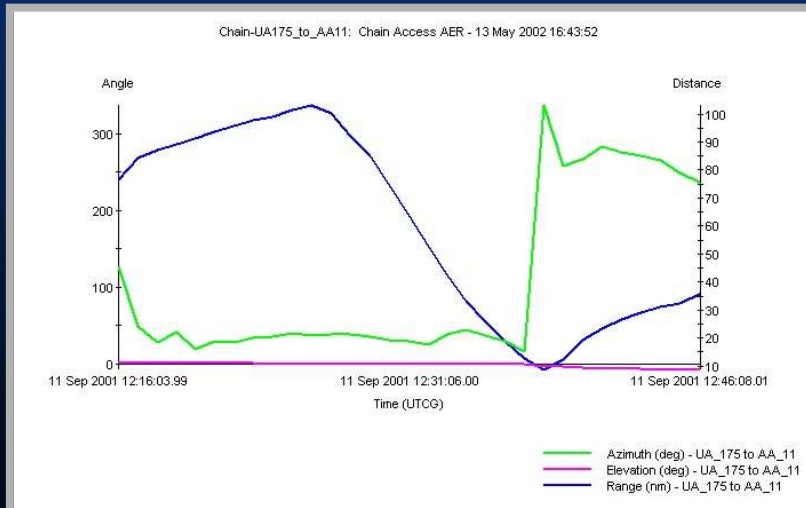


- Terrain masking
- Dynamic access graphics

• Strand access graph



# Chain Access Computations



Chain-AirlinersAccess: Chain Access AER Data 13 May 2002 16:33:20

AA\_11 to UA\_175

Time (UTC)	Azimuth (deg)	Elevation (deg)	Range (nm)
11 Sep 2001 12:42:48.77	117.672	6.250	28.647406
11 Sep 2001 12:43:48.00	97.296	7.032	30.636782
11 Sep 2001 12:44:48.00	93.072	7.353	31.795224
11 Sep 2001 12:45:48.00	78.319	7.492	34.939024
11 Sep 2001 12:46:08.01	68.929	7.503	35.732895

UA\_175 to UA\_93

Time (UTC)	Azimuth (deg)	Elevation (deg)	Range (nm)
11 Sep 2001 12:42:48.77	305.806	-8.049	34.879130
11 Sep 2001 12:43:48.00	296.617	-8.714	28.115010
11 Sep 2001 12:44:48.00	292.835	-9.020	23.404006
11 Sep 2001 12:45:48.00	261.546	-9.469	21.164610
11 Sep 2001 12:46:08.01	254.724	-9.497	20.664031



# Questions & answers

