

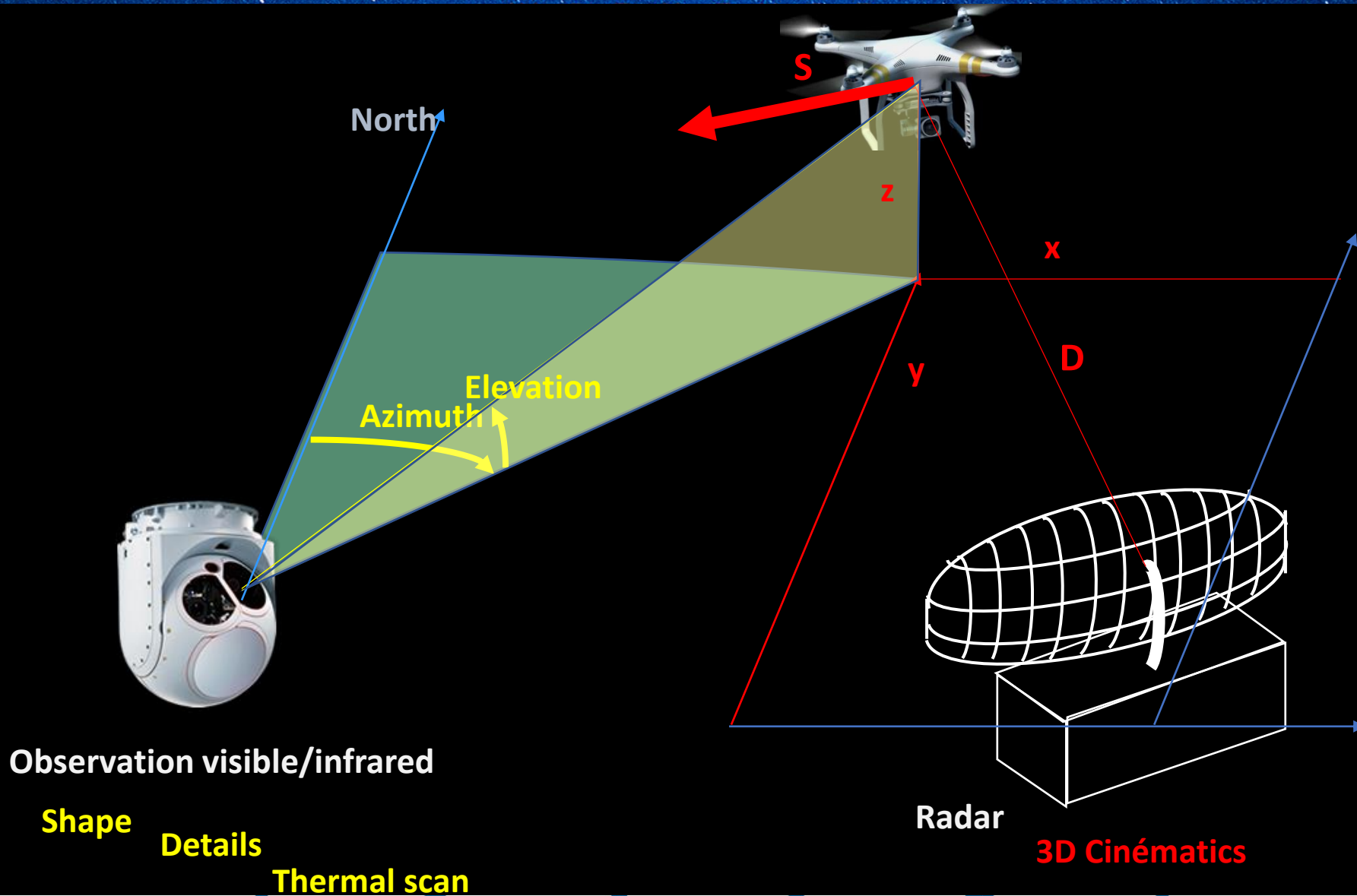
# CAIPAN-2

W O R K S H O P

## Use of data crossing in UAP investigations Application on 2 cases

Jean-Marc ANDRE  
*Sigma2 committee*

TOULOUSE,  
13 > 14 octobre 2022



Video and related inlaid data

Optical set operation data

Target computed data

LOS bearing

Aircraft flight data



## The chilian Cougar case (11/11/2014)

Daytime

Altitude 4500 feet

Wescam MX15  
FLIR camera



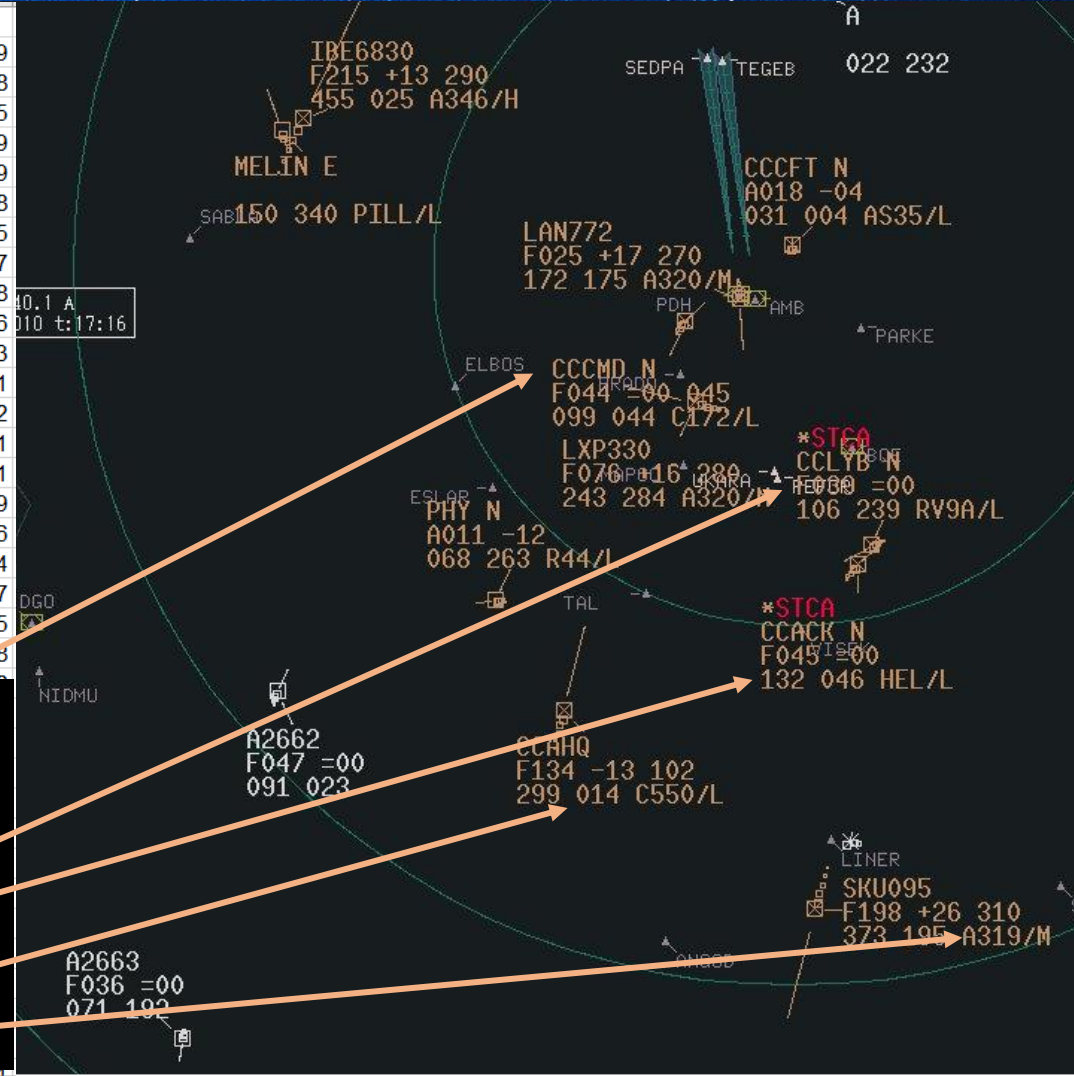
Id	Time	MsgTy	Rng(nmi)	Az(deg)	Hgt(ft)	MC(ft)	MCM3	M3	M2	M2	Lat	Lon	DecLon	DecLat
QJQ	00:23:50.282	Bcn	17,625	304,45		-100	1	0	0	0	18.26.06.889	066.00.48.075	-66,0133541	18,4352469
QJQ	00:24:50.562	Bcn	17,625	304,28		-100	1	0	0	0	18.26.04.199	066.00.49.996	-66,0138877	18,4344998
QJQ	00:25:38.658	Bcn	17,625	304,28		0	1	0	0	0	18.26.04.216	066.00.50.022	-66,0138949	18,4345045
QJQ	01:02:17.404	Bcn	22,625	299,88		-100	1	0	0	0	18.27.24.876	066.06.09.130	-66,1025362	18,4569099
GDT	00:00:00.000	Bcn	000,00	000,00		00000	0	0	0	0	00.00.00.000	000.00.00.000	00,0000000	00,0000000
GDT							2150	1	0	0	18.59.52.850	067.50.41.285	-67,8448013	18,9980139
GDT							2150	1	0	0	18.58.34.737	067.49.35.397	-67,8264993	18,9763158
GDT							2150	1	0	0	18.57.11.698	067.48.23.592	-67,8065534	18,9532495
GDT							2150	1	0	0	18.56.05.790	067.46.57.363	-67,7826008	18,9349417
GDT							2150	1	0	0	18.54.47.098	067.45.52.095	-67,7644708	18,9130828
GDT							2150	1	0	0	18.53.23.462	067.44.40.930	-67,7447028	18,8898506
GDT							2150	1	0	0	18.51.59.591	067.43.30.027	-67,7250075	18,8665553
GDT							2150	1	0	0	18.50.58.010	067.42.10.328	-67,7028688	18,8494471
QJQ											18.16.41.614	067.16.26.937	-67,2741492	18,2782262
QJQ							4743	1	0	0	18.20.48.585	066.50.37.558	-66,8437661	18,3468291
QJQ							4046	1	0	0	18.19.19.333	067.07.45.226	-67,1292294	18,3220371
QJQ							401	1	0	0	18.26.54.783	067.05.24.777	-67,0902142	18,4485509
QJQ											18.24.01.878	066.59.23.247	-66,9897907	18,4005216
QJQ	23:00:00.227	Sch	71,125	275,45							18.22.39.358	066.59.55.535	-66,9987608	18,3775994
QJQ	23:00:00.352	Sch	29,125	279,76							18.21.01.975	066.15.40.948	-66,2613744	18,3505487
QJQ	23:00:00.414	Sch	67,125	283,36							18.31.28.497	066.54.12.468	-66,9034634	18,5245825
QJQ	23:00:00.414	Sch	98,5	283,27							18.38.21.181	067.26.22.744	-67,4396512	18,6392198
QJQ	23:00:00.695	Bcn	26,375	293,91		1100	1	1200	1	0	00.00.00.000	000.00.00.000	00,0000000	00,0000000
QJQ	23:00:00.789	Sch	58,875	293,56										
QJQ	23:00:00.898	Bcn	16,5	297,69		900	1	4515	1	0	0			
QJQ	23:00:00.913	Bcn	23,25	298,74		200	1	1200	1	0	0			
QJQ	23:00:00.929	Bcn	40,75	299,8		4700	1	3272	1	0	0			
QJQ	23:00:00.945	Bcn	24,875	299,97		1100	1	1200	1	0	0			
QJQ	23:00:01.038	Bcn	18,75	301,73		400	1	4746	1	0	0			
QJQ	23:00:01.054	Sch	22,625	300,06										
QJQ	23:00:01.116	Bcn	17,375	305,24		-100	1	23	1	0	0			
QJQ	23:00:01.116	Bcn	49,25	306,12		80000	1	1274	1	0	0			
QJQ	23:00:01.147	Bcn	17,25	305,51		-100	1	1200	1	0	0			
QJQ	23:00:01.147	Bcn	17,25	305,33		-100	1	2000	1	0	0			
QJQ	23:00:01.584	Bcn	30	321,24		90000	1	1275	1	0	0			
QJQ	23:00:11.413	Sch	27,5	250,75										

## RADAR DETECTION FILES

- Time
- Detection type
- Range - Azimuth
- Altitude
- Location

## SCREENSHOTS

- Code name
- Flight level – climb rate
- Ground speed (Kts)
- Track (mag. degrees)
- Aircraft type



## The chilian Cougar case (11/11/2014)



- ✓ Observation in visible and IR
- ✓ Several camera modes are used
- ✓ 9 minutes video recording



## The chilian Cougar case (11/11/2014)

30 radar control screenshots, one every 30 seconds :

✓ traffic identification and flight data

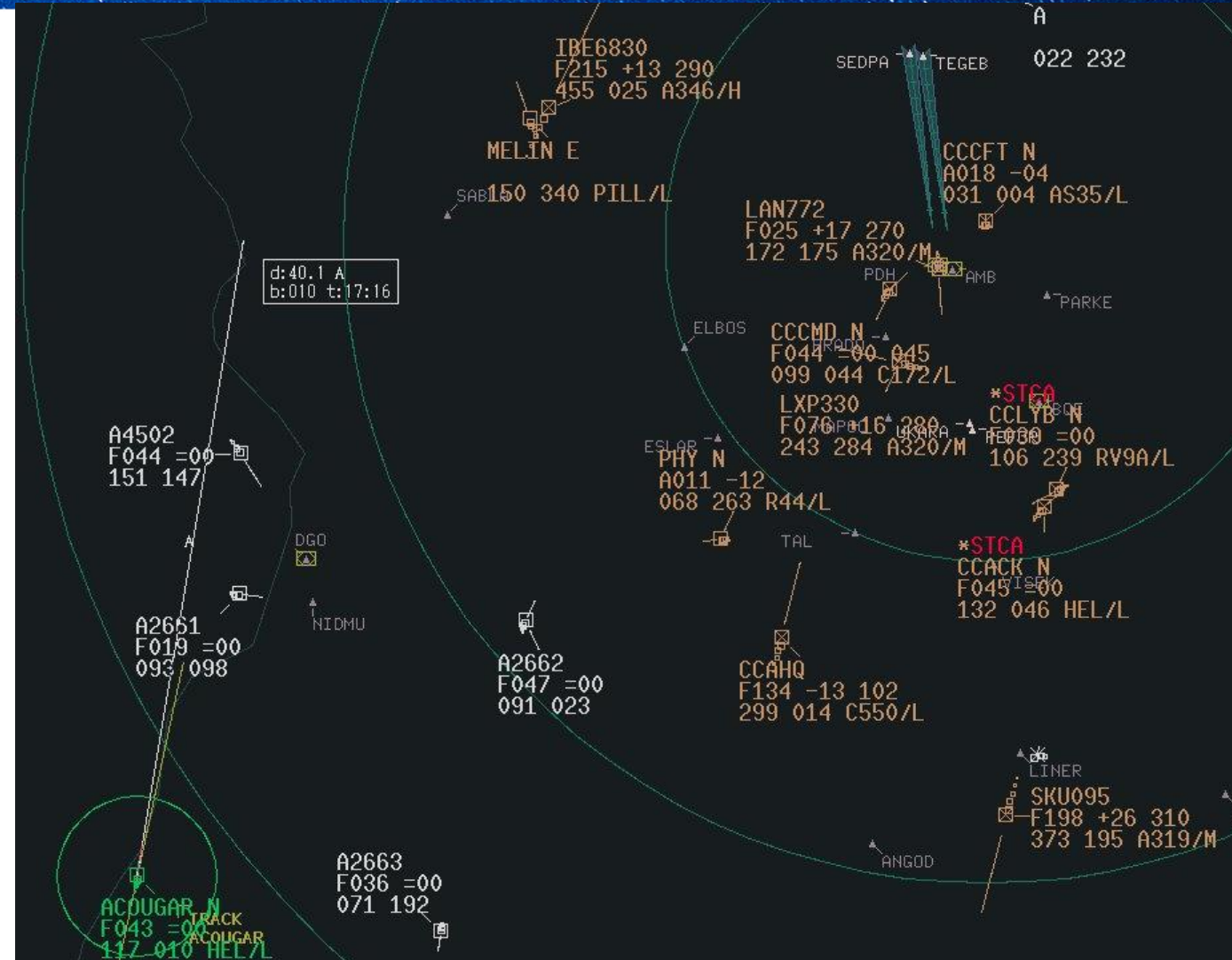
+

Video recording :

✓ UAP visible and IR images

✓ Cougar position

✓ Wescam payload technical and operating data (LOS elevation and bearing – magnification)



## The chilian Cougar case (11/11/2014)

Construction of 26 detected traffics  
flight paths from screenshots  
extracted data

Consistency discussion on the basis of

- ✓ Aircraft type (IR signature)
- ✓ Ground position, altitude, trajectory





**The chilian  
Cougar case  
(11/11/2014)**

**IBE6830 is departing Santiago airport,  
climbing and turning to en route heading  
(025°)**

✓ **13:52:35 – Dist. Cougar/IBE6830 = 41 NM**

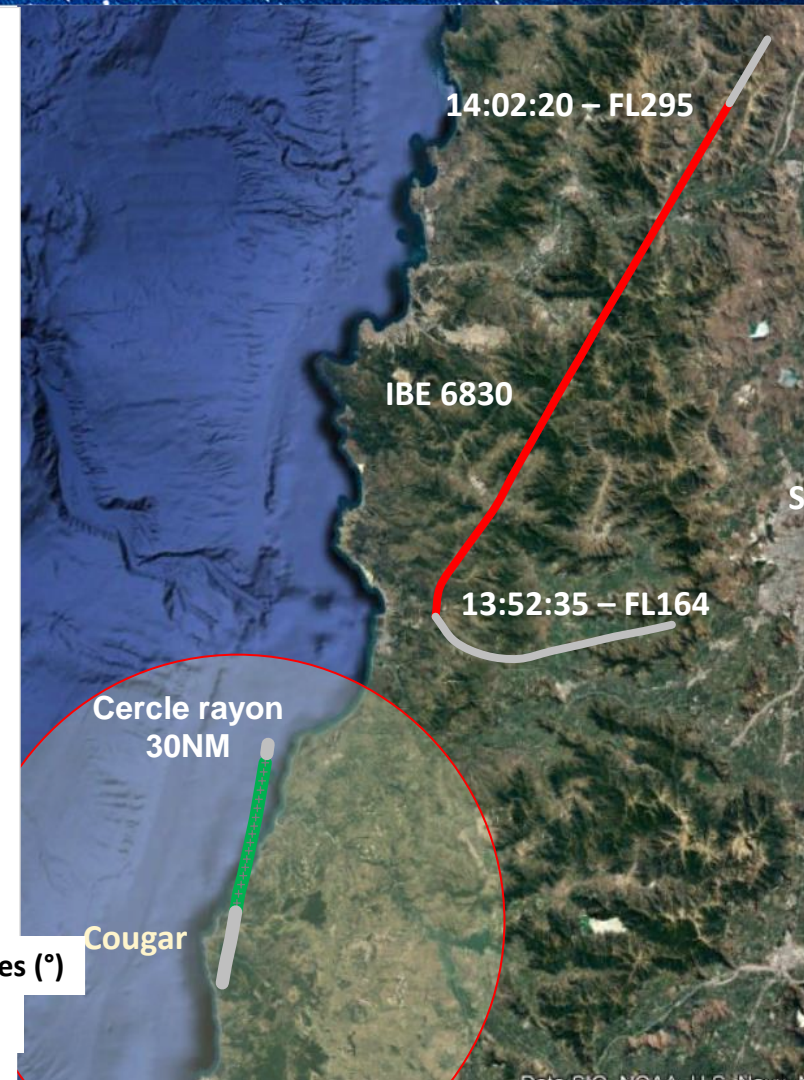
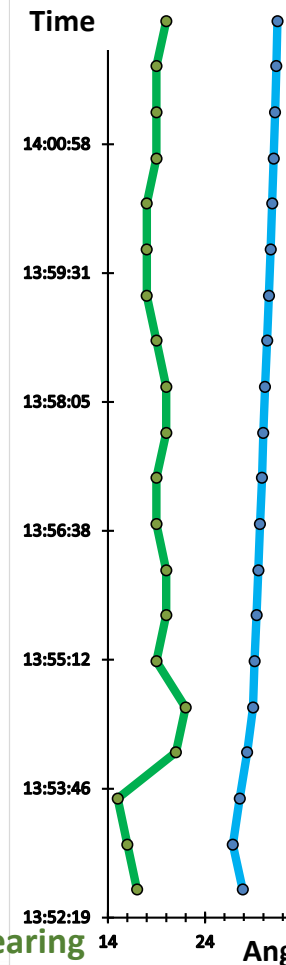
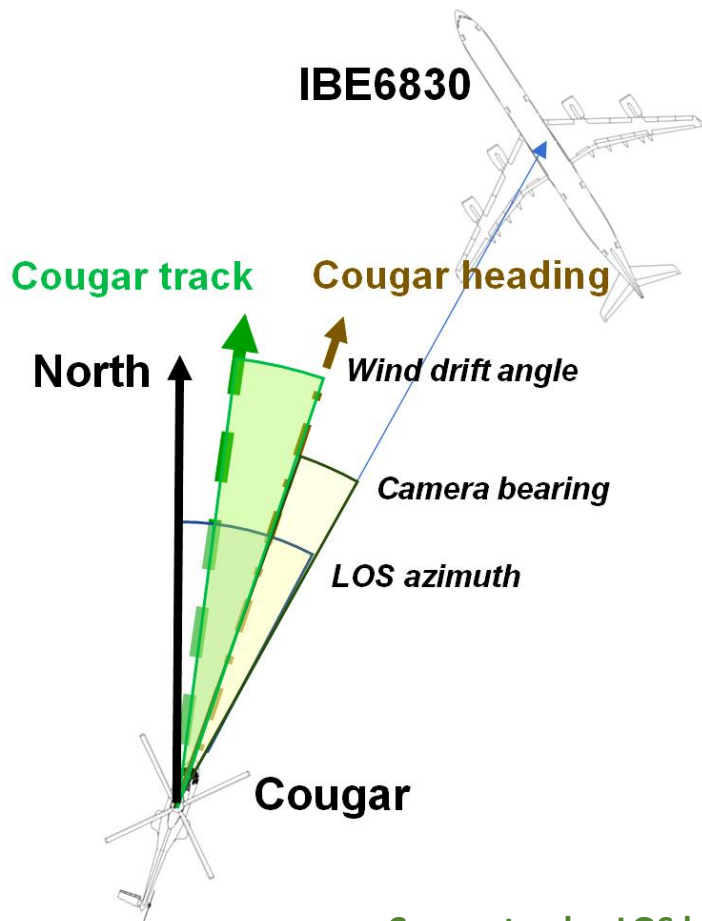
✓ **14:02:20 – Dist. Cougar/IBE6830 = 97 NM**



## The chilian Cougar case (11/11/2014)

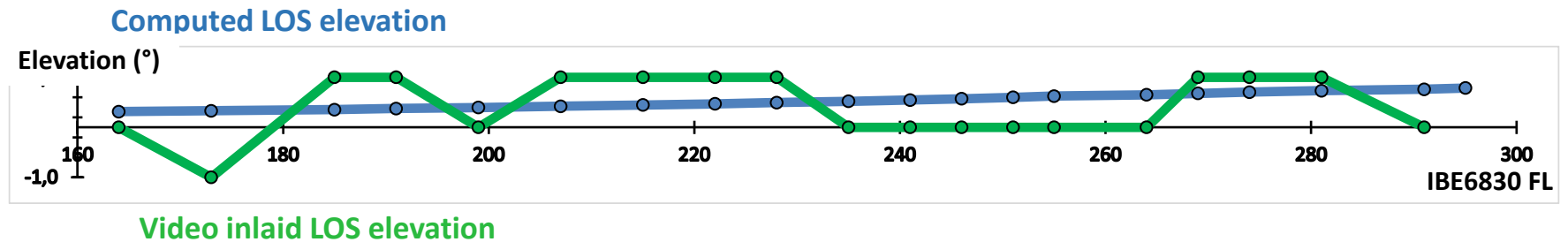
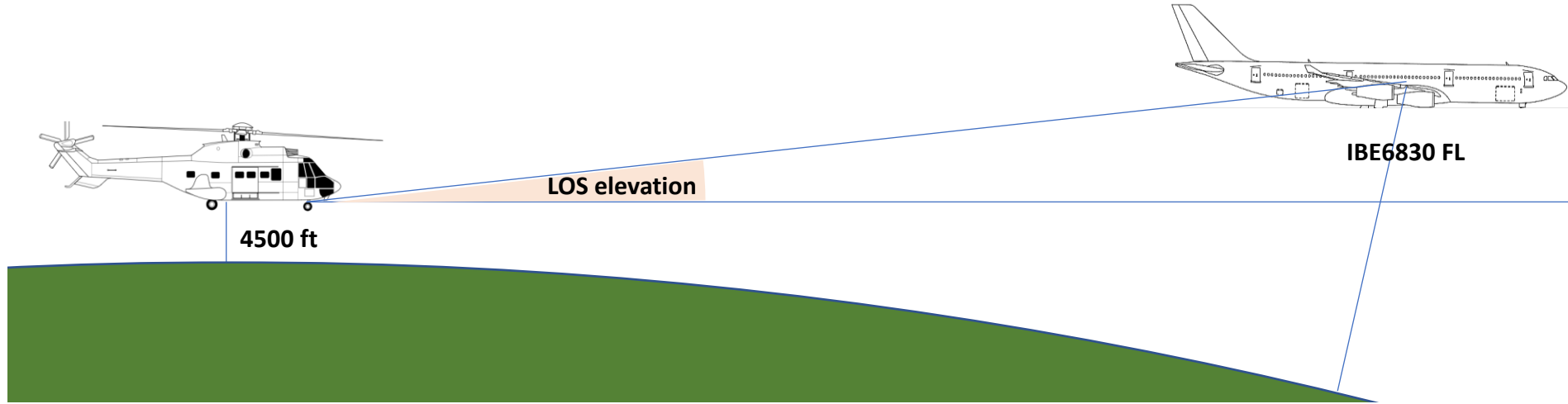
7 to 12 degrees nearly constant difference includes Cougar wind drift

Cougar track + LOS bearing is consistent with IBE6830 azimuth



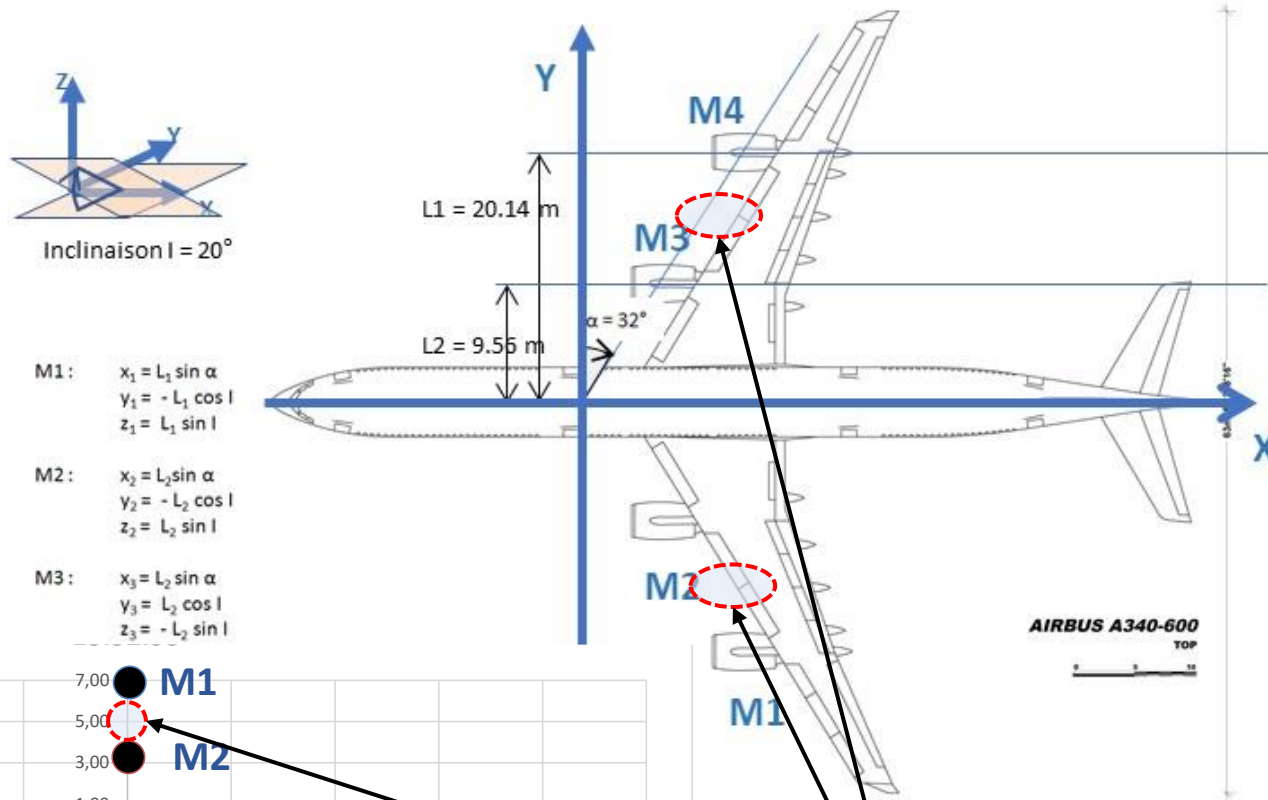
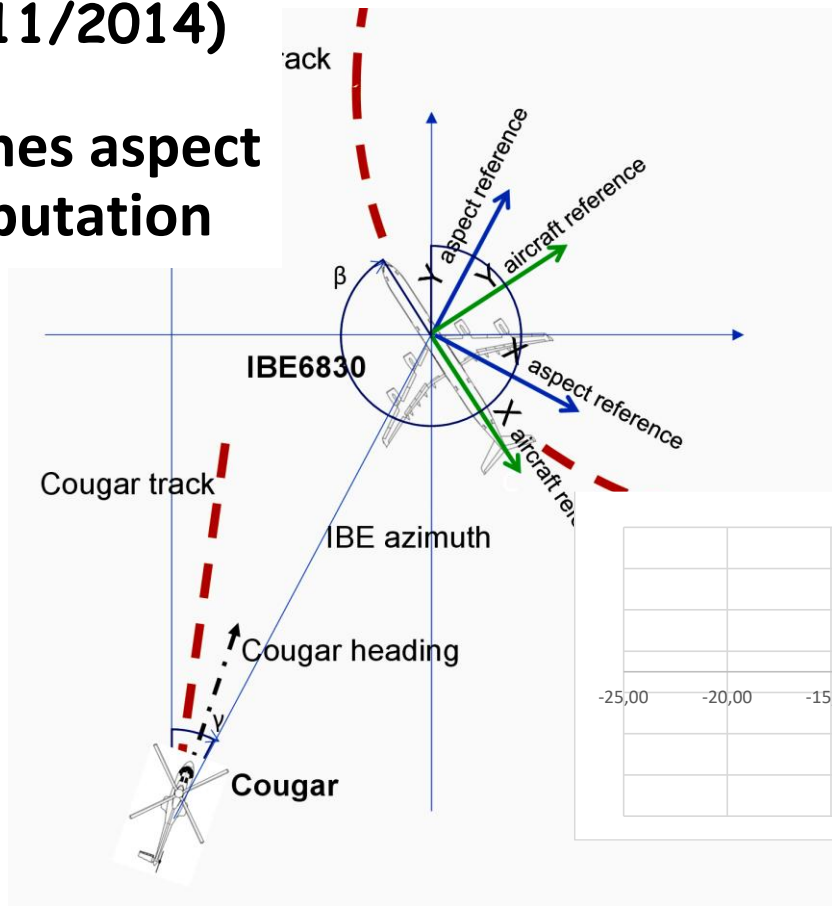
## The chilian Cougar case (11/11/2014)

LOS elevation is consistent with IBE6830 increasing altitudes



## The chilian Cougar case (11/11/2014)

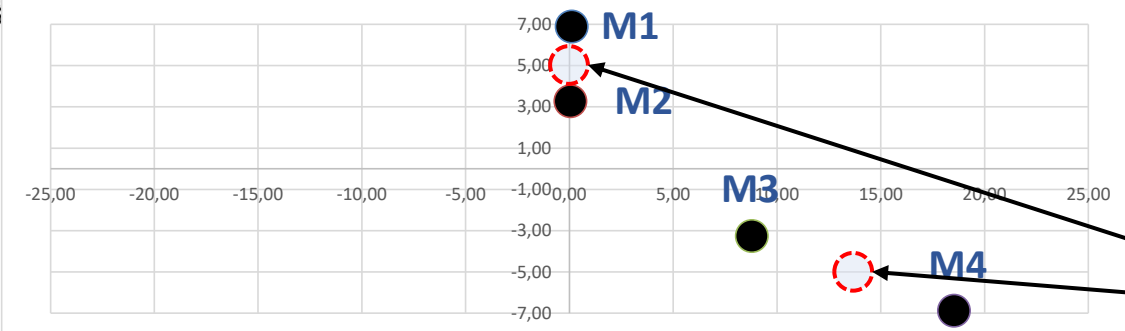
## Engines aspect computation



M1:  $x_1 = L_1 \sin \alpha$   
 $y_1 = -L_1 \cos l$   
 $z_1 = L_1 \sin l$

M2:  $x_2 = L_2 \sin \alpha$   
 $y_2 = -L_2 \cos l$   
 $z_2 = L_2 \sin l$

M3:  $x_3 = L_2 \sin \alpha$   
 $y_3 = L_2 \cos l$   
 $z_3 = -L_2 \sin l$



Virtual engines to match to pictures



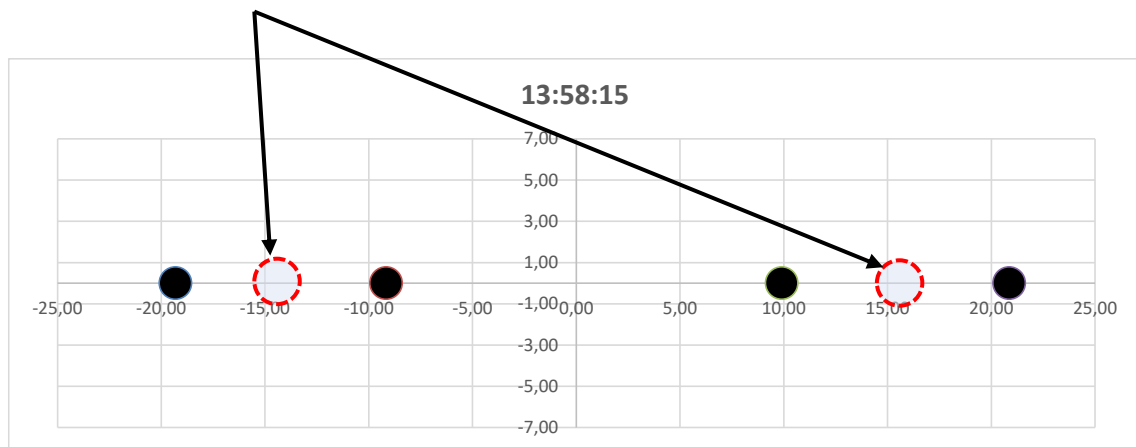
## The chilian Cougar case (11/11/2014)

**13:58:15 - Distance Cougar to IBE6830 : 71,8 NM**

✓ **Distance between virtual engines : 29,6 m - Computed angular size : 0,22 mrad**

✓ **IR mode - Magnification : 675 - Observed angular size : 0,21 mrad**

Virtual engines



**IBE6830 angular sizes which are measured on frames are consistent with computed values**

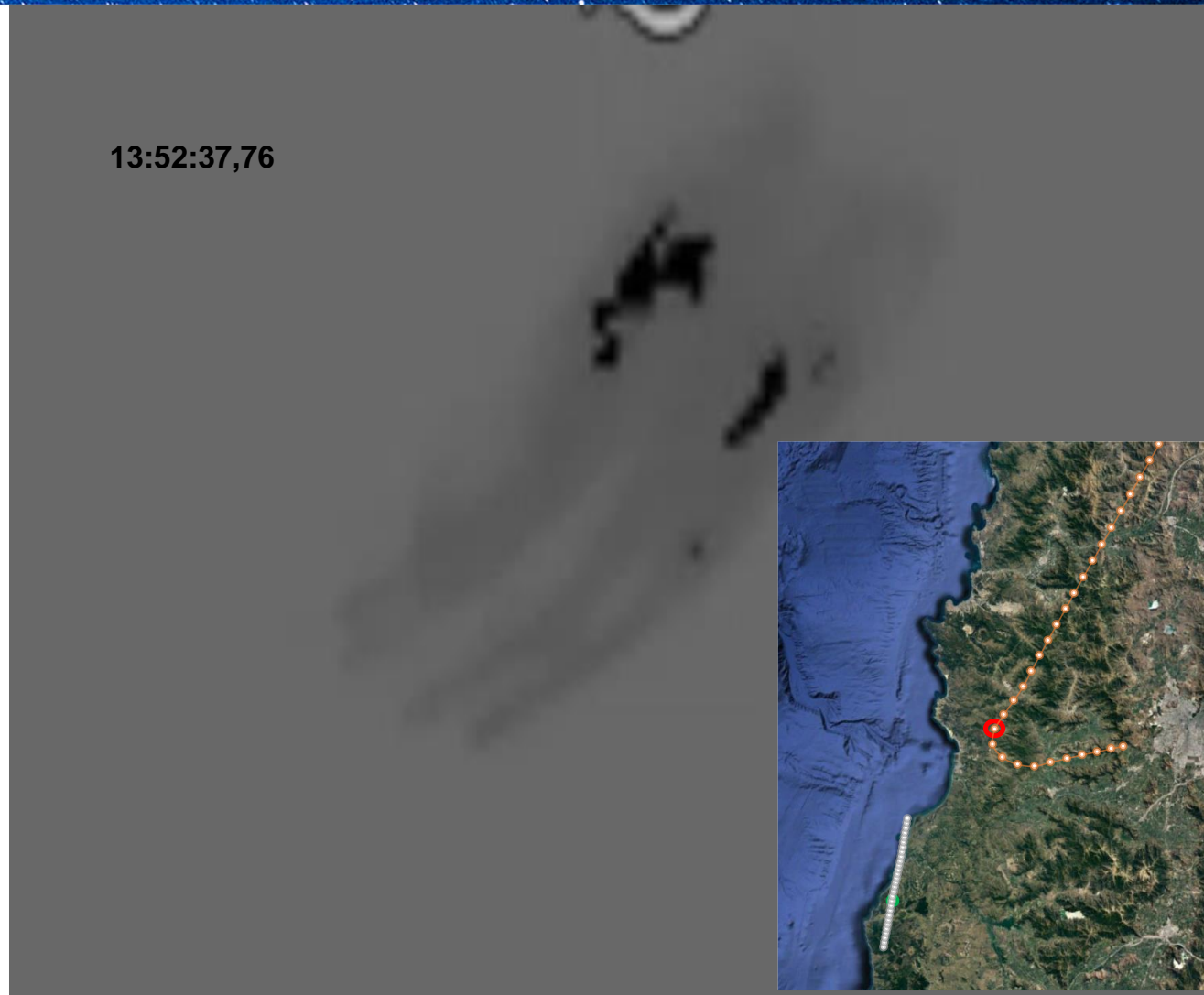


**The chilian  
Cougar case  
(11/11/2014)**

**Special frame (1/30 seconde)  
extracted from the video recording  
during a focal lenght change (135  
to 675)**

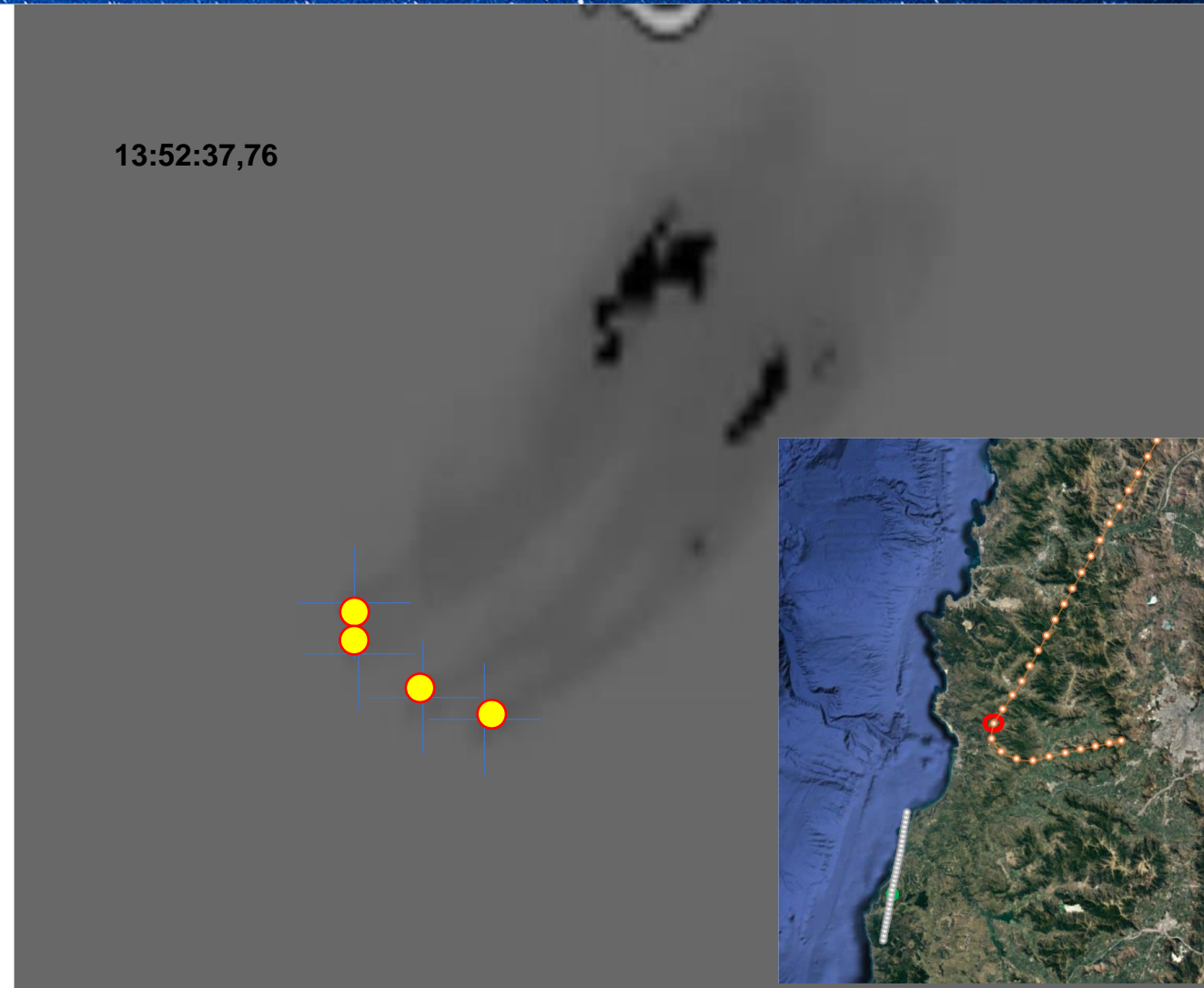
**IBE6830 is still turning right  
(banking 20°)**

**The plumes start from 4 points  
that could be aircraft engines**



## The chilian Cougar case (11/11/2014)

Computed engines aspect at this  
time matches the 4 engines  
presumed points



## The Aguadilla case (04/25/2013)

By night

DHC-8 (CBP)

Wescam MX-15D  
imaging turret



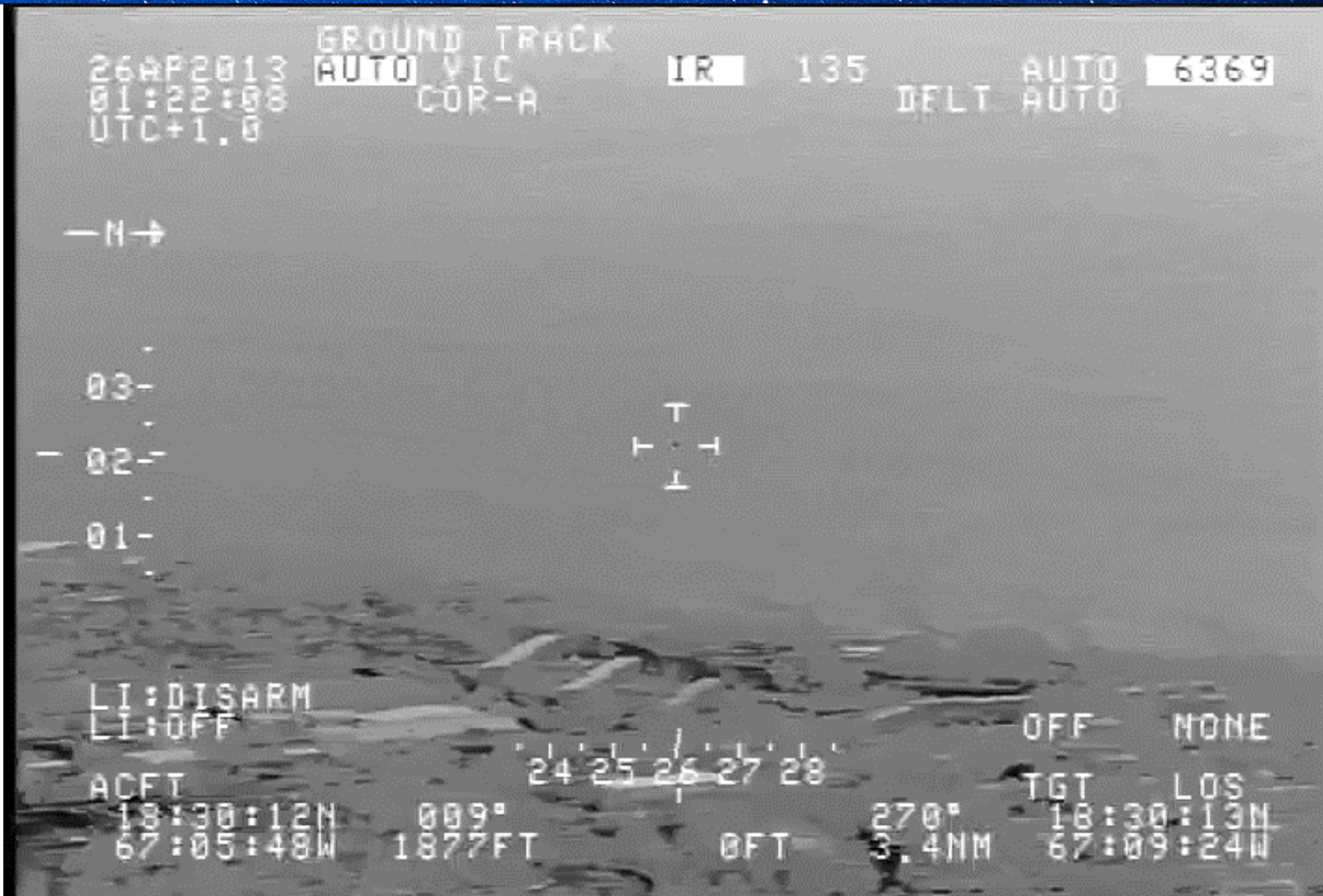


## The Aguadilla case (04/25/2013)

3 minutes video recording  
from IR sensor

Available data :

- ✓ Video recording with inlaid data
- ✓ Radar data files from distant site (145 km)



## The Aguadilla case (04/25/2013)

UAP image disappearing or  
fading

UAP image splitting



## The Aguadilla case (04/25/2013)

**Object signature (shape) in visible and IR are different- in visible the real shape is seen by reflecting the sunshine  
In IR spectrum, the shape is perceived from thermal emission (hot spots mainly, partially seen)  
some generating an image  
Blurring mostly due to saturation.**



**3 engines jet seen by the DHC-8 patrol aircraft IR camera (IR band 2)  
3 hot spots nozzles with saturating effect (white circles)**

**Microdrone – electrical powered with rotors  
In visible (left- IR band 2 center- IR band 3 right)**



**Thai lantern : visible (right), IR band 3 image (left)**

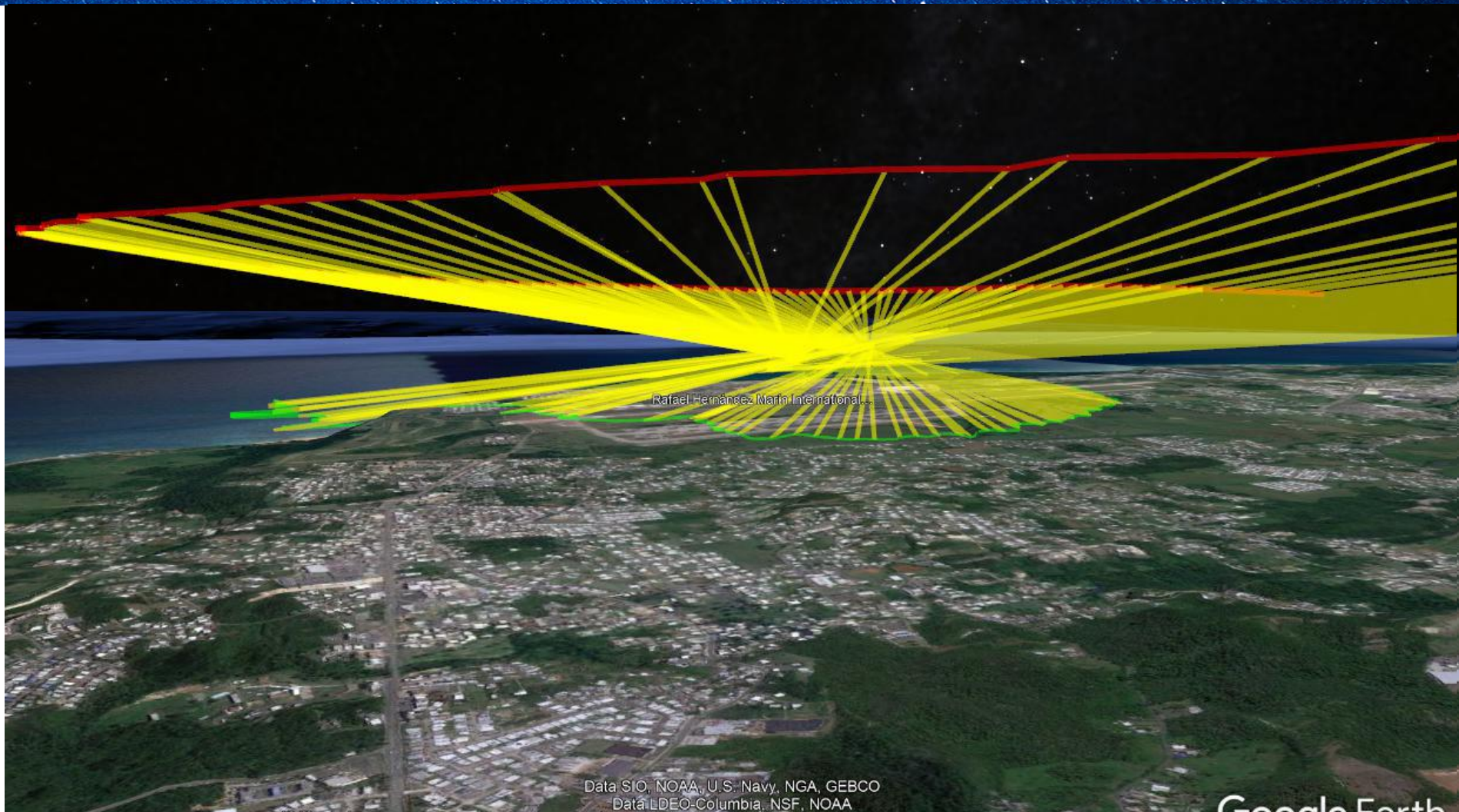


## The Aguadilla case (04/25/2013)

Video data based  
DHC-8 trajectory

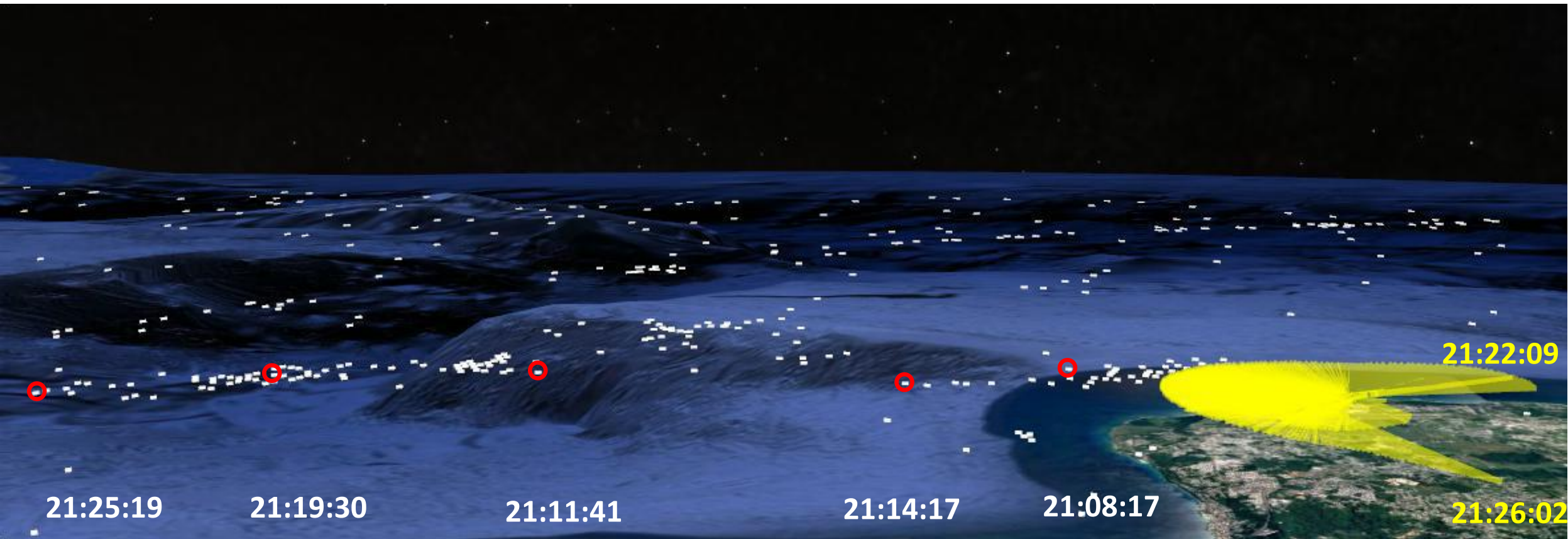
Target altitudes =  
ground elevation

UAP location can  
be anywhere on  
lines of sight (LOS)



## The Aguadilla case (04/25/2013)

Radar plots are not in the LOS area : there is no connection  
between radar contacts and video observed UAP

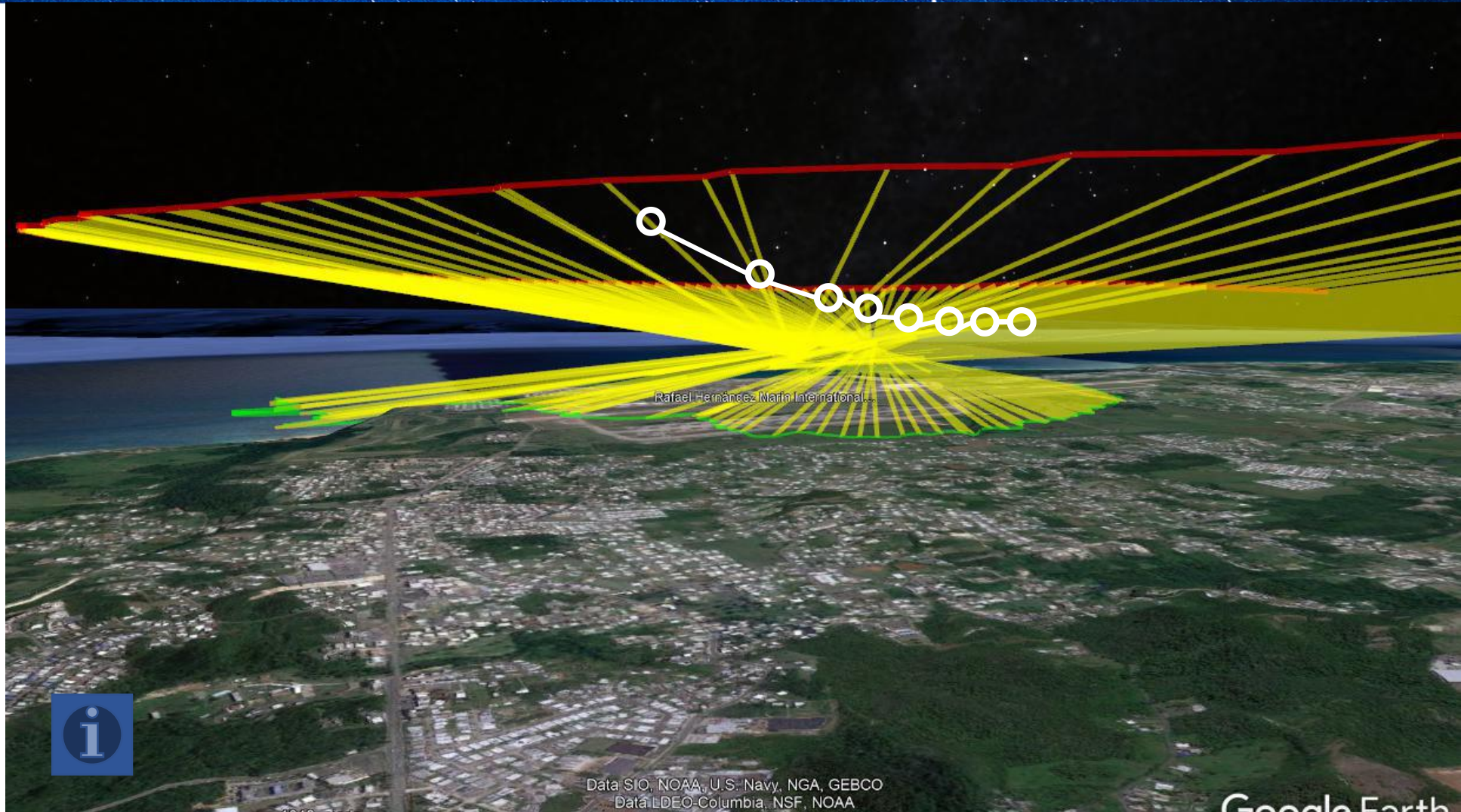


## The Aguadilla case (04/25/2013)

### Simulation of UAP trajectories

#### Entry parameters :

- ✓ UAP initial altitude or any specific point
- ✓ Vertical speed

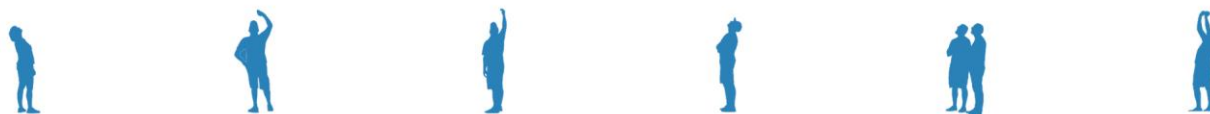
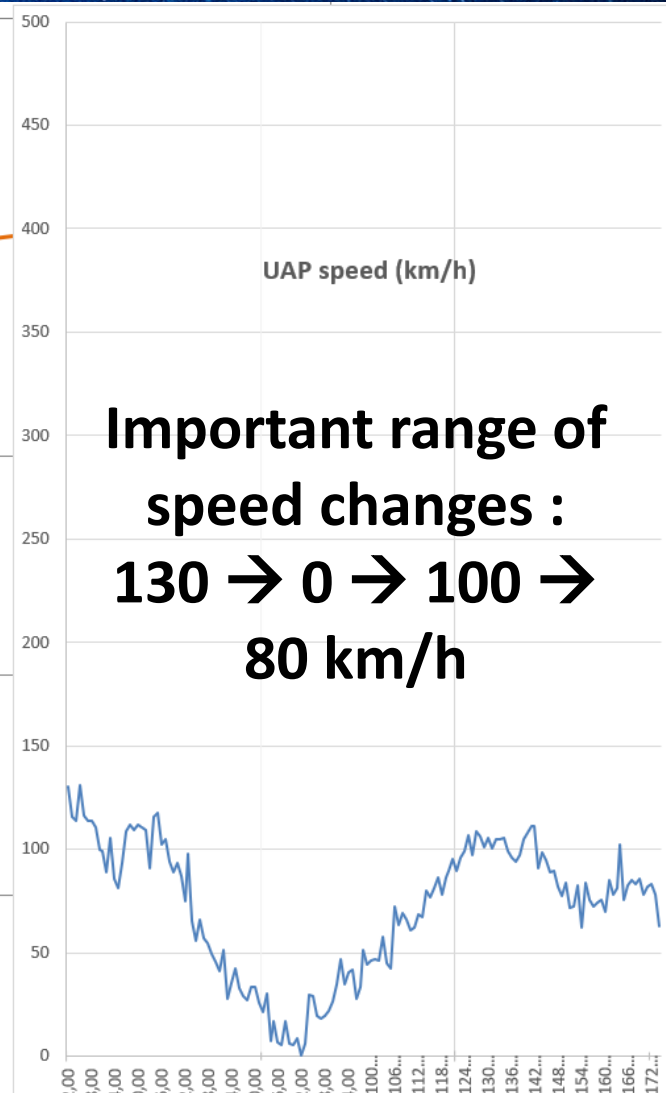
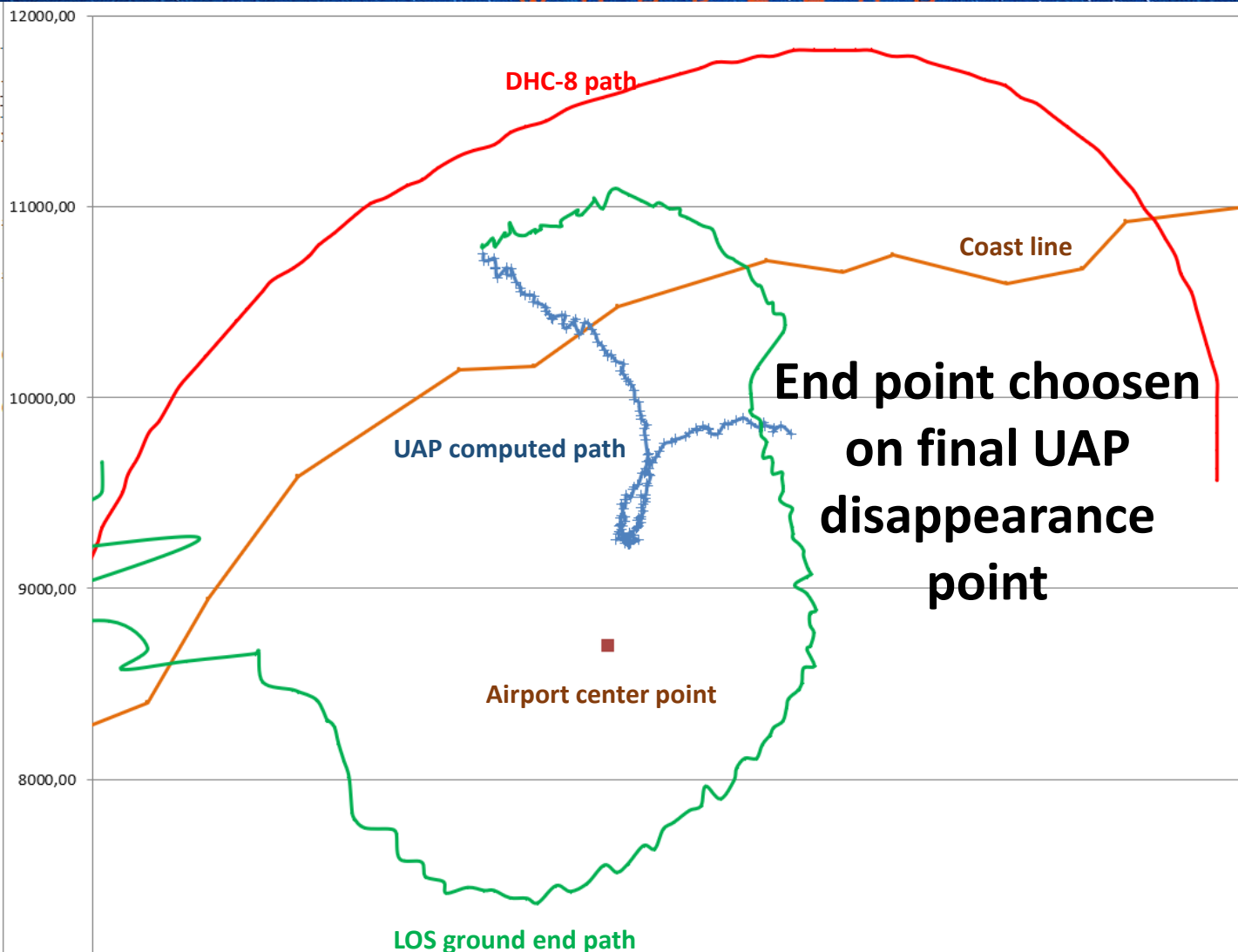


UAP Flight path drawing starts at second 12 : previous points are ignored, due to erratic laser measured distances inducing erratic positions

Initial UAP altitude	▲	1270 feet
UAP vertical speed	▼	-7,2 feet/s

Safe flight 1
Safe flight 2

VS rate of change ▲ ▼ 0 feet/s

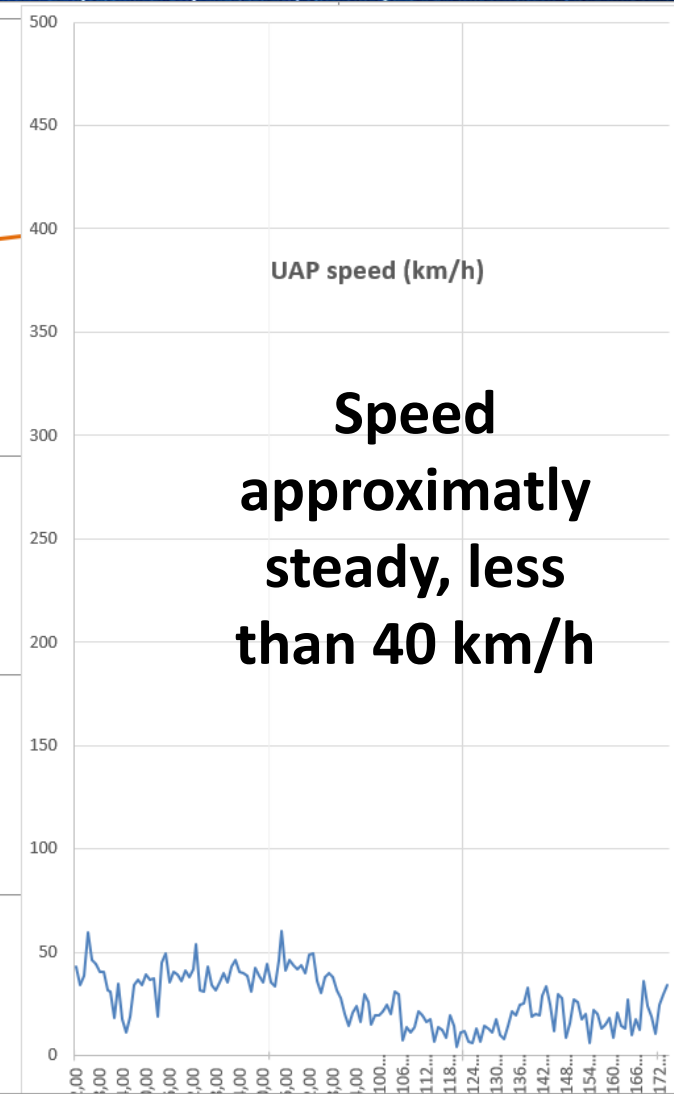
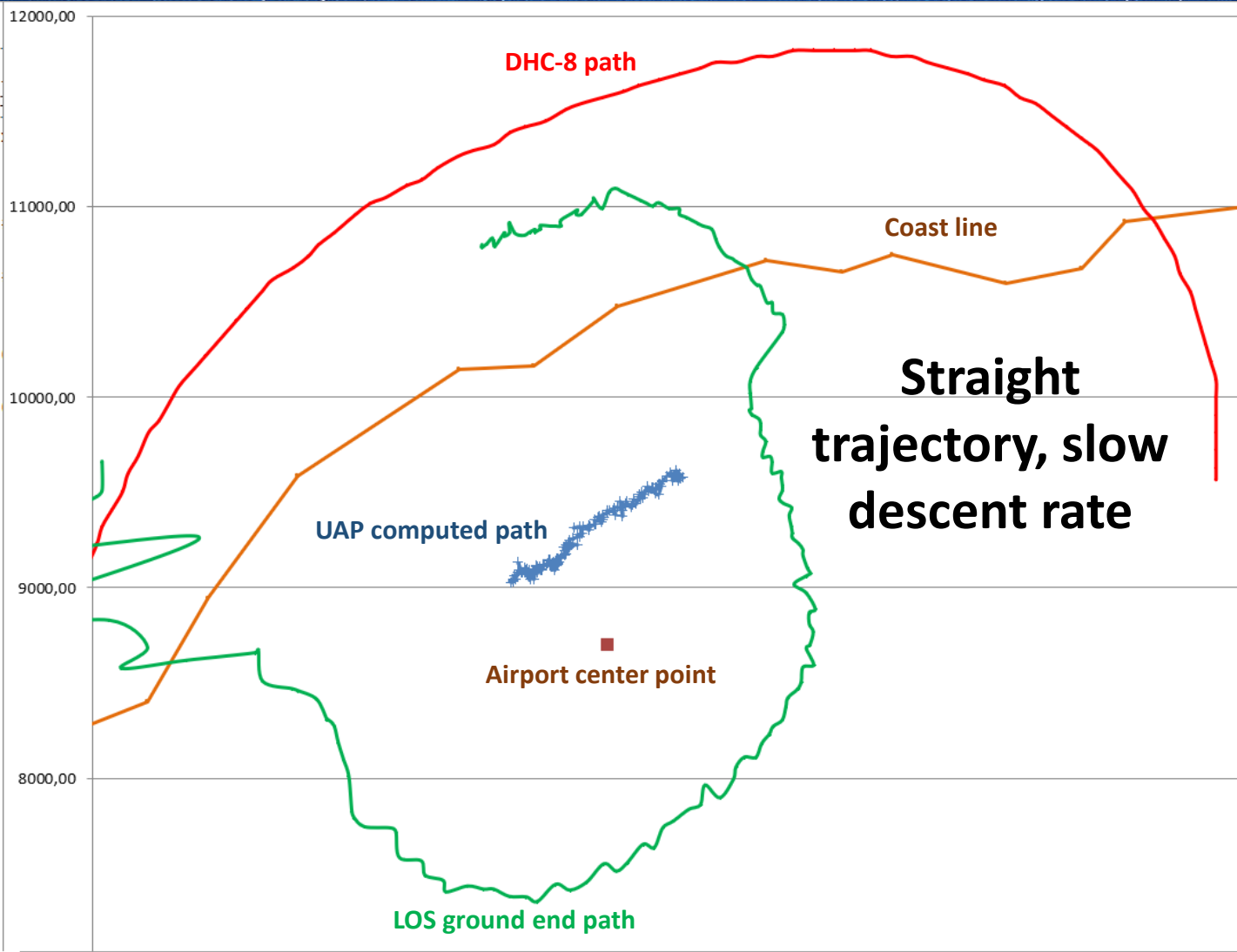


UAP Flight path drawing starts at second 12 : previous points are ignored, due to erratic laser measured distances inducing erratic positions

Initial UAP altitude	▲	1010 feet
UAP vertical speed	▼	-2,1 feet/s

Safe flight 1	■
Safe flight 2	■

VS rate of change ▲ 0 feet/s ▼





## The Aguadilla case (04/25/2013)

Consistency of profiles are discussed in regard with :

- ✓ Size, speed range and characteristics of known flying objects
- ✓ IR signature
- ✓ UAP disappearances
- ✓ Wind data
- ✓ Produced testimonies

2 preferred hypotheses :

- ✓ Fast mini or micro UAV
- ✓ Thai lantern

