



EUFAR TA DeMinTIR 2011 FLIGHT REPORT

FLIGHT PROGRAM – SCHEDULE

DeMinTIR/SOKOLOV (D01 + N01)

Pre-campaing meeting	Sunday, July 17, 2011. Prague, UTC16:00 (18:00CEST)
D01 Nominal flight	Monday, July 18, 2011, starting at UTC09:45 (CEST11:45)
D02 Back-up flight	TBD
N01 Nominal flight	Wednesday, July 20, 2011, starting at UTC00:00 (CEST02:00)
N02 Back-up flight	TBD

FLIGHTS PERFORMED

FLIGHT D01	Tuesday, July 19, 2011, starting at UTC09:38 (CEST11:38). FP01 and FP02 are completed. FP03 is cancelled (clouds).
FLIGHT N01	Friday, July 22, 2011, starting at UTC21:45 (CEST23:45). FP01 and FP02 are completed.
FLIGHT D02	Saturday, July 23, 2011, starting at UTC09:45 (CEST11:45). Data acquisition is cancelled due to unfavourable weather conditions in the study area (cloud cover).

FLIGHT D01

Flight ID	FLIGHT D01 - AHS (master sensor) + CASI1500i survey
Date & time of the flight	July 19, 2011 starting measurements at UTC09:38 (CEST11:38).
Test site	Sokolov (Czech Rep.) mining site.
Purpose	AHS & CASI1500i data collection.
Flight patterns	SOKOLOV FP01 AHS full coverage of the study site (P01-P09, 9 flight lines). SOKOLOV FP02 Crossed line (P11, 1 flight line). SOKOLOV FP03 CASI 1500i full coverage (P21-P28, 8 lines). Cancelled due to clouds.
Weather conditions	Presence of high clouds in the study area (SCT 3/8-4/8) and low clouds (FEW 1/8-2/8). Wind blowing from the South at the flight level.
Coordination	With the DeMinTIR proposal P.I.
Summary	Take off at UTC09:07 from Prague airport (LKPR). Arrival to the study area keeping flight level MSL8000FT and starting to record data at UTC09:38 along P09 from its North ending, with true heading of 180°. Later on, decision is made to go to the Western part of the study area, in which the presence of clouds is significantly lower. P01 is flown from the South (heading of 360°), P02 from the North, and so on up to P08, that is covered following 180° true heading. Afterwards, the flight crossed/diagonal flight line, P11 is completed from its SW ending, with 060° heading. At UTC11:30, the FP03 flight pattern to provide CASI1500i full coverage, is cancelled due to the increasing presence of pop-up clouds below and at the flight level. Return to Prague airport.



DeMinTIR/SOKOLOV D01 SURVEY - SOKOLOV FP01 FLIGHT PATTERN (P01-P09).

FLIGHT LINE ID.	AHS REC. ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN- RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P09 AHS201107190945-18.7-P09 CASI201107190945-SPEC096-P09	HD08 FILE040	09:38	8000FT (2438m)	180°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	SCT high clouds. FEW low clouds. Strong wind blowing from the South.
AHS P01 AHS201107190945-18.7-P01 CASI201107190945-SPEC096-P01	HD08 FILE041	09:51	8000FT (2438m)	360°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	The lines in the West side of the study area are made first because of the cloud cover is considerably lower in that side.
AHS P02 AHS201107190945-18.7-P02 CASI201107190945-SPEC096-P02	HD08 FILE042	10:02	8000FT (2438m)	180°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	
AHS P03 AHS201107190945-18.7-P03 CASI201107190945-SPEC096-P03	HD08 FILE043	10:13	8000FT (2438m)	360°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	
AHS P04 AHS201107190945-18.7-P04 CASI201107190945-SPEC096-P04	HD08 FILE044	10:24	8000FT (2438m)	180°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	
AHS P05 AHS201107190945-18.7-P05 CASI201107190945-SPEC096-P05	HD08 FILE045	10:34	8000FT (2438m)	360°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	
AHS P06 AHS201107190945-18.7-P06 CASI201107190945-SPEC096-P06	HD08 FILE046	10:45	8000FT (2438m)	180°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	
AHS P07 AHS201107190945-18.7-P07 CASI201107190945-SPEC096-P07	HD08 FILE047	10:55	8000FT (2438m)	360°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	
AHS P08 AHS201107190945-18.7-P08 CASI201107190945-SPEC096-P08	HD08 FILE048	11:07	8000FT (2438m)	180°	10.8NM(20.0km)/ 4min38s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	

DeMinTIR/SOKOLOV D01 SURVEY - SOKOLOV FP02 FLIGHT PATTERN (P11).

FLIGHT LINE ID.	AHS REC. ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN- RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P11 AHS201107190945-18.7-P11 CASI201107190945-SPEC096-P11	HD08 FILE049	11:23	8000FT (2438m)	060°	13.4NM(24.9km)/ 5min46s	18.7 Hz	SPECTRAL 096 bands IT=15ms RS=3 Max. aperture	

DeMinTIR/SOKOLOV D01 SURVEY - SOKOLOV FP01 FLIGHT PATTERN (P21-P28).

FLIGHT LINE ID.	AHS REC. ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN- RATE	CASI-1500i CONFIGURATION	REMARKS
CANCELLED DUE TO UNFAVOURABLE WEATHER CONDITIONS (CLOUD COVER)								



FLIGHT N01

Flight ID	FLIGHT N01 - AHS survey (night flight)
Date & time of the flight	July 22, 2011 starting measurements at UTC21:45 (CEST23:45).
Test site	Sokolov (Czech Rep.) mining site.
Purpose	AHS data collection.
Flight patterns	SOKOLOV FP01 AHS full coverage of the study site (P01-P09, 9 flight lines). SOKOLOV FP02 Crossed line (P11, 1 flight line).
Weather conditions	Clear sky. Strong wind at the flight level blowing from the West (25-30Kts).
Coordination	With the DeMinTIR proposal P.I.
Summary	Take off at UTC21:14 from Prague airport (LKPR). Arrival to the study area keeping flight level MSL8000FT and starting to record data at UTC21:45 along P09 from the North ending, with true heading of 180°. Later on, P08 is started from the South, then P07 from its North ending, P06 from the South with 360° true heading and P05 towards the South. Afterwards, P11, the oblique line that crosses the study area through its diagonal, is made from the SW side with a true heading of 60°. The second group of FP01 lines is started with P04 that is flown from the North, P03 from the South, P02 from the North and, to end, P01 is covered from its South ending. Data acquisition is completed at UTC23:36. Return to Prague airport.

DeMinTIR/SOKOLOV N01 SURVEY - SOKOLOV FP01 FLIGHT PATTERN (FIRST GROUP, P09-P05).

FLIGHT LINE ID.	AHS REC. ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN- RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P09 AHS201107222200-18.7-P09	HD08 FILE050	21:45	8000FT (2438m)	360°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	Clear sky. Strong SW wind. Drift correction = 12°
AHS P08 AHS201107222200-18.7-P08	HD08 FILE051	21:57	8000FT (2438m)	180°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P07 AHS201107222200-18.7-P07	HD08 FILE052	22:07	8000FT (2438m)	360°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P06 AHS201107222200-18.7-P06	HD08 FILE053	22:18	8000FT (2438m)	180°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P05 AHS201107222200-18.7-P05	HD08 FILE054	22:29	8000FT (2438m)	360°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	

DeMinTIR/SOKOLOV N01 SURVEY - SOKOLOV FP02 FLIGHT PATTERN (P11).

FLIGHT LINE ID.	AHS REC. ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN- RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P11 AHS201107222200-18.7-P11	HD08 FILE055	22:42	8000FT (2438m)	060°	13.4NM(24.9km)/ 5min46s	18.7 Hz	N/A	GS=145KS (strong SW wind)

DeMinTIR/SOKOLOV N01 SURVEY - SOKOLOV FP01 FLIGHT PATTERN (SECOND GROUP, P04-P01).

FLIGHT LINE ID.	AHS REC. ID.	TIME (UTC)	ALT. (MSL)	TRUE HDG.	LENGTH/DUR. (GS 72ms ⁻¹ 140KTS)	AHS SCAN- RATE	CASI-1500i CONFIGURATION	REMARKS
AHS P04 AHS201107222200-18.7-P04	HD08 FILE056	22:57	8000FT (2438m)	180°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P03 AHS201107222200-18.7-P03	HD08 FILE057	23:08	8000FT (2438m)	360°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P02 AHS201107222200-18.7-P02	HD08 FILE058	23:19	8000FT (2438m)	180°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	
AHS P01 AHS201107222200-18.7-P01	HD08 FILE059	23:30	8000FT (2438m)	360°	10.8NM(20.0km)/ 4min38s	18.7 Hz	N/A	



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D01 FLIGHT performed on 17/07/2011 over SOKOLOV study area.

Pictures taken from the aircraft during the measurement flight.

(1. UTC09:12, 2. UTC10:15, 3. UTC10:53, 4. UTC11:08, 5. UTC11:10)



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D02 FLIGHT performed on 23/07/2011 over SOKOLOV study area.

Pictures taken from the aircraft during the flight.

(6. UTC10:07, 7. UTC10:08)



FLIGHT DATA & SENSOR SETTINGS

AIRCRAFT

Nominal aircraft ground speed
 Altitude above ground level
 Mean ground elevation
 Positioning

CASA 212-200 S/N270, "Paternina" (EADS)

GS 72ms⁻¹ (140KTS)
 AGL 1839m (6033FT)
 ELEV 600m (1969FT)
 Real-Time DGPS based in StarFire constellation.

HYPERSPECTRAL SENSOR #1

Installation
 Positioning & orientation

 IMU installation
 Set up lever arms
 Boresight calibration flight
 Scan rate
 IFOV/FOV/OFFSET
 Number of pixels per scan-line
 Pixel size @ nadir
 GSD @ nadir
 Swath
 Flight-line side-overlapping

AHS (S/N 001) (ArgonST)

on the main cabin floor front window
 Applanix POS/AV 410 V5
 (PCS S/N 2336 IMU LN200 S/N 402296)
 On AHS scan head. ACTIVE
 (See note 1 below)
 Fulfilled on 28/April/2011 in Villacañas (Toledo, Spain)
 18.7rps @ m (AGL6033FT)
 2.5mrad / 1.571rad (90degrees)
 750 pixels
 4.60m @ 1839m&72ms⁻¹(AGL6033FT&GS140KTS)
 3.86m @ 1839m&72ms⁻¹(AGL6033FT&GS140KTS)
 3678m @ 1839m(AGL6033FT)
 FP01 flight pattern 40%
 FP02 flight pattern N/A
 FP01+FP03 flight patterns 70%
 16% @ 72ms⁻¹(GS140KTS)
 FLIGHT D01 T_{BB1}= 280K (7°C) & T_{BB2} = 316K (43°C)
 FLIGHT N01 T_{BB1}= 278K (5°C) & T_{BB2} = 313K (40°C)
 80 spectral channels (VNIR, SWIR, MWIR & LWIR)
 Port 1+ Port 2A + Port 2 + Port 3 + Port 4
 (See note 2)
 April 2011

Along-track scan-line overlap
 Internal thermal reference sources

 Spectral configuration

 Calibration date

(Further information about AHS can be found at www.inta.es and www.crepad.rcanaria.es/info/npoc/indexlab.html)

Note 1. "Lever Arms" for AHS scan head mounted on the front nadir-looking window.

Ref. to IMU lever arm
 X(m) = -0.2961
 Y(m) = +0.2309
 Z(m) = -0.2720

Ref. to primary GPS lever arm
 X(m) = -0.200
 Y(m) = -0.006
 Z(m) = -2.253

Note 2. AHS spectral configuration characterized on April 2011 after system spectral characterisation.

(Further information about AHS can be found at www.inta.es and www.crepad.rcanaria.es/info/npoc/indexlab.html)

HYPERSPECTRAL SENSOR #2

Installation
Positioning & orientation

IMU installation
Set up lever arms
Boresight calibration/bundle adjustment flight
Operating mode
Integration Time
IFOV/FOV
Number of pixels per line
Pixel size/GSD @ nadir

Swath
Flight-line side-overlapping

CASI-1500i (S/N 2516) (Itres Research Limited)

on the main cabin floor rear window
Applanix POS/AV 410 V5
(PCS S/N 2335 IMU LN200 S/N 414187)
In CASI-1500i sensor head unit. ACTIVE
See note 3 below.
28/April/2011 BAF in Villacañas (Toledo, Spain)
SPECTral mode, 96 bands, SPEC096 (RS=3)
15ms
0.49mrad / 0.698rad (40degrees)
1440 pixels (spectral mode)
Across track 0.90m @ 1839m (AGL6033FT)
Along track 1.08m @ $IT15ms \& 72ms^{-1}$ (GS140KTS)
1339m @ AGL1839m (AGL6033FT)
FP01 flight pattern (gaps between lines)
FP02 flight pattern N/A
FP01+FP03 flight patterns 18%

18% (when considering flight patterns FP01 & FP03)

Calibration date June 2011

(Further information about CASI-1500i can be found at www.inta.es, www.crepad.rcanaria.es/info/npoc/indexlab.html and www.itres.com)

Note 3. "Lever arms" for CASI-1500i SHU mounted on the rear nadir-looking window.

Ref. to IMU lever arm

X(m) = +0.155
Y(m) = -0.053
Z(m) = +0.063

Ref. to primary GPS lever arm

X(m) = +0.782
Y(m) = +0.029
Z(m) = -2.045

COORDINATES OF STARTING AND ENDING POINTS

WGS84/ETRS89	LAT (DMX)		LONG (DMX)		ALT MSL
P01N	N50	17.530'	E012	31.562'	8000FT
P01S	N50	6.744'	E012	31.562'	8000FT
P02N	N50	17.531'	E012	33.419'	8000FT
P02S	N50	6.745'	E012	33.419'	8000FT
P03N	N50	17.532'	E012	35.277'	8000FT
P03S	N50	6.746'	E012	35.277'	8000FT
P04N	N50	17.533'	E012	37.135'	8000FT
P04S	N50	6.747'	E012	37.135'	8000FT
P05N	N50	17.533'	E012	38.994'	8000FT
P05S	N50	6.747'	E012	38.994'	8000FT
P06N	N50	17.532'	E012	40.852'	8000FT
P06S	N50	6.746'	E012	40.852'	8000FT
P07N	N50	17.531'	E012	42.710'	8000FT
P07S	N50	6.745'	E012	42.710'	8000FT
P08N	N50	17.530'	E012	44.568'	8000FT
P08S	N50	6.744'	E012	44.568'	8000FT
P09N	N50	17.529'	E012	46.425'	8000FT
P09S	N50	6.743'	E012	46.421'	8000FT

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SOKOLOV FP01 flight pattern at MSL8000FT (AHS FULL COVERAGE).

Flight lines co-ordinates in geographic WGS84/ETRS89 system.
(Modified as agreed in the pre-campaign meeting).

WGS84/ETRS89	LAT (DMX)		LONG (DMX)		ALT MSL
P11W	N50	8.734'	E012	30.056'	8000FT
P11E	N50	15.282'	E012	47.846'	8000FT

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SOKOLOV FP02 flight pattern at MSL8000FT (CROSSED LINE)

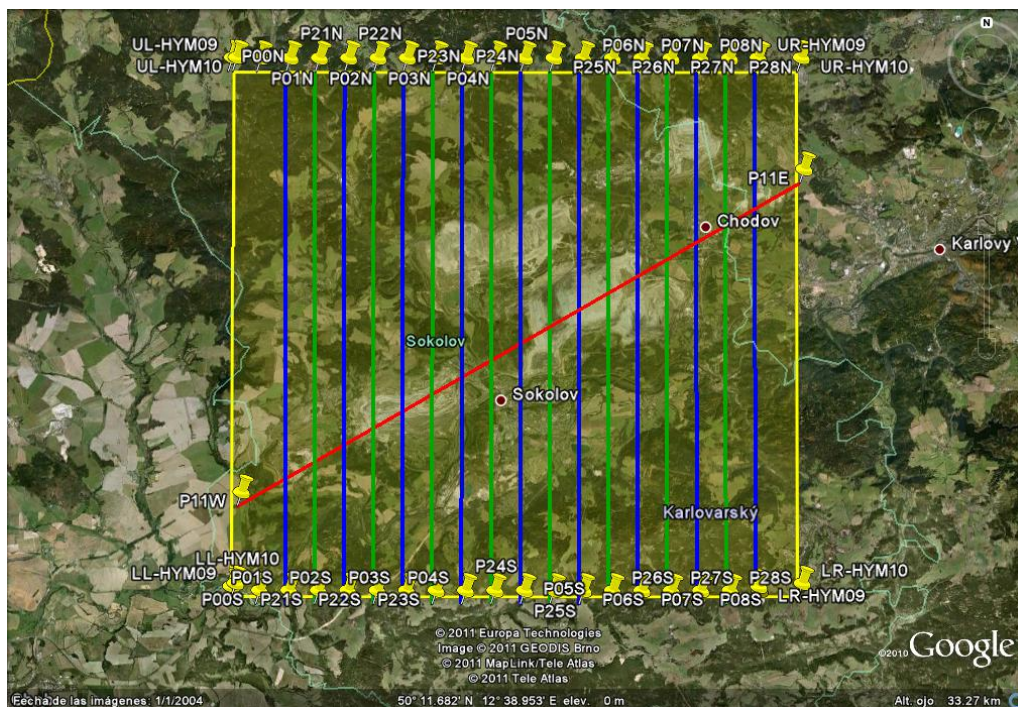
Flight lines co-ordinates in geographic WGS84/ETRS89 system.
(Modified as agreed in the pre-campaign meeting).

WGS84/ETRS89	LAT (DMX)		LONG (DMX)		ALT MSL
P21N	N50	17.531'	E012	32.491'	8000FT
P21S	N50	6.744'	E012	32.491'	8000FT
P22N	N50	17.532'	E012	34.349'	8000FT
P22S	N50	6.746'	E012	34.349'	8000FT
P23N	N50	17.533'	E012	36.207'	8000FT
P23S	N50	6.746'	E012	36.207'	8000FT
P24N	N50	17.533'	E012	38.065'	8000FT
P24S	N50	6.747'	E012	38.065'	8000FT
P25N	N50	17.533'	E012	39.923'	8000FT
P25S	N50	6.746'	E012	39.923'	8000FT
P26N	N50	17.532'	E012	41.780'	8000FT
P26S	N50	6.746'	E012	41.780'	8000FT
P27N	N50	17.531'	E012	43.638'	8000FT
P27S	N50	6.744'	E012	43.638'	8000FT
P28N	N50	17.529'	E012	45.496'	8000FT
P28S	N50	6.743'	E012	45.496'	8000FT

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SOKOLOV FP03 flight pattern at MSL8000FT (CASI1500i FULL COVERAGE)

Flight lines co-ordinates in geographic WGS84/ETRS89 system.
(Modified as agreed in the pre-campaign meeting).

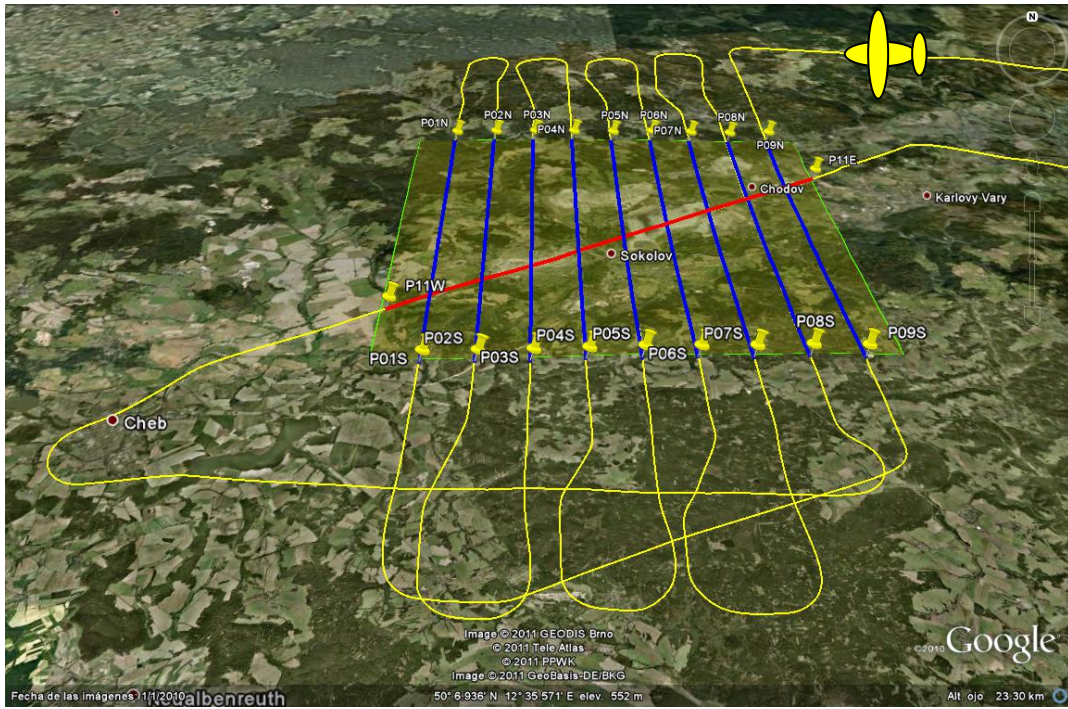


EUFAR TA DeMinTIR 2011.

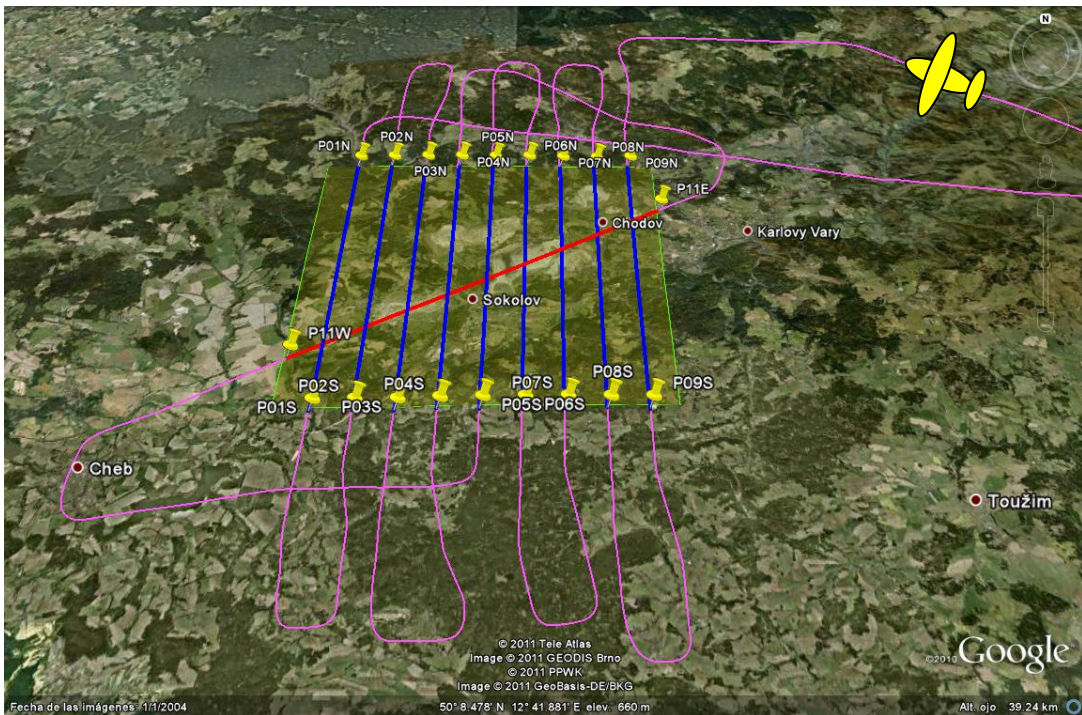
SOKOLOV HYMAP2010 test site (square in yellow).

SOKOLOV FP01 flight pattern (lines P01-P09 in blue colour), FP02 (P11 in red) and SOKOLOV FP03 (lines P21-P28 in green) at MSL8000FT.

(Flight pattern after including the modifications agreed during the pre-campaign meeting).
(Imaged in Google Earth).



EUFAR TA DeMinTIR 2011.
Flight D01, 19/07/2011. Track coloured in yellow.
SOKOLOV FP01 flight pattern (lines P01-P09 in blue colour) and FP02 (P11 in red).
 (Imaged in Google Earth).



EUFAR TA DeMinTIR 2011.
Flight N01, 22/07/2011. Track coloured in fuchsia.
SOKOLOV FP01 flight pattern (lines P01-P09 in blue colour) and FP02 (P11 in red).
 (Imaged in Google Earth).



TELEPHONES & ADDRESSES

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ABBREVIATIONS & ACRONYMS

AGL	Above Ground Level	LWIR	Long-Wave Infra-Red
AHS	Airborne Hyperspectral System	MIR	Mid Infra-Red
BAF	Bundle Adjustment Flight	MSL	Mean Sea Level
BB	Black-Body	MWIR	Mid-Wave Infra-Red
BKN	Broken sky (5/8 a 7/8)	N	North
CASI	Compact Airborne Spectrographic Imager	N/A	Not Available
CEST	Central European Summer Time	OVC	Overcast sky (8/8)
DGPS	Differential GPS	PCS	POS Computer System
E	East	POS	Position and Orientation System
ELEV	ELEVation	RS	Rows Summed (CASI-1500)
ETRS89	European Terrestrial Reference System 1989	S	South
FEW	Scarse clouds (1/8 a 2/8)	SHU	Sensor Head Unit
FOV	Field Of View	S/N	Serial Number
FT	Foot/Feet	SCT	Scattered clouds (3/8 a 4/8)
GPS	Global Positioning System	SKC	Clear sky (0/8)
GS	Ground Speed	SWIR	Short-Wave Infra-Red
GSD	Ground Sample Distance	TBC	To Be Confirmed
ICU	Instrument Control Unit	TBD	To Be Defined
IFOV	Instantaneous Field Of View	UTC	Universal Time Coordinated
IMU	Inertial Measurement Unit	UTM	Universal Transverse Mercator
INS	Inertial Navigation System	VNIR	Visible & Near Infra-Red
INTA	Instituto Nacional de Técnica Aeroespacial	W	West
IT	Integration Time	WGS84	World Geodetic System 1984
KTS	KnoTS	XTE	Cross Track Error