

Balloon System

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Workshop Stratéole-2

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AGENDA

- CONCORDIASI reminding
 - ◆ Flight System Configuration
 - ◆ Flight Control Centers
- SPB system for Stratéole-2
 - ◆ Foreseen improvements
 - ◆ In parallel of the Stratéole-2 phase A
 - ◆ Main tasks of 2015 and following
 - ◆ Design phase

CONCORDIASI Flight System Configuration

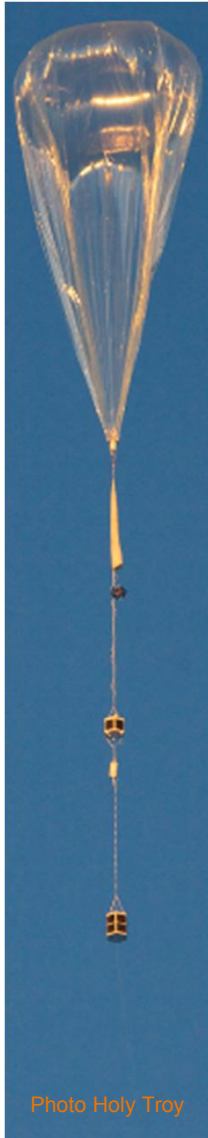


Photo Holy Troy

12 m balloons

Suspended mass budget 45-50 kg, including :

- Service Module Gondola : 18,5 kg, 20,5 kg with TSEN
- Payload Gondola : 20-24 kg

Solar panels and module of energy distribution

Safety :

- Back-up localization with Argos
- Back-up flight terminating system with an adjustable timer



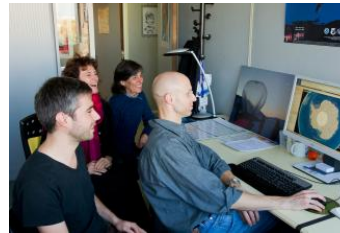
CONCORDIASI Flight control centers, Data Collection and Distribution

LMDOz and TSEN instruments monitoring
CNRS_LMD, Palaiseau, F.

ROC instrument monitoring
Purdue U., W. Lafayette, In.

WPC instrument monitoring
U. Wyoming, Laramie, Wy.

UCOz instrument monitoring
U. Colorado, Boulder Co.



Driftsonde Mission center
Météo-France, Toulouse F.

“CCT” : Balloon Flight Control Center, Toulouse, France

Automatic download of onboard stored data, housekeeping & science,
Data sharing & storage,
Flight control at float,
Instruments control,
End of flight

Driftsonde control center, NCAR, Boulder Colorado USA

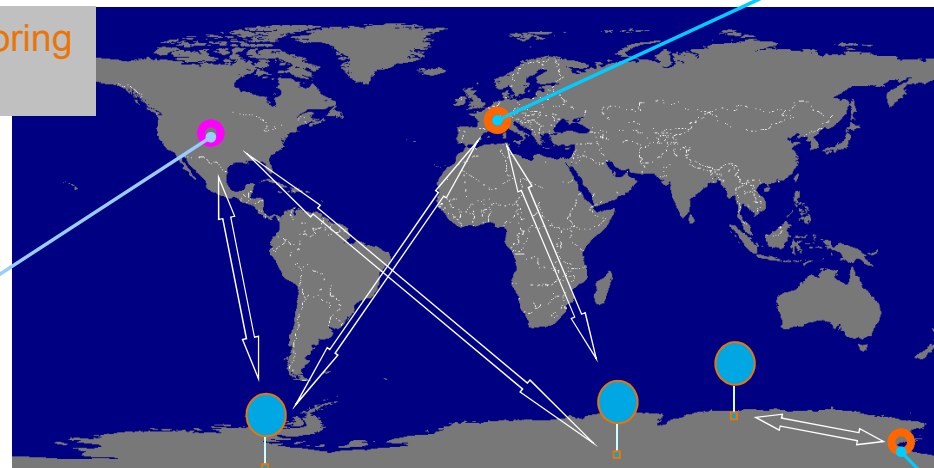
Driftsonde payload monitoring and dropsonde data download

WEB based data exchange



Flight control during ascent and beginning of float

“CCL” : Launch Control Center, McMurdo Station, Antarctica



SPB system for Stratéole-2

Foreseen improvements

Concordiasi CNES flight control gondola needs some improvements :

- Several electronic components were too sensitive to flux particles
- To be fully compliant with CNES safety rules (risks to not terminate the flight on demand and/or to unwillingly terminate it through the secondary terminating system)
- To reduce the suspended mass in order to withstand the severe environment of the very low latitude flights, not to the detriment of the scientific instruments mass

Main evolutions :

- Second RF link as secondary terminating system instead of the timer system
- More efficient solar panels
- Optimization of the power storage and dispatch
- Up-to-date and lighter equipment items

Use of the existing high safety standard onboard software of the zero pressure balloons

New associated control center

Balloon size adapted to the two Stratéole-2 flight levels

Update of the BPS system in parallel of the Stratéole-2 phase A

All payload gondolas will be autonomous :

- Development of the “ZEPHYR” gondola together with its flight control center
- Up to 4 instruments on board the ZEPHYR gondola

TSEN instrument as part of the CNES housekeeping gondola :

- In the frame of the mass reduction objective (removal of redundant sensors)
- CNES will supply LMD with air pressure (every 30 s) and temperature (every second) within a maximum delay of two hours
- The dialog protocol with CNES onboard software has been established

CNES developments shared with LMD :

- Solar panels together with the overall power system (storage, dispatch,...)
- Iridium modem

Mass objectives :

- 13 kg for “EUROS” CNES housekeeping gondola, including TSEN
- 12 kg for “ZEPHYR” and 10 kg for scientific instruments

Update of the SPB system

Main tasks of 2015 and following

	2015											
	J	F	M	A	M	J	J	A	S	O	N	D
VLD-BPS update												
Design definition		Preliminary		↑	Final	↑						
Preliminary risk analysis and safety file						↑						
General specification for conception and environnement				↑								
Product plan					↑							
Justification files, development plan						↑						
<u>Preliminary Design Review</u>							↑					
Call for tender file and selection								Call of tender	↑	Selection	↑	
<u>STR2 Phase A file (including cost, planning)</u>												↑

2016 :

- Detailed design phase, validation models manufacturing
- Critical design review mid May
- Beginning of ground qualification tests

2017 :

- End of ground qualification tests, qualification review
- Manufacturing and assembly of the flight qualification models

Update of the BPS system

Design phase (1/2)

Power system shared with ZEPHYR :

- Two new solar panels technologies in qualification tests (humidity and thermal chocks, vacuum test, thermal cycling, UV exposure test) : final results in may
- SunPower mono crystalline cells with high efficiency (22% instead of 16%)
- Preliminary design of the configuration :
 - 4 vertical panels of 9 cells for EUROS, TBD for ZEPHYR
 - 1 or 2 battery packs depending of the final needed power
- First model of the dispatch system mid of June
- Technical specification of the software for mid of June

Gondola structure :

- Polystyrene foam cube approximately 50 cm sided
- First inside layout for mid June

New updated equipment's :

- 9523 modem under evaluation
- New strobe light under evaluation and new radar transponder



Update of the SPB system

Design phase (2/2)

Secondary RF link :

- For safety, localization and terminating system only
- Based on SBD Iridium protocol

Flight Control System :

- Global architecture principles reused from CONCORDIASI
- Evaluation of RUDICS service : nice performance for TM and TC
- Ongoing feasibility of the reuse of the ZPB TM/TC decoding system

Balloons :

- New diameters for Stratéole-2 but same design : about 11 m and 13 m
- A 13 m first model is planned to be manufactured in 2015
- A launch technique test of this balloon is planned next year
- A new launch technique for situations with very low surface wind is being developed