CNES'S CONCLUSIONS OF THE BALLOON WORKSHOP HELD IN PAU, SEPTEMBER 22-24, 2008

This document presents the main conclusions of CNES to the Pau Workshop. These conclusions aim at answering to the conclusions and recommendations of the Scientific community, as expressed in the relevant papers and describe the tentative road map to be followed by CNES. These conclusions have been presented and welcome by the CNES management committee.

The main objectives of the balloon workshop organized by CNES in Pau, September 22-24, 2008, were:

(i) to confirm the mid term scientific orientations in all the domains interested in balloon utilization: atmospheric sciences, astrophysics, planetary missions,

(ii) to identify the needs of the European science community interested in balloon utilization: what are the quantities to measure ? what are the required tools (types of balloons, gondolas, instruments, launch sites, season, duration, etc) ?

(iii) to precise the place of balloon activities in the global context (in particular vs satellites and ground & airborne devices),

(iv) to improve the efficiency of the CNES balloon programme and the satisfaction of the users.

CNES considers that the objectives (i), (ii) and (iii) have been achieved. The paper prepared under the coordination of Niel Harris and Hermann Oelhaf describe the needs of the Atmospheric community as the projects presented during the workshop are examples of the needs in the field of Planetary sciences and Astrophysics. With respect to objective (iv), the paper "conclusions and recommendations of the Scientific community" indicates that the objective has been achieved even if some progress have to be made by the operators.

In the field of atmospheric sciences, balloons are a unique experimental tool to probe the high atmosphere (e.g. stratosphere at 15-45 km), they provide a complement to satellite observations on the one hand, to ground and air-borne measurements on the other hand, they are used for the calibration & validation of satellite data. To do so, the users need to have launch possibilities at every latitude, in the polar zones (Kiruna, Svalbard, Antarctica), in the tropical areas (Teresina, Kourou?), and in the mid latitudes (Trapani, Aire/Adour, Gap). A serious problem has been underlined: the question of safety constraints (see below).

In the field of space sciences and exploration, balloon flights represent opportunities rather than systematic research tools. In astrophysics, they allow precursor experiments so as to validate an experimental technique while providing valuable science data (Boomerang, Archeops). The users need to have launch possibilities at various latitudes depending on the portion of the sky they wish to observe. Planetary missions are a very peculiar domain, with very diverse environments and specific deployment techniques, whereas the safety constraints are replaced by the planetary protection rules.

The workshop had been planned for a long time and it was open to European users and operators. It came in a special context since the scientific users have been made dissatisfied by the development of recent campaigns (bad information transfer chain, shorter flights than expected, and finally poor results). In 2005, in a similar context, there had been a review of the CNES balloon programme chaired by G. Debouzy, then followed by a first European workshop held at Paris Observatory in December 05. Nevertheless three years later a major part of the recommendations presented at that time were still in the news. The Pau workshop was organized on 1 ½ day and a large amount of time was reserved for discussions, which had not been the case in the Paris workshop. It appears to CNES, that the conclusions of this second European workshop pave the way to a really efficient activity of the Balloons operators, but after a temporary phase of transition, at least for CNES.

After having recalled that the success of a campaign is measured by the scientific results which have been obtained, some very general recommendations (see the relevant paper for extended description) came out and are welcome by CNES:

- from the beginning of the preparation of their proposals, the users shall be provided in due time with all the relevant information and they shall be involved in the critical decision making process (e.g. campaign design, campaign postponement, shortening or cancellation),

- the technical and scientific teams shall not be allowed to go for a campaign as long as all the necessary information is not available (flight authorisations, safety analysis, weather forecast, etc) …

- … with adequate schedule margins (too often the campaign is at the limit of its schedule when the operations start),

- it is necessary to improve the communication with the scientific users; to that end, a new position has been created at CNES (recent nomination of T. Lam-Trong) …

- … and to re-enforce a rigorous management of the planning.

As it has been said above, the safety constraints have been discussed and sometimes criticized. It is exact that quite often they are known very late but the encountered problems find their origin less in the safety rules themselves (derived from those of civilian air traffic) than in their implementation. It is important to realize certain types of flights from some mid-latitude launch sites are getting more and more constrained, mainly due to the increasing density of population, and of the related increasing air and ground traffic.

A new strategy for solving safety issues has to be implemented. Today, balloon architectures are not compliant with Failure & Safety requirements. FS waiver will no longer be accepted after June 09 except for flights above loosely populated areas. The safety authority is presently reviewing the BPS Balloon configuration and BPS Balloons could be classified as lethal objects (a decision is expected by mid March 2009). As a matter of fact, the probability of a victim for a flight above inhabited areas is calculated

with a dedicated algorithm called “Larri”. Resulting figures are too high and cannot be accepted by safety authority. But “Larri” is too much simple and needs to be improved in order to give more reliable figures. That will be undertaken.

In parallel the development of new tools allowing a better control and monitoring of the flight has been decided in order to make the balloon systems compatible with FS requirement (NOSYCA project) and to improve the landing accuracy (PAROR).

The possibility of using alternative launch sites at mid-latitude, e.g. French Military zones, Trapani, will be investigated, and also the possibility of flying over oceans and seas (recuperation devices, mission analysis). In addition not only the safety issues will be addressed in the near future but also the science capacity will be upgraded: the feasibility of a Kourou launch site will be studied and balloon upgrades will be undertaken: Large Pressurized balloons 16m (TBC), Aeroclipper improvement, BPCL/NANO adaptations.

In order to recover a full launch capacity, we are thus entering a 3 to 4 year transition phase (2009-2012). We have to manage that transition phase so as to start successfully a routine phase by 2012 with a new generation of balloon systems. During that transition phase we will continue making science. The missions which are already in the pipeline (STRAPOLETE, CONCORDIASI, FIREBALL & PILOT) will be performed. Though no further flight opportunity in France will be possible due to the FS waiver restriction and to the limited amount of resources (financial and human) available for campaigns while the new tools are under development, a couple of “Short Term Deliveries” will be identified to fly in 2010 and 2011 above low populated areas (polar or equatorial). To that end, no AO will be released; we will look among the recent experiments, scientifically evaluated, whose payload is available without major change (provided the PI expresses his interest for a re-flight). In parallel, the post-2012 missions will be prepared (STRATEOLE II, BAMED); in 2009 or 2010 an AO for the futures experiments that could fly beyond 2012 will be released.

In complement we also propose to re-examine the overall organisation of the balloon programme:

- at the national level, the co-operation with CNRS-INSU must be re-enforced and formalised (see below),

- at the European level, the co-operation with the other operators must also be better structured (see below).

At the French level, a model is provided by the air-borne experiments. SAFIRE (Service des Avions Français Instrumentés pour la Recherche en Environnement) is a joint venture (« Unité Mixte de Service ») between INSU (Technical Division) + Météo-France (Meteorological Research Centre) + CNES (funding support). SAFIRE gathers the technical, human and financial resources that the partners dedicate to air-borne experiments, and it is in charge of the maintenance of the fleet (3 planes), of the development of the onboard instruments, and of performing the flight campaigns.

Our proposal is to build along the SAFIRE model a joint effort between INSU and CNES in view of managing the balloon programme:

- the campaigns would be operated by the CNES personnel,

- the instruments would be developed by the laboratories with the technical support of INSU's Technical Division and the financial support of CNES,

- the programme would be managed by a steering committee INSU + CNES + representatives of the users,

- the selection process of the experiments would be simplified and harmonised at the French level; there are today several channels (INSU\LEFE, CNES\TOSCA, ANR) which would leave the floor to a single selection procedure based on specific AOs jointly issued by INSU and CNES,

- a scientific and technical committee would be set up with the duty of reviewing the proposals and to propose an implementation plan to the steering committee.

This proposal is currently under review at CNRS/INSU.

At the European level, it has to be acknowledged that the existing CNES European programming committee does not work as it should. A first proposition is to implement a non binding co-ordination committee between the European operators so as to

- exchange information and co-ordinate activities,

- re-enforce the inter-operability of the hardware,

- harmonize the safety procedures.

The draft terms of reference of that so-called committee, European Balloon Advisory Working Committee (EBWAC) have been distributed to the organising committee of the workshop and to the present CNES European programming committee. The EBWAC could decide to set up ad hoc working groups on either scientific or technical issues and could be supported by experts as needed. These terms of reference have been welcome by these committees and will be presented during the next ESA PAC symposium, Bad Reichenhall, Germany, June 2009.

A goal could be to have European integrated teams whenever possible in order to reduce the costs and to gradually set up a true European balloon activity: the promoters of a balloon campaign launched from a given launch site would be supported by the local teams.

A second proposition is to create a European research infrastructure dedicated to balloons within the framework of the FP 7 of the European Commission. Once again, the model is provided by the air-borne experiments and the EUFAR network (EUropean Fleet for Airborn Research). EUFAR aims at co-ordinating the operations of the European fleet dedicated to research in Earth and environment sciences and to facilitate the access to the airborne facilities for the scientific community. However, even if an operator agency such as CNES is needed to be the motor of the project, it is also necessary to have a motivated scientist, or a group of scientists, to defend it in front of the European assessment organs.