AUTOMATED SHIPBOARD AEROLOGICAL PROGRAMME PANEL (ASAPP)

Twelfth Session

Reading, United Kingdom, 27-29 September 2000

FINAL REPORT

JCOMM Meeting Report No. 6

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

AUTOMATED SHIPBOARD AEROLOGICAL PROGRAMME PANEL (ASAPP)

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1. ORGANIZATION OF THE SESSION

1.1 Opening of the session

1.1.1 The twelfth session of the ASAP Panel (ASAPP) was opened at 0900 hours on 27 September 2000 in the Met. Office College, Reading, United Kingdom, by the chairman of the panel, Dr Klaus Hedegaard. Dr Hedegaard welcomed participants to the meeting, and called on Dr J. Caughey, Technical Director of the Met Office, to address the meeting.

1.1.2 On behalf of the Chief Executive of the Met Office, Mr P. Ewins, Dr Caughey welcomed participants to the United Kingdom and to the Met Office. He reiterated the importance of ASAP, not only to numerical weather prediction and operational meteorology, but also to global climate studies and in the provision of essential ground truth data for satellite soundings. He also noted that there was continual pressure on national budgets, with a need to optimise networks and to demonstrate the cost-effectiveness of observing systems. In this context, international cooperation was essential, with the integration and enhanced coordination of marine observing systems being developed under JCOMM being crucial to this effort. ASAPP certainly had a role to play in this development. Dr Caughey assured the meeting that the United Kingdom would continue to invest in ASAP, most probably directed in the future through EUMETNET and EUCOS. Dr Caughey concluded by wishing participants a very successful meeting and an enjoyable stay in the United Kingdom.

1.1.3 On behalf of the Secretary-General of WMO and the Executive Secretary IOC, the WMO Secretariat representative also welcomed participants to the meeting. In doing so, he expressed his thanks, on behalf of WMO and of the panel, to the Met Office for hosting the meeting and providing such excellent facilities, support and hospitality. He expressed particular thanks to Ms Sarah North for her efforts and efficiency in organizing and supporting the meeting and its participants. The Secretariat representative then also underlined the importance of the meeting, and expressed pleasure at the large number of participants, which in itself was an indication of the growing recognition of the value of the work of the panel. This work included, in particular, efforts to extend ASAP applications worldwide, specifically through the new WRAP project, which had received strong endorsement from the global climate programmes. The Secretariat representative urged the panel to become actively involved in the JCOMM plans to integrate marine observing systems, which could only serve to strengthen the work and recognition of ASAPP.

1.1.4 The chairman of ASAP, Dr Klaus Hedegaard, in turn thanked the Met Office very sincerely for hosting the meeting and providing such excellent support. He noted that the work of the panel had clearly established the cost effectiveness and efficiency of ASAP, and assured everyone that the panel would play its role in the development of JCOMM. He concluded by welcoming new participants in the panel session, including in particular representatives of the Australian Bureau of Meteorology, German Weather Service and of manufacturers (Geolink and Vaisala).

1.1.5 The list of participants in the meeting is given in *Annex I*.

1.2 Adoption of the agenda

1.2.1 The panel adopted its agenda for the session, which is given in *Annex II*. The session documentation was introduced by the Secretariat.

1.3 Working arrangements

1.3.1 The session agreed its hours of work and other necessary working arrangements.

2. REPORT OF THE CHAIRMAN

2.1 The chairman of the panel, Dr Klaus Hedegaard, presented a summary report on activities in support of the panel and its work programme since the last session undertaken by himself, panel members and the Secretariat. Specific action items arising from this report are dealt with under the relevant agenda items.

3. OPERATIONAL PROGRAMME (REPORTS INCLUDING MONITORING)

3.1 National programmes of the ASAP operators

3.1.1 Each participant representing a national organization operating an ASAP or related system gave a presentation on the status of the work, including a report on the performance of their systems during 1999/2000. Such reports were made by Denmark, France, Germany, Iceland/Sweden, United Kingdom and USA. An additional written report from Japan, and verbal report from the chairman on behalf of Spain, were also noted with interest. Points of particular interest relating to national programmes included:

(i) France reported some problems with the reliability of wind measurements with GPS sondes, which required a large operator involvement, though otherwise the systems worked well;

(ii) Frequent changes of ships and crews were again a problem for Iceland/Sweden, resulting in reduced observations through difficulties in training and maintenance;

(iii) Staffing problems in Germany had resulted in only two units out of five being operated during recent months, but it was hoped that these problems would soon be rectified;

(iv) Spain had not been active with ASAP since the demise of Omega, but was planning to restart operations shortly, with some assistance from the panel. The chairman was corresponding with Spain on this issue;

(v) The United Kingdom reported that although their new ASAP system was now operating satisfactorily, some windfinding problems were being experienced. The location of the launch container adjacent to the ship's funnel had also caused some problems, and consideration was being given to use of a deck launcher;

(vi) Funding in the USA for ASAP was primarily from research programmes, and for this reason there was no operational maintenance of the programme and no activities in 2000. However, work had continued on system development, and this is reported under agenda item 4.1;

(vii) The panel agreed on the potential value of having available a training video or CD-ROM (language independent) which could be used to train ship operators, thus helping to reduce a variety of operational errors. (**Action**: chairman and Secretariat to investigate possibilities for development of this aid.)

3.1.2 These reports, updated appropriately, as well as reports from other operators, will be reproduced as usual in the 2000 ASAP Annual Report. (**Action**: Operators, chairman and Secretariat.)

3.2 Report of EUMETSAT

3.2.1 The EUMETSAT representative reported on the status of its monitoring activity and of the geostationary meteorological satellites in general, including in particular a report on the status of Meteosat Second Generation (MSG). This report will be reproduced as usual in the 2000 Annual

Report. The panel expressed its appreciation to EUMETSAT for this report and for its continuing support for ASAP.

3.3 Report of ECMWF

3.3.1 The ECMWF representative reported on their monitoring activities for ASAP. The report indicated that there continued to be some call sign corruption, particularly with Meteosat DCPs, and that the humidity bias in Vaisala sondes also remained. (**Action**: ECMWF to discuss these questions directly with Eumetsat and Vaisala respectively.) The panel was pleased to note that ASAP data quality continued to be comparable with or superior to that of land stations with respect to model fields. The panel expressed its appreciation to ECMWF for this report, which will be updated and reproduced in full in the 2000 Annual Report.

3.4 Report of ASAP monitoring centre

3.4.1 The representative of France reported on the status and operation of and some results from the ASAP monitoring centre, which had been established by Météo France as agreed at ACC-VII. He noted that the monitoring had identified a problem in report duplication, in particular involving Bracknell and Offenbach. There was also some data corruption with reports received via Meteosat. The meeting agreed that these identified problems should be addressed directly by the ASAP Monitoring Centre, the Met Office, the German Weather Service and Eumetsat, as appropriate. (**Action**: Météo France, MO, DWD, Eumetsat.) The panel expressed its appreciation to Meteo France for this comprehensive and very valuable report. The updated report of the ASAP Monitoring Centre will be reproduced in the 2000 Annual Report.

3.5 Report on EUCOS

3.5.1 The panel noted with interest a report from the EUCOS Programme Manager, Mr Francois Gerard, on the proposed EUCOS/COSNA pilot project, which would test, *inter alia*, variable ASAP sounding modes in relation to identified sensitive areas for observational data for NWP in western Europe. Details of this pilot project are given in *Annex III*. Implementation procedures should be discussed directly between EUCOS and the operators concerned. (**Action**: EUCOS and operators.)

3.6 Report on the EUMETNET ASAP project

3.6.1 The ASAPP chairman and EUMETNET ASAP Project (E-ASAP) manager, Dr Klaus Hedegaard reported on the status of the E-ASAP. This report, appropriately updated, will be included in the 2000 Annual Report.

3.7 Worldwide Recurring ASAP Project (WRAP)

3.7.1 The meeting noted with interest a report on the status of planning for WRAP. As a result of a number of actions during the past year on the part of the chairman, the Australian Bureau of Meteorology (ABOM) and the Secretariat, conceptual planning for the project had advanced substantially. A potential line and ships had been identified; the USA (NOAA/OGP) had agreed to provide, on loan, a complete sounder and launcher system for the project; and ABOM was in the process of securing funding for consumables and related items for soundings in the Indian and Southern Oceans and Tasman Sea.

3.7.2 The meeting expressed its appreciation for these developments, and reiterated the importance of this project for ASAP globally, for operational meteorology and for global climate studies. It therefore agreed that WRAP should have the highest priority among the activities of the panel in the immediate future. The meeting recognized that a number of major issues remained to be addressed in the implementation of WRAP, including in particular the recruitment of the ship, the initial installation of the sounder system, crew training, etc. It was agreed that this process could best be initiated through a feasibility study, to be undertaken by an expert contracted to the panel. The meeting proposed that Captain Gordon Mackie should be contracted by WMO to undertake this work, with funds to be provided from the ASAP Trust Fund (see also agenda item 7.4). The terms of reference for this consultancy are given in *Annex IV*. The report should be delivered to the ASAPP chairman by April 2001, at which time a decision on and timetable for WRAP implementation could be established. (**Action**: Secretariat, Capt. Mackie, chairman, ABOM, NOAA/OGP.)

4. TECHNICAL ASPECTS

4.1 Development of new systems

4.1.1 The meeting noted with interest the following developments or proposals related to new or improved ASAP systems:

(i) The USA had completed development of a portable deck launcher system, which would form part of the sounder system to be provided for WRAP. Details of this launcher are given in *Annex V*.
(ii) LORAN-C was to be used for wind finding for E-ASAP in the Mediterranean.
(iii) It was suggested that Inmarsat Mini-M might prove a viable, fast, low-cost alternative to Inmarsat-C for ASAP communications. Some complications were, however, noted in this proposal, including the need for a stable antenna platform and directional antenna, and the lack of code 41 facility.

4.2 Information from manufacturers

4.2.1 As before, manufacturers were invited to inform the panel of new equipment developments relevant to use with ASAP. In this context, the meeting noted with interest the following reports:

(i) From Geolink, on a new GPS radiosonde system, which was to take part shortly in a WMO radiosonde intercomparison experiment.
(ii) From Vaisala, on wind finding methods in the Vaisala Sounding System, covering a GPS performance improvement project; DigiCORA III; LORAN-C wind finding; and the RS90 sonde family.

The meeting expressed its appreciation to both Geolink and Vaisala for their participation and reports, which it regarded as being of considerable value. Details of these reports are given in *Annexes VI and VII* respectively.

4.3 Communicating ASAP data to the GTS

4.3.1 The meeting agreed that Inmarsat-C remained a proven, reliable and widely available communications system for ASAP data, and was the preferred choice of many operators. As noted above, Inmarsat Mini-M provided a possible low-cost alternative, but there were several inherent difficulties in its application in practice.

4.3.2 The meeting recognized that there remained problems in the use of Meteosat DCPs, where up to 20% data losses were noted. Eumetsat agreed to address these problems once more, but suggested that they may be solved with the introduction of Meteosat Second Generation (MSG). (**Action**: Eumetsat and operators.)

4.4 Channels for data transmission via meteorological satellites

4.4.1 The panel reviewed the status and operational use of channels allocated for data transmission via meteorological satellites, with which no major problems were noted. There was a possible interference problem identified with International Channel 12, involving France and Germany. (**Action**: Eumetsat to investigate with operators concerned, together with the ASAP Monitoring Centre.)

4.5 Data and information dissemination

4.5.1 The panel reviewed the status of information on ASAP included in relevant WMO catalogues and operational publications, and ASAP information dissemination in other ways such as the WWW Operational Newsletter. In this context, it noted that the list of operational ASAP ships and national contact points for ASAP operations had not been updated for some time. The Secretariat was therefore requested to circulate the existing list to operators for updating, with the new list to be disseminated in a forthcoming Operational Newsletter and in the 2000 Annual Report. (**Action**: Secretariat and operators.)

4.5.2 In addition, the Secretariat was requested to investigate the possibility to establish a separate supplement to the WMO ship catalogue (WMO-No. 47), to be available on-line through the WMO web page, giving complete metadata of ASAP ships, including ASAP unit IDs and IMO numbers. (**Action**: Secretariat.)

4.6 Operator and system ID in FM 36-XI TEMP SHIP

4.6.1 The meeting agreed that there was a problem in the monitoring of ASAP activities in that only the ship's call sign identified the unit. This caused identification problems either in case of ships hosting different units, or when systems were transferred to other ships. The meeting therefore discussed different possibilities to provide owner and system ID in a convenient way. The following possibilities and conclusions were arrived at:

(i) Modify the TEMP SHIP code to include this information. This solution was not possible since CBS no longer accepted character code modifications.

(ii) Replace the ship call sign with an ASAP unit indicator. While feasible, it was recognized that this solution would serve to dissociate the TEMP message from the normal SHIP reports and ship metadata, which could provide difficulties for many operational and climate users.

(iii) Migrate all ASAP reports to BUFR, where it would be simple to include the additional information. Operators were recommended to implement this option as a long term solution, in particular once system upgrades to DigiCORA 3 were implemented, since this would include an option for BUFR encoding. (**Action**: Operators.)

(iv) Implement a ship catalogue supplement for ASAP ships as noted above, to include the additional information. Operators should update the information in this catalogue as often as necessary and monitoring centres should check the catalogue regularly for changes. The following unit ID scheme was agreed: D/ASAP1,2,3 etc.; F/ASAP1,2,3 etc.; GB/ASAP1,2 etc.; DK/ASAP1,2 etc.; IS/ASAP1,2 etc.; EU/ASAP1,2,3 etc.; WRAP/ASAP1,2 etc. (**Action**: Secretariat and operators.)

4.7 ASAP costs

4.7.1 The panel reviewed both the capital cost and the operating cost of ASAP units. It agreed that the document originally developed on this topic remained essentially valid, with the removal of references to ECUs. The revised ASAP cost document is given in *Annex VIII* and will also be reproduced in the 2000 Annual Report. (**Action**: Secretariat.)

4.8 Other technical aspects

4.8.1 No other technical questions relating to ASAP were noted.

5. SCIENTIFIC ACTIVITIES RELATED TO ASAP

5.1 Report of the COSNA Scientific Evaluation Group (SEG)

5.1.1 The COSNA SEG held its tenth session in March 2000 in Toulouse, in conjunction with the Second CGC/WMO Workshop on the Impact of Various Observing Systems on NWP. Papers given at this workshop had clearly indicated the positive impact of radiosonde data over the oceans, as well as the need for such data to calibrate satellite soundings. A further published paper had established that ASAP soundings were of a sufficient quality to impact significantly on analyses and NWP. In addition, ECMWF stressed that the lack of profile data from the Pacific Ocean on occasions had a significant negative impact on their D+5 and D+6 prognoses for Europe.

5.1.2 A further study by Dr M. Bader (Met Office), on the impact of lack of observational data (especially profile data) from the area south west of United Kingdom and France, had demonstrated that there was a manifest lack of data over the Atlantic, in particular with vertical information. Such data could, at present, only be derived from dropsondes or sondes launched from ASAPs.

5.1.3 The meeting noted these results with interest, and agreed that they demonstrated the critical role which ASAP would play in NWP for at least the next decade.

5.2 Other scientific aspects

5.2.1 No other relevant scientific matters were noted at the present time.

6. RELATIONS TO OTHER BODIES

6.1 Co-ordinating Group on COSNA (CGC)

6.1.1 The meeting noted that ASAP operations remained an important component of COSNA, even though the CGC was in the process of being incorporated into EUMETNET, in a way yet to be clearly defined. The chairman reported briefly on the eleventh session of the CGC (August 2000), at which he had made a presentation on behalf of the panel, and at which the importance of ASAP had again been underlined. The meeting noted that the EUCOS Pilot Project presented under item 3.5 above was also sponsored by the CGC.

6.2 CBS, CIMO, GCOS

6.2.1 The meeting noted with appreciation that a presentation on ASAP (including WRAP) had been given to the sixth session of the GCOS/AOPC (Geneva, April 2000). The AOPC had expressed its strong support for the work of the ASAPP, and noted the value to global climate studies of ASAP soundings, including in particular those proposed in the Southern Hemisphere under WRAP. A concrete example of the effects of this support was the success in obtaining additional funding to support WRAP in Australia. The meeting agreed to maintain close liaison with AOPC and GCOS in the future, in view of the obvious mutual benefits of such liaison. (**Action**: chairman and Secretariat.)

6.2.2 The meeting further noted with appreciation that the Secretariat had made presentations on ASAP to two recent CBS expert team meetings relating to the Global Observing System (Geneva, June and September 2000). Both meetings had emphasised the importance of ASAP to the WWW, and expressed appreciation for the work of the ASAPP in maintaining and expanding ASAP. The meetings had also noted with appreciation the work of JCOMM towards the integration of marine observing systems, the JCOMMOPS proposal, and the agreement of JCOMM to participate in the CBS Rolling Requirements Review process. This latter process would eventually encompass ASAP data. The meeting agreed to fully support this interaction of JCOMM and CBS.

6.3 JCOMM

6.3.1 The meeting recognized that the merger of CMM and IGOSS into the new Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), approved by Congress in May 1999, had some significance for ASAPP. In particular, JCOMM was now the primary reporting mechanism for all operational ocean-related activities of WMO and IOC, and had the responsibility, *inter alia*, to coordinate the implementation and operation of ocean observing systems in support of WWW, GOOS and GCOS. JCOMM was thus also the primary reporting mechanism for the ASAPP. This fact had been recognized at the previous panel session, where the terms of reference had been modified accordingly.

6.3.2 In this context, the meeting noted with interest an update on the status of JCOMM. A second meeting of the interim JCOMM Management Committee had been held in Paris in June 2000. This meeting, in particular, had agreed a detailed proposal for the new substructure for JCOMM, including full terms of reference for the different components, to be eventually submitted to JCOMM-I (Iceland, June 2001) for approval. *Annex IX* gives a schematic of this substructure. The substructure includes, within the Observations Programme Area, a Ship Observations Team (SOT), encompassing the VOS, SOOP and ASAP as previously proposed. The proposed integrated terms of reference for the SOT are given in *Annex X*. The meeting noted that the SOT was designed to integrate ship-based operations to the extent possible, particularly in areas such as logistics and communications, while preserving the identity of the individual component groups and their capabilities to address specific technical problems. The meeting supported the reasons for and concept of SOT, and agreed to participate fully in its development, including the planned first combined SOT meeting in early 2002.

6.3.3 The meeting further noted with interest the proposal for a JCOMM Observing Systems Operations Support Centre (JCOMMOPS), to be based on the existing DBCP/SOOP and Argo coordinators (see *Annex XI*). It recognized that this was a natural development under JCOMM, which would undoubtedly provide operational support of considerable value to VOS as well as DBCP, SOOP and Argo, and supported the concept in principle. At the same time, however, it agreed that ASAP was presently a relatively small operation, with adequate support being provided by operators and organizations such as EUMETNET. In addition, the development of WRAP was the current main priority for the panel, which would take all its human and financial resources over the next year or so. The meeting therefore agreed to review the development of JCOMMOPS at the first SOT meeting, and also to reassess the possibilities for the direct involvement of ASAPP at that time. (**Action**: Secretariat.)

7. ORGANIZATIONAL MATTERS

7.1 Future status of the ASAPP

7.1.1 ACC-IX agreed to maintain the committee (now panel) in its present form for the immediate future, on the basis of perceived requirements and benefits, but to review its status at each session, in particular in the light of ongoing support from operators. In this context, the meeting noted the ongoing importance of the work of the panel, the expansion of its operations worldwide through WRAP, and the increased interest by operators in this work. It therefore agreed to maintain the panel in its present form, within the context of the JCOMM Ship Observations Team as agreed above under item 6.3.

7.2 Terms of reference

7.2.1 The meeting recalled its agreement regarding the participation of the panel in SOT, as well as the proposed SOT terms of reference (*Annex X*). These integrated terms of reference will be presented to JCOMM-I for approval. In this context, the meeting agreed to maintain the existing ASAPP terms of reference (see Annex V of the final report of ACC-XI) unchanged, at least until the first session of the SOT.

7.3 Membership

7.3.1 The meeting welcomed the reintegration of Germany into the work of the panel at the present session, as well as the participation of Australia for the first time. It noted that the participation of many more ship-operating countries in the SOT would provide an ideal opportunity to introduce ASAP to them, and also possibly recruit more ASAP participants.

7.4 Status of ASAP Trust Fund

7.4.1 The meeting reviewed and approved a finalized statement of account for the ASAP Trust Fund for the biennium 1998/99, as well as an interim statement for the present biennium to July 2000. These statements are given in *Annex XII*. It recognized that substantial expenditures would be required during 2001, in particular to support the development and implementation of WRAP, including the engagement of a consultant as agreed under item 3.7. It therefore agreed a draft budget for 2001, including a table of possible contributions, which is given in *Annex XIII*. The Secretariat was requested to invoice contributors as usual during December 2000. The budget includes a sum set aside as a forward commitment towards the reprinting of the brochure after the establishment of WRAP. (**Action**: Secretariat.)

7.5 Election of officers

7.5.1 The meeting re-elected Dr Klaus Hedegaard as panel chairman and elected Mr Jean-Louis Gaumet as vice-chairman, to hold office until the end of the next panel session. In doing so, it noted with regret that Margaret Bushby was unable to continue as vice-chairman of the panel, and thanked her for her valuable work in support of ASAP over the past year.

8. FUTURE WORK PROGRAMME OF THE ASAPP

8.1 Programme implementation

8.1.1 The meeting reiterated that the top priority in programme implementation for the panel over the next year and more would be the implementation of WRAP. Other implementation activities would include:

(i) Continuation and enhancement of the ASAP monitoring by Météo France. (**Action**: Météo France.)
(ii) Liaison with monitoring and NWP centres regarding ASAP impacts and quality. (**Action**: Operators.)
(iii) Updating ASAP information in the Operational Newsletter and implementation of the Ship Catalogue supplement for ASAP. (**Action**: Secretariat and operators.)
(iv) Seeking support from EUMETNET for WRAP while in the EUCOS area and also for activities outside the EUCOS area as a contribution to WWW. (**Action**: chairman and EUCOS Programme Manager.)

8.2 Promotional activities

8.2.1 The meeting expressed its appreciation to the Met Office for the excellent article on ASAP recently published in the Marine Observer. It noted with appreciation that an article on ASAP was to appear shortly in the next edition of Ocean Views, published by ABOM, and suggested that a similar article might also be published in the Mariners Weather Log (NOAA/NWS). (**Action**: USA). Furthermore, the meeting suggested that an ASAP article based on that in the Marine Observer might be prepared and proposed for publication in the Inmarsat journal Ocean Voice. (**Action**: MO, Capt. G. Mackie and the Secretariat.) The Secretariat was also requested to post the ASAP Annual Report in future on the WMO web site, so that it was available for wider use and distribution by operators.

8.2.2 The meeting recognized that the ASAP brochure required some revision, but agreed that publication of the revised version should be delayed until after the implementation of WRAP and E-ASAP. The Met Office agreed to prepare a first revised draft for review by panel members before the first SOT meeting, with the new brochure to be published during 2002. (**Action**: MO.)

8.3 Annual report and other publications

8.3.1 The panel reviewed and endorsed existing procedures for the preparation of the annual report, as well as the overall structure for the 2000 report. These are given in *Annex XIV*. The Annual National Report Format was also reviewed, and a number of modifications proposed, as follows:

(i) Addition of a column to Table 1 to include information on launch method, together with a footnote as follows:

Launch method examples: deck launcher (portable); deck launcher (fixed); container (manual); container (semi-automatic); other.

(ii) Addition of a column in Table 2 to give balloon size (grams).

The revised report format is given in *Annex XV*.

8.3.2 Finally on this item, operators were requested in include in the “comments” section on the second page of the report information on system operators, e.g. ships crews, meteorological service personnel, etc.

9. CLOSURE

9.1 Date and place of ASAPP-XIII

9.1.2 The meeting noted with interest that the National Institute of Oceanography (NIO), India, which was a member of the SOOP Implementation Panel, had tentatively offered to host the first session of the SOT in the first quarter of 2002. The meeting further noted with interest the offer of Météo France to also host this meeting, should the offer of NIO not come to fruition. The chairman and Secretariat were requested to finalize the date and place of this meeting as soon as possible, and inform panel members accordingly.

9.2 Adoption of the final report

9.2.1 The meeting reviewed and adopted the final report of ASAPP-XII.

9.3 Closure

9.3.1 In closing the meeting the chairman, Klaus Hedegaard once more expressed his sincere thanks, on behalf of all participants, to the Met. Office, and particularly to Margaret Bushby and Sarah North, for hosting the meeting and for supporting it so well and hospitably, which had contributed both to the success of the meeting and the enjoyment of the participants. He noted that the WRAP project was an excellent example of the value of the panel in coordinating and strengthening ASAP globally, which was very important for many international programmes. The present meeting had succeeded in significantly advancing the planning for WRAP, as well as other aspects of the work of the panel, and he thanked all participants for their valuable contributions to this success.

9.3.2 Speaking on behalf of all participants, Gordon Mackie expressed his thanks to the chairman, both for his very able conduct of the meeting, and also for his wise and energetic leadership of the panel during the intersessional period.

9.3.3 The twelfth session of the ASAP Panel closed at 1130 hours on Friday, 29 September 2000.

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AGENDA

1. ORGANIZATION OF THE SESSION

1.1 Opening of the session
1.2 Adoption of the agenda
1.3 Working arrangements

2. REPORT OF THE CHAIRMAN

3. OPERATIONAL PROGRAMME (REPORTS INCLUDING MONITORING)

3.1 National programmes of the ASAP operators
3.2 Report of EUMETSAT
3.3 Report of ECMWF
3.4 Report of ASAP monitoring centre
3.5 Report from EUCOS
3.6 Report on the EUMETNET ASAP project
3.7 Worldwide Recurring ASAP Project (WRAP)

4. TECHNICAL ASPECTS

4.1 Development of new systems
4.2 Information from manufacturers
4.3 Communicating ASAP data to the GTS
4.4 Channels for data transmission via meteorological satellites
4.5 Data and information dissemination
4.6 Operator and system in FM 36-XI Ext. TEMP SHIP
4.7 ASAP costs
4.8 Other technical aspects

5. SCIENTIFIC ACTIVITIES RELATED TO ASAP

5.1 Report of the COSNA Scientific Evaluation Group (SEG)
5.2 Other scientific aspects

6. RELATIONS TO OTHER BODIES

6.1 Co-ordinating Group on COSNA (CGC)
6.2 CBS, CIMO, GCOS
6.3 JCOMM

7. ORGANIZATIONAL MATTERS

7.1 Status of the ASAPP
7.2 Terms of reference
7.3 Membership
7.4 Status of ASAP Trust Fund
7.5 Election of officers

8. FUTURE WORK PROGRAMME OF THE ASAPP

8.1 Programme implementation
8.2 Promotional activities
8.3 Annual report and other publications

9. CLOSURE

9.1 Date and place of ASAPP-XIII
9.2 Adoption of the final report
9.3 Closure

EUCOS activities in relation to ASAPP

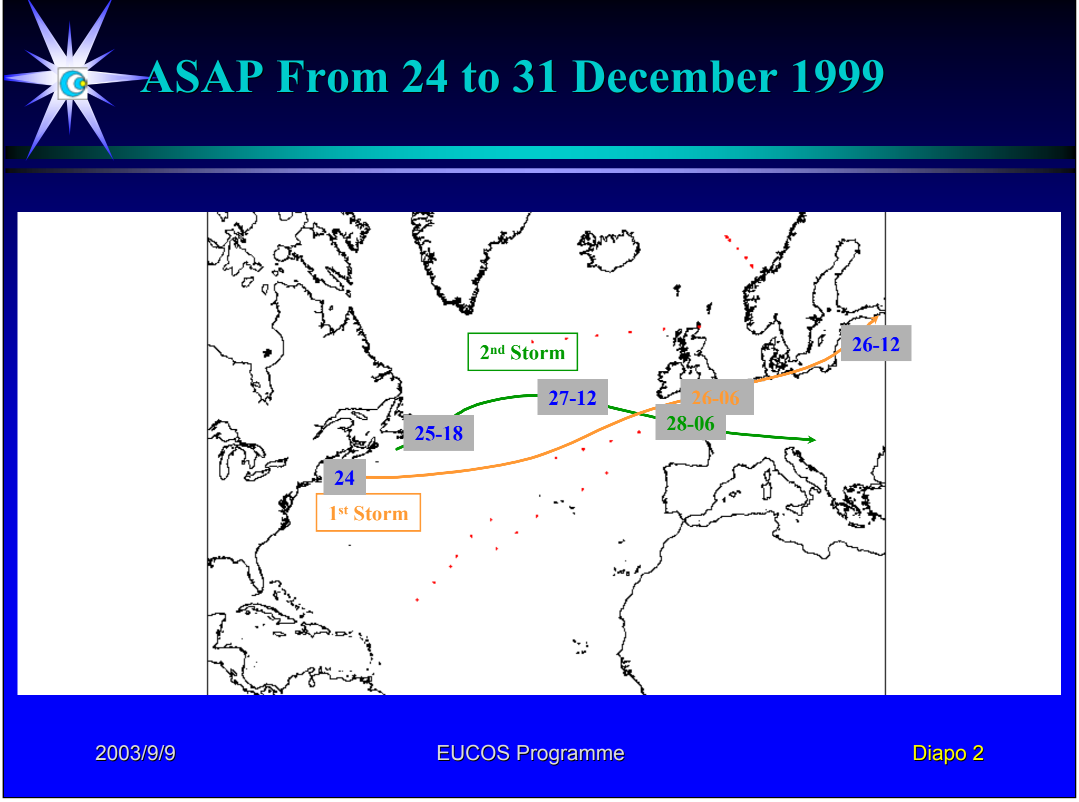
Presentation at ASAPP-XII
Reading, 27 to 29 September 2000

François Gérard, Programme manager

EUCOS is the EUMETNET programme aimed at defining the ground based observing system optimised for short range numerical weather forecast (up to 72h) over Europe.

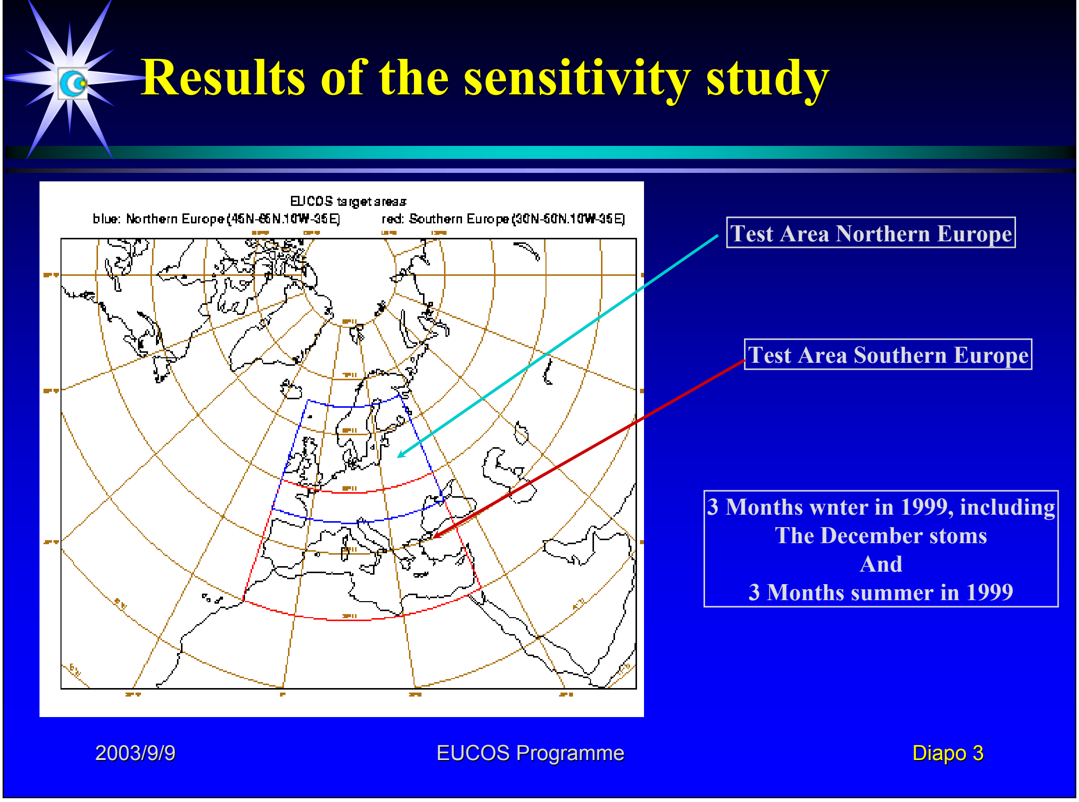
EUCOS activities in 1999 and 2000 result in the request for new observation strategies for the Atlantic Ocean, the Mediterranean and some surrounding areas over North-west Africa.

These results lead to plan for 2001 a feasibility study of observation targeting from ASAP units, which is described here, as of interest to ASAPP members.



This slide shows the tracks of the two storms having affected Western Europe end of December 1999, together with the location of the TEMP SHIP messages produced during the same period. None of these observations is located at a place and time significant for the forecast of the storms, mainly the western part of the North Atlantic ocean. Therefore, the question may be raised wether or not a new strategy targeting where and when to make a significant observation effort could have improved forecast skills during these events.

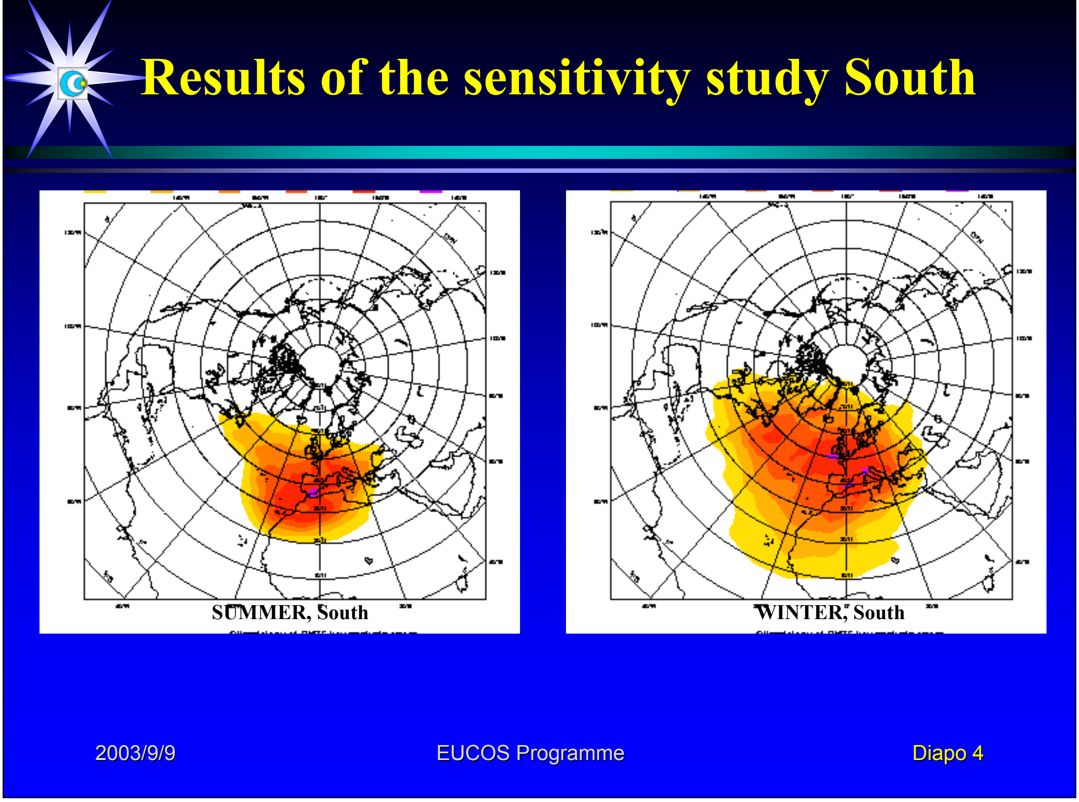
Answer to such a question is part of EUCOS problematics, which has led a study for identifying where additional observation should be implemented to increase forecas quality over Europe, as already demonstrated by an experiment like FASTEX (1997).



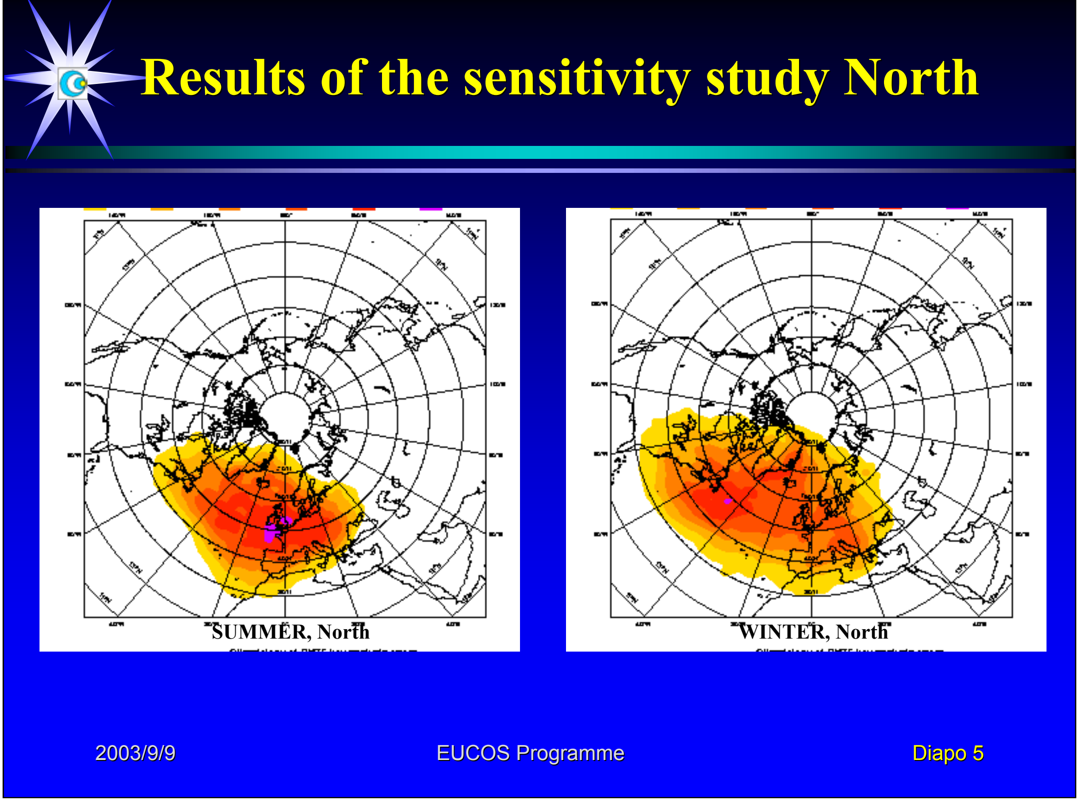
EUCOS included a Climatology of the areas senstitive for the 48h forecast over Europe. It has been performed using the ECMWF sensitivity suite, on two target areas, Northern Europe and Southern Europe, for three months in summer, three months in winter 1999. The cases of the December storms, included in the climatology period, were used to check the method validity.

What may be told here is :

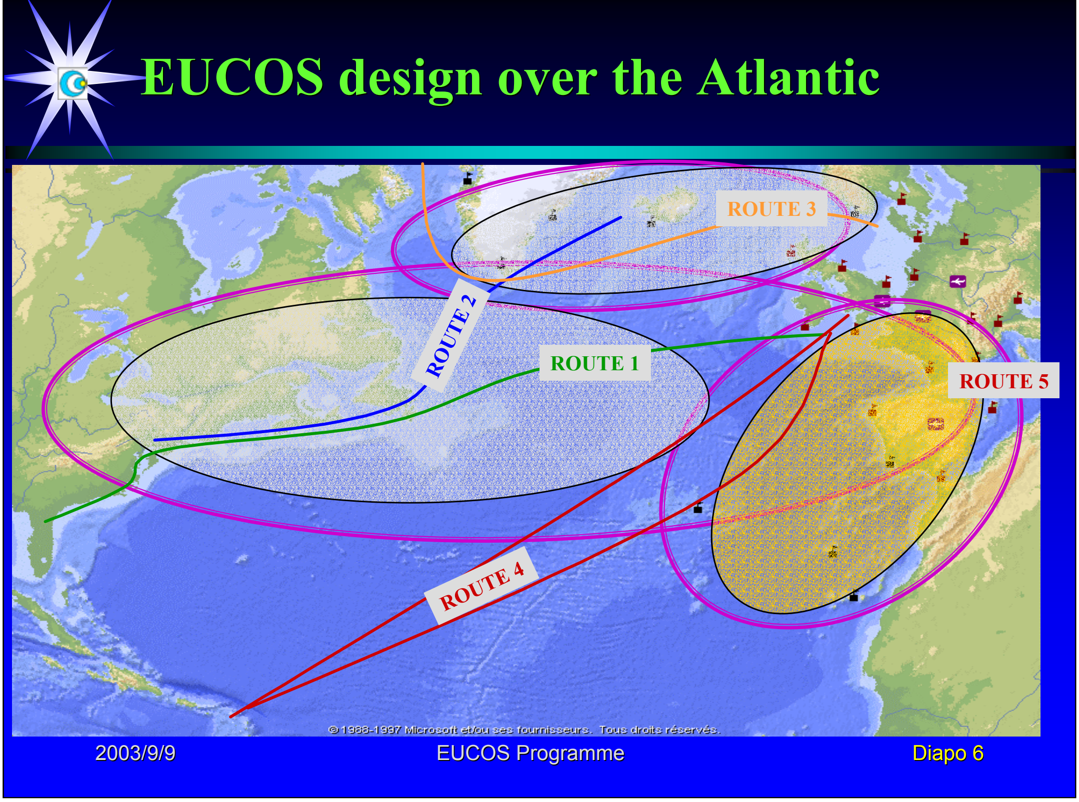
- The study confirms what was suspected in terms of location and variations of the sensitive areas (see following slides)
- The maximum sensitivity layer is around 500-400 Hpa.
- It provides guidelines for the deployment of additional profile, mainly over the Atlantic and the Mediterranean, which shall be properly sampled to produce an average improvement of 48h numerical forecast quality over Europe.



- The sensitive areas for southern Europe are closer to Europe than for Northern Europe, especially in Summer....
- The sensitive area in South-west of Iberia, identified by soms case studies is confirmed, especially in Summer.
- Southern Europe is also sensitive to what happens in the Northern part of the EUCOS area in Winter
- Europe itself is a sensitive area.... what may be also considerd for the territorial network design and operations.



- A band of Atlantic between 30 and 60° North with extension in the Denmark strait and the Norvegian sea is globally sensitive all the hear round. The most sensitive is
  - Close to America and partly over US-Canadian territory east of 100° W in Winter
  - Shifted to the east in Summer, over North-West Africa, with extension in the Atlantic up to the Azores and Cape Verde islands as well as in the Mediterranean basin, this confirming part of the intuitions of UKMO for the Atlantic part of this sensitive area.



Three main areas over the Atlantic, where an specific observation effort shall be implemented are sketched here. The proposal is to propose new observation schedule on the route operated under E-ASAP in 2001 : target the areas, with shift to the West in winter and to the East in summer. The routes are :

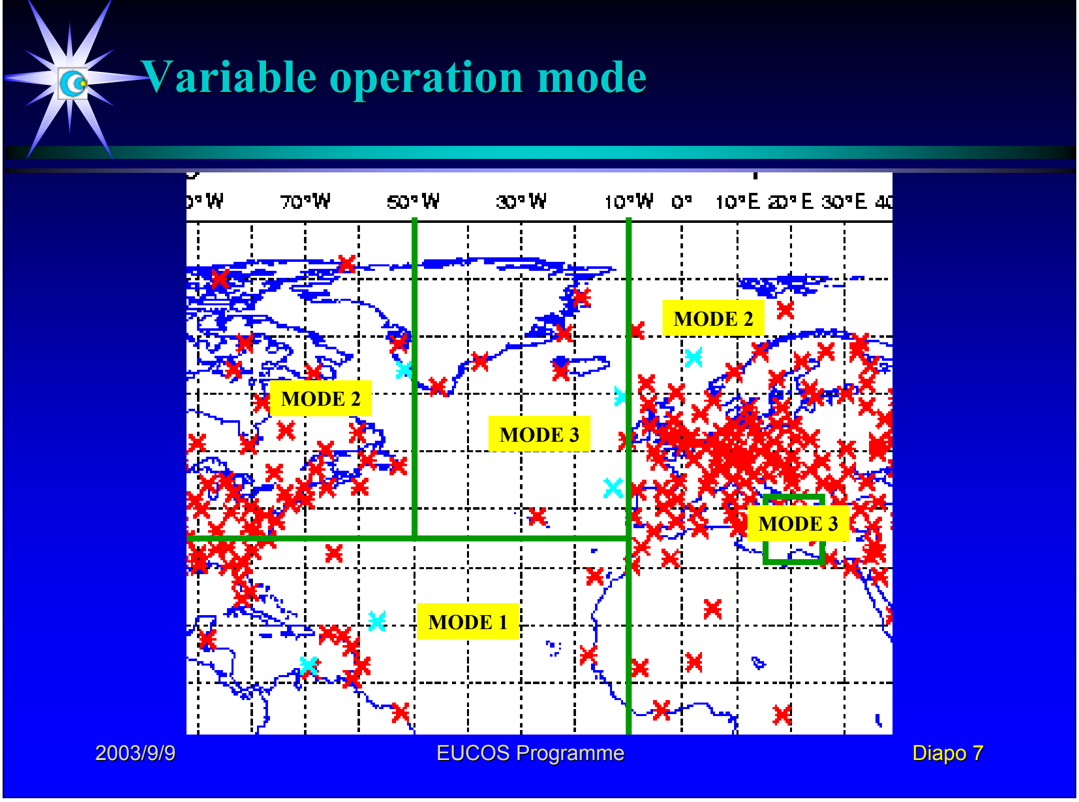
Route 1 :the UK unit plus the new Atlantic E-ASAP unit;

Route 2 :the swedish / icelandic unit;

Route 3 : the two danish units;

Route 4 : the four french units plus one german unit ;

Route 5 : the new Mediterranean E-ASAP unit.



A variable oservation schedule, depending on position will be tested. Three operations mode are identified :

Mode 1 : 2 soundings at 00 and 12 UTC, the ususal practice;

Mode 2 : 2 soundings at 06 and 18 UTC, a new practice to be implemented when cruising close to coastal radiosonde stations operating at 00 and 12 UTC, to complement sampling at intermediate times and avoid redundancy with stations less than 500 km from the ship. It is recommended to implement it when crusing within the EEZ of coastal state (less than 200 nm from coast).

Mode 3 : 4 soundings at 00, 06, 12, 18 UTC, when crossing the sensitive areas.

The slide above illustrate in a simple manner the areas where these modes shall be implemented, based on the geometry of the routes.

The experiment will take place during two months in 2001, and will be co-funded by EUCOS and COSNA, pending final decision by governing bodies. It is expected to report on this at the next ACC meeting, in 2002.

Terms of Reference for the WRAP Consultancy

1. Approach P&O Nedlloyd Fleet Manager with regard to the use of one of their round-the-world container vessels for ASAP (taking into consideration possible renewal of the fleet).

2. Present to the Fleet Manager the concept of ASAP, in particular the NOAA/OGP concept based on the Vaisala DigiCORA III (MW21) and the designed deck launcher. The MW21 should be on the bridge and the launcher at an adequate free area, e.g. monkey island or bridge wing (aft).

3. Assuming agreement, agree on a selected ship. Study General Arrangement (GA) Plan of ship in P&O office.

4. Visit ship (London or Rotterdam), discuss operation of ASAP by ships' officers (cadet?). The equipment is expected to have automatic Inmarsat-C transmission and a workload for the operator should then be about half an hour/sounding.

5. Identify ports for logistics for ASAP. A likely port for the installation of the equipment would be at either Tilbury or Rotterdam, while consumables most conveniently may be provided at Melbourne by the Australian Bureau of Meteorology.

6. Obtain full details of ship's communications (for admin. ASAP traffic), obtain up-to-date sailing schedule of ASAP vessel. Obtain agreed P&O contact point for ship's movements, e.g. change of ports, ETAs etc (particular ship's shore manager).

7. Write report on the study for ASAPP Chairman, cc WMO Secretariat (Peter Dexter).

Timescale: 4 - 8 man-weeks distributed.

Annex V

NEW UNITED STATES BALLOON LAUNCHER

The NOAA Office of Global Programs and the National Center for Atmospheric Research have developed a new, portable balloon launcher that may be used on ASAP ships. The design concept for the launcher is to give ASAP operators aboard ship a relatively lightweight, portable, and marine hardened device for launching balloons. The unit is constructed of fiberglass and stainless steel and uses a “bag launcher” concept for holding the balloon until launch. The unit is rugged enough for commercial shipping and may be easily moved aboard ship to minimize balloon launching problems.

Figure (1) shows the side view of the launcher. Note the fiberglass construction, Delrin leg and wheel assembly and sturdy locking devices

Figure (2) shows the rear stainless steel leg assembly.

Figure (3) shows the launcher deployed with the supporting legs extended

Figure (4) shows the launcher open. Note the balloon support flap that will be extended for launch.

Figure (5) Close up of the support flap with Velcro launcher bag attachment.

Figure (6) Close up of Radiosonde holder

Figure (7) Inside of launcher showing power supplies for fan for radiosonde ventilation

Figure (8) Launcher deployed with launcher bag attached

Figure (9) Balloon inflated and held in place by launcher bag

Figure (10) Side view of inflated balloon in launcher bag, with radiosonde held in place, and ventilator piping for stabilizing radiosonde sensors

Figure (11) Balloon being released using heavy-duty zipper

Figure (12) Balloon launched with radiosonde attached

Figure (13) Photograph of front view of launcher showing relative size to an operator.

GEOLINK

GEOLINK PRESENTATION

1.- COMPAGNY

1.1.- Main activity

French private company created in 1991, Geolink is now employing a total staff of 96 persons. The head office is located at Roquevaire, near Marseille, south of France. Main activity consists in satellites communications and navigation systems. Our agency in Paris is in charge of land field communication applications while Roquevaire manages the maritime field including both communication and navigations systems for Merchant, Fishery and Navy sectors. In connection with the maritime department, 12 agencies, spread over in main harbours all along the coast, represent our technical support for on board installations and services.

1.2.- Meteorological department birth

At the first beginning, 4 years ago, C.N.E.S. (French space launch center for “Ariane” rocket) published a tender to acquire a wind-finding system based on GPS radiosounding. As our engineers were already experts in GPS and radio, we submitted an application in spite of famous competitors participation such as AIR and Vaisala.
Finally, we won this tender and then we decided to carry on improvement and adaptation of the sonde to meet meteorological specifications (weight, dimensions, humidity sensor, price…etc.).
Geolink Meteorological Department has been actually created in 1998.

2.- REFERENCES

2.1.- Evaluations and tests

Our system has been evaluated by Méteo France and many demonstrations with comparison flights have been performed by others foreign Met Offices such as:

- UK Met Office (Beaufort Park)
- National Weather Service (Washington)
- Deutscher Wetterdienst (Lindenberg)
- Algerian Met Office (Alger)

Note: Météo France performed several evaluations in its laboratory at Trappes and also some tests in real conditions from a French ASAP ship.

In the near future, Geolink sondes will take part in the following inter-comparison campaigns:

- UK Met Office intercomparison — Camborne — Dec 00
- WMO intercomparison of GPS radiosondes — Brazil — May 01

2.2.- Equipments in operation

Scientific purpose

CNES 1 System

Military purpose

French Army: 1 System

French Air Force 3 Systems

Meteorological network

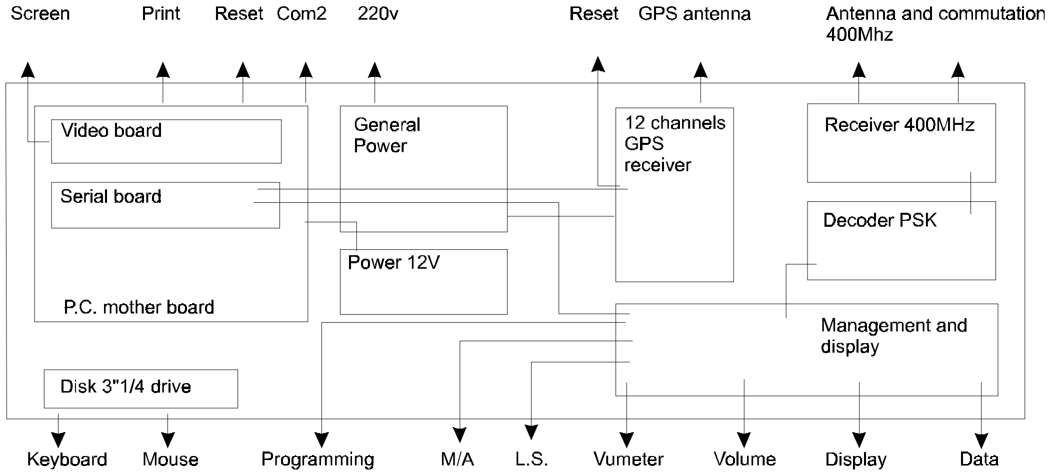
At the time being, we have no system routinely operating in the WMO network.

3.- SYSTEM DESCRIPTION

3.1. – SR2K ground station

The station is mounted in a 19 inches case and consists of:

- 400Mhz radio receiver module
- 12 channel GPS receiver
- Telemetry decoder board
- Power supply (117-220v 50-60Hz)
- Management and display board
- PC mother board
- Hard drive disk
- 3''1/4 drive
- Data acquisition software working under NT4 or NT5
- A graphic Module (Optional)



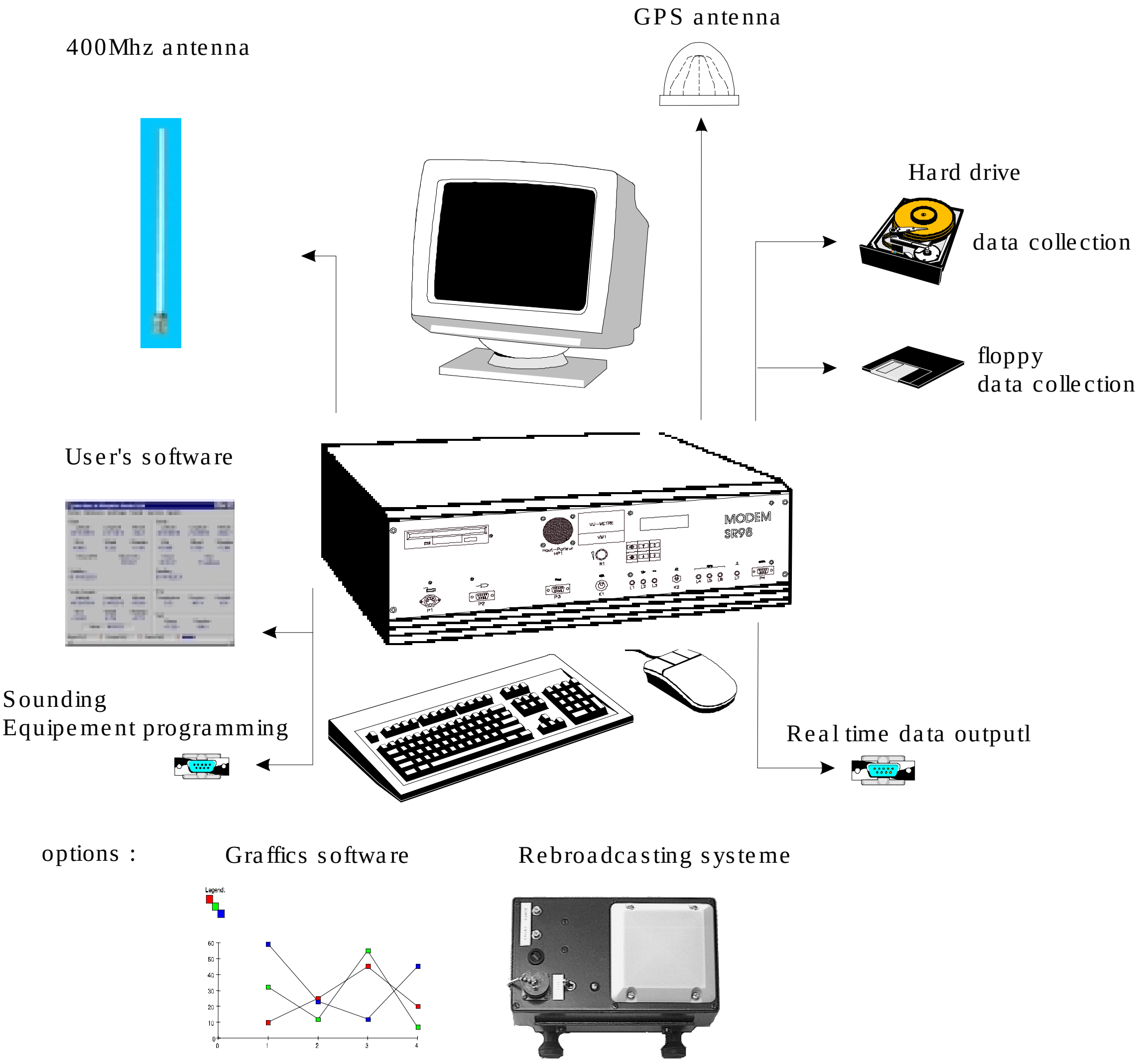
Geolink presentation

Peripherics connected to the SR98 :

- Display/ monitor
- Keyboard
- Mouse
- GPS antenna with 30 feet coaxial cable RG223U
- 400 MHz antenna with 30 feet coaxial cable
- Sondes transmitter programming interface

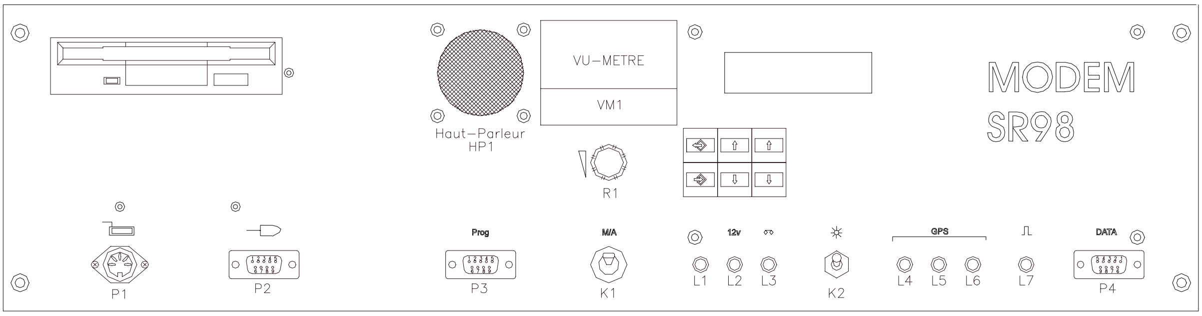
- Printer.(Option)
- GPS signals rebroadcasting system (Option)

Besides the registration and the storage of telemetry data on hard disk and 3 ” 1/4 disk the station provides a RS232 serial output allowing real time data processing, on a specific application like the calculator STAR of Meteo-France.

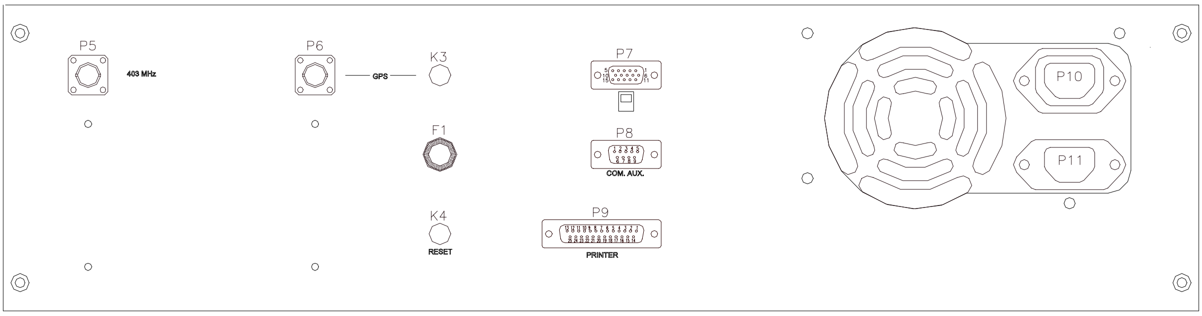


Geolink presentation

Front panel view:



Back panel view :



Low noise antenna amplifier :

Using low noise AsGa and MMIC technology, its position upright at the antenna in a weather-tight box gives optimum signal to noise ratio even with long cable runs.

Radio receiver module :

Double conversion synthesised Superhétérodyne.
Frequency coverage : 400 Mhz to 406 Mhz
Sensivity : 0,3 micro Volt for 10^{-4} B.E.R.
Selectivity : +/- 15 Khz at 3 dB
+/- 100 Khz at 70 dB
Stability 2ppm internal reference (TCXO)
Digital frequency display

Telemetry decoder :

This module is connected to the receiver output and unscrambles the various telemetry information to be processed later : calculated pressure, temperature, humidity, wind parameters.
The final calculation is made by the calculator STAR (Meteo-France).
The data output interface is a standard RS232.

GPS antenna :

Over ground plane with 26 dB gain L.N.A. The aperture of the turnstile antenna is wider and more regular than that of a standard patch antenna usually connected to a GPS receiver

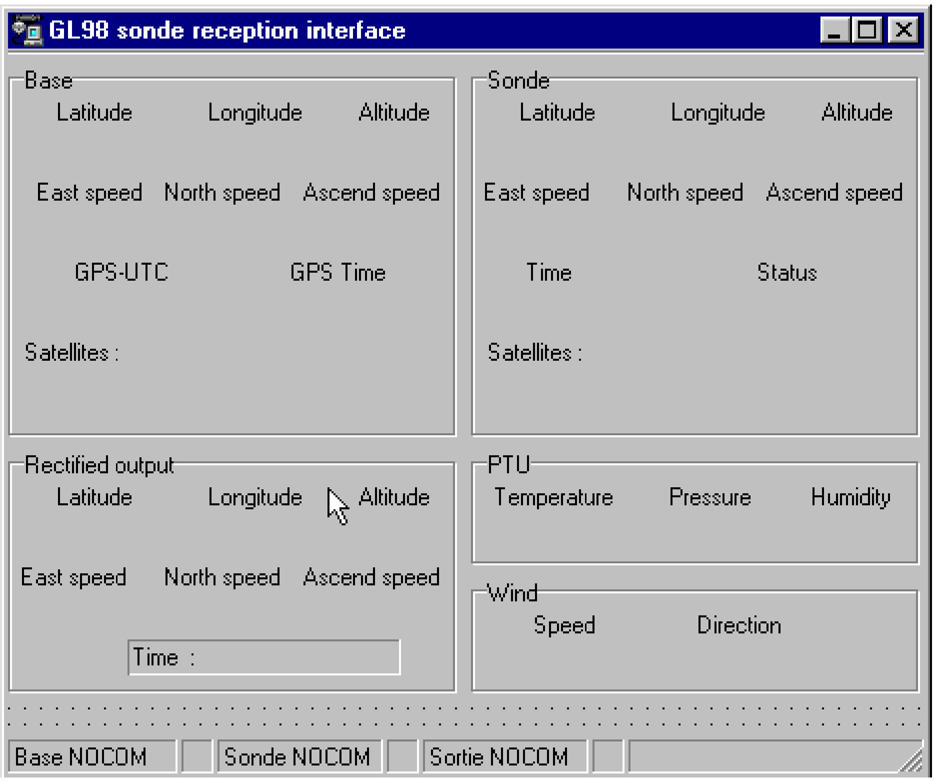
GPS receiver module:

12 channels receiver providing GPS data for differential correction.

In the 0 to 32 km zone the accuracy on the altitude is better than 10m and the resolution will depend on the observed layer. For information, it will be better than 1 meter for 50m layers with a balloon raising at 5 m/s.

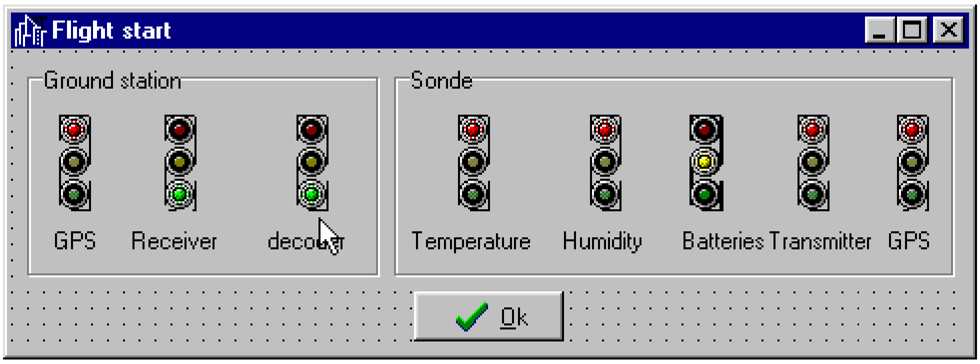
Software :

A software is provided with the receiving station (under NT4 or NT5) for data acquisition. :

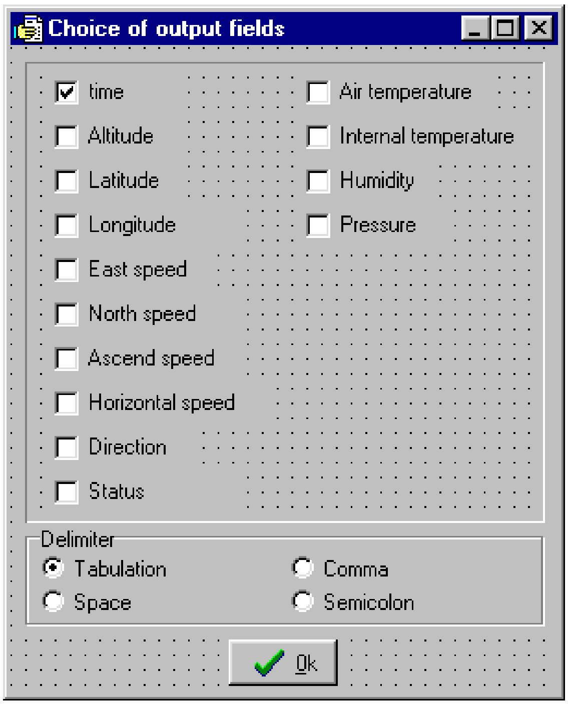


Geolink presentation

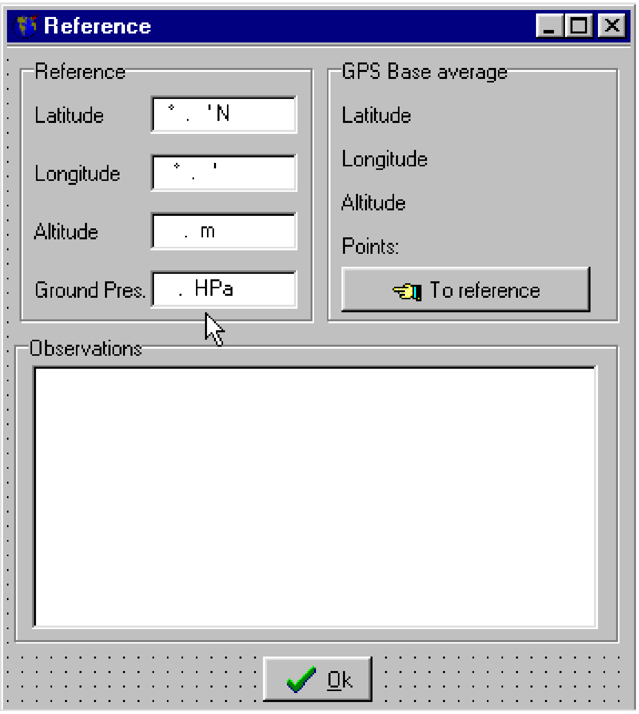
A special departure procedure shows the status of all parameters in the radiosonde transmitter insuring a safe launching of the balloon :



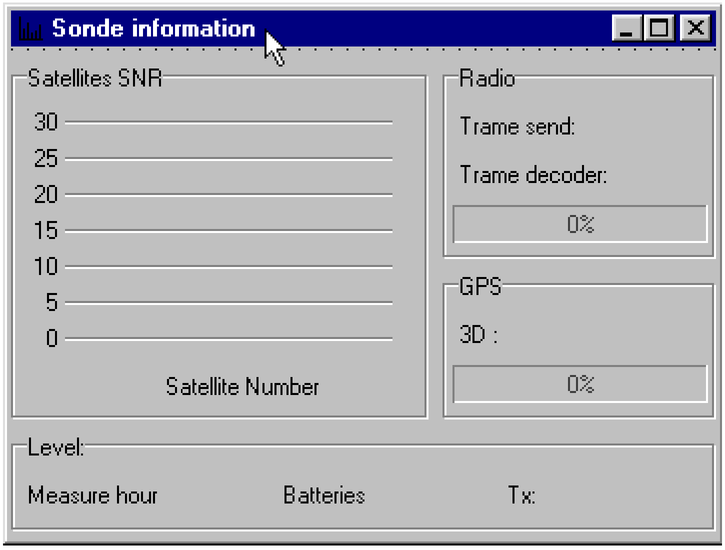
Thanks to this software it is possible to format data, that means to select fields to be recorded :



Ground station data may also be entered to initialise the differential station and the barometric equation

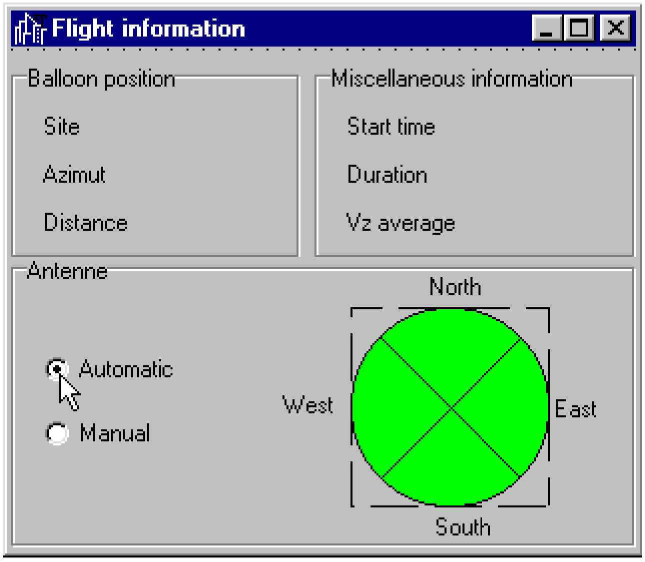


The software gives some statistical information about the flight :

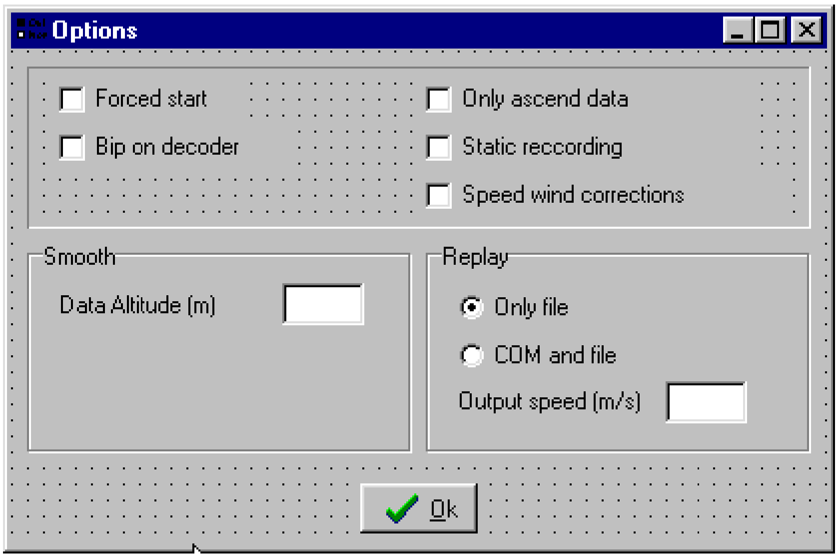


Geolink presentation

Information on the switching of the antenna allows to visualise the active antenna.



It is possible to record automatically either the whole flight, or the descent only :



Options :

GPS Rebroadcasting system :

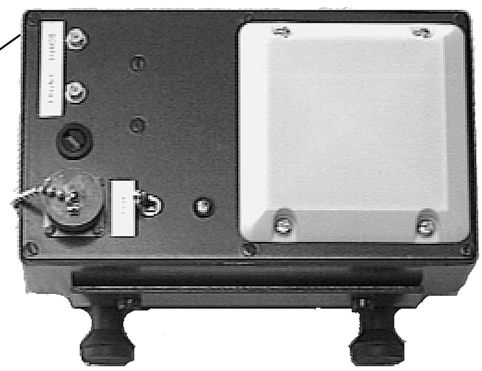
It allows the balloon GPS system to be initialised inside a building. This gives great ease in preparing the flight especially in bad weather conditions, its use is recommended

Technical features :

The outside antenna is a patch with 36 dB gain
The rebroadcasting antenna is a low loss patch

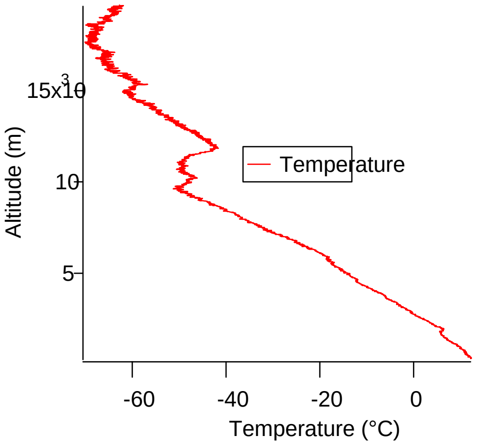
max. output -10 dBm

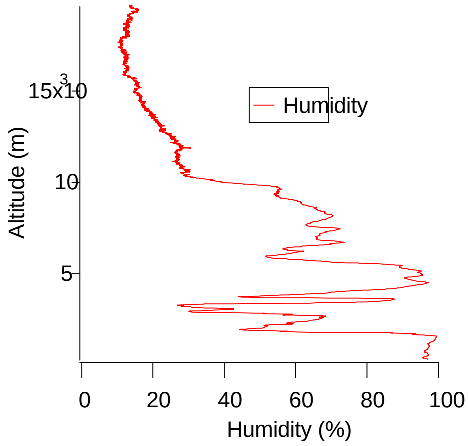
power supply 8-32 v 200mA max
On/off switch
led
190 * 110 * 65 mm

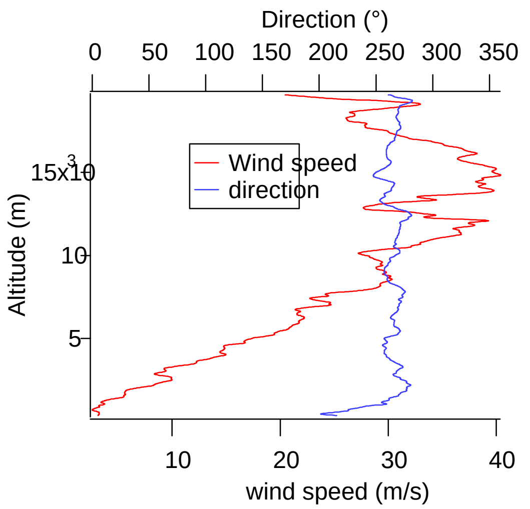


Graphic module

Software allowing to display data under graphic shape, for i.e. :







3.2.- Radiosondes PTU

This monobloc radiosonde is equipped with sensors allowing the different measurements and with a radio transmitter. Access to batteries and programming compartments is very easy

Pressure :
The pressure is calculated by the barometric equation from GPS altitude, temperature and humidity.

Humidity :
The humidity is measured by the help of a capacitive sensor whose capacitive value is proportional to the rate of relative humidity.

It consists of 3 fundamental elements :

- A basic substrate is an electrode
- A dielectric whose permissiveness varies with the relative humidity value
- A porous electrode is the second electrode of the electrical condensator. This porous electrode with a low response time is also an atmospheric filter.

Temperature :
The temperature is measured by help of a thermistor sensor.

Wind :
Components of the wind speed are measured by help of the GPS. Wind speed and direction are calculated from Doppler measurement. This gives an accuracy of 0,1 m/sec on the three axes with inverse differential correction.

GPS-BASED RADIOSONDE SYSTEM

GPSonde GL98

(WMO code 77)

SR2K Ground station

Main Features

GPSonde GL98	SR2K Ground station
FULLY-CODED GPS RADIOSONDE	**19 Inch RACK FITTED**
PRESSURE DERIVED FROM GPS ALTITUDE	**12-CHANNEL GPS RECEIVER**
SENSORS CALIBRATION STORED ON EEPROM	**REAL TIME DIFFERENTIAL GPS (DGPS)**
GROUND CHECK FACILITY	**BOTH RAW AND PROCESSED DATA AVAILABLE**
400 TO 406 MHz DIGITAL SYNTHESISER	**EDITION OF WMO CODE MSG**
200 KHz STEP FREQUENCY SETTING	**STANDARD COMPUTER ABILITIES**
DIGITAL TRANSMISSION IN 1 SEC CYCLES	**FRIENDLY USE SOFTWARE WORKING ON NT4 & NT5 OPERATING SYSTEM**
NARROW BANDWIDTH	**REAL TIME GRAPHICAL VISUALIZATION**
POWER SUPPLY WITH DRY CELL BATTERIES	**BUILT-IN FREQUENCY SCANNER**
BATTERIES LIFE > 3HOURS	**OMNIDIRECTIONAL AERIALS EASY TO INSTALL**
NO SUSPENSION LENGTH LIMITATION	**SONDE PROGRAMMING INTERFACE**

GEOLINK - Quartier la Chaume - Pont de l'Etoile - 13360 Roquevaire - France
Tél : (33) **4 42 32 99 74** - **Fax** : (33) **4 42 32 94 95**
E-mail: rpepin@alhena-groupe.com

SUMMARY OF TECHNICAL SPECIFICATIONS

GPSonde GL98 RADIOSONDE:

GENERAL

Dimensions	: 113 x 155 x 146 mm
Weight	405 g (including batteries)

BATTERIES

Technology	: 1.5V Alkaline
Autonomy	: >3 h
Package	: 8-battery pack

TEMPERATURE

Sensor type	: Thermistor
Measurement range	: +50° to –90°
Resolution	: 0.1°C
Absolute accuracy	: +/- 0.5°C
Response time	: <2s
Measurement rate	: 1 Hz
Calibration adjustment	: Calibration prior launch
Factory calibration	: Stored in EPROM

HUMIDITY

Sensor type	: Capacitor
Measurement range	: 0% to 100%
Resolution	: 0.1%
Absolute accuracy	: +/-5%
Response time	: <2s
Measurement rate	: 1 Hz
Calibration adjustment	: Calibration prior launch
Factory calibration	: Stored in EPROM

WIND MEASUREMENT

General	: DGPS with C/A code altitude
Altitude Range	: Unlimited with authorisation
Position accuracy	: 10 m
Horizontal Wind accuracy	: 0.15 m/s
Wind direction accuracy	: 2 °
Position resolution	: 0.01 m
Horizontal wind resolution	: 0.01 m/s
Wind direction resolution	: 0.1 °
Measurement rate	: 1 Hz

TRANSMITTER

Frequency range	: 400 to 406 MHz
Frequency step	: 200 KHz
Frequency setting	: Programming interface
Maximum drift	: +/- 1 KHz
Output Power	: 300 mW
Modulation type	: Digital PSK 4800 bauds

CALIBRATION

Factory calibration	: Stored on EPROM
Ground Check	: Prior launch

SR2K GROUND STATION

GENERAL

Dimensions	: 19'' rack - Width: 450 mm – Depth: 320 mm – Height: 135 mm
Weight	: 12 kg
Consumption	: 150 W
Output	: Real time data, COM1, COM2, LP1, VGA, USB, PS2, Ethernet
Programming interface	: Front panel connector with cable
GPS	: 12-channel receiver
Computer functions	: Non dedicated PC allowing work on others Windows applications
Accessories	: All standard computer accessories can be connected: Printer, modem, …

TELEMETRY

Built-in receiver	: 400 – 406 MHz digital Synthesiser
Tracking range	: 250 Km
Modulation	: PSK

GEOLINK - Quartier la Chaume - Pont de l'Etoile - 13360 Roquevaire - France
Tél : (33) **4 42 32 99 00** - **Fax** : (33) **4 42 32 94 95**
E-mail: rpepin@alhena-groupe.com

Windfinding methods in the Sounding System of Vaisala

2000-09-27…29
ASAP Panel
Reading, UK

Erkki Järvinen
Product Line Manager
Upper Air Division

Contents

- GPS Performance Improvement Project
- ASAP Automation
  - DigiCORA III
  - Automation in Sounding Processor & Launching System
  - Service & Maintenance Concept
- GPS Windfinding
- Loran-C Windfinding
  - Automatic Loran-C Chain Selection
  - On the Windfinding Accuracy of Loran-C
  - Upgrade Path from Loran-C to GPS
- RS90

VAISALA

GPS Performance Improvement Project

Starting Point:

- Vaisala's storage tests for GPS-121 modules indicated in Summer 1999 an IF drift
- Station monitoring focused to GPS performance
- Customer Feedback analysis from windfinding perspective starts

- Improvement project launched on September 3th 1999.
  - Quality manager as team leader, 10 to 15 team members
  - Project meetings twice a week

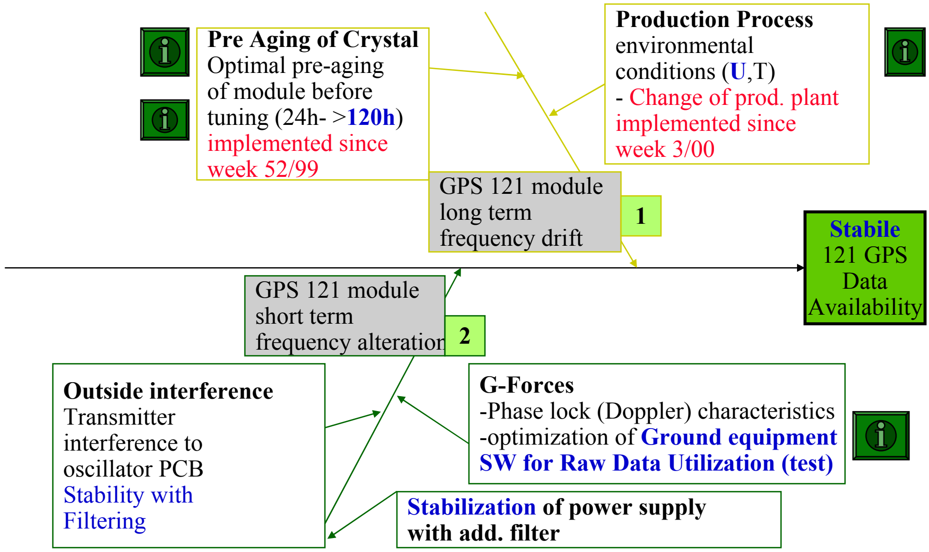
VAISALA

A set of simultaneous tests started

- Gather statistics of IF drift, magnitude of the problem
- Aging tests
- Aging tests in different humidities
- Drying tests with heat treatment
- Drying tests with heat treatment and power supply
- Shock and g-force tests
- Battery performance teats
- Balloon pendulum effects
- Oscillator clock start-up tests
- Several test setups with electronics changes
- Massive test sounding operation (300 soundings)
- Engagement of suppliers in investigation (TQ)

VAISALA

Conclusions / Implementation



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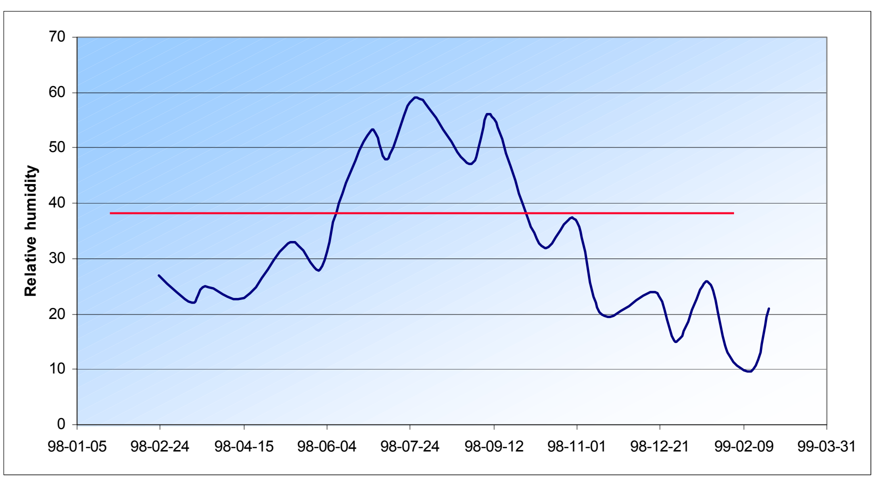
Relative humidity at sub-contractor



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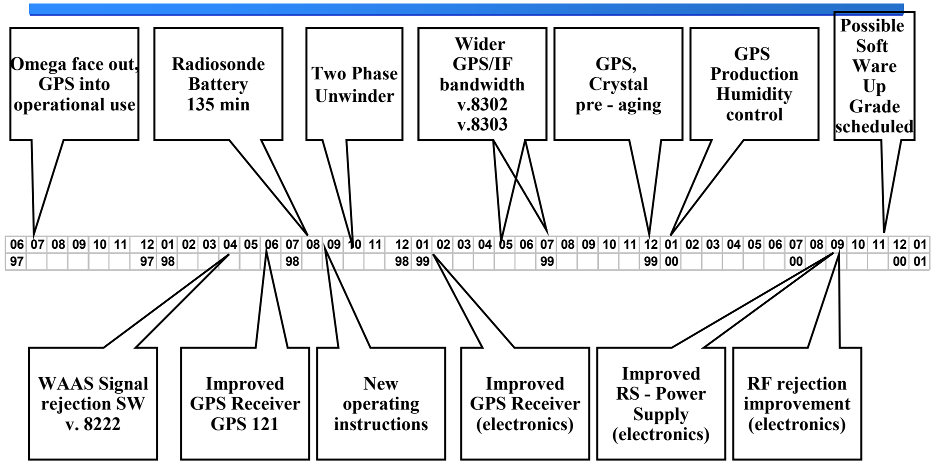
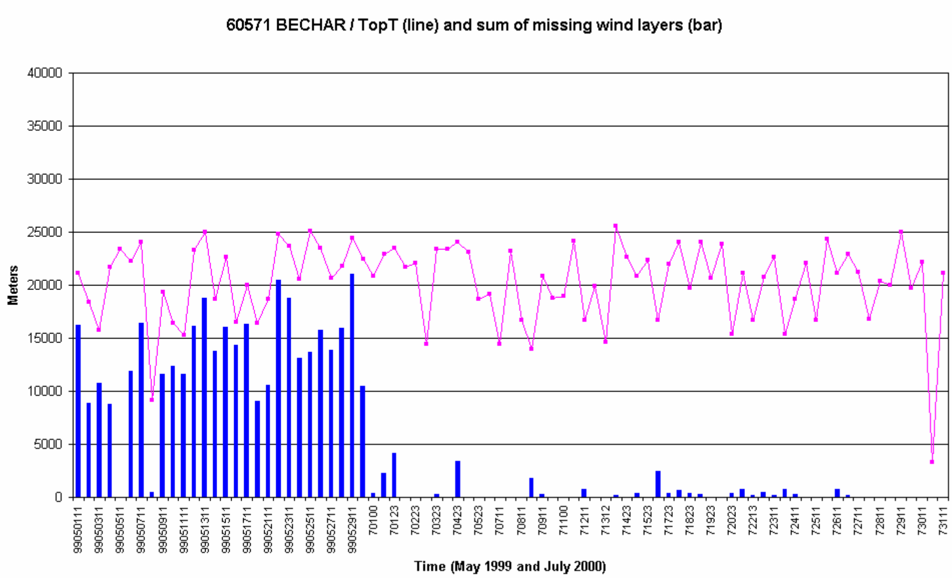
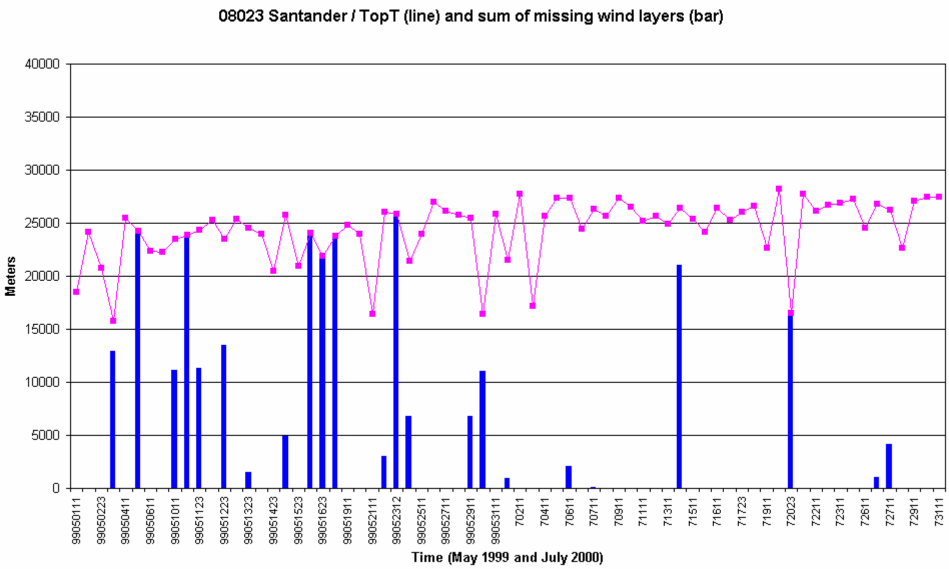
Chronological order of GPS Improvements



VAISALA



VAISALA



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Further monitoring of performance stability

- Storage tests according to normal routine
- Aging tests with new modules, special attention to crystal performance
- Monitoring of test soundings at Vaisala
- Monitoring of synoptical sounding network
- Customer feedback process

VAISALA

DigiCORA III

The New Generation Sounding System

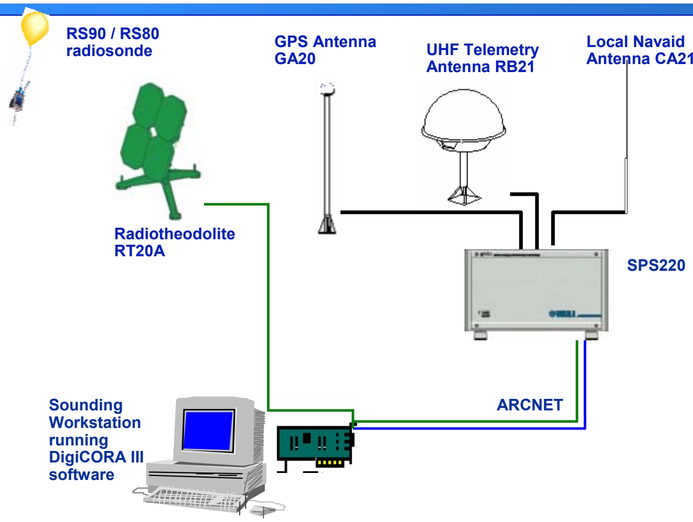
VAISALA

DigiCORA III

The "Operator-free and LAN-based Upper Air system concept"

- **Standard functionality of sounding ground station**
- **PTU and Wind data collection, processing and archiving**
- **Raw PTU data graphical display**
- **All functions accessible from a single interface**
- **Access to software functionality dependent on user level**
  - Standard Level / Operators: Soundings only (default), expandable
  - Advanced Level / System Administrators: Soundings, simulations, system parameters, Operator access
- **All user prompts can be translated / localized**
- **Stable and robust software design**
  - Modular structure, discrete and autonomous processes

DigiCORA III Structure



DigiCORA III in ASAP

Easy to use compared to existing ASAP installation:

- **Automatic Loran-C chain selection**
- **Possibility to use Inmarsat C**
  - **Inmarsat C coordinates are fed to the system automatically**
  - **Compared to DCP, does not loose data in compression**
  - **Compared to DCP, the data transmission is 100% vs. 80%**
- **Supports BUFR message format**
- **In next SW-release: Possibility to feed the surface pressure automatically, P-value from radiosonde or from AWS.**

VAISALA

System Upgrade Path

Most surface equipment can be upgraded to DigiCORA III

- Processor card upgrades may be required
  - PTU upgrade: PTU Processor card UPP210A
  - GPS wind upgrade: GPS Processor card MWG203
  - Loran-C wind upgrade: VLF-Navaid Processor card MWV201
- DigiCORA MW11 / MW11A
  - MW11: Subrack upgrade to MWF12F
  - MW11A: No internal modifications required
- MARWIN MW12 / MW12A
  - MW12: Subrack upgrade to MWF12F
  - MW12A: No internal modifications required
- DigiCORA II MW15
  - No internal modifications required
- Radiotheodolite RT20
  - RTC20, RTH21 and Card frame need to be upgraded

VAISALA

Service and maintenance Agreement

New service concept

- Levels of support optimized for different customer needs
- Annual fee covers all work done within the contract framework
- Simplifies maintenance
- Guarantees up-to-date software at all times
- Possibility of remote software updates and system maintenance

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Service and Maintenance Contract

CASE: DigiCORA III

Level 1: Software Maintenance (default)

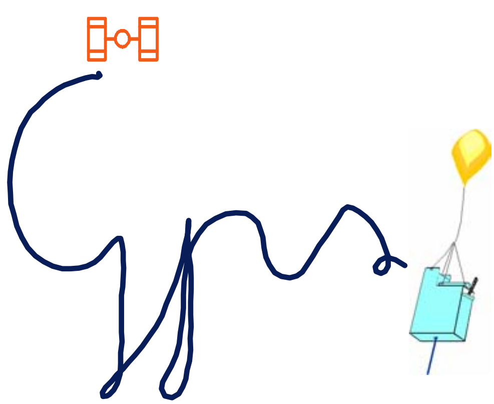
- Sounding Software updates and new versions
- Remote Diagnostics service
- Require efficient data transmission, for eg. Inmarsat MiniM

Level 2: 24h HelpDesk Services including Spare Parts

- Includes Level 1
- 24 hour Technical Assistance service, 7 days per week
- Guaranteed Spare Part Availability
- Level 3: On-site Support
- Includes Level 1 and 2
- Annual one day site visit for Maintenance
- Guaranteed response times for On-site Technical Assistance and Expert Services

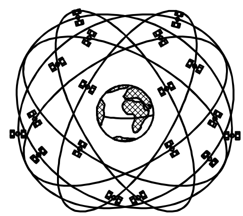
VAISALA

Windfinding Technology with GPS



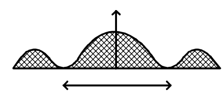
GPS (Global Positioning System)

24 satellites in 6 orbital planes with a 55 degrees inclination at a distance of 21000 km from earth.



All satellites use two carrier frequencies of 1.226 (L2) and 1.575 (L1) GHz to transmit BPSK modulated spread spectrum signals.

Signal level -130 dBm at receiver i.e. 20 dB below thermal background noise.



Vaisala GPS: Codeless technique with Carrier Doppler shift observable.

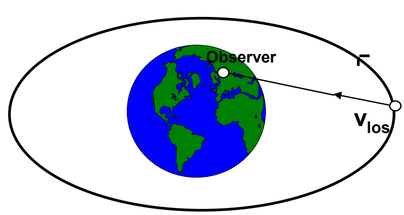
Doppler Observable

The GPS121 receiver in the radiosonde measures doppler shifted carrier wave frequencies of the GPS satellites.

The doppler shift of the received signal is directly proportional to the line-of-sight velocity between the user and the satellite.

$$\Delta f = (v_{line-of-sight} / c) f_{carrier}$$

where c is speed of light and $f_{carrier}$ is the nominal GPS L1 carrier frequency



VAISALA

Codeless, Digital GPS Solution

Codeless GPS receiver:

- Zero-IF GPS radio
- Full custom ASIC

Features:

- Unique digital codeless 8-channel GPS receiver.
- Digital squaring of GPS BPSK signal for spread spectrum removal.
- 8 independent 4th order digital PLL's for Doppler tracking.
- Doppler measurement resolution 5 mHz at 24 bits

VAISALA

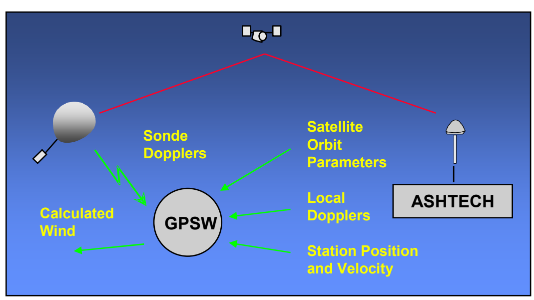
GPS Windfinding

The Wind Equation

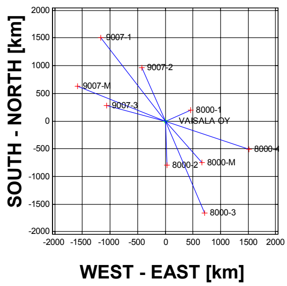
$$\mathbf{D} \cdot \mathbf{x} = \mathbf{f}$$

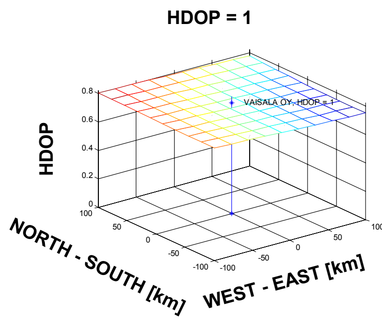
direction cosines · sonde velocity = sonde doppler

$$\underbrace{\begin{bmatrix} d_x^1 & d_y^1 & d_z^1 & 1 \\ d_x^2 & d_y^2 & d_z^2 & 1 \\ \dots & \dots & \dots & \dots \\ d_x^n & d_y^n & d_z^n & 1 \end{bmatrix}}_{n\times 4}^{\mathbf{D}} \underbrace{\begin{bmatrix} v_x \\ v_y \\ v_z \\ v_t \end{bmatrix}}_{4\times 1}^{\mathbf{v}} = \underbrace{\begin{bmatrix} f^1 \\ f^2 \\ \dots \\ f^n \end{bmatrix}}_{n\times 1}^{\mathbf{f}}$$



Loran-C

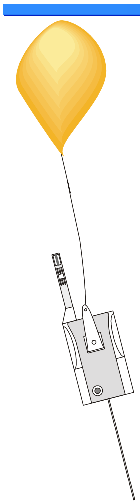




Foreword

- There has been growing uncertainty in the meteorological community about the future of upper air soundings using Loran-C radionavigation system.
- This presentation summarizes latest information in order to give a concise view of the usefulness of Loran-C on meteorology.

Why Loran-C windfinding



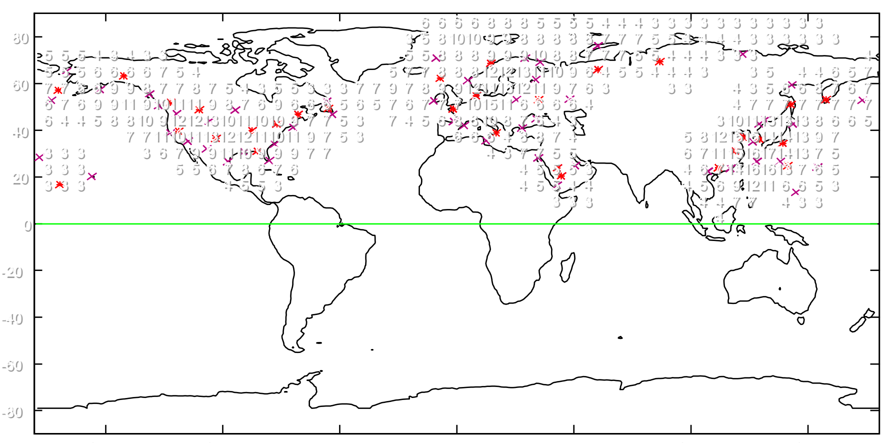
Advantages

- **Low cost radiosonde**
- **Accurate**
  - **Loran-C accuracy exceeds numerical forecast requirements**

Limitations

- **Regional coverage**
- **Sounding geometry must be taken into account: Automatic chain selection.**
- **Chayka off-air four days each month**

Loran-C and Chayka Coverage

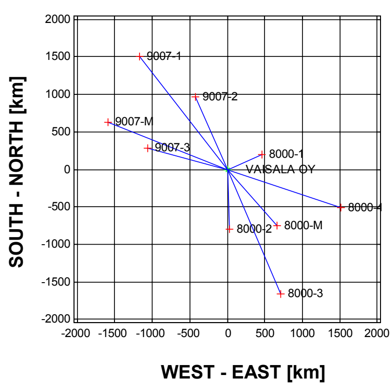


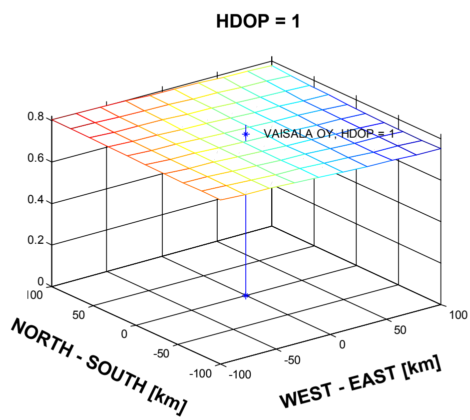
Station Availability, accuracy -1+2 stations

NOTICE: This is an estimate of the expected coverage

Automatic Loran-C Chain Selection

Good Loran-C geometry





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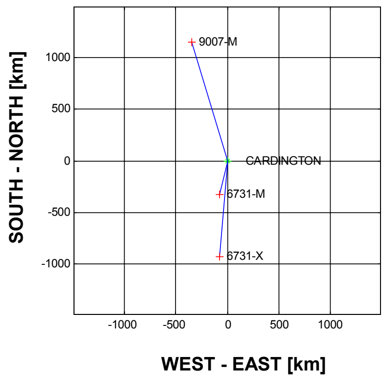
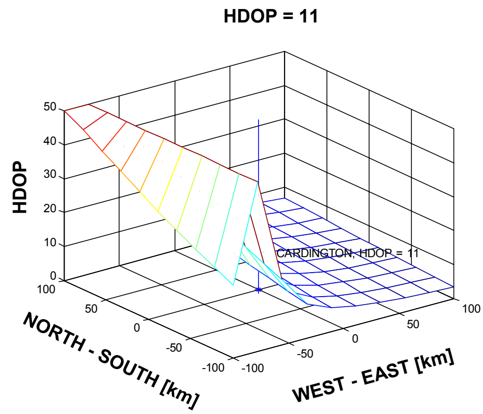
Poor Loran-C geometry





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Sounding geometry

Dilution of Precision (DOP) describes the effect of transmitter geometry on the windfinding accuracy

Horizontal DOP	Geometry	Accuracy
• HDOP < 5	Good	Best accuracy
• 5 - 10	Moderate	Reduced accuracy
• 10 - 20	Poor	Missing winds
• HDOP > 20	Bad	No wind

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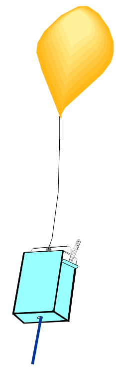
Automatic Loran-C Chain Selection

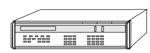
Loran-C windfinding

- Vaisala Loran-C receiver uses two Loran-C chains in soundings.

Automatic Chain Selection

- Automatic Loran-C Chain Selection selects the best two chains out of four predefined alternatives to be used in the sounding before the sounding starts.
- The selection is based on station geometry and signal quality





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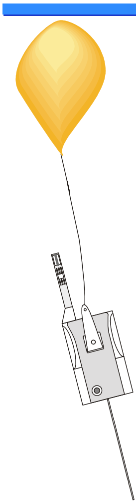
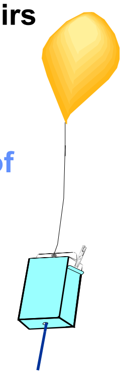
Objectives

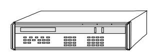


- To get the best possible sounding geometry for each launch.
- To increase reliability of soundings.
  - Disturbances in signal quality (distant chains).
  - Unpredictable maintenance breaks.
- To simplify operator's work.

How the best chains are selected

- The predefined Loran-C chains are paired and the pairs are compared using quality estimates calculated for each pair.
- Quality estimate is based on geometry and number of available transmitters of a chain pair.
  - HDOP - Horizontal Dilution Of Precision describes the geometry.
- The smaller the value of quality estimate the more suitable the chain pair is for sounding purposes.





On the Windfinding Accuracy of RS90-AL vs. RS80-15L Loran-C

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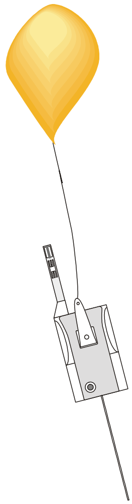
Test report 1999-02-01 ... -02-26

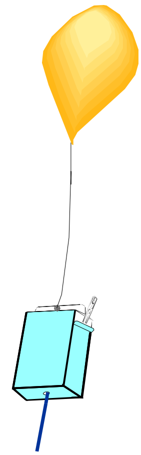


24 soundings

- 23 GPS reference soundings
- 22 GPS vs. Loran-C soundings

Equipment

- MW15 + MWV201 (RS90-AL)
- MW15 + MWV201 (RS80-15L)
- MW15 + MWG201 (RS80-15G)



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Wind component error

Average of error estimates

System	North	East
RS80-15G GPS	0.04	0.04
RS90-AL Loran-C	1.10	1.13
RS80-15L (18L) Loran-C	1.21	1.32

Median of error estimates

System	North	East
RS80-15G GPS	0.03	0.03
RS90-AL Loran-C	1.07	1.03
RS80-15L (18L) Loran-C	1.18	1.18

Conclusions

RS90-AL Loran-C accuracy was typically 0.1 - 0.2 m/s better than RS80-15L (18L) accuracy in this test series.

The RS90-AL Loran-C performance is probably slightly better than the RS80-15L (18L) performance.

Vaisala RS80 GPS wind is a very accurate reference for comparison tests.

On the Windfinding Accuracy of Loran-C, GPS and Radar

Juhana Jaatinen, Vaisala Oyj, Finland
John B. Elms, The Met. Office (RS5), U.K.

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Average of wind component error

Windfinding method		North [m/s]	East [m/s]
GPS	MW15 (MWG201)	0.09	0.09
Loran-C	MW15 (MWV201)	0.80	1.20
Loran-C	MW15 (MWL11)	1.00	1.28
Radar	Cossor	0.76	0.63

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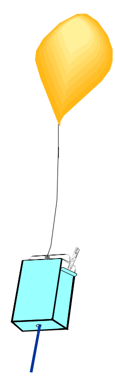
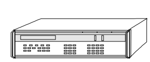
Summary

Windfinding accuracy

- **GPS** Vaisala RS80 GPS is a very accurate reference with error less than 0.3 m/s
- **Loran-C** Both Loran-C systems provide about 1 m/s accuracy which degrades at ranges exceeding 150 km
- **Radar** Accuracy depends on the range. At short range (<60 km) more accurate and at long range (>130 km) less accurate than Loran-C.





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Upgrade Path from Loran-C to GPS

All that is needed

for the existing DigiCORA III Loran-C sounding system

is the

GPS-processor MWG2xx

and SW-Upgrade

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RS90 -

high performance radiosonde family

VAISALA

Main Features

- Improved measurement performance
  - new unique sensors, specifically designed and optimized for upper air measurements
- Outstanding observation data quality
- Lightweight, economical and easy to use
- Environmentally friendly design
  - No styrofoam used in the housing

VAISALA

Improved Measurement Performance

- Fast temperature sensor, F- THERMOCAP®
  - Accurate temperature sensor with fast response time and minimized solar radiation error
- Shock-resistant pressure sensor BAROCAP®
  - Silicon pressure sensor, shock resistant, and offers a fast temperature response
- Fast, defrosting humidity sensor heated HUMICAP®
  - Short response time, reduces condensation and icing
- Factory calibration covers a wide measurement range and includes also measurement electronics

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RS90 Models Available

Model	*Transmitter*	*Sensors*	*Wind finding*
RS90-A	**400 MHz ± 120 kHz (90%)**	**PTU**	**-**
RS90-AL	**400 MHz ± 120 kHz (90%)**	**PTU**	**Loran-C**
RS90-AG	**400 MHz ± 120 kHz (90%)**	**PTU**	**GPS**

Assessment of standard ASAP costs as given by ASAPP-XII September 2000

The ASAP Panel (ASAPP) revised the ASAP cost estimates at its 12th session 27 to 29 September 2000. The ASAPP notes that several solutions may be chosen both for the initial investment and also for the way to run the system, thereby leading to differences in both capital costs and running costs. The ASAPP finds, however, that for ease of reference there should be drawn up standard costs for ASAP.

The standard capital cost for a complete ASAP system, i.e. including both the launching system and the sounding equipment, is on the average **150,000 USD**.

The following assumptions are made concerning the price of consumables:

- **130 USD per GPS-sonde**
- **15 USD per balloon**
- **20 USD for helium per sounding**
- **10 USD for communication and miscellaneous items per sounding**

This gives a total of **175 USD per ASAP sounding for consumables**. The operator cost per sounding varies from nothing on research vessels to around 190 USD on ships with professional sounding operators and some 20 to 40 USD on merchant ships paying a fee to the officers for taking the sounding.

In order to calculate a total cost the following assumptions are made for ASAPs:

- **The total capital investment is 150,000 USD per unit**
- **The investment is depreciated linearly with 10% annually of initial value**
- **Maintenance, transfer of equipment etc. is 15,000 USD annually**
- **The ASAP unit carries out 350 soundings annually**
- **Each sounding costs 175 USD in consumables (using GPS-sondes)**

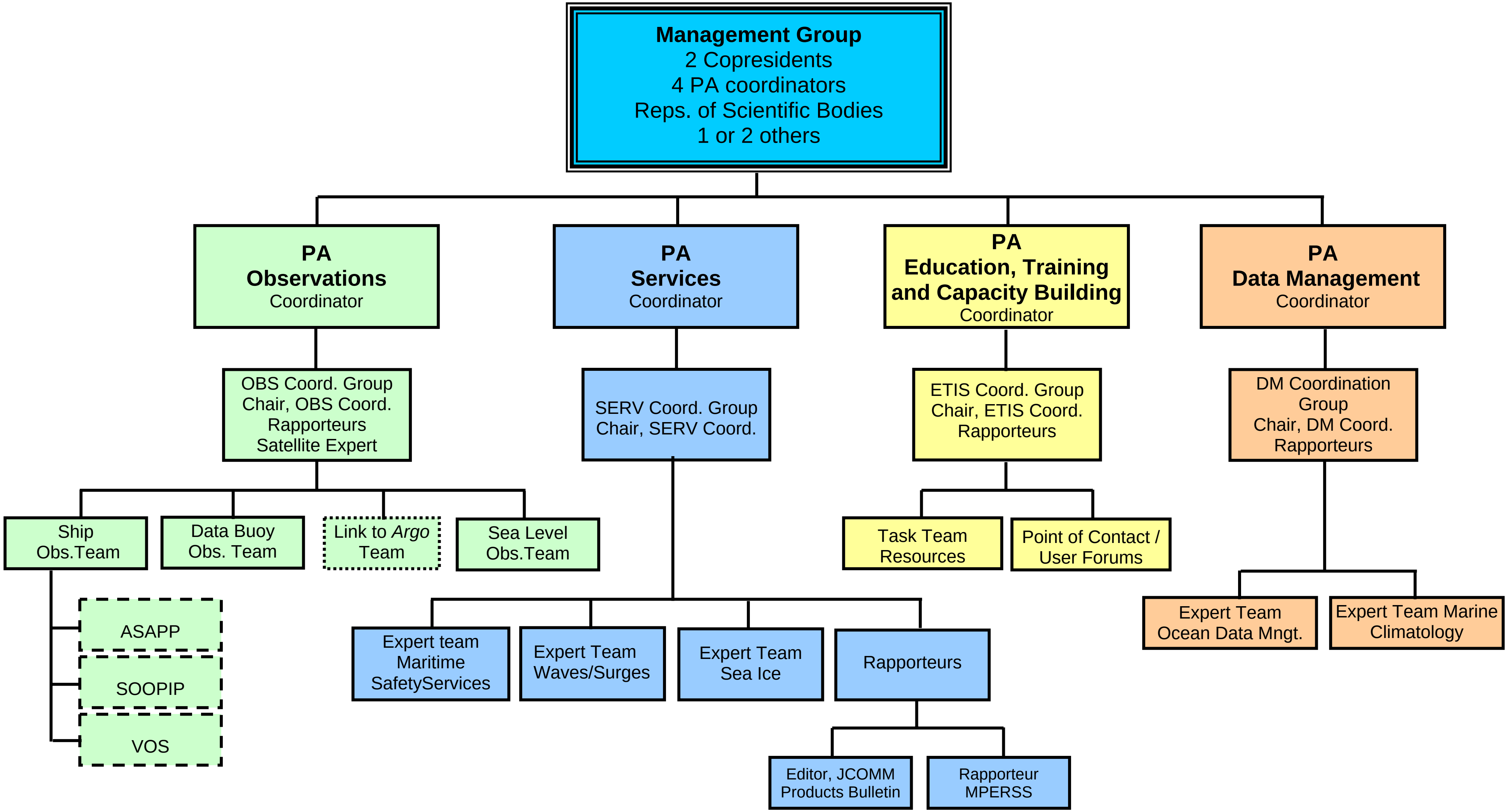
This gives the following figures:

Annual ASAP costs			
Depreciation and maintenance	Consumables	Operator cost[1]	**Total cost per unit**
30,000 USD	62,000 USD	67,000/14,000 USD	**159,000/106,000 USD**

[1] The first number is with professional sounding staff aboard the ship, the second is using the ships officers being payed a minor fee.

Annex IX

PROPOSED JCOMM STRUCTURE



JCOMM SHIP OBSERVATIONS TEAM

Terms of Reference

Generic

1. Review and analyse requirements for ship-based observational data expressed by the WWW, WCP, WCRP, GOOS, GCOS and in support of marine services, and coordinate actions to implement and maintain the networks to satisfy these requirements;
2. Review marine telecommunications facilities and procedures for observational data collection, as well as technology and techniques for data processing and transmission, and propose actions as necessary for improvements and enhanced application;
3. Coordinate PMO/ship greeting operations globally, propose actions to enhance PMO standards and operations, and contribute as required to PMO training;
4. Review, maintain and update as necessary technical guidance material relating to ship observations and PMOs;
5. Liaise and coordinate as necessary with other JCOMM Programme Areas and expert teams, in particular those relating to maritime safety services, marine climatology and ocean data management; in addition, liaise and coordinate with CBS, WCRP, GOOS and GCOS regarding the contribution of ship based observations to their respective programmes;
6. Establish, as necessary, *ad hoc* task teams to address specific issues such as: accuracy of hardware and software used on board ship; data quality control procedures for shipboard instrumentation; specifications for modifications to data transmission codes and general data formats;
7. Participate in planning activities of appropriate observing system experiments and major international research programmes as the specialist group on ship based observations;

SOOP Implementation Panel

1. Review, recommend on and, as necessary, coordinate the implementation of specialized shipboard instrumentation and observing practices;
2. Coordinate the exchange of technical information on equipment and expendable development, functionality, reliability and accuracy;
3. Ensure the distribution of available programme resources to ships to meet the agreed sampling strategy in the most efficient way;
4. Ensure the transmission of low resolution data in real time from participating ships; ensure that delayed more high resolution data are checked and distributed in a timely manner to data processing centres;
5. Maintain, through the SOOP Coordinator, appropriate inventories, monitoring reports and analyses, and information exchange facilities;
6. Provide general guidance to the coordinator in his support for the SOOP;

ASAP Panel

1. Coordinate the overall implementation of the ASAP, including recommending routes and monitoring the overall performance of the programme, both operationally and in respect of the quality of the ASAP system data processing;
2. As may be required by some members, arrange for and use funds and contributions in kind needed for the procurement, implementation and

operation of ASAP systems and for the promotion and expansion of the programme;

3. Carry out other activities as agreed upon by participating members to implement and operate ASAP and to promote and expand the programme internationally;
4. Prepare annually a report on the status of ASAP operations, data availability and data quality;

VOS panel

1. Review, recommend on and coordinate the implementation of new and improved specialized shipboard instrumentation, siting and observing practices;
2. Support the development and maintenance of the VOSClim Project;
3. Develop and implement activities to enhance ship recruitment, including promotional brochures, training videos, etc.

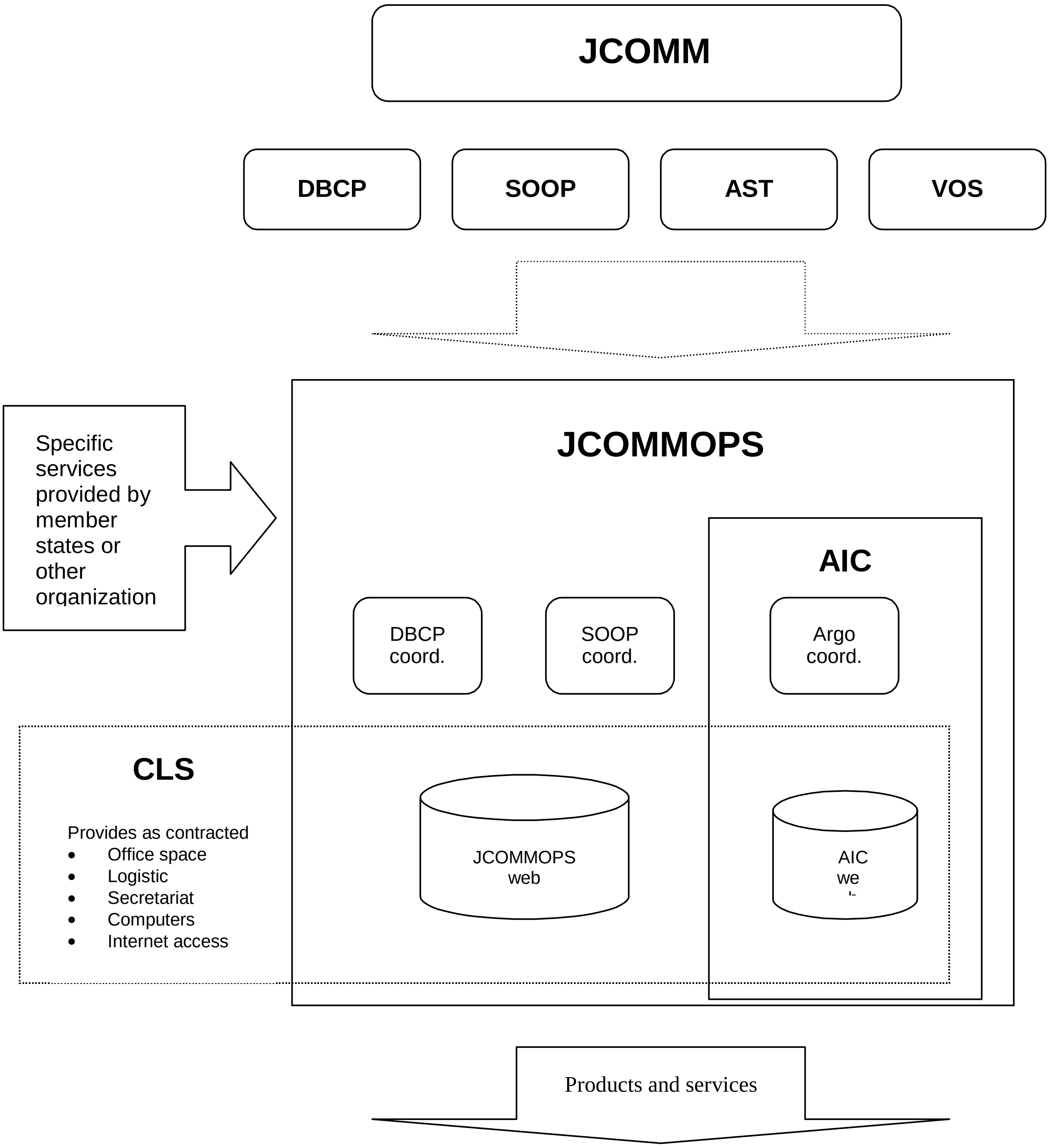
Membership

Chairman selected by JCOMM
Operators of VOS, SOOP and ASAP
Representatives of monitoring centres, data management centres and bodies
Representatives of Inmarsat and other communications satellites
Representatives of manufacturers as appropriate
Representatives of science advisory bodies and users as appropriate

Structure of JCOMMOPS

JCOMMOPS is located in Toulouse, France. Office space, logistical and secretariat support as well as computer support, including Internet access is provided by CLS as contracted between CLS and the DBCP, SOOP, and the AST.

JCOMMOPS operates a web site, includes the Argo Information Centre, and the services of the Argo, DBCP and SOOP Coordinators. It is managed by the Technical Coordinator of the DBCP.



WORLD METEOROLOGICAL ORGANIZATION

ASAP TRUST FUND

Statement of Account as at 31 December 1999

		SFR
Balance from 1997		1,052
Contributions received		22,400
Total Receipts		23,452
Less Expenditure:		
Publications	3,511	
7% Support Costs	246	
7% Support Costs (on 1996-97 expenditure)	924	
Total Expenditure		4,681
Total funds available		18,771
Represented by:		
Cash at Bank		18,771

Contributions

Denmark	6,000
Iceland	1,000
United Kingdom	3,000
United States of America	12,400
Total	22,400

WORLD METEOROLOGICAL ORGANIZATION

ASAP TRUST FUND

Statement of Account as at 15 July 2000

	SFR
Balance from 1999	18,771
Contributions received	2,000
Total Receipts	20,771
Less Expenditure:	-
Total funds available	20,771
Represented by:	
Cash at Bank	20,771

Contributions

Iceland	500
United Kingdom	1,500
Total	2,000

ASAPP ESTIMATED INCOME AND EXPENDITURE 2000/01

Income

	SFR
Funds available at 15 July 2000	20,771
Contributions 2000/2001	14,000
TOTAL	34,771

Expenditure

Commitments 2000	1,000
Publications	2,000
Travel, promotion and general support activities	7,000
WRAP consultancy and related expenditure	12,000
Forward commitment for brochure	10,000
Carry forward 2002	1,771
WMO charges and contingencies	1,000
TOTAL	34,771

Table of Provisional Contributions 2001

Denmark	2,000
Iceland	500
United Kingdom	1,500
USA	5,000
TOTAL	9,000

Annex XIV

ASAP ANNUAL REPORT LAYOUT

FOREWORD

CONTENTS

ANNEXES

Report Preparation Timetable

January: Secretariat to circulate ASAP operators and monitoring centres, requesting input to the report to be submitted to the chairman and Secretariat by end of February

March: Chairman to prepare text of report and send to Secretariat for publication

April/May: Publication of the report and distribution to EC, operators and others

Annual National ASAP Report

COUNTRY: . . . . NAME OF AGENCY: . . . . YEAR: . . . .

...... ASAP units operated during the year on ...... ships								
Type of ship 1)	Name	Call sign	Comm. method 2)	Windfind method/ Sonde type 3)	Launch Method 4)	Launch height 5)	Area of operations 6)	ASAP Unit ID No.

1) Merchant ship, research ship, supply ship, etc.

2) Using IDCS, Inmarsat-C, or others

3) E.G. GPS/Vaisala RS80-G, Loran/Vaisala RS80-L, VIZ GPS Mark II Microsonde, etc.

4) Launch method e.g.: deck launcher (portable); deck launcher (fixed); container (manual); container (semi-automatic); other.

5) The height above sea level from where the sonde and balloon is released

6) Ocean area, e.g. North Pacific, North Atlantic, Indian Ocean, variable

Summary of performance of ASAP units during the year						
Call sign	Total No. of sondes launched	No. of messages transmitted	No. of relaunches	Average terminal sounding height (km)	Balloon Size (gm)	Percentage on GTS[1)]
Total or average						
1) Based upon reports received at a data centre or GTS insertion point, name: ____________ Ratio of reports received against reports transmitted						

COMMENTS:

ESTIMATES FOR FOLLOWING YEAR:

AUTOMATED SHIPBOARD AEROLOGICAL PROGRAMME PANEL (ASAPP)

Twelfth Session
(Reading, United Kingdom, 27-29 September 2000)

Action sheet

REFERENCE	SUBJECT	ACTION REQUIRED	TARGET DATE	EXECUTION
		Chairman		
FR para.3.1.1(vii)	*Training of ship operators*	*To investigate possibilities for development of training facilities aid (video, CD-ROM)*		*With Secretariat*
FR para 6.2.1	*ASAP and international bodies and programmes*	*To maintain close liaison with AOPC and GOCOS*		*With Secretariat*
FR para.8.1.1(iv)	*Future ASAP programme implementation*	*To seek support from EUMETNET for WRAP while in the EUCOS area and also for activities outside the EUCOS area as a contribution to WWW*		*With EUCOS Programme Manager*
		Secretariat		
FR para.3.7.2	*Status of the Worldwide Recurring ASAP Project (WRAP)*	*To prepare the report on a feasibility study for the WRAP*	*April 2001*	*With Capt. Mackie, chairman, ABOM, NOAA/OGP*

REFERENCE	SUBJECT	ACTION REQUIRED	TARGET DATE	EXECUTION
FR para. 4.5.1, 4.5.2, 4.6.1(iv)	*Data and information dissemination*	*a. To update the existing list of operational ASAP ships and national contact points* *b. To disseminate the updated list in a forthcoming Operational Newsletter and in the 2000 Annual Report* *c. To check the catalogue regularly for changes* *d. To investigate the possibility to establish a separate supplement to the WMO ship catalogue (WMO-No. 47), to be available on-line through the WMO web page*		*With operators* *With monitoring centres*
FR para 4.7.1	*ASAP cost document*	*To revised and reproduced the ASAP cost document in the 2000 Annual Report*		
FR para. 6.3.3	*JCOMM Observing Systems Operations Support Centre (JCOMMOPS)*	*To review the development of JCOMMOPS and reassess the possibilities for the direct involvement of ASAP in this activities*	*SOT meeting*	
FR para.7.4.1	*ASAP Trust Fund*	*To invoice contributions for the ASAP Trust Fund for 2001*	*December 2000*	

REFERENCE	SUBJECT	ACTION REQUIRED	TARGET DATE	EXECUTION
FR para.8.1.1(iii)	*Future ASAP programme implementation*	*To update ASAP information in the Operational Newsletter and implement the ship Catalogue supplement for ASAP*	*Continuously*	*With operators*
		Operators		
FR para 3.1.2	*Reports on the status of the work*	*To prepare the final version of the national reports to be reproduced in the 2000ASAP Annual Report*		*With chairman and Secretariat*
FR para. 4.6.1(iii)	*ID system in FM 36-XI TEMP SHIP*	*To migrate all ASAP reports to BUFR*		
FR para. 8.1.1(ii)	*Future ASAP programme implementation*	*To liase with monitoring and NWP centres regarding ASAP impacts and quality*		
FR para 8.2.1	*Promotional activities*	*a. To publish an article on ASAP in the Mariners Weather Log (NOAA/NWS)*		*USA*
		Others		
FR para. 3.3.1	Report of ECMWF	*To discuss the problems of call sign corruption and humidity bias with*		*ECMWF*

REFERENCE	SUBJECT	ACTION REQUIRED	TARGET DATE	EXECUTION
		Eumetsat and Vaisala		
FR para 3.4.1	*Report of ASAP monitoring centre*	*To address the problems of reports monitoring corruption and duplication to appropriate monitoring centres*		*Météo France, MO, DWD, Eumetsat*
FR para. 3.5.1	*Report on EUCOS*	*a. To discussed the implementation procedures of the proposed EUCOS/COSNA pilot project*		*EUCOS with operators*
FR para 4.3.2	*Inmarsat-C system for ASAP*	*To address and solve problem of communication data losses*		*Eumetsat with operators*
FR para. 4.4.1	*Data transmission via meteorological satellites*	*To investigate the possible problem identified with using the International Channel 12 for data transmission*		*Eumetsat with operators concerned, together with the ASAP Monitoring Centre*
FR para. 8.1.1(I)	*Future ASAP programme implementation*	*To continue and enhance the ASAP monitoring by Météo France*		*Météo France*

REFERENCE	SUBJECT	ACTION REQUIRED	TARGET DATE	EXECUTION
FR para. 8.2.1, 8.2.2	*Promotional activities*	*a. To publish an article on ASAP in the Inmarsat journal Ocean Voice*		*MO, Capt. G. Mackie, Secretariat*
		b. To prepare a first revised draft of the ASAP brochure for review by panel members	*Before SOT meeting*	*MO*