EUROPEAN SOUTHERN OBSERVATORY

La Silla Observatory

SCIENCE OPERATION DEPARTMENT

Re-Engineering Project:

Structure and Operation

LSO-PLA-ESO-9000-1

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1.0	2002-05-29 modif. from comments from 2d round included. All the dicussions stripped out.

CONTENT

1- INTRODUCTION

1.1- PURPOSE AND SCOPE

This document discusses the general structure of the Science Operation Department (SciOp) of La Silla, in the framework of the restructuration of the 2p2, 3p6 and NTT teams. This document will eventually become part of a larger document describing the Science Operation Department as a whole.

This document is the result of the discussion that took place on Thu. 2002 Feb 14 at la Silla and Vitacura, based on an earlier draft of this document. Presence at that meeting, in La Silla, Andres Gonzalez, Ariel Sanchez, Cristian Esparza, Eduardo Celis, Emilio Barrios, Francisco Labrana, Gaetano Andreoni, George Hau, Jose Cortes, Karla Aubel, Lisa Germany, Malvina Billeres, Martin Kurster, Olivier Hainaut, Rolando Vega, Ivo Saviane, and in Vitacura, Gaspare Lo Curto, Kate Brooks and Leonardo Vanzi. Version 0.91 was released to the LaSilla audience for discussion and comments, which were edited and included by M.Sterzik and O.Hainaut (contributions were reveived from P.LeSaux, R.Mendez, and M. Sterzik . E. Barrios and J. Melnick). The comments and replys are included in the review version of this document (v.0.93), which was released for a second round of comments, leading to v.1.00.

1.2- GENERAL COMMENTS

It will be clear to the gentle reader that the TIOs are getting much more responsibilities than in the past. The reason for this is that the TIOs are the ones who actually operate the observatory telescopes, not the astronomers. Indeed, TIOs tend to have a longer life time in the organization (time scale of 10 yrs) than the astronomers (time scale of 2 yrs), therefore, they can accumulate much more experience and have a very broad overview of the telescopes and instrumentation. This is acknowledged in this plan, whose global idea is to distribute the responsibilities to whom they naturally below: a question about the best strategy to observe the spectral variability of a quasar in the near IR is for an astronomer, but a question about the best way to select and acquire a guide star in a crowded field for spectroscopic chopping-and-nodding observations is for the TIO.

1.3- STYLISTIC CONVENTION

In this document, "he" and "his" refer to the position described. In practice, these position can be occupied by people of any gender.

1.4- DOCUMENTS AND REFERENCES

[1] LSO-PLA-ESO-90000-4 SciOp Re-engineering: SciOp communications
[2] LSO-PLA-ESO-90000-5 SciOp Re-engineering: Administrative and Managerial internal structure

1.5- ABBREVIATIONS and ACRONYMS

ETC: Exposure Time Calculator
LED: La Silla Engineering Department
SM: Service Mode

SMA: Service Mode Astronomer
SWC: La Silla Software and Communication Team
TIO: Telescope and Instrument Operator
VA: Visiting Astronomer
SciOp: La Silla Science Operation Department

2- CLIENTS, SERVICES and PROCESSES

2.1- SERVICES PROVIDED

SciOp provides astronomical data to its clients, as well as the information needed by the clients

- to obtain these data (e.g. instrument manuals, exposure time calculators, etc), and,
- to transform these astronomical data (i.e. measurements in adu as a function of the x,y position on a CCD) into astrophysical data (i.e. measurements in flux units (erg/s/m2/A/arcsec2) as a function of other physical quantities (wavelengths, RA, Dec, ...)).

p>SciOp does not provide the scientific idea for which the data are needed, and does not interpret astrophysically the data, although the astronomers belonging to SciOp do it for their own projects, and are therefore experts whose experience is of great value when assisting the clients.

The data produced by SciOp (including those produced by Visiting Astronomers) must be of the best achievable technical quality (e.g. instrument always in focus), and must be calibrated -or, more specifically calibratable, i.e. they must be accompanied by a set of auxiliary data that allows the astronomer to fully remove the instrumental signature of the instrument (flat field, standard stars, etc.). These auxiliary data are defined in the calibration plan of each instrument.

In more details, the scope of SciOp is:

·Preventive maintenance of instruments, telescope and auxiliary equipment
·Calibration Plan
·Telescope and Instruments Statistical Process Control (Performance)
·Help desk for VAs (for pre- and post- observing run questions).
·Assistance to P1PP/P2PP and during observations.
·Environment Monitoring (Weather safety)
·Reporting
·Telescopes & Instruments Configuration control (Optic, Mechanic, Software, Electronic, infrastructure ...)
·Provide full year coverage for all the above.

2.2- CLIENTS

The "clients" of SciOp are the members of the international astronomical community at large, and in priority the astronomers of the ESO member states.

More specifically, these includes:

- Visiting Astronomers (VAs, who will come to la Silla to perform their observations) and "Service Mode" Astronomers (SMAs), who don't come to la Silla, their observations being performed by SciOp staff, either in Service Mode (queue schedule) or as Delegated Observation Mode (on fixed dates).
- Potential astronomers: who may submit a project that would eventually get accepted, and who will then become VAs or SMAs.
- The Archive: the data produced by SciOp are archived in the ESO Science Archive (cf archive.eso.org) for use by future astronomers. The role of the archive is double: 1/ it constitutes a 100% reliable backup of the data, 2/ it constitutes a mine of data that can potentially be re-used for other purposes than those of the original project. It is therefore important that the data be calibrated (calibratable) and the instruments characterized.
- Projects and Technical Astronomers: SciOp hosts some projects (new instruments, prototypes, experiements...). Some of the SciOp astronomers can be deeply involved in these projects (e.g. as project scientist or project manager). Their schedule and support load is to be adjusted in order to accomodate these duties. Additionally, external astronomers attached to project (e.g. an instrument scientist from Garching or other institute) can be at La Silla for a fairly long time. These astronomers will be integrated as guest to SciOp, in order to improve communication, training, info, and to give them better support.
- Guest/Visitor instruments (such as SHARP, CIGALE...): SciOp is not responsible for these instruments. It will provide support only to the telescope-related aspects of the operation, i.e. Day + Night TIO, support astronomer for generic astronomical support (e.g. hints and tips on the telescope), but obviously no support for the instrument.

2.3- PROCESSES

From an "ISO-9001" point of view, the processes that belong to SciOp are the following:

- **a-Production of Scientific Data:** the input is the scientific question, the output is the corresponding observations replying to this question. SciOp will deal with all aspects of this process, i.e. to help prepare a technically sound proposal that will get time (assuming of course that it is a "good" question), prepare his observations so that they optimally reply to his question, help him performing the observations, or perform them ourselves (all flavors of Service Mode), and finally help him in the data reduction (**not** by reducing the data for him). Basically, all the technical aspect of his question are our job: with our help, he should find trivial to reply to his astronomical question.

- **b-Operation of the instruments and telescopes:** the input is the tons of hardware and software constituting the telescopes and instruments, the output is a scientific instrument, fully understood, certified and characterized. Obviously, this is an internal process (i.e we provide the input and use the output during the first process).

3- TECHNICAL STRUCTURE

3.1 INTRODUCTION

The SciOp Department will be constituted of Astronomers, Telescope and Instrument Operators (TIOs) and Operation Engineers. The main differences with the current Team structure are the following:

- SciOp will operate the 3 telescopes, while each team was operating only one telescope. This gives us a large potential of flexibility that was not available with the individual teams. The way we use this potential should increase both the overall efficiency, AND the individual satisfaction (i.e. possibility to learn new things, to teach things, to remove the duplication of tasks that currently exists because of they are done independently in each team, leaving more time for more interesting tasks, etc.
- SciOp will not include Electronic Engineers nor Electronic Technicians, who will belong to the LED, where a "Telescope Support" sub-department will be formed to centralize direct support to the telescopes. At least for the first year, this sub-department will be constituted by some of the current Team Electronics, so that their expertise is not lost by dilution in the Engineering Dptm. One senior engineer from the current teams should be the head of that sub-department; he shall keep an overview of the system.

The main difference between La Silla SciOp and Paranal SciOp is that, in La Silla, SciOp "owns" the telescopes and instruments, on which the support teams and departments will perform work for us. In Paranal, the Engineering Dptm owns the telescope and instruments, and lend them to SciOp for the night. The main advantage of the La Silla scheme is that SciOp owns the complete processes (c.f. previous section). The expertize to perform first level of troubleshooting and basic preventive maintenance should be maintained within SciOp. In that framework, each task will either be performed internally (according to internal SciOp procedure), or externally (e.g. 3.6m top ring change will be handled by LED). In case it is performed by an external provider, SciOp will accept (or not) the job done. The main disadvantage of this scheme is that most of the maintenance work will be "outsourced" to LED; to work properly, it will require a very good coordination. This makes the role of the Telescope Coordinator crutial.

3.2- INSTRUMENT CORE

INSTRUMENT SCIENTIST

Each instrument (e.g. EMMI, WFI...) will have an INSTRUMENT SCIENTIST (astronomer) and an INSTRUMENT TIO. Together, the Instrument Scientist and Instrument TIO form the INSTRUMENT CORE that concentrates all the operation-related expertise on the instrument: if there is some info or knowledge related to the operation of an instrument, the Core should have it. Obviously, some of the specialized experience will stay with the corresponding expert (e.g. optical layout, cryogenics, electronics...).

The role of the instrument scientist will be very similar to that of the current instrument scientist, i.e. more specifically

- defining and implementing (possibly with the support of EngDpt, SWC...) observing modes
- defining and implementing the calibration plan,
- writing and maintaining the relevant documentation (user's manual, instrument web pages, etc).
- training other SciOp members on the use of the instrument (e.g. coaching other astronomers in view of them giving support to the clients, etc)
- track pending problems and action points related to the instrument (e.g. give a few phone calls to make sure that things keep moving)
- develop data processing recipes. Priority goes to recipes to aiming at a fairly automatic processing of calibration plan data to monitor the health of the instrument. Secondly, to process easilly

observations on-line (e.g. standard wavelength calibration for all fixed modes (grisms), standard solution for echelle gratings, etc.)

It is important to note that the SciOp Operation Engineers will be deeply involved in most of these points. Also note that it is not expected that the instrument scientist will perform all the support on his instrument.

INSTRUMENT TIO

The instrument scientist will be assisted by a TIO, who will be have expert knowledge of that instrument, both for day and night operation. The role of the Instrument TIO can be summarized as following:

- assist the Instrument Scientist in testing observation modes,
- assist the Instrument Scientist to perform the calibration plan (e.g make sure that the frames needed are obtained, obtain more if needed).
- together with the Instrument Scientist, define the best way to operate the instrument at night
- coach other TIOs on how to operate the instrument in the best way,
- track pending problems and action points related to the instrument (e.g. give a few phone calls to make sure that things keep moving).
- together with the operation engineers, define and improve the operation procedures and check list related to that instrument (all TIOs should always try to optimize operation procedures and check-list -while respecting the strict conf.Ctrl-, but naturally, as they know "their" instrument better than anybody else, they will be most productive for that instrument).

It is important to note that the Instrument TIO does not have to work only on that instrument. The "Instrument TIO" job is more a background task that he can perform during his "background turno" (former Mid-Day/Mid-Night, cf below), during the night (long exposures), during the day (phone calls), etc... While it is desirable that he keeps accumulating experience on the instrument (e.g. operating it at night, performing set-up at day, etc), it is also important that he spends some "background" time on the instrument, e.g. when performing some tests while it is in the lab. In summary, the actions related to the "Instrument TIO" job have a time-scale of weeks/months (following up problems, testing new modes) and not day-by-day.

Also, only one TIO is "Instrument TIO" for a given instrument, not 2, in order not to dilute responsibility. Of course, the Instrument TIO can appoint one or various delegates, for instance in his contra-turno, or to tackle with a specific issue, but he will remain the one "officially" in charge.

To reach the level of full "Instrument TIO", it is likely that some additional training will be required by the operation engineer, electronics, optics, and/or whoever needed.

From the administrative point of view, the "Instrument TIO" title will appear in the Goals and Objective. The evaluation criteria will be (these are examples, not an exhaustive list): efficiency in following up problem reports (not in solving them, which is the task of the person/deptm to whom the problem is assigned), efficiency in performing the calibration plan, in coaching other TIOs, etc. For the first year, there will of course be some real-time adjustments to the G&O: the idea is definitely not to sack anybody on this new responsibility, but to get the best out of the system, and to get the system as good as possible.

TELESCOPE SCIENTIST/TIO

In a similar way, each telescope (NTT, 3.6, 2.2) will have a Telescope Scientist and Telescope TIO, forming a Telescope Core. The Telescope Core has the same role for the telescope and related systems as the Instrument Core for the instruments. For instance, pointing model, mirror model, active optics, followup of action points and problems related to domes, hydraulics, etc... are under the Telescope Scientist/TIO Core' responsibility.

3.3- INSTRUMENT FORCE

The various Instrument Nuclei are combined into "INSTRUMENT FORCES"; the various Instrument Forces that come into mind are:

- Imaging: WFI and SuSI
- Visible spectro imagers: EFOSC2 and EMMI
- IR: SofI and TIMMI2
- High-res spectro: CES/HARPS, FEROS, EMMI/Echelle
- Telescopes

These forces should exchange expertise at all levels: observation procedures, data reduction, hints and tips, etc. Also, the Instrument Scientist of one of the instrument will almost automatically be able to give basic support on the others of the same instrument force. This should foster communication between the current teams. One Core can belong to several Forces. Other forces could be considered, eg 2p2 (=2p2 + WFI + FEROS), NTT (= NTT+EMMI+SUSI+SOFI), 3p6 (=3p6+ EFOSC+ TIMMI + CES/HARPS).

In addition to the Instrument Scientists of the instruments constituting it, the Force will also include additional scientists, i.e. "new" astronomers who are not yet Instrument Scientists, and "senior" scientists (this includes Fellows who completed their first year) who fully master all the instruments from one Force and are expanding to other Forces. In that framework, the support of a given instrument will be provided by the astronomers of its Force, not only by the Instrument Scientists. The average nr of nights during which each instrument is scheduled must be taken into account when constituting the forces and, to a certain extend, when hiring replacement for leaving scientists.

At this point, the 5 above-mentioned forces should meet briefly, but fairly formally (e.g. every 2 months), with the following agenda:

- important news,
- new important problems (i.e. that could be of interest for the other nuclei)
- follow-up of previous important problems
- new hints and tip.

Each of these meeting should be summarize briefly in a "monthly instrument force report", which will 1/ diffuse the info to SciOp as a whole, 2/ document and archive the problems, achievement, hints and tips..., 3/ provide input for the bimonthly SciOp report that the head of SciOp has to produce for the upper management (i.e. help me!).

In the future, the rhythm and scope of these meetings will be adjusted depending of the usefulness of the first ones.

It must be noted that the Instrument Core and Instrument Force structure is a technical structure, which obviously overlaps with the administrative structure (described in [2]) since the same people are involved. It is not a problem, since these structures have well defined scopes that are not overlaping.

3.4- OPERATION ENGINEER

As their title suggests, the Operation Engineers are in charge of all the engineering aspects of the operation. As such, they will have a crutial role within the Instrument Nuclei and Instrument forces, but also at a broader level.

Their responsibilities include:

- Configuration control officer: enforce and verify general configuration control. Some specific aspects of the conf.Ctrl are delegated to other Department (namely SWC for VLT software and related, and Eng. for hardware), but the overall control stays with the OpEng. This responsibility include training of newcommers to the concept of configuration control, and countinuous training on that topic to all staff.
- Development, testing, approval, implementation and maintenance of operation procedures and check lists. Some procedures can be developped by other SciOp members (specifically the Forces), but OpEngs have the final word for approval.
- General training of TIOs to operation, esp. the aspects of the use of operation and maintenance procedures and check lists, configuration control, etc, and the general philosophy of operation of VLT-like systems.
- In collaboration with the instrument forces, development, testing, approval, implementation of observations, calibration, set-up and maintenance templates. OpEng has the power to approve/reject any change.
- Participation to the maintenance plan, and to general operation. While it is important that the OpEng actually performs the operations in order to test procedures, check that they are not obsolescent, etc, this is supposed to take only a small fraction of their time.

4- OPERATION

4.1- NIGHT OPERATION

No major change with respect to the current system:

- A **Night TIO** is in charge of the night operation. He has FULL RESPONSIBILITY on the telescopes, its instruments, and its user. This includes:
  - Decision to close the telescope because of weather conditions (i.e. no formal need to call the La Silla Coordinator)
  - Decision to re-open (i.e. no need to call the La Silla Coordinator)
  - Decision to call standby SciOp or Support Teams (LED, SWC...). Head of SciOp will approve overtime or whatever other administrative stuff related to emergency night call. .
  - decision to shut-down the telescope because of un-recoverable problem, etc

Of course, the night TIO can always call whoever he things can help in his decision, or whoever he things can help make his decision enforced (i.e. if the Visiting Astronomer wants to get explanation on the humidity rules by an astronomer, get the Support Astronomer, Shift Leader (see below) or head of SciOp to come to help). In particular, for weather matters, an unexperienced Night TIO should call a more senior Night TIO.

- The **Support Astronomer** will assist the TIO and the Visiting Astronomer for all astronomical aspects of the observations. The Support Astronomer is supposed to give an extended introduction to the Visitor (i.e. hold his hand at least till the first successful science exposure is read out), and is supposed to be on "stand-by" (available in the control room, in his office, or anywhere else till ~2AM, then on call later for important questions/problems that should not wait till the next day). The Suppport Astronomer must be "certified" (cf SciOp Internal Training Plan) for the telescope and instrument he supports, meaning that he will be able to perform some troubleshooting (e.g. diagnoze and fix or work-around a crashed template).

After Dec.2003 (when SciOp will have lost the current 2p2/WFI staff), this scheme will have to be condensed, sharing TIOs and/or Support Astronomers among telescopes, e.g. no night TIO for the 2p2 when in FEROS mode, or no astronomer in WFI/Service Mode. Priorities will have to be defined in case a person has to attend 2 telescopes at the same time, eg. Visitor Mode has priority over service, and/or larger diameter over smaller one.

4.2- DAY OPERATION

4.2.1- TELESCOPE COORDINATOR

As maintenance will be mostly performed by "outsiders" (i.e. from Engineering Dpt and SWC), coordination will be of critical importance.

For each telescope, the **Day TIO** will be in charge of that coordination (and be TELESCOPE COORDINATOR). His role is equivalent to that of the Paranal's **UT Manager**. On a day-to-day basis, he will

- Coordinate with Eng.Dept and SWC the maintenance actions
- Coordinate with outsiders and insiders the various actions to be taken
- Accept (or not) the work performed on the telescope by other teams or internal teams
- Coordinate with the support astronomer/visiting astronomer the time of start-up and the time of the hand-over.
- Keep a log of the actions taken
- Finally, deliver the telescope in perfect condition to the Night TIO. (in summer time, the telescope can be handed over to the "Background TIO" who will receive it on behalf of the Night TIO arriving later).
- On Tuesdays, he will check the pending problems and action points, and call the responsible person (or have them called) for a status report
- On Wednesday, he will 1/ chair the weekly operation meeting during which the problems and action points are discussed 2/ issue the internal and external week reports.

One of the Telescope Coordinators (typically a "senior" one) will be SCIOP COORDINATOR, i.e. in addition to coordinate his telescope, he will also coordinate the actions that affect SciOp as a whole. He will be in charge of representing SciOp at the Action Point Meeting on Thu, and -if needed- invite additional SciOp members to be present at that meeting. He is also the person who mans the lasilla@eso.org account (cf [1])

4.2.2- SUPPORT ASTRONOMERS

Durning the day (starting at a decent time considering the time he went to bed the night before), the Support Astronomer will

- Get informed about the end of the previous night, if relevant
- Check that the day calibrations taken were successful and that all required calibrations were obtained.
- Give off-line (P2PP and Co) intro if required
- Background work

4.2.3- SHIFT LEADER

One of the support astronomer (most senior) is the Astronomer Shift Leader (which corresponds very closely to the former La Silla Coordinator). He is in charge of taking astronomy-related decision, as to schedule ToO requests (checking that they are approved/pre-approved), approve ToO Requests in case of emergency (eg WE if Director not available), etc. He is also in charge of formally "closing" ToO tickets in the Remedy system (cf [1]). The Shift Leader can also enforce the authority of the TIOs for weather and safety related matters (e.g. in case of recalcitrant Visitor).

It is suggested that the task of closing the Library curtains during the WE be passed to SWC, as they will become the most numerous users of the Admin building.

4.2.3- BACKGROUND TIO

The third TIO will either

- perform some background work (e.g on his instrument, on documention, etc), or
- be on training.

It should be noted that if the 3rd TIO is needed for on-line work, this has priority on any background task. For instance, if he is needed for urgent trouble shooting, problem solving, or to ensure the day/night transition, he should stop his background activities.

4.2.4- OPERATION ENGINEERS

They participate to maintenance plan, and on-line operation. Most of their time should be devoted to configuration control and operation developments, as described above

4.3. DAILY OPERATION SCHEDULE

- **08:00** Telescope coordinators get the reports of the night and assign the new problems/request to the relevant department. In case of urgent item, make sure that the corresponding people get the info and act. Adjust the operation plan of the day to cope with that emergency (note that this should be an exception).

- **08:00--12:00** Troubleshooting of previous night pending problems, Calibrations and set-up for night, maintenance Plan, in that order of priority. Note that in normal operation (i.e. not in technical time, there is no "installation/test of improvement" - this should go to technical time).
- **13:30--14:00 Dayly Coordination meeting**: Attendance compulsory for the 3 telecope coordinators, OpEng, a coordinator from Eng and a coordinator from SWC. Coordinators can also "invite" specific specialists (eg. instrumentation, mechanics) or other departments (ISG, Hotel...). Support astronomers are expected to attend unless they are on full night schedule. It must be noted that this is an open meeting, everybody is welcome. This meeting will also be the base for the Coordinators to prepare the weekly report on a day-by-day bases.
  - Brief report of the night, its problems and what is being done to solve them.
  - Brief report of actions under way
  - Coordination of the next 24h, esp.
    - actions to be taken in the afternoon
    - time of the startup for each telescope, and time of start of observations. Here should come a very brief summary of the observing program and of its technical implication.
    - scheduled maintenance actions for the next morning.
- **14:00--16:30:** Operation, complete what is left from the morning
- **Wednesday only: 14:00-15:00: Weekly coordination meeting.** All the pending problems are reviewed, as well as the action points. New action points are dicussed. At the end of that meeting, the Coordinators should enter the final comments in the Remedy system, and prepare the weekly reports, both the external one (generated by Remedy) to be sent to astro, and the internal one, which includes the summary of the week for the next turno. It is important to note that this coordination meeting must be prepared in advance: at the latest on Mon. or Tue., the Coordinators should contact the provider for each problems for feedback (unless that feedback appears in the problem report).
- **~16:30**Startup (time to be adjusted depending on the season and the need). All maintenance actions stop.
- **~17:30**Start of calibrations, then observations.
- **Just before twilight:** "hand over" from the day TIO to the night (or mid/day/night) TIO, with the Supp.Astro: pass the information of the day to the night people.

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