

## **Organization, Management and Manpower in Operations**

“Large projects are not just bigger small projects, they are completely different beasts” \*

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Appendix: Lessons Learned Links to Wiki pages

[\\*http://www.thomsettinternational.com/main/articles/largeprojects/managing\\_large\\_projects.pdf](http://www.thomsettinternational.com/main/articles/largeprojects/managing_large_projects.pdf)

## Overview

The background upon which the management of Herschel has been conducted has evolved towards the ESA concept of “Distributed Responsibility” which is now a quite accepted concept in large complex projects. Herschel, although not as large as what is conventionally defined as “large” (>\$10/Euros billion, like the Alaska oil pipeline or projects like the International Space Station), nevertheless has many of the same management challenges as a large project.

Specific challenges in a project like Herschel have been 1) the large number of stakeholders, 2) the separation of many management centers by country and in some cases large time differences, 3) the relatively long timescale that the project has to function over (leading to ***rapid change*** in both manpower and technology advances during the project, 4) the use of new and innovative technology that comes with any new observatory, 5) the need for the many levels of management to react quickly to changing situations and to make mid-course corrections, and 5) the many different national funding agencies involved in the project. Furthermore, the launch of Herschel required a rapid and uninterrupted transitions from pre- to post-launch operations. As a result of these complexities, the early management of the Project adopted concepts such as “Smooth Transitions” and “Agile Development” as

mechanisms to attempt to make the project work smoothly and flow from one phase of the mission to another. Although many of these factors are not especially unique to Herschel, nevertheless these issues were part of the organizational/management landscape that needed to be addressed in the early stages of the project. To a very large degree, these innovative methods were successful, and in themselves, are a positive lesson to be learned.

Here are several Lessons that came from the discussions about organization, management and manpower.

- 1) **Good communication between teams is the key to Distributed Management.** Herschel's many interfaces generally worked well under this distributed management systems with many key players distributed geographically and across time zones. When the management is distributed in this manner, good, frequent communication is essential, especially between the various management teams. In the Herschel project, good use was made of video-conferencing, traditional PolyCom-systems, but also later in the mission—software like WebEx. Disparate time zones (esp. Europe/US) was sometimes a problem, but generally solved with a careful choice of meeting times, and frequent in-person visits. There was a sentiment that the flat management structure

could have benefited from more direct face-to-face contact between key teams and team leads, especially at key moments in the project.

- 2) **Need to built-in from the beginning the inevitability of “change”** that is both healthy and a necessary part of a large complex project. Most large projects have “change management” built into the planning from the beginning. Although this was probably not consciously done, the Herschel project was able to react to changes quite quickly where needed. An example was the shift from a “nightly build” approach for software development, to frequent CCBs to manage broad changes quickly as software was rolled out. Building into the plan, for both management and staffing profiles, that change is inevitable, is a vital and important concept that leads to quick corrections to problems, and less finger-pointing when things go in a different direction from that initially envisaged.
- 3) **The use of “hindsight” to evaluate the “success or failure” of a particular management decision, should be avoided**, and be replaced by the concept of “Reasonableness Audits” in which the decisions of a manager should be looked upon in terms of “how reasonable” was the decision give the conditions prevailing at that time. This can often help to make the project run smoothly and

avoid undue loss of momentum over recent past decisions. Projects which adopt this approach do better than those that spend a lot of time questioning decisions that it is too late to change (a Herschel example might be the adoption of Python/JAVA versus IDL as the basis of a DP system).

- 4) **Managing Staffing Profile “Stress Points”** in the project timeline by forward planning that considers where the staff shortages may occur. Although this is hard to predict, in a complex project like Herschel, it is worth attempting to predict, based on the experience of previous missions, where the biggest human “stress points” may lie. Typical stress points are usually at periods when there are stringent time-pressure (such as in the pre-launch check-out phase) and where key people are expected to multi-task under pressure : often involving drawing on resources over large distances and time-zones. Limited funding resources, and the concentration of expertise in a few key people, can put high pressure on those personnel at these critical times, and it is always good to learn from these experiences. A mission like Herschel was particularly hard because pre-launch and immediately post-launch and transit to L2 involved very rapid transitional-task management. These transitions were helped by the “smooth transition” concept which was embraced by Herschel, in which common software was used

both before and after launch to monitor and provide feedback on Herschel systems. This was only partly successful because in some cases the software was being tested for the first time in high-stress situations. However, it was recognized that “smooth transitions” seem, on the whole to work well during these transitional phases.

- 5) **Being prepared to take risks but also admit mistakes early and make necessary mid-course corrections**—changes should be seen as “normal”, and mid-course corrections should not be seen as a failure of the management, but embracing change should be part of the expected picture. Herschel took a risk in embracing new technology—e. g. the controversial decision to go with an “objected oriented” approach to software design, and was able to make sufficient mid-course corrections (for example by creating the HIPE GUI interface) to enable users to ultimately have a user-friendly (though expert) system.
- 6) **Positive use of embedded “Liaisons”** when dealing with the interests of teams separated by large time-zone and geographical distances. The NHSC/HSC liaison embedded at ESAC worked well, and was deemed extremely useful by both the NHSC and the HSC. Embedding a staff scientist (“liaison”) from the NHSC into the HSC had many advantages, ranging from allowing good clear two-way communication between the teams at critical times, enhancing US advocacy where needed, and

providing the HSC with an extra-pair of hands during critical phases of the mission. The Liaison was also able to attend meetings that were hard to attend by US staff because of the 9-hr time-difference between centers—thus allowing more seamless communication. In situations where large time differences are envisaged in future missions, the “science liaison’ concept should be strongly considered as one tool to increasing good communication between geographically separated partners.

- 7) **Assignment of Responsibility of Work-packages by Center, not shared or floating manpower:** The way that some common DP development was managed early on in the Herschel project was that each center signed up for, and contributed to parts of a workpackage (floating manpower), rather than each center being assigned a specific package under their overall responsibility. The latter approach was found to be much more successful since control of all the moving parts was under one roof, rather than under many with many management “heads”.