



"Not LEAN without Scheduling"

Francis BONLIEU, Responsible for Continuous Improvement, DAUPHIN Supply Chain, EUROCOPTER



The EUROCOPTER Group was formed from the merger of two important companies in Aerospace. First in the market with rotary wing aircraft at the beginning of the century, the original company became, over a number of years more famous and important. In 2000 the Group AEROSPATIALE (France) and DEUTSCHE CHRYSLER AEROSPACE (Germany) merged to form EADS which today has plants in France, Germany and Spain. EUROCOPTER is a wholly owned subsidiary of EADS, as is Airbus and Astrium.

In 2009:

- The global turnover of EUROCOPTER amounts to around 4.57 billion EUR
- It has grown steadily since its creation, with increased revenues of 1.9% in 2009
- 55% of the revenues comes from aircraft manufacture, 35% from customer services (support/training, etc.) and 10% from other activities
- 52% of aircraft are made for so-called civil use, while 38% is for the military
- 65% of EUROCOPTER's aircraft are exported
- In 2009 EUROCOPTER delivered 558 aircraft

The time of average manufacturing time will depend on the model and the finish required. Typically it will average at 6 to 7 months from the order while a more complex product such as the DAUPHIN will take around 12 months to complete today. Two years ago this would have been 24 months. Military helicopters have longer cycle time because of more complex manufacturing, controls and the necessary approvals to be carried out.



EUROCOPTER is the leader in its market well ahead its competitors. The Group has a market share of about 51.2% of the world helicopter market. It has three plants in France, Germany and Spain employing some 13,700 people. The Marignane site in France is specialized in the manufacture and assembly of light helicopters such as the Super Puma, the Cougar, the Dauphin, the Panther, the Tiger, NH90 and the EC175, while Spanish and German plants are specialised in the manufacture and assembly of the EC135, EC145, Tiger and NH90.

EUROCOPTER today has 24 subsidiaries in the world employing approximately 35,700 people. It has total revenues of the order of 2 360 million EUR in 2009. It has over 2,800 customers (85% have more than 5 helicopters) and total fleet of 10,929 aircraft located in 147 countries. Their aircraft logged 9,324,000 flight hours in 2009.

The EUROCOPTER Business

EUROCOPTER has three main businesses:

- Design and the Development
- Manufacturing & Assembly
- Support services such as Maintenance and Training

The Design and development business aims to launch a new spearhead development program every two years which is necessary to be the world leader in innovation. More than 1,200 engineers work in R&D. Within this there are more than 250 crews used for testing, 60 cockpit engineers and some 30 test pilots. Over 5,000 flight hours a year are dedicated to the testing. Certification is required every year to ensure the maximum security of appliances, and this the number one position for EUROCOPTER.

Manufacturing and Assembly is also very important. EUROCOPTER has key in-house skills in the production of:

- Helicopter blades
- Airframes
- Critical moving assemblies
- Composite materials components
- Systems integration
- Maintenance and Repair

This expertise in the manufacturing process of its helicopters manufacturing process is a key differentiator so is very important that the Group does very little subcontracting.

Thus each stage of the process from design to manufacture to maintenance and the training of pilots is done within EUROCOPTER. Each step is strictly controlled and followed to ensure the highest quality and maximum satisfaction for its customers.

For services EUROCOPTER has developed a complete package of services to ensure close cooperation with its customers, and also to be more responsive. Services on site can also be offered such as maintenance as well as tailor-made services required by the client. These services are comprehensive covering all aspects of the helicopter. Today EUROCOPTER have 80 maintenance and repair centres, 3 logistics locations (Europe, Asia, USA) and 19 training centres,

Products

EUROCOPTER is the world leader in helicopter manufacturing. The Group offers a wide range of aircraft designed for the civil and military markets. In the civil market the aircraft are used for emergency services, search and rescue, private and public services, and oil platform transport. In the military market their products are used in combat (Tiger) for anti-tank, tactical transport and anti-submarine warfare. The DAUPHIN may be used as a combat helicopter but also for troop transport. It is also often used to locate or monitor troop movements because of its advanced radar system.

Identifying the Problem

Francis BONLIEU became responsible for the DAUPHIN line improvement group three years ago. Its mission was to review all of the DAUPHIN manufacturing processes and significantly reduce the assembly cycle times. This line has suffered from lack of investment and needed to be upgraded to promote the DAUPHIN and maintain its competitiveness in anticipation of its successor. It began with a thorough study of the current system. This showed that :-

- The DAUPHIN Assembly line was not optimized.
- Many orders were delivered late. Customers would accept a delay of a few days, but several months was often the case.
- Parts for assembly were delivered late to the line which in turn delayed the assembly process.
- The cost and quality of the helicopters needed to be improved.
- The market image of the DAUPHIN needed to be changed.
- The original objectives of the project "Cycle short Dauphin" which required a reduction in the cycle time from 30 weeks to 12 was not feasible.

Francis BONLIEU decided he needed to be closer to the production line in order to understand the issues better as so he moved there for several months.

The EPS project



The objective was to optimize the Assembly process by applying LEAN MANUFACTURING methods to reduce costs of assembly by 10%. EUROCOPTER uses Lean Manufacturing throughout the Group using EPS (Eurocopter production System) based on principles of the Toyota Production System.

"We brought together all the parties in the process", said Francis BONLIEU, "from preparation, production, supply, management, quality, logistics, and testing. Our goal was to reduce the average assembly cycle time of a DAUPHIN helicopter to 16 weeks"

The project started in April 2007 and was completed in December 2009. It included the following aspects :-

- Building an organisation team to manage the assembly the helicopters.

- Handling Logistics and workflow management.
- Manual workstation management and organization of workshops.
- Reduce the operations in the assembly process.
- Improve communication between departments using visual indicators.
- Introduce Continuous improvement.
- Ensure teams take account of all factors when making decisions.

"Once we had identified what we needed to do in each area " says Francis BONLIEU, "we established what was feasible. To achieve our goal, we had to go further and take into account all of the constraints at every level of production. For example, we needed to reduce unnecessary movement of staff in the workshop. We became aware of a great deal of lost time in changeovers on machines and in the search for lost documents. We needed to smooth the flow of work so that components would arrive in time to the assembly lines. We have looked at how in SAP we could manage this but very quickly came to the conclusion that SAP is not helpful for detailed scheduling. SAP schedules but does not sequence. We started to use Excel but very quickly we have reached the limits of this solution. We had to look for a solution that was specialized and dedicated to this type of problem. So I created a set of data which would simulate our needs and passed this to a dozen companies".

This data set featured some of the following requirements:

- Be able to manage and assign operators with specific skill sets.
- Be able to work with the limited data available from SAP.
- Deal with complex assemblies.
- Be able to take into account each workshop with different assembly capabilities.
- Be able to manage the occurrence of missing components.
- To manage specific constraints.

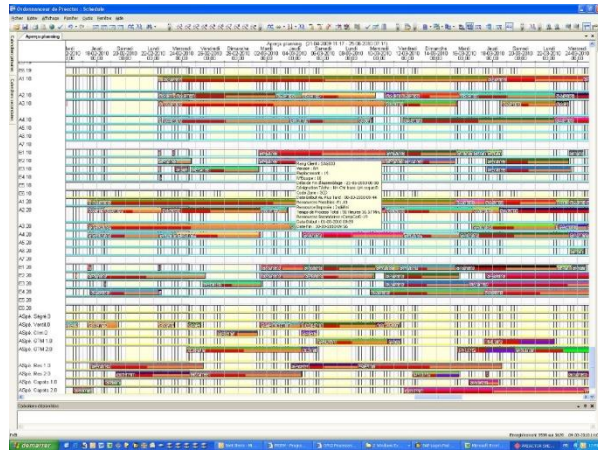
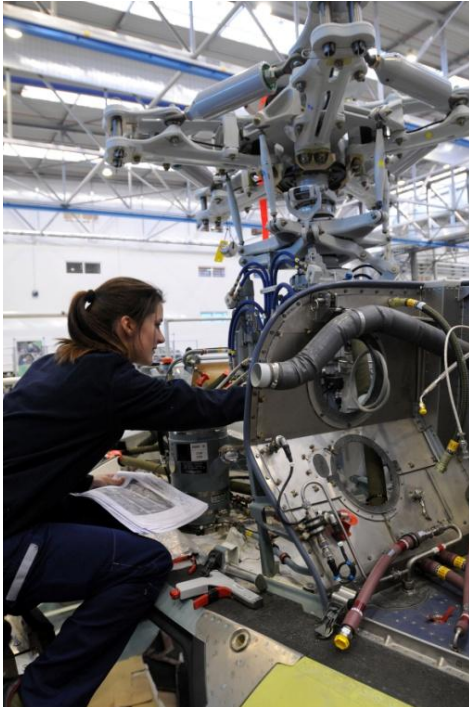
We very quickly highlighted three distinct groups of planning and scheduling products on the market:

- Those who have a very expensive solution and do not allow you to test it with real data without charge.
- Those who have a low-cost solution but who will not visit to discuss requirements and have applications that generate schedules with the required volume of data in an unacceptable response time of more than 8 hours.
- And PREACTOR, which from the outset has shown responsiveness by providing us with a model we could use for 15 days. This was able to prove the application even with a complex data set and their team had a professional approach to project control. The project was carried out by SEGULA Conseil Industriel (SCI), a PREACTOR partner for many years.

The Solution

Francis BONLIEU again. *"A scheduler has been recruited who is today dedicated 100% to planning and sequencing of our assembly lines. It is he who has worked with SCI to set up the solution for our needs. PREACTOR currently manages 45,000 parts that constraints are applied to. We are today able to schedule each aircraft in detail with 70% of each assembly included. The interface with SAP was developed by SOPRA. SAP is the reference point for all data. PREACTOR optimizes the schedule and feeds the information back to SAP. Its*

powerful scheduling engine complements the SAP system. SAP is not able to do this. SAP should not be confused with planning and scheduling software", commented Francis BONLIEU. "We have approximately 800 operations to plan with a WIP of 25 aircraft. Only Thierry SARCAN, the Scheduler uses PREACTOR however the schedule is accessed by the other SAP users as data is held in a repository. In the workshop, the operators will see the tasks that need to be completed in each week".



The sequencing of the components is done by PREACTOR once a week, usually on Mondays. The list of parts required are sent to the stores who then deliver them on small trolleys to where they are required at the right time and in the correct quantity. In this way there is complete optimization of the supply chain. No longer are there stocks of parts at the beginning of the assembly lines, they are pulled through as required.

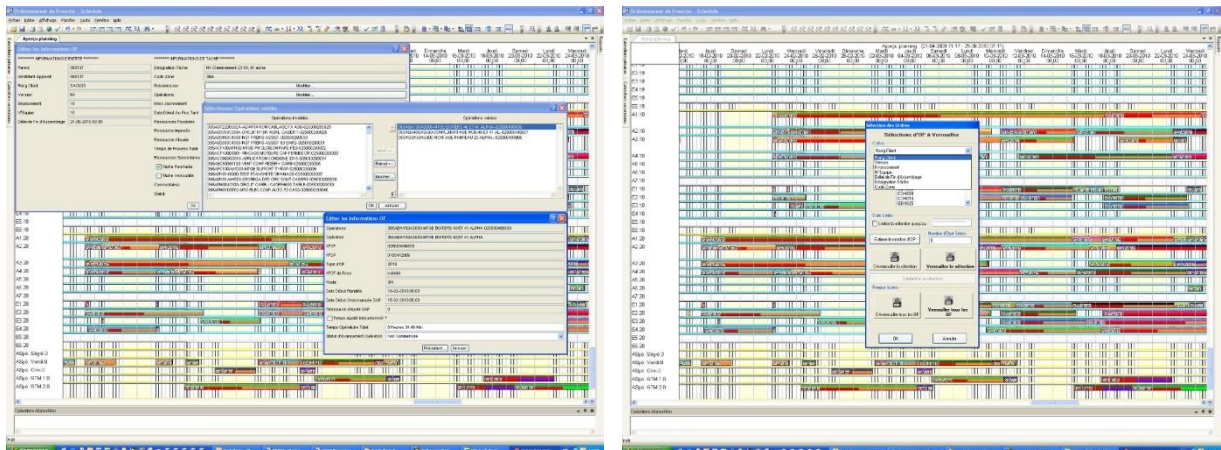
Francis BONLIEU maintains that it is not possible to follow Lean Manufacturing without a powerful scheduling solution. "Thanks to PREACTOR we have been able to implement 'pull' and not 'push' manufacturing. With 20 aircraft types the level of complexity involved was too much to do in the head or use Excel. Also we wanted to formalize our scheduling solution and not rely on the expertise of a single person".

During the scheduling process PREACTOR recognises those operations that are waiting for parts and sequences them as late as possible without affecting the promised delivery dates for its customers. When a part is missing PREACTOR moves the operation to meet the deadlines and a visual indicator appears within SAP alerting the users to the situation. The head of the workshop can then take the decision to use the same part from another aircraft type.

The planning horizon is set to about 4 weeks. PREACTOR is used to validate the data and highlight errors in SAP. The schedule data is then released to the workshops via a server where it can be accessed by all the team heads in an appropriate format that they could use.

Francis BONLIEU again. "PREACTOR is very powerful. We began by putting into the scheduling model the essential constraints of our production system, then, as we made measurements of the actual results, we made adjustments. We divided the shop into areas or departments, then, taking into account the skills of the operators, we assign them to specific areas and specific tasks in the schedule. The aim is to reduce unnecessary movement from one area to another".

Results & Benefits



"The DAUPHIN overall cycle time which was around 28 weeks is now down on average to 19 weeks today. The goal is 16 weeks. This is a significant reduction of more than 30%. In addition the stocks and work in progress has also been significantly reduced. We now have high quality schedule information. Whenever we have a problem the reason was related to the quality of the data that was sent in PREACTOR" Francis BONLIEU.

The Future

The DAUPHIN line is now the Benchmark for other divisions of the Group to follow. The workshop is now the place where visitors are brought to show the advances made within EUROCOPTER.

Francis BONLIEU commented. *"Other areas will now adopt the scheduling solution to help them to achieve their objectives with the EC175 likely to be the next to take the same approach. The Super-Puma will also follow later with the future forecast being used to plan further ahead. In addition the DAUPHIN line will further refine their model. For example, data on staff capabilities and qualifications will be used to allocate work. Also the model needs to be extended to schedule the testing activities taking into account the location the airport in Marseille MARGNANE and must share resources with scheduled flights. It is clear that PREACTOR has become the tool reference of our Group for planning and scheduling"*.