

# MOONRAKER

## *The MRO Lab* Adaptive Innovations



Changing a nose wheel on a narrow body aircraft (Boeing 737/Airbus A320) may not be considered a very complex task, but in a time-constrained Line Maintenance environment, any time savings are welcome.

AFI KLM E&M has now developed an innovative service cart that improves safety, ergonomics, and error-proofing in nose wheel changes, delivering average time savings of an impressive 60%.

### The issue

#### Heavy handling

The service cart generally used by ground engineers to change wheels is a generic tool designed for changing nose-wheels, main wheels, and brakes. Maintenance equipment tends to be designed for wide-body aircraft, and does not, therefore, take the specific features of narrow body aircraft into account. This results in equipment that is cumbersome and extremely inefficient for nose-wheel changes. Narrow body aircraft nose wheels are only slightly larger than a car wheel, weighing around 30kg each, making them relatively easy to handle. Moreover, data analysis of wheel changes over a period of ten years showed that more than 40% of all wheel changes were for nose wheels only, justifying a specific approach to designing a dedicated nose wheel replacement service cart.

### The adaptive solution developed by AFI KLM E&M

#### Moonshine

As part of its Lean Six Sigma strategy, AFI KLM E&M launched the 'Moonshine' program designed to stimulate team based on creativity and innovation. 'Moonshine' is a Japanese lean manufacturing philosophy that seeks innovative methods to improve, ergonomics and safety, for example. Results have shown that this focus has an important positive effect on both the time and the cost of maintenance. It emphasizes creative use of available materials, scrounging, and 'doing a lot with a little'. Experimentation is encouraged, as are all kinds of simulation, prototyping and trials, to explore and inspire, in an activity known as 'trystorming'. Getting out of the immediate worksite, talking with others and observing how they do their jobs is encouraged. Leaders facilitate and encourage team creativity by using a structured method based on the principle of learning by doing. Moonshine is named after the nocturnal activities of poor farmers during the Prohibition era in the USA, who invented their own machines to distill alcohol. They did this in the 'shining of the moon'. The key success factor of any team based Moonshine effort is that end users such as mechanics, ground engineers, warehouse employees, and equipment engineers, are the innovation designers and, as such, are actively involved in every stage of the Moonshine process.

#### New design

The generic set of Moonshine design principles, including safety, error proofing and ergonomics give guidance to any Moonshine design team. When applied to Moonraker, it turned out that the final design resulted in an extremely efficient cart that led to an impressive 60% reduction in the time required for nose wheel changes. The cart has been designed so that the warehouse employees can load and unload it from one side only. In addition, all operations carried out by ground engineers, like retrieving their tools and inflating the tires, are performed on one side of the cart only, cutting out unnecessary 'to ing and fro ing'. The cart is a simple, open construction that contains only those tools required for nose wheel changes.

### Key benefits

- Safety for warehouse employees
- Error proof, ie, it can be used in only one way: the right way
- Faster loading/unloading. Ergonomics
- Less time required for nose wheel changes (60% reduction)
- Reduced movement and transportation
- Leverages end-user skills and expertise for increased pride, motivation, and job satisfaction
- No unnecessary activities/handling.  
Simple to use. Simple design leading to lower maintenance costs





*The MRO Lab*  
Adaptive Innovations

“ Save 60% of time for your nose wheel changes ”

This adaptive solution was developed under the Lean Six Sigma Moonshine program by the **AFI KLM E&M narrow body Line Maintenance Department** responsible for Boeing 737 New Generation line maintenance, in conjunction with the Materials and Equipment department, both part of the Line Maintenance department. For further information please contact your Sales Manager.



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