IFS Aviation Maintenance

Maintenance Planning

CAMO Module

Document Revision: 8.3-SP13-1

Publication Date: November 25, 2025

Contents

1

Task deadlines and forecasting

A task deadline is the date when the task must be completed, also called the due date: it is a key criteria for maintenance planners to decide which tasks to group in a work package. The deadline of the next occurrence of a recurring task is calculated based on the last time the task was performed on the inventory item, and the scheduling interval of the task. Forecasting is the process CAMO Module uses to predict or estimate the calendar date that the task may come due. In CAMO Module, the next occurrence of a recurring task is the active task (it has the status value ACTV), and subsequent occurrences that CAMO Module creates are the forecasted tasks (they have the status of FORECAST).

For tasks whose deadlines are calculated simply in elapsed calendar time; that is, forecasting deadlines for each occurrence of a recurring task that is due every six months is a straightforward process. However, for tasks whose deadlines are based on the usage accrued by the asset, such as flying hours or cycles, CAMO Module includes and uses more elaborate forecasting capabilities that consider the flight plan, longer term forecasting models, and rounding and forecasting thresholds.

When information about an inventory item changes and is updated in CAMO Module, such as the usage accrued during the last flight, the task deadlines are recalculated automatically to take the updated information into consideration. Therefore, the most up to date information is available for planning the maintenance work. There is also a CAMO Module job that your administrator can configure to run at regular intervals to update task deadlines based on the latest information in the system. For more information about CAMO Module jobs, see the *Maintenix Administration Guide*.

1.1Task deadlines

CAMO Module calculates the deadline of planned routine work according to the scheduling information and rules included in the requirement definition, or in the block definition when a block is used.

Non-routine work consists of faults that were deferred, on-condition tasks that became necessary because a specific circumstances, for example an inspection task for electric systems is needed because the aircraft was hit by lightning, and ad hoc tasks. For non-routine work, the deadline is set manually in CAMO Module—on the Scheduling tab of the Fault or Task Details page—by the user who creates the task, the user who defers the fault, or it may be left up to the maintenance planner to set the deadline. However, on-condition tasks can include pre-defined scheduling information stating that, for example, the task should be completed five days after the prerequisite condition occurred.

The scheduling information in the requirement and block definitions associated with routine tasks includes the following:

- The scheduling start date or value.
- The interval to add to the start date or value to calculate the deadline. After the task has been completed once, the interval is added to when the task was performed to determine the due date of the next occurrence of the task.

The interval is specified using calendar parameters, usage parameters, or a combination of both.

You can see the due dates of tasks on many different pages in CAMO Module, for example the Inventory Details page, the Task Details page, and many pages that list tasks such as the Fleet Due List tab.

Some organizations allow maintenance planners to do the following:

- Change the interval related to the deadline of an ad hoc task or a fault, which affects the deadline.
- Extend the deadline of a task.
- Add or remove a deadline to an ad hoc task or a fault; in some organizations, the engineering department is responsible for setting the deadline of ad hoc tasks, while the maintenance controller does the same for ad hoc faults.
- Switch a soft deadline to a hard deadline to ensure the work is completed during a specific maintenance visit. This can only be done on ad hoc tasks and faults, not tasks that are based on a task definition.

Several CAMO Module pages also show the Schedule Priority tasks. CAMO Module changes the schedule priority from LOW to HIGH when the deadline is within the notification interval specified in the task definition. If the work is not completed by the deadline, the task is considered overdue, which can ground an aircraft. Tasks with soft deadlines are never considered overdue.

Estimated due dates for tasks with usage-based scheduling

When CAMO Module forecasts deadlines, the usage parameters considered are:

- Flight schedules (short term tasks),
- Forecast models, and blackout periods,
- Bypass thresholds,
- Rounding rules.

Except for forecast tasks due after today, the estimated due date is the latest time that the task can be done, or could have been done, before becoming overdue:

In flight plan?	Estimated due date based on	Scenario	Estimated due date
Yes*	CYCLES LANDINGS HOURS	Positive or 0 remaining usage Negative remaining usage	One minute before the departure date of the flight during which remaining usage will become negative.
No	Forecast model	Task due after today	23:59 the day before task becomes due**
No	Forecast model	Task due today	Today at 23:59

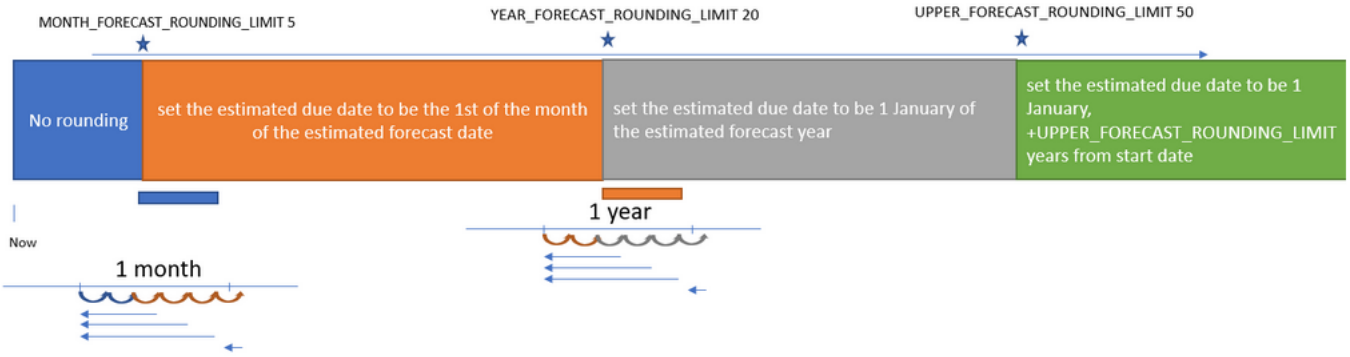
Note ***Organizations can set thresholds for bypassing the flight plan** which improves the forecasting accuracy of longer deadlines by using the faster and less volatile forecast model. The recommended threshold values should equate to 1 or 2 years of flying: 6000 hours/3000 cycles for a typical airline. Setting the threshold too low (example: 100 hours) will negatively affect the precision of shorter deadlines as flight plans offer more precision. See 9.4.7 in the administration guide for setting bypass thresholds. ****Organizations can set rounding rules for estimated due dates.** These reduce the volatility of longer-term deadlines which in turn reduces the effort to calculate and maintain deadlines. See 9.4.8 in the administration guide for setting rounding rules.

1.2Due dates estimation for tasks with usage-based scheduling

By adding a threshold and rounding off dates, the CAMO module forecast deadlines only when needed, thereby avoiding unnecessary calculations.

There are four rounding rules on how the due dates estimation model works:

UPPER_FORECAST_ROUNDING_LIMIT (Default of 50)
YEAR_FORECAST_ROUNDING_LIMIT (Default of 20)
MONTH_FORECAST_ROUNDING_LIMIT (Default of 5)



1. Deadline date < MONTH_FORECAST_ROUNDING_LIMIT, then do not do any rounding
2. MONTH_FORECAST_ROUNDING_LIMIT< forecasted date < YEAR_FORECAST_ROUNDING_LIMIT, set the estimated due date to be the 1st of the month of the estimated forecast date
3. YEAR_FORECAST_ROUNDING_LIMIT< forecasted date <UPPER_FORECAST_ROUNDING_LIMIT, set the estimated due date to be 1 January of the estimated forecast year
4. UPPER_FORECAST_ROUNDING_LIMIT <forecasted date, set the estimated due date to be 1 January, +UPPER_FORECAST_ROUNDING_LIMIT years from start date

As the diagram above shows, in the rounding rules when dates fall on the edge, the forecasting logic skips the first month, and first year when it comes to rule 2 and rule 3.

For example: Consider a situation where the date falls on the edge of a limit as the second rounding rule between the month and the year limit, the deadline is rounded to the 1st of the month in the setting range. If scheduling starts today June 15th,2023, and the YEAR_FORECAST_ROUNDING_LIMIT is 20 years, the setting range falls in the year 2043, i.e January 1st to December 31st, 2043. The deadline due for Task B is July 15th, 2043, the deadline forecasted is rounded to July 1st, 2043, If Task A has a deadline due on April 8th, 2043, this is rounded to April 1st, 2043.

The rounding off to January 1st begins from the second year of the setting range. According to this example, the year 2044. The same calculation applies to limits that fall in the edge when MONTH_FORECAST_ROUNDING_LIMIT is applied.

Note You can set the rounding threshold for your organization to accommodate your forecasted calendar deadline setting preferences.

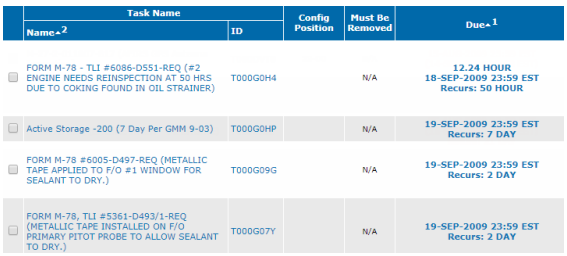
1.3Viewing due dates and recurrences of tasks

On CAMO Module pages that list tasks, the predicted due date for a task is shown, along with other information—such as the extended deadline when applicable and, for recurring tasks, the repeat interval. You can use this information to decide when to execute a particular task. This applies to tasks based on a task definition, and to ad hoc tasks.

For recurring tasks, you can see how much of the repeat interval has been used up already, and how much yield has been achieved since the last time the task was performed.

This information is shown in the Due column (see the figure) that appears on the following CAMO Module pages:

- Work Package Details page, Assigned Tasks tab.
- Work Package Details page, Unassigned Tasks Tab
- Open Task
- Fleet Due list.
- Open Tasks page.



Due column

The content of the Due column differs slightly depending on whether the task is recurring, and if the task deadlines are specified using a usage parameter or a calendar parameter.

If the deadline is based on calendar days, the date shown is the actual due date.

For deadlines based on usage parameters, you see the following information:

- The remaining usage before the task is due. If a deadline extension was added to the task, the sum of the remaining usage and the extension is shown in parenthesis.
- The predicted due date. This is not shown if the target inventory of the task is loose—not installed on an aircraft.
- The repeat interval, for recurring tasks only.

For deadlines based on calendar parameters, you see the following information:

- The due date.
- The new due date, which is the date that corresponds to the due date plus the deadline extension that was added to the task.
- The scheduling interval, for recurring tasks only.

1.4Driving tasks and driving deadlines

The due date of a work package or a block that is listed on the Open Tasks or Preview Release pages for an aircraft is determined by the driving task. CAMO Module uses the driving task as the due date on a work package or block to help ensure tasks don't become overdue during planning and execution of maintenance.

The driving task is the task in a work package or block that has the earliest deadline. When driving tasks in work packages or blocks are overdue, the work package and block due dates and the driving task are displayed in bold red font on the Open Tasks and Preview Release pages for an aircraft.

Before examining which task drives the due date for a block or work package, it is useful to understand the driving deadline for a task.

Driving deadline for a task

If a task has more than one scheduling rule based on different usage parameters such as hours and cycles, the driving deadline for a task is the deadline that is forecast to arrive earliest. If a task definition has one scheduling rule that requires the task to be done after 100 flying hours and another scheduling rule that requires the task to be done after 50 cycles, which rule drives the deadline for the task? For usage based scheduling CAMO Module uses the flight plan and the forecast model (the rate at which the aircraft accumulates usage) to estimate calendar dates when the aircraft will reach each of the scheduling deadlines. For example, if a task is due in 100 hours or 50 cycles and the plan is that the aircraft will operate 5 hours a day, and 2 cycles a day, then the aircraft will reach the hours deadline in 20 days and the cycles deadline in 25 days. If the task is scheduled to the earliest deadline, then the deadline based on hours is the driving deadline. If the task is scheduled to the latest deadline, then the deadline based on cycles is the driving deadline.

Using the earliest due date as the driving deadline for a task is the default behavior, but you can specify in a block or requirement definition that the task deadline should be scheduled to the latest of its deadlines. In this case, the latest deadline becomes the driving deadline. (You do this by selecting the Schedule to Latest Deadline option in the block or requirement definition.) The rest of this topic describes the default behavior that uses the earliest deadline.

Driving task for a work package

The driving task for the work package is the requirement or block included in the work package that has the earliest driving deadline – even if an assigned task is due before the start date of the work package.

Driving task for a block

When several requirements are grouped in a block, the driving task has the earliest driving deadline among the block itself and its assigned requirements - even if an assigned task is due earlier than the block. It is possible that a requirement can be assigned to a block where the scheduling interval of the requirement is less than the scheduling interval of the block and the task deadline is therefore earlier than the block deadline.

Note that the due date displayed for the block, depends what page you are looking at:

- On the Task Details for the block, the due date displayed is not the driving task, but the due date based on the scheduling defined in the block's task definition. This date can be different than the due date for the block that shows on other pages.
- When you look at the open task list for an aircraft - the Inventory Details page, Open Tasks tab or the Preview Release page, the due date for a block is the due date of the driving task. This alerts you to blocks that you might want to pull into a current work package.

If the usage deadlines for several tasks in a block are on the same date, CAMO Module determines the driving task and deadline for the block by sorting the usage deadlines in the following order:

1. Due date.
2. Deadline data type:
   a. usage in cycles
   b. usage in hours
   c. usage in days
   d. calendar days
3. Remaining usage quantity.

The block is displayed as a list sorted by deadline, so the first task in list is the deadline for the block. For example, a block and its five requirements are ordered as follows, with REQ 2 as the driving task for the block:

REQ2	Usage Remaining: 20 Cycles. Due: Sept 20, 2012
Block	Usage Remaining: 22 Cycles. Due: Sept 20, 2012
REQ4	Usage Remaining: 38 Hours. Due: Sept 20, 2012
REQ1	Usage Remaining: 40 Hours. Due: Sept 20, 2012

REQ5	7 Days Remaining. Due: Sept 20, 2012
REQ3	Due: Sept 22, 2012

Under the hood, CAMO Module sorted these tasks in three iterations to determine the driving deadline for the block:

1. By due date: Block, REQ1, REQ2, REQ4,REQ5, REQ3
2. By deadline date type: Block, REQ2, REQ1, REQ4,REQ5, REQ3
3. By quantity of remaining usage: REQ2, Block, REQ4, REQ1,REQ5, REQ3

1.5Deadline extensions

Maintenance Planners use deadline extensions in situations where the aircraft cannot be brought to the repair station in time to do the maintenance. They approach the appropriate regulatory authorities and ask for permission to get a small extension; enough time to make it to a maintenance airport. They do this to avoid grounding the aircraft, which is what would happen if the deadline goes overdue.

This procedure is also useful before activating new revisions of requirements or maintenance programs, to avoid having many tasks become overdue because of the revision.

You extend the deadline by adding to the deviation on its scheduling parameter(s). When you extend a deadline by a number with fractions, for example, 2.5, and the deadline uses calendar days, weeks, or months as the scheduling parameter, the extension can cause the new deadline to be at a specific time during a day. To avoid a task from becoming overdue, CAMO Module sets the deadline to 23:59 on the previous day. When you extend the deadline for a block, CAMO Module also extends the deadlines for all sub-tasks (requirements) with the current driving deadline on or before the extended deadline for the block.

When you are looking at the due date of tasks from the Aircraft Work Package> Assigned Tasks > Due column, you can tell if the deadline has been extended when Extended Due Date column is updated.

1.6Plan By Date

Requirements have a due date based on their intervals. However, large or long-term requirements must be manually staggered so that they are not all executed at the same time to ensure that parts and tools are all available, and that optimal use is made of the labor resources that are available. Using the Set Plan By Date feature, you can set the date by which the requirement task should be completed to an earlier date than its due date. The plan by date does not replace the due date; it is an additional piece of information maintenance planners can use. You can set

the plan by date for any active occurrence of the requirement. You can set the plan by date on individual active occurrences of the requirement, or for multiple occurrences of the requirement. When you access the task from the Aircraft Work Package page, CAMO Module displays the option to set the plan by date.

Note CAMO Module indicates using the plan by date on the 'plan by date' column.

2
Planning types

Planning types provide an approximation of the number of hours of non-routine work likely to be generated for every hour of work on a specific aircraft type, and the skills needed to complete this non-routine work.

The estimate of the amount of effort required to complete non-routine work that will be found during a planned, routine maintenance task—called the initiating task—is generated using the planning type that is assigned to the initiating task. Each planning type has a non-routine factor that specifies the number of hours of non-routine work for one hour of work performed on the initiating task. Ideally, the non-routine factor specified is based on historical maintenance data that was recorded over time for the task, as it was performed several times on a specific type of aircraft.

For example, a maintenance department has recorded the faults found, and the work performed on aircraft of type X during a routine inspection. The accumulated data shows that for every hour spent inspecting that type of aircraft, the faults raised required two hours of work. Therefore, for the routine inspection task on aircraft of type X, the non-routine factor is 2. If for every hour of inspection, 30 minutes of corrective work are required, the non-routine factor is .5.

The planning type also identifies the skills required to complete the non-routine work, which is helpful when comparing the work required with the nominal capacity that is available. Continuing with the earlier example, if historical data shows that the non-routine work resulting from the routine inspection is completed in part by a machinist, in part by an electrical technician, and in part by an avionics technician, you add each of these skills to the planning type, and set the percentage of the non-routine work duration that requires each skill. If the skills required for a planning type are unknown, you can specify a generic skill, for example that 100% of the non-routine work is done using the laborer skill.

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