MCX Toolset User Guide

FY2022

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1. Introduction

The Aircraft Maintenance Cost Data Exchange (MCX) program is now part of IATA's Global Aviation Data Management (GADM). MCX is a voluntary, free of charge program for airlines.

Each year, we collect maintenance-related data from more than 50 airlines around the world and publish a benchmark report. This report is provided exclusively to participating airlines in order to help them monitor their costs and compare their performance to the industry. To benefit from this useful information, the interested airlines should fill out the MCX Toolset or "input toolset". The MCX Toolset is maintained by IATA and reviewed annually and revised if needed.

This user guide provides all the information needed to properly fill it out.

Who should read this user guide?

This user guide is intended for airline personnel in charge of cost control or cost monitoring, finance controllers, planning managers, strategic planners in technical division.

About the MCX Toolset

The MCX Toolset can be used as a single-place repository for your airline maintenance-related information. It consists of financial, operational, maintenance and human resources data that an airline should collect and monitor on a consistent basis.

The Toolset is a Microsoft Excel file with 14 tabs including 3 tabs that are filled automatically with data provided in the other tabs. In order to reflect the impact of the COVID-19 crisis in 2020, we have added two new tabs in the FY2020 toolset and kept them for this data collection cycle.

Each tab will be explained and detailed in the following sections:

- Intro
- Summary Tables – **Automatically filled with the data provided in the other tabs**
- Airline General Info
- Airline Active Fleet Info
- Tell us about 2022 – **Introduced in FY2020 toolset**
- Level 1–Mtc Segments
- Parking/Storage Costs – **Introduced in FY2020 toolset**
- Personnel & Overhead
- Level 2.1–Airframe Mtc
- Level 2.2–Engine Mtc
- Level 2.3–Components
- Maintenance Reserves
- Summary Graphs – **Automatically filled with the data provided in the other tabs**
- P&O Graphs – **Automatically filled with the data provided in the other tabs**

1.1. Important Remarks

As soon as you open the file, before you enter any data, click on Enable Content in the Security Warning Message.

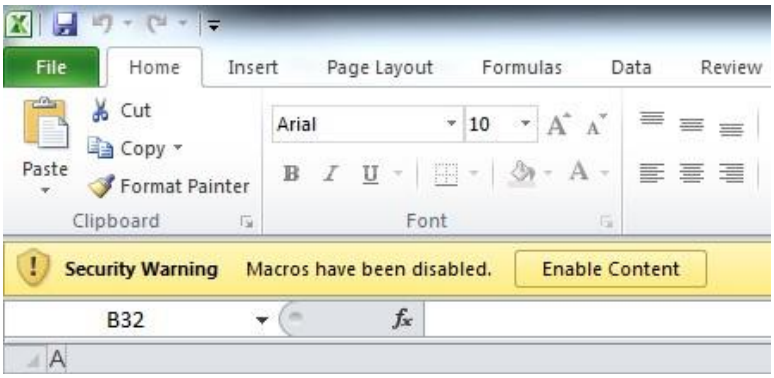
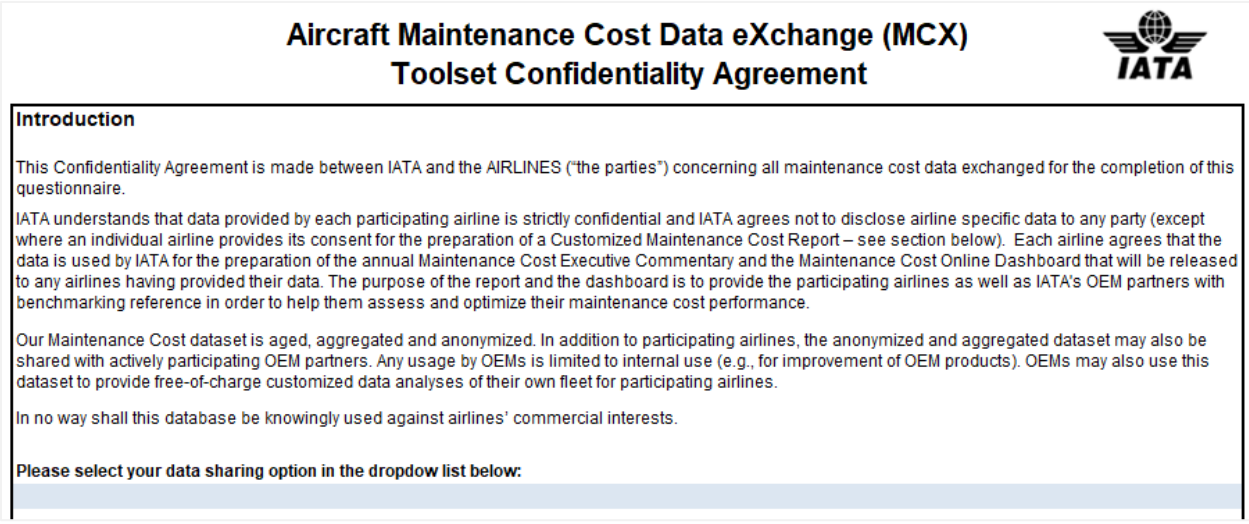


Figure 1. Click on Enable Content



Aircraft Maintenance Cost Data eXchange (MCX)
Toolset Confidentiality Agreement

Introduction

This Confidentiality Agreement is made between IATA and the AIRLINES ("the parties") concerning all maintenance cost data exchanged for the completion of this questionnaire.

IATA understands that data provided by each participating airline is strictly confidential and IATA agrees not to disclose airline specific data to any party (except where an individual airline provides its consent for the preparation of a Customized Maintenance Cost Report – see section below). Each airline agrees that the data is used by IATA for the preparation of the annual Maintenance Cost Executive Commentary and the Maintenance Cost Online Dashboard that will be released to any airlines having provided their data. The purpose of the report and the dashboard is to provide the participating airlines as well as IATA's OEM partners with benchmarking reference in order to help them assess and optimize their maintenance cost performance.

Our Maintenance Cost dataset is aged, aggregated and anonymized. In addition to participating airlines, the anonymized and aggregated dataset may also be shared with actively participating OEM partners. Any usage by OEMs is limited to internal use (e.g., for improvement of OEM products). OEMs may also use this dataset to provide free-of-charge customized data analyses of their own fleet for participating airlines.

In no way shall this database be knowingly used against airlines' commercial interests.

Please select your data sharing option in the dropdow list below:

Figure 2 - Intro Tab – Data Sharing Option

Always make sure to read the Introduction paragraph and select one of the proposed options. **Your data submission will only be accepted if one of these options is selected.**

To know if you are using the last updated MCX Toolset, go to row 17 on the Intro tab. It should read:
1. Save your file "MCX-FY2022-AirlineCODE_date.xlsm" (example: MCX-FY2022-XB_2023.05.15)

1.2. Mandatory/Non-Mandatory Fields

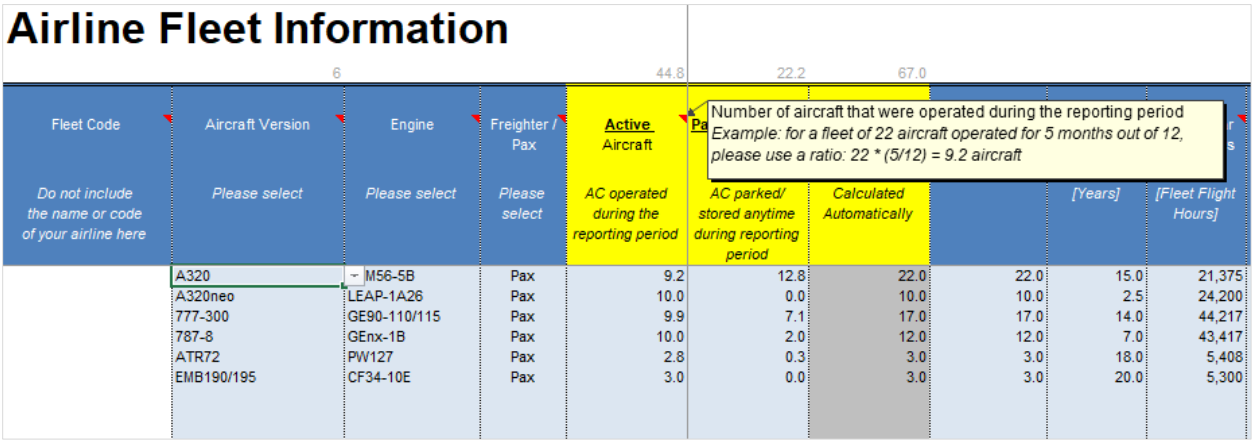
Color-coding is used to indicate the different categories of fields in the toolset.

- **BLUE** fields are Mandatory.
- **WHITE** fields are Optional; however, we recommend that you populate as many as you can.
- **GREY** fields are calculated and/or automatically populated.

1.3. Definitions

We provide definitions for the majority of the fields in the toolset. Definitions are found in comments of header cells and pop-up messages of blue/white fields.

To view a definition, hover the cursor over the header cell with a red triangle on the upper right corner or click on blue/white fields where data should be entered (see example below).



Airline Fleet Information

Number of aircraft that were operated during the reporting period
*Example: for a fleet of 22 aircraft operated for 5 months out of 12, please use a ratio: 22 * (5/12) = 9.2 aircraft*

Fleet Code	Aircraft Version	Engine	Freighter / Pax	Active Aircraft	Pa				
	6			44.8	22.2	67.0			
Do not include the name or code of your airline here	*Please select*	*Please select*	*Please select*	*AC operated during the reporting period*	*AC parked/ stored anytime during reporting period*	*Calculated Automatically*		*[Years]*	*[Fleet Flight Hours]*
	A320	M56-5B	Pax	9.2	12.8	22.0	22.0	15.0	21,375
	A320neo	LEAP-1A26	Pax	10.0	0.0	10.0	10.0	2.5	24,200
	777-300	GE90-110/115	Pax	9.9	7.1	17.0	17.0	14.0	44,217
	787-8	GEnx-1B	Pax	10.0	2.0	12.0	12.0	7.0	43,417
	ATR72	PW127	Pax	2.8	0.3	3.0	3.0	18.0	5,408
	EMB190/195	CF34-10E	Pax	3.0	0.0	3.0	3.0	20.0	5,300

Figure 3 - Definition of Field in Column Header

If additional explanation is required, please consult this user guide and/or contact us (mctg@iata.org).

1.4. Importance of Reporting Operational Data

Our focus is clearly on maintenance costs, however operational data, such as flight hours (FH), flight cycles (FC), available seat kilometers/miles (ASK/ASM), number of maintenance events, check intervals and turnaround times, is very important to calculate unit costs and KPIs.

Most of this information is easily available for all airlines. This data is required to calculate common industry KPIs, such as cost per ASK (CASK), cost per FH and cost per FC.

We would like to draw your attention on the importance of reporting accurate operational data and cost data in order to get the best benchmark data and analysis possible for the benefit of the airline industry and your own airline.

1.5. Importance of Data Quality

Good data quality is our main concern; it helps reduce the time before producing the benchmark report and improves its accuracy. We strongly encourage you to check your data before submitting it.

For that purpose, built-in checks are included in the data collection form in order to help you get an idea of the main metrics. Please check the Summary Tables, Summary Graphs and P&O Graphs tabs that summarize several data at airline level and aircraft type level:

- Operational data: Number of Aircraft, Average Aircraft Age, Total Flight Hours, Total Flight Cycles, ASK/ASM etc.
- Cost data: Total Maintenance Cost (Labor + Material vs Subcontracted), $/Flight Hour, $/Flight Cycle, $ per Maintenance Segments, $ per Maintenance Elements, etc.
- Spares & Inventory: Total Inventory Value, Inventory Value/Aircraft
- Staff/Aircraft: number of Mechanics/Aircraft, number of Overhead Staff/Aircraft

Unscheduled events can cause dramatic impact on maintenance spend, that is why we need also as many comments to explain unusually high or low costs.

1.6. Submitting your Data

- Save your file with the airline's code and the date included, for example: **MCX-FY2022-XB_2023.05.15.xlsm**

- The e-mail return address is: mctg@iata.org

- The deadline to submit data is **June 30, 2023**.

1.7. Acceptance of Data

It takes a fair amount of time for airlines to gather and submit data, and it takes a lot of effort to validate this data in order to deliver the most relevant benchmark analysis in a reasonable amount of time. We often need to contact airlines and ask for clarifications.

For this initiative to remain viable and reliable, it is critical to get the data in due time. That's why we would like to remind you of the importance of making sure you respect this deadline.

2. Intro Tab

The first tab of the MCX Toolset informs the users of the content of the maintenance cost data collection program.

The users are invited to select their preference on three (3) items.

2.1. Data Sharing Option

Always make sure to read the Introduction paragraph and select one of the proposed options on row 12 (highlighted in blue in Fig. 4):

- Share your airline's anonymized data with all OEMs
- Share your airline's anonymized data with the respective OEM (e.g., the Airbus fleet data goes to Airbus only, the Boeing fleet data goes to Boeing only, etc.)
- Not share any of the data with the OEMs

Your data submission will only be accepted if one of these options is selected.

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Our Maintenance Cost dataset is aged, aggregated and anonymized. In addition to participating airlines, the anonymized and aggregated dataset may also be shared with actively participating OEM partners. Any usage by OEMs is limited to internal use (e.g., for improvement of OEM products). OEMs may also use this dataset to provide free-of-charge customized data analyses of their own fleet for participating airlines.

In no way shall this database be knowingly used against airlines' commercial interests.

Please select your data sharing option in the dropdow list below:

Figure 4. Intro Tab – Data Sharing Option

2.2. Additional Selections

The users shall also select their preferred options on rows 29 and 34 (highlighted in blue in Fig. 5).

On row 29, the users shall indicate whether or not they would like to request a customized report from our OEM partners.

On row 34, the users shall indicate whether or not they allow IATA to disclose the name of their airline in the list of participants. This list is solely used for the purpose of attracting more airlines and improving the quality of the benchmark through greater industry representation. Data will remain confidential and de-identified. The name of the airlines will by no means be associated with the data.

Get a Customized Maintenance Cost Report

IATA's OEM partners can provide your airline with a customized maintenance cost report, an in-depth analysis of direct maintenance cost data (i.e. excluding overhead) by fleet type for airframe, components and engines, and the year-on-year evolution (if data is available).

In order to participate, you need to provide detailed data for Airline Info, Fleet Info, Level 1 and Level 2) and authorize IATA to provide our OEM partners with the airline code and contact details in order to be contacted for data clarification. For aircraft fleets of non-participating OEMs, IATA could perform some benchmark analysis against MCX data.

Is your airline willing to receive a Customized Maintenance Cost Report? ***(Please select answer from the dropdown list below)***

Help this program to grow

To improve the quality of the benchmark through greater industry representation, we are looking for airlines that are willing to publicly disclose their airline names for the sole purpose of attracting more airlines. Data will remain confidential and de-identified. The name of your airline will by no means be associated with your financial data.

Is your airline willing to disclose participation in this program? ***(Please select answer from the dropdown list below)***

Figure 5. Additional Selections

3. Summary Tables

The Summary Tables recapitulate several data:

- **At airline level**
  - In-House (Labor + Material) vs Contract (Outsourcing)
  - Average number of staff per aircraft (mechanics and overhead staff)
  - Technical Division cost breakdown

- **At aircraft type level**
  - Operational data (total flight hours, total flight cycles, etc.)
  - Cost data: Total Maintenance $, $/Flight Hour, $/Flight Cycle, $ per Maintenance Segments, $ per Maintenance Elements, etc.

This will help you check your data before submitting it. You can also use these tables as a reporting tool in your airline.

Below is an example of the Summary Tables. These numbers are for illustration purposes only!

Airline Summary

1. In-House vs Contract Maintenance Cost

In-House vs Contract Maintenance Cost:			
In-House (Labor + Material) Cost	3,248,000	USD	7%
Contract (Outsourcing) Cost	39,973,400	USD	90%
LLP Cost	1,414,000	USD	3%

2. Staff/AC

Mechanics and Overhead Staff per Aircraft:		
Mechanics/AC	0.7	People/AC
Overhead Staff/AC	0.5	People/AC

3. Technical Division Cost

Total Technical Division Cost:			
Direct Labor Cost	2,350,000	USD	3%
Direct Non-Labor Cost *(Material, LLP & Subcontracted)*	42,285,400	USD	55%
Overhead Labor Cost	1,633,000	USD	2%
Overhead Non-Labor Cost	30,590,000	USD	40%
Total Technical Division Cost	76,858,400	USD	100%

Aircraft Summary

Aircraft Version	Engine	Total Fleet	Active Aircraft	Parked/ Stored Aircraft	Average Fleet Age *(Years)*	FH/AC	FC/AC	$/FH *(USD / FH)*
Total		67	45	22	11.8	3,210	1,130	310
%		100%	67%	33%	-	-	-	-
A320	CFM56-5B	22	9	13	15.0	2,332	1,480	484
A320neo	LEAP-1A26	10	10	0	2.5	2,420	1,590	110
777-300	GE90-110/115	17	10	7	14.0	4,459	624	422

Figure 6. Examples of Summary Tables

The toolset also has summary graphs for maintenance costs and P&O graphs. Please see Section 11 for more details.

4. Airline General Info

This section of the toolset collects general information about your airline. Most of the fields are explained below.

- It is mandatory to enter the **airline full name** and the 3-letter ICAO code.
- In the **Fiscal Year (From)** field, enter the first day, month and year for your airline's maintenance cost submission (calendar year or fiscal year). The last day will be automatically calculated.
- **Contact Information:** Mandatory entry fields (**Last Name, First Name, Job Title/Department, E-mail, and Phone**), necessary for IATA to contact the airline and clarify the maintenance cost submission, if required.
- **Finance:** Select Local Currency or USD currency and remain consistent throughout the toolset.
    - If you report in your local currency, it is important to enter the average exchange rate in the right format:

      1 USD = [your exchange rate] CY

      Example: if local currency is EUR, it will show 1 USD = 0.9455 EUR
    - If local currency and reporting currency are both USD, enter '1' in the exchange rate cell and it will show:

      1 USD = 1 USD
- **In-House Labor Rate Over the Fiscal Period**
    - **Average In-House Labor Rate:** Labor cost, including overtime and social costs but excluding overhead, for the productive workforce, divided by the productive time. The value entered here is automatically reported in the "Personnel & Overhead" tab in cell S25 and it is compared to the automatically calculated value in cell P25. This is one of the built-in checks of the toolset!
        - **In-house Line Maintenance:** Manual Labor Direct Cost divided by the Maximum Potential Time (In-house rate for Line function only).
        - **In-house Base Maintenance:** Manual Labor Direct Cost divided by the Maximum Potential Time (In-house rate for Base function only).
        - **In-house Component Maintenance:** Manual Labor Direct Cost divided by the Maximum Potential Time (In-house rate for Component function only).
        - **In-house Engine Maintenance:** Manual Labor Direct Cost divided by the Maximum Potential Time (In-house rate for Engine function only).
        - **In-house Cabin Maintenance:** Manual Labor Direct Cost divided by the Maximum Potential Time (In-house rate for Cabin function only).

- **Subcontracted[1] Labor Rate Over The Fiscal Period:** It applies to hangar maintenance (i.e. airframe maintenance) not performed in-house.
    - **Average Subcontracted Labor Rate:** Contract labor cost by fleet type.
- **Units of length and distance:** There is a choice between the metric system (km) and the imperial system (miles). Either system can be used, however it is critical to remain consistent and use the same system throughout the toolset.
- **Comments:** You can inform us of any important facts can help us understand your data better (e.g. airline merger, change in maintenance supplier, important fleet retirement/introduction, etc.)
- **Secondary Contact Information:** Enter details for an additional contact. This will help us keep in touch in case the primary contact is not available.

[1] Subcontract: Employ another party (external provider) to provide all or a specific part of the work or materials.

5. Airline Fleet Info

This section collects information about your airline's fleet. You can gather the fleet mix and operational data from your reliability group (flight hours, cycles, dispatch reliability) and your commercial/marketing team (ASKs). Once the airline fleet information is entered, it auto-populates fields in the Level 1, Level 2 and Maintenance Reserves tabs.

- **Fleet Code:** This column is optional, you can use a code identify a specific fleet (e.g. young/old fleet, owned/leased fleet, etc.). For confidentiality reasons, please do not include the name or IATA/ICAO code of your airline.

- **Aircraft Model / Version:** Select the Aircraft Model / Version contained in this fleet. Please be as exact as possible: e.g. A350-900, B787-8, CS100, EMB 190/195

Please avoid using the "COMMON" version as much as possible unless there is no individual data available, and it is not possible to estimate the allocation by aircraft version.

- **Engine Type:** Select the engine type installed on the aircraft in this fleet.

- **Freighter / Pax:** Select pax (passenger) or freighter aircraft. Separate fleets need to be created for pax and for freighter aircraft.

- **Active Aircraft:** Number of aircraft that were operated during the reporting period.
  *Example: for a fleet of 22 aircraft operated for 5 months out of 12, please use a ratio: 22 * (5/12) = 9.2 aircraft*
  If a fleet type is retired (no flight hours or cycles) and there was no maintenance cost, do not report it.

- **Parked/Stored Aircraft**: Number of aircraft that were parked/stored anytime during the reporting period.
  *Example: for a fleet of 22 aircraft parked/stored for 7 months out of 12, please use a ratio: 22 * (7/12) = 12.8 aircraft*

- **Total Fleet Size**: The sum of Active Aircraft and Parked/Stored Aircraft. This field is automatically calculated.

- **Fleet Size with Operating Lease:** Number of active aircraft that were operated under operating lease during the reporting period.

- **Average Fleet Age:** Average age of the active aircraft at end of the reporting period.

- **Fiscal Year Flight Hours:** Number of flight hours[2] flown during the reporting period.

- **Fiscal Year Flight Cycles:** Number of flight cycles[3] flown during the reporting period.

- **Cumulative Fleet FH since New:** Cumulative number of flight hours flown since the first flight of each aircraft.

- **Cumulative Fleet FC since New:** Number of cumulated flight cycles flown since the first cycle of each aircraft.

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[2] Flight Hours: Airborne time, i.e. wheels-off to wheels-on, in hours.
[3] Flight Cycle: A completed take-off and landing sequence.

- **Available Seat Kms/Miles (ASK/ASM):** Available Seat Kms/Miles applicable to passenger aircraft. A seat-kilometer/mile is available when a seat is flown one kilometer/mile. It is the sum of the products obtained by multiplying the number of passenger seats available for sale on each flight stage by the stage distance. It excludes seats not available for the carriage of passengers due to the mass of fuel or other loads.

- **Available Ton Kms/Miles (ATK/ATM):** Available Ton Kms/Miles apply to freighter and possibly passenger aircraft. It is the sum of the products obtained by multiplying the number of tons available for the carriage of revenue load (passengers, baggage, freight and mail) on each flight stage by the stage distance.

If the ASKs and ATKs are not readily available in your MIS, you should get them from your Statistics/Reporting department or Commercial or Marketing or Network Planning, depending on your organization.

IMPORTANT: ASK/ASM and ATK/ATM have to be reported in units, NOT in thousands.
Example: report "5,000,000" for 5 million Kms.

- **Dispatch Reliability (%):** Technical Dispatch Reliability for the fiscal period. It includes delays due to maintenance and/or technical reasons only, including cancellations. It does not include 'in chain' delays-delays caused by past delays.

$$\text{Dispatch Reliability(\%)} = \frac{1 - (\text{No.of delays greater than 15 min including cancellations})}{\text{Total number of scheduled revenue departures}} \times 100$$

The following four fields are populated automatically:

- **Fleet Age Group:** The age group to which the average fleet age corresponds.
  - **Young** – less than 5 years
  - **Mature** – between 5 and 15 years
  - **Old** – over 15 years

- **Average Annual FH per A/C:** Number of flight hours per year averaged for one aircraft.

- **Average Sector Length:** Flight hour to flight cycle ratio

$$\text{Average Sector Length (Hours)} = \frac{\text{Fleet Flight Hours}}{\text{Fleet Flight Cycles}}$$

- **Daily Utilization:** Average number of hours flown per day by one aircraft for the respective fleet.

$$\text{Daily Utilization} = \frac{\text{FH per Aircraft}}{\text{Days in Year}}$$

The MCX Toolset provides the capability to record operational data and maintenance costs on a per aircraft ("tail number") perspective if any airline wishes to do so.

You can enter the specific aircraft serial number or registration in the Fleet Code column, and 1 in the Fleet Size column.

Please note that all subsequent data sheets need to be filled on the same aircraft basis.

6. Tell us about 2022

This tab has first been introduced in the FY2020 toolset to enable participants to provide comments on their airline's experience during the first year of the COVID crisis. We decided to keep it in the FY2022 toolset and cover other areas, such as return to service and supply chain issues.

Users are invited to provide information on the following areas. They can add anything else they deem relevant.

- The COVID situation and related restrictions in your region
- The part of your fleet that remained grounded
- The challenges with continuing airworthiness during parking period
- Asset management: e.g. aircraft retirements, aircraft sales, sales and lease backs, leased aircraft deliveries or redeliveries, greater focus on cargo (passenger to freighter conversion), etc.
- How did your airline approach the industry restart? What was your return-to-service strategy? All in or phased return?
- De-preservation strategy: which aircraft type(s) first and why?
- Maintenance issues:
    - Defects identified during aircraft de-preservation (e.g. corrosion, leaks, software update, cabin readiness, etc.)
    - Overdue maintenance
    - MRO capacity (i.e. slots availability). In what area(s): engines, aircraft and large parts?
- Staffing challenges:
    - Difficulties retaining talents: if yes, in which area(s)? Mechanics, engineering, IT, material management, etc.
    - Training and re-certification
- Supply chain issues:
    - Spare parts shortages
    - Repair delays (Turn Around Times)
    - Consumable/expendable delays and long lead times
    - Logistics, transportation, custom delays, etc.
    - Price increases beyond inflation

7. Level 1 – Maintenance Segments

In this part of the toolset, we collect maintenance costs split by segments (Line, Base, Component and Engine) and elements (Labor, Material and Subcontracted) as well as per flight hour. We also collect information on the number of maintenance events, turnaround times, and spares & inventory data.

Information for this section can be provided by Fleet Managers.

7.1. Total Annual Cost by AC Version

Columns C, D and E is auto-populated with information entered in the Airline Active Fleet Info tab.

7.2. Line Maintenance

Line Maintenance refers to the on-aircraft work, including minor maintenance, A-checks and "gate checks", performed at the Line Station or Line Maintenance Hangar space. Please refer to section 6.1 for the definitions of various maintenance check types.

Line maintenance costs **include**:

- Transit
- Daily
- Overnight up to and including A/B checks (i.e. maintenance events with lower than 10 months occurrence)
- Out-of-phase maintenance
- Deferred maintenance

Line maintenance costs **exclude**:

- Commercial cleaning and aircraft handling done at the gate
- Cost of repair of removed LRUs
- Accidental damage occurred, for which insurance credit is expected
- AOG-related costs

If A/B checks are done by Base Maintenance personnel in a hangar environment and if it is difficult to segregate their cost, please include them in Base Maintenance and indicate so in the Comments section.

If an A-check is combined with another check, report the costs with the higher check under Base Maintenance costs.

- **Labor Cost:** Labor cost for line maintenance done in-house for the reporting period. They include manual/direct labor wages, overtime and social costs/benefits. Labor cost exclude overhead.

- **Material Cost:** Material cost for in-house line maintenance for the entire period for the respective fleet. Material purchased by the airline for their line maintenance subcontractors should be reported under Subcontracted Costs.

- **Subcontracted Cost:** Subcontracted cost for line maintenance for the reporting period, including expenses for cabin textile if they are done at A-checks or below.

- **Cost per FH:** Sum of line maintenance costs per flight hour (calculated automatically)

7.3. Base Maintenance

Base Maintenance refers to heavy maintenance, C-checks, multiple C-checks and "hangar checks" performed at the Base Maintenance Hangar space. Please refer to section 10.1 for the definitions of various maintenance check types.

- **Labor Cost:** Labor cost for base maintenance for the reporting period, including manual/direct labor wages, overtime and social costs/benefits. Labor costs exclude overhead.
- **Material Cost:** Material cost for in-house base maintenance for the entire period for the respective fleet. Material purchased by the airline for their base maintenance subcontractors should be reported under Subcontracted Costs.
- **Subcontracted Cost:** Subcontracted cost for base maintenance for the reporting period, including expenses for cabin textile if they are done at C-checks (over 18 months).
- **Cost per FH:** Sum of base maintenance costs over fiscal year per flight hour. (calculated automatically)
- **Number of Events:** Number of base maintenance events performed when the aircraft is removed from daily operations. This number should be the same as the number of events reported in Level 2.1 (column L) for C-checks, HMV 1, HMV 2, HMV 3 and HMV 4.

7.4. Component Maintenance (Including powerplant System)

- **Labor Cost:** Labor cost for component and powerplant systems maintenance done in-house for the reporting period. They include manual/direct labor wages, overtime and social costs/benefits. They exclude overhead.
- **Material Cost:** Material cost for in-house component and powerplant systems maintenance for the entire period for the respective fleet.

  Material purchased by the airline for their component maintenance subcontractors should be reported under Subcontracted Cost.
- **Subcontracted Cost:** Subcontracted cost for component and powerplant system maintenance for the reporting period
- **Cost per FH:** Sum of component maintenance costs per flight hour (calculated automatically)

7.5. Engine Maintenance

- **Labor Cost:** Labor cost for in-house engine maintenance (core engine) for the reporting period. They include manual/direct labor wages, overtime and social costs/benefits. They exclude overhead.

- **Material Cost:** Material cost for in-house engine maintenance (core engine) for the entire period for the respective fleet, excluding LLP costs. LLP costs should only be reported in column Y, "Cost of Life-Limited Parts (LLPs)".

  Material purchased by the airline for their engine maintenance subcontractors should be reported under Subcontracted Cost.

- **Subcontracted Cost:** Subcontracted cost for engine maintenance (core engine) for the reporting period, including Engine Rent costs

- **Cost of Life-Limited Parts (LLPs):** Cost of parts that may not exceed a certain time, or a certain number of flight hours or cycles. If the cost of LLPs cannot be isolated, use an average of 30-35% of Material Costs to estimate LLP costs.

- **Cost per FH:** Sum of engine maintenance costs per flight hour (calculated automatically)

- **Number of Engine Shop Visits (ESV):** Number of engine shop visits performed during the reporting period.

- **Average Engine Turnaround Time:** Number of calendar days, on average, from the day the engine is removed until the engine is available to be installed, including transportation time, overhaul time, custom clearance, etc.

Provisions for Engine Overhaul

Provisions for engine overhaul should not be reported in the MCX Toolset.

- If your airline owns the aircraft, report the full amount of the overhaul only when it happens.

- If your airline leases the aircraft:
  - When the overhaul happens, report 100% of the overhaul amount
  - When the aircraft is returned to its lessor, but no overhaul is required at the same time, report all the agreed upon amount related to that engine so far (in anticipation of future overhaul)

7.6. Spare and Inventory

- **Value of Spare Engines:** Book value of the spare engines , including engine-related inventory (e.g. modules, QEC)

- **Value of Spare Rotables:** Book Value of all Spare Rotables including APUs (excludes Spare Engines and related inventory)

- **Value of all Other Spares:** Book value of all consumable and repairable spares and material not covered by other items.

- **Value of Total Spares:** Sum of all spares (book values).

- **Number of Owned Spare Engines:** Number of spare engines that your airline owns

- **Engine and Component Access, Loan or Lease Costs:**
    - Components: all the costs for commercial and industry pooling
    - Engines: loan and lease costs, excluding engine rental cost to cover during an engine overhaul

Allocating Spares and Inventory

When Spares & Inventory are common to several aircraft types (e.g. A320 family), you can allocate the value by number of aircraft.

Example:

- *Value of Spare Rotables for A320 family aircraft: $20,000,000*

- *A320 Family Fleet: 10 aircraft*
    - *A319: 3 aircraft*
    - *A320: 7 aircraft*

- *Allocation of Value of Spare Rotables:*
    - *A319: $20,000,000 × (3/10) = $6,000,000*
    - *A320: $20,000,000 × (7/10) = $14,000,000*

8. Parking/Storage Costs

In 2020, the COVID crisis forced the airline industry to ground up to two thirds of the global fleet. Although these aircraft were not flying, they still required specific maintenance and generated extra costs.

In 2022, the situation improved, however some aircraft remained parked/stored for part or all of the year.

In this part of the toolset, we collect two categories of costs for parked/stored aircraft:

- The maintenance costs during the period of parking/storage
- The parking/storage fees

8.1. Maintenance Costs During Parking/Storage

- **Parked / Stored Aircraft:** Number of aircraft that were parked/stored at any time during the reporting period. *Example: for a fleet of 22 aircraft parked/stored for 7 months out of 12, please use a ratio: 22 * (7/12) = 12.8 aircraft*

- **Induction [MH]:** Number of man-hours for putting aircraft into parking/storage

- **Periodic Checks [MH]:** Number of man-hours for the periodic checks during the aircraft parking/storage period

- **Reactivation / Return to Service (RTS) [MH]:** Number of man-hours for putting aircraft into parking/storage

- **Total MHs:** Sum of the man-hours for Induction, Periodic Checks and Reactivation/Return to Service (calculated automatically)

- **Average Man-Hour Rate:** Average labor cost per man-hour, including overtime and social costs but excluding overhead, for the Induction, Periodic Checks and Reactivation/Return to Service.

- **Labor Cost:** Labor cost for parking/storage induction, periodic checks and reactivation maintenance. Total MHs * Average MH Rate (calculated automatically)

- **Material Cost:** Material cost for parking/storage induction, periodic checks and reactivation maintenance for the respective fleet.

- **Total Cost:** Sum of the Labor and Material Costs

- **Average Cost per Parked/Stored AC:** Total Cost / Parked/Stored AC (calculated automatically)

- **Comments:** Please provide any comments that can help understand your data.

8.2. Parking/Storage Fees

- **Receiving Fee:** (Optional) One-time fee per aircraft paid when the aircraft is received at parking/storage location.

- **Parking / Storage Fees:** Parking/Storage fees for all the aircraft of the fleet type. *Example: (3 aircraft x $50/day x 200 days) + (14 aircraft x $45/day x 125 days)*

- **Parking / Storage Duration:** Total number of Parking/Storage Days for all the aircraft of the fleet type
- **Total Parking/Storage Fees:** Sum of the Receiving Fee and Parking/Storage Fees (calculated automatically)
- **Average Parking/Storage Fees per AC:** Total Parking/Storage Fees (column T) / Number of Parked/Stored Aircraft (calculated automatically)
- **Average Parking/Storage Duration per AC:** Parking/Storage Duration / Number of Parked/Stored Aircraft (calculated automatically)
- **Comments:** Please provide any comments that can help understand your data.

9. Personnel & Overhead Data

This tab gives an overview of Technical Division costs including direct and indirect labor costs, and other overhead costs (e.g. building, tools, IT systems, etc.).

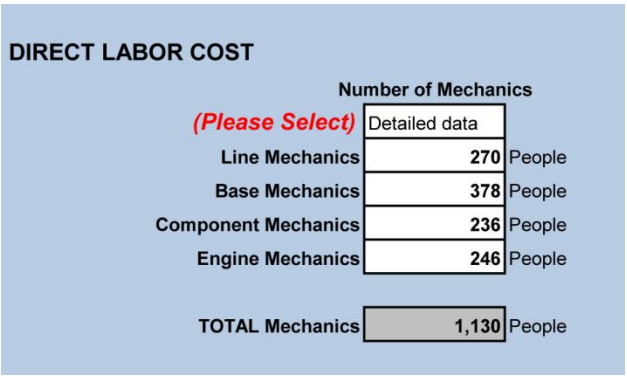
Your Finance Department can provide the information needed to fill this spreadsheet.

At the bottom of the spreadsheet, there will be a summary of the Technical Division Labor Cost (Block 5) and a summary of the Total Technical Division Cost (Block 6).

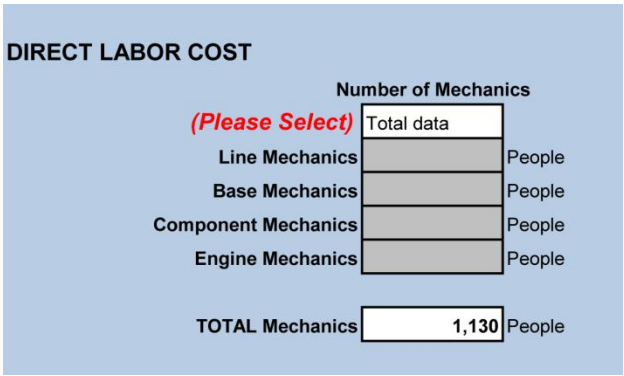
9.1. Block 1 – Direct Labor Cost

Block 1 collects data on direct labor force. Direct labor refers to all personnel working directly on the aircraft and/or its parts.

- **Number of Mechanics:** number of staff within the direct labor force. You have the option to report the total number of mechanics or the detailed number of mechanics broken down into each maintenance segment (Line, Base, Component and Engine). Before entering any data, please select from the dropdown list in cell F7: **Detailed data** or **Total data**.
    - If you select "**Detailed data**" as shown below (left side), enter the number of mechanics for each maintenance segment in cells F8 to F11. The total will be calculated automatically in cell F13.
    - If you select "**Total data**" as shown below (right side), enter the number of mechanics in cell F13.



DIRECT LABOR COST		
	Number of Mechanics	
(Please Select)	Detailed data	
Line Mechanics	270	People
Base Mechanics	378	People
Component Mechanics	236	People
Engine Mechanics	246	People
TOTAL Mechanics	1,130	People



DIRECT LABOR COST		
	Number of Mechanics	
(Please Select)	Total data	
Line Mechanics		People
Base Mechanics		People
Component Mechanics		People
Engine Mechanics		People
TOTAL Mechanics	1,130	People

Figure 7 - Figure 9. Select Detailed Data or Total Data in cell F7

- **Average Direct Labor Cost**
    - **Average Direct Labor Cost:** This should reflect the average amount for ONE (1) EMPLOYEE for ONE (1) YEAR.
    - **Salary and Wages:** The average amount one employee receives as salary after employer deductions.

- **Social Cost:** Costs attributed to non-available time, plus other costs incurred as a direct result of employing staff (holiday pay, long service leave, pension, medical cost). These are automatically calculated when you enter both Average Direct Labor Cost and Salary & Wages.

Average Direct Cost = Social Cost + Salary & Wages

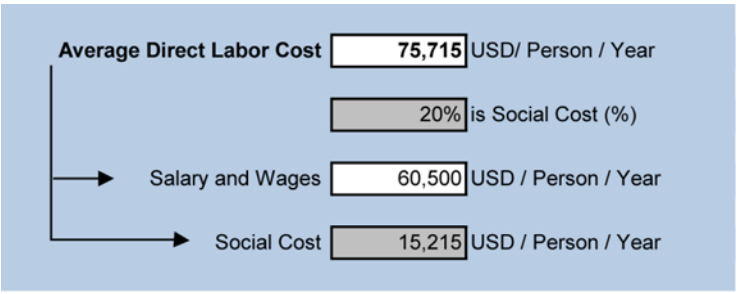


Figure 8. Average Direct Labor Cost

- **Potential Time Breakdown:** Number of hours for one (1) person for one (1) year.

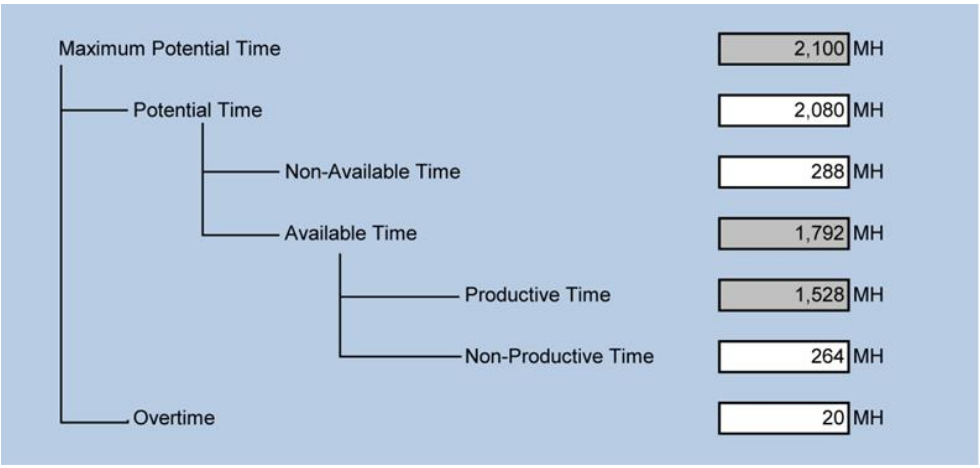


Figure 9. Potential Time Breakdown

Example of calculation

- **Maximum Potential Time:** Total amount of time for the year that one (1) employee is eligible to work. This cell will be automatically populated when you enter data in Potential Time and Overtime.
    - *Potential Time + Overtime ⇨ 2,080 hrs + 20 hrs = 2,100 hrs (262.5 days)*
- **Potential Time:** Total amount of potential time that one (1) employee can work in a year; excluding overtime.
    - *8hr/day, 5 days/wk, 52 wks/yr ⇨ 8 x 5 x 52 = 2,080 hrs (260 days)*
- **Non-Available Time:** Non-available hours (i.e. paid holidays, sick days and vacation time) that one employee can work out of the Potential Time.
    - *12 public holidays, 20 vacation days, 4 sick days ⇨ 36 x 8 = 288 hrs (36 days)*
- **Available Time:** Automatically calculated by subtracting Non-Available Time from Potential Time.
    - *Potential Time - Non-Available Time ⇨ 2,080 - 288 = 1,792 hrs (224 days)*

- **Productive Time:** Number of hours during which one (1) employee is working and being productive, automatically calculated by subtracting non-productive time from available time.
    - *Available Time - Non-Productive Time ⇨ 1,792 hrs - 264 hrs = 1,528 hrs*
- **Non-Productive Time:** Number of hours that one (1) employee is in training, breaks or meetings.
    - *Meeting: 0.5 hr/day × 224 days = 112 hrs*
    - *Break: 0.5hr/day × 224 days = 112 hrs*
    - *Training: 5 days/yr × 8 hrs = 40 hrs*
    - *Non-Productive Time: 264 hrs*
- **Overtime:** Working hours in addition to those of Potential Time. Overtime is considered 100% productive, assuming there is no reason to spend overtime in doing non-productive tasks (e.g. meeting, training, etc.) However, in certain cases, travel time is considered as overtime. These cases, although they exist, should not be included in the calculation.
    - *Overtime: 20 hrs*

9.2. Block 2 – Data Checks

This part is automatically populated, and it compares Labor cost entered in Level 1 and data entered in Block 1 to make sure they are consistent.

- **Total Direct Labor Cost**
    - **Personnel & Overhead Data (cell P13):** Number of Manual Workers (cell J7) × Avg. Direct Labor Cost (cell F13)
    - **Level 1 Maintenance Segments (cell S13):** Sum of Labor Cost for Line, Base, Engine and Component, as entered in "Level 1 - Mtc Segments" tab
- **In-House Productive Labor Rate**
    - **Personnel & Overhead (cell P25):** Avg Direct Labor Cost (cell J7) divided by Productive Time + Overtime (cell J25 + cell J29)
    - **Airline General Information (cell S25):** In-House Productive Labor Rate, as entered in cell H33 on "Airline General Info" tab

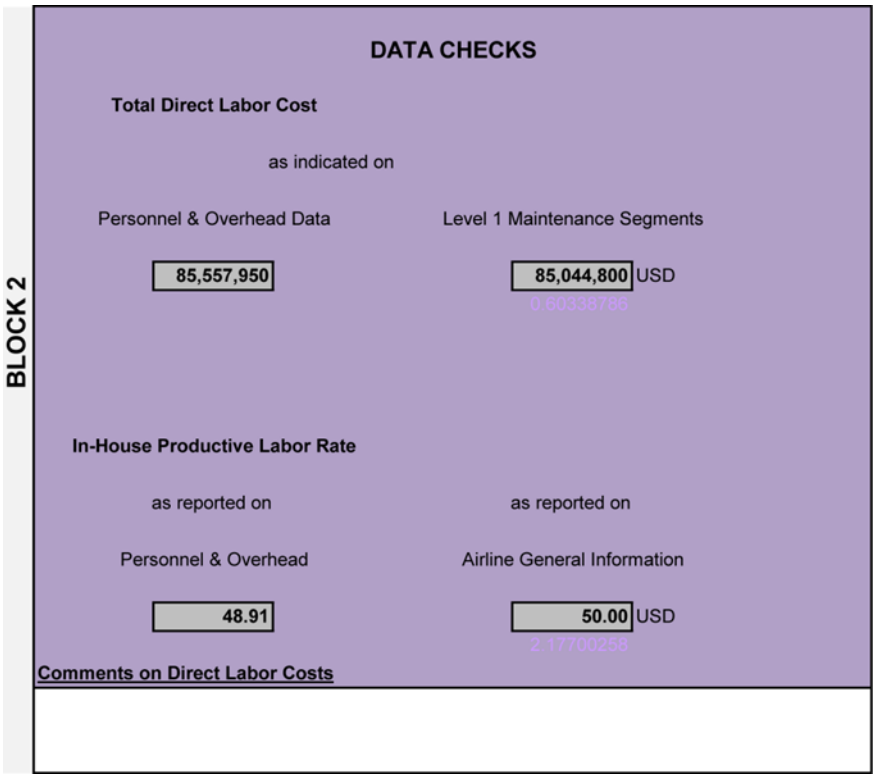


Figure 10. Block 2 - Data Checks

- **Comments on Direct Labor Costs:** Enter any comments or explanation if there are discrepancies between cell P13 and S13, and between cell P25 and S25.

9.3. Block 3 – Indirect Labor Cost

Block 3 collects data on indirect labor force (i.e. overhead staff), this includes engineering, planning and contract support.

- **Non-Manual Workers (cell I43):** total staff of all the indirect labor functions
- **Technical Management (cell G35):** heads of divisions and sub-divisions, e.g. SVPs, VPs, Technical Directors, Head of Engineering & Maintenance, General Managers, Directors, etc.
- **Inspection and Quality Control (cell G37):** all inspectors and quality personnel, assuming that they are not performing mechanic work of the aircraft (direct labor). Inspection-related work written on task cards is considered Direct Labor and such inspectors should be listed under Direct Labor in Block 1).
- **Technical and Industrial Engineering (cell G39):** all personnel in engineering (including CAMO), reliability, maintenance programs, performance improvements (Six-Sigma, Lean, etc.), engine and component engineers, etc.

- **Production Planning and Control (cell G41):** all planners, schedulers, division metrics managers (including line maintenance)
- **Supply Chain (cell G43):** all personnel in supply chain departments (related to aircraft maintenance)
- **Material Management (cell G45):** all personnel in material management (inventory & spares) departments
- **Supervision of Manual Labor (cell G47):** staff that supervises mechanics but do not work directly on the aircraft
- **Other Services (cell G49):** other Overhead staff, including personnel responsible for Contract Administration and MRO Administration, including finance, cost control

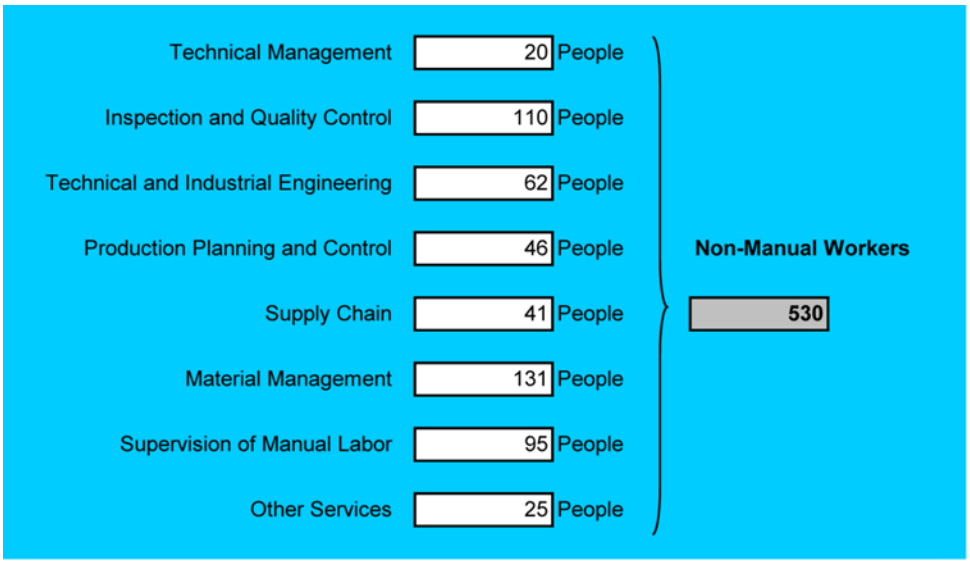


Figure 11. Number of Non-Manual Workers (breakdown)

- **Average Indirect Labor Cost:** This should reflect the average amount for one (1) employee for one year.
- **Salary and Wages:** Average annual salary & wages for Indirect Labor for one (1) employee for one year.
- **Social Cost:** Average annual social cost for Indirect Labor for one (1) employee for one (1) year.

Avg. Indirect Cost = Salary & Wages + Social Cost

Figure 12. Indirect Labor Cost

9.4. Block 4 – Other Overhead Cost

Before entering any data, please select from the dropdown list: **Detailed Data** or **Total** in cell S33.

If you select **Detailed Data**, fill out the 7 items as shown below (left side). Total Non-labor Overhead Cost will be automatically calculated.

If you select **Total Data**, only enter Total Non-Labor Overhead Cost (right side below).

OTHER OVERHEAD COST	Detailed data	*(Please Select)*
Facilities/Utilities	8,000,000	USD
Equipment	14,000,000	USD
Communication/IT Systems	6,000,000	USD
Training	7,200,000	USD
Insurances	4,700,000	USD
Taxes	3,000,000	USD
Other	1,300,000	USD
Total Non-Labor Overhead Cost	44,200,000	**USD**

OTHER OVERHEAD COST	Total data	*(Please Select)*
Facilities/Utilities		USD
Equipment		USD
Communication/IT Systems		USD
Training		USD
Insurances		USD
Taxes		USD
Other		USD
Total Non-Labor Overhead Cost	44,200,000	**USD**

Figure 13. Select Detailed Data or Total Data in cell S33

- **Facilities/Utilities (cell S35):** Cost related to operating the Technical Division's buildings, hangars, warehouses and their related utilities.
- **Equipment (cell S37):** Tools and other maintenance related equipment (e.g. stands, test benches, etc.).
- **Communication/IT Systems (cell S39):** e.g. Internet services, cellphones, landlines, IT systems and software licenses, etc.
- **Training (cell S41):** For Technical Division employees only.
- **Insurances (cell S43):** Only related to maintenance property, plants and equipment (PPE).
- **Taxes (cell S45):** Only related to maintenance property, plant & equipment (PPE).
- **Other (cell S47):** e.g. Technical Division employee travel costs; employee severance package; contract breaking fees; memberships & subscriptions; transportation cost for parts (if not already reported in Level 1)
- **Total Non-Labor Overhead Cost (cell S49):** Summation of all Indirect Costs ⇨ Facilities + Equipment + Communication/IT Systems + Training + Insurance + Taxes + Other Expenses for the Mtc. & Engr. Function.
- **Total Overhead Labor Cost (cell S53):** Automatically Calculated with data entered in Block 3.

Total Overhead Cost = Avg Indirect Labor Cost (cell G56) × Non-Manual Workers (cell I43)

- **Total Overhead Cost:** Sum of Total Non-Labor Overhead Cost (cell S49) + Total Overhead Labor Cost (cell S53)

- **Estimate of third-party work (cell S60):** Enter your estimate of Third Party Work, if any.

- **Depreciation[4] (cell S62):** Non-cash expense for items related to items that are associated to aircraft maintenance activities such as:
    - Heavy maintenance visit
    - Engine overhaul
    - Aircraft parts (i.e. spare engines, LLPs, aircraft spare parts–inventory)
    - Hangars and facilities where maintenance activities are performed
    - IT system used solely for maintenance, (if it is easy to extract from the corporate IT account)

The actual aircraft itself (i.e. aircraft frame, engine, etc.) is excluded from this section.

Depreciation amounts may vary depending on the method and rate used by each airline.

- Capital Expenses (cell S64): e.g. IT system related to maintenance; test cell; ATEC machine, etc.

- Inventory Holding Costs (cell S66): i.e. carrying costs, as a percentage of the value of inventory carried including:

- Opportunity cost (cost of capital, cost to borrow funds)

- Obsolescence

- Shrinkage (due to damage by handling, weather, or other mechanisms, through mishandling, poor keeping, or theft)

- Depreciation of spare parts and warehouse building(s)

- Taxes related to spare parts (e.g. property tax if applicable)

- Insurance related to warehouse and inventory of the spare parts

9.5. Block 5 – Total Technical Division Labor Cost

All data in Block 5 (Total Technical Division Labor Cost) is automatically calculated with the data you have entered. It might not reflect reality if your inputs are incomplete.

- **Technical Division Workers:** Total number of the Manual Labor and the Non-Manual Workers.

- **Salary and Wages:** Total annual salary & wages for Direct & Indirect Labor, i.e. CY /year.

---

[4] **Depreciation:** Non-cash expense that is incurred over the life of an asset as it matures.

- **Social Cost:** Total annual social cost for Direct & Indirect Labor, i.e. CY /year.
- **Total Labor Cost:** Total annual cost for Direct & Indirect Labor (salary & wages and social cost), i.e. CY/year.
- **% Social Cost:** Total social cost as a percentage of Total Labor Cost.

9.6. Block 6 – Total Technical Division Cost

The Total Technical Division Cost displayed in Block 6 is automatically calculated with the data you entered. It might not reflect reality if your inputs are incomplete.

- **Direct Labor Cost:** Sum of Labor Costs as reported on Level 1 for Line, Base, Component and Engine maintenance.
- **Material Cost:** Sum of Material Costs as reported on Level 1 for Line, Base, Component and Engine maintenance.
- **Subcontracted Cost:** Sum of Subcontracted Costs as reported on Level 1 for Line, Base, Component and Engine maintenance.
- **Total Direct Cost:** Sum of Labor, Material and Subcontracted costs, for work performed on aircraft operated by the airline (i.e. excluding third party).
- **Total Overhead Cost:** Sum of all Indirect Costs, both Labor and Non-Labor Overhead Costs, as reported in Blocks 3 and 4.
- **Total Technical Division Cost:** Sum of the Total Direct Costs and the Total Overhead Costs.

10. Level 2.1 – Airframe Maintenance Program and Events

This tab collects data on the airframe maintenance program, turnaround times and costs of events, with more granular details the further you go on the right of the spreadsheet.

Fleet Managers can provide the information for the maintenance program (up to column P). This first part of the spreadsheet is mandatory.

Data reported on one row should be consistent, i.e. costs and man-hours reported in columns R to BD should match the number of events reported in column L.

In this section, it is important to only report events that have been performed during the reporting period. If a particular check type (e.g. HMV3 for 767-400) hasn't been performed during the reporting period, please do not enter any information on this specific row.

10.1. Maintenance Program

In this part of the spreadsheet (up to column N), we collect data on your airline's maintenance program.

Airline Check Type Name	MPD Revision (Optional)	Approved Interval	Interval Unit *Please select*
Transit			
Daily		1	Days
Weekly		10	Days
A		400	Flight hours
C		18	Months
HMV1		6	Years
HMV2			
HMV3			
HMV4			

Figure 14. Prepopulated Maintenance Check Types

- **Airline Check Type Name:** We have pre-populated nine check types. We understand that not all checks are the same and your airline may not use the exact same check type names. Using the definitions below, try to find the best fit given your airline's operational profile and maintenance program, and provide the most accurate data.

Transit	Pre-flight check, including ETOPS
Daily	Performed every 24 to 48 hours (also known as "PS" Periodic Check)
Weekly	Performed every 7 to 14 days
Type "A"-Check	Performed every 300-500 flight hours which usually happens every 3-4 months
Type "C"-Check	Usually performed every 18-24 months. From our experience, the following are some names for Type "C"-Checks: Light C-check, 1Y, 2Y, 3Y, 6,000 FH, 5,000 FH
HMV1	The first heavy check, usually happening at 5-6 years (also known as D-check or Heavy C-check). Some other names for HMV1 are: 4Y, 5Y, 6Y, 8Y, 6C, 4B, 4C/5Y, 4C/6Y, 4C/D1
HMV2	Happens at 10-12 years, and most likely includes a structural inspection (the 2nd D-check as the aircraft gets older). The following are HMV2 checks: 8C/10Y, 8C/12Y, 8C/D2
HMV3	Happens at 15-18 years (or a 3rd D-check)
HMV4	Happens at 20-24 years (or a 4th D-Check)

Table 1. Check Type Definitions

- **MPD Revision:** Indicates the revision of the aircraft manufacturer's maintenance planning document (MPD) on which the maintenance program is based.
- **Check intervals:** In case of several limits (e.g. 6,000 FH, 18 months, whichever comes first), please indicate one limit in Approved Interval (column H), and the other(s) in the Comments (column N). Then, please provide the Achieved interval (column J) in the same unit.
    - **Approved Interval:** Interval for check as approved by the MPD and the local authorities.
    - **Interval Unit:** Unit of the interval in Days, Flight Hours, Flight Cycles, Months or Years. If the interval is in multiples of 12 hours, report in Days, e.g. 1 day if interval is 24 hours, 1.5 days if interval is 36 hours and 2 days if interval is 48 hours.
    - **Achieved Interval:** Actual interval since the last similar check.
- **Number of Events:** Number of checks of a specific type performed for this fleet during the reporting period.
- **Maintenance Policy:** Indicates whether airframe maintenance is done in-house, subcontracted (i.e. outsourced) or mixed (i.e. part of maintenance is done in-house and the rest is subcontracted).

10.2. Turnaround Time (TAT)

- Turnaround Time: Approximate turnaround time for check's MPD task package.
- TAT Unit: Unit of the turnaround time. Units can be Hours or Calendar days. Please convert weeks into calendar days if needed.

10.3. Total Check Cost

This section (columns Q to T) collects the total man-hours and cost of maintenance checks, broken down by elements (Labor, Material and Subcontracted). It is important to note that labor has to be reported in man-hours. To calculate the total check cost, it has to be multiplied by the Labor Rate reported in Airline General Info (cell H33).

- **Labor (Routine + Non-Routine):** Enter the total number of man-hours for Routine and Non-Routine tasks for all the events of a same check type (e.g. all A-checks) performed during the reporting period
- **Material Cost (Routine + Non-Routine):** Enter the total material cost for Routine and Non-Routine tasks for all the events of a same check type (e.g. all A-checks) performed during the reporting period
- **Subcontracted Cost (Basic + Out-of-Scope):** Enter the total Subcontracted cost for Basic and Out-of-Scope tasks
- **Total Check Cost (Labor + Material + Subcontracted):** (Labor Man-Hours × Average Labor Rate) + Material costs + Subcontracted cost

If you cannot provide the detailed data in columns Q, R and S, you can overwrite the formula and enter the total in column T (Total Check Cost).

The data reported in this section should match the maintenance policy indicated in column M (e.g. In-house, Subcontracted, Mixed).

As a general rule, costs reported in Level 2.1 (as well as 2.2 and 2.3) should always be equal or a little bit lower than the ones in Level 1.

10.4. Check Details (Routine/Non-Routine)

This section goes into the details of the data reported in Total Check Costs (columns Q to T) by breaking the Labor and Material costs into Routine and Non-Routine, and the Subcontracted cost into Basic and Out-of-Scope.

- **Pure MPD**
    - Select "yes" if the majority (80%-90% of Routine MH from MPD) of the costs (MH and monetary) that you report for this fleet/check is related to MPD tasks.
    - Select "no" if you are not sure or your data is not clear enough to provide full visibility to separate MPD from non-MPD tasks.

- **Man-Hours (MH)**
  - **Routine:** Man-hours spent on routine tasks (e.g. inspections, etc.) which originate from the OEM MPD.
  - **Non-Routine:** Man-hours from non-routine tasks (e.g. finding rectification) originating from Routine tasks (MPD).
  - **Routine + Non-Routine (R/NR):** If you cannot report Routine and Non-Routine man-hours separately, please indicate the combination of both. MPD tasks only, if possible.

- **Material Cost**
  - **Routine:** Material cost (expendables, consumables) from routine tasks (e.g. inspections, etc.) which originate from the MPD.
  - **Non-Routine:** Material cost (expendables, consumables) from non-routine tasks (e.g. finding rectification) originating from Routine tasks (MPD).
  - **Routine + Non-Routine (R/NR):** If you cannot report Routine and Non-Routine material cost separately, please indicate the combination of both MPD tasks.

- **Subcontracted Cost**
  - **Routine:** Subcontracted cost (Labor + Material) from routine tasks (e.g. inspections, etc.) which originate from the MPD.
  - **Non-Routine:** Subcontracted cost (Labor + Material) from Non-routine tasks (e.g. finding rectification) originating from Routine tasks (MPD).
  - **Routine + Non-Routine (R/NR):** If you cannot report Routine and Non-Routine Subcontracted costs separately (i.e. Labor + Material), please indicate the combination of both MPD tasks only.

10.5. Items to Isolate from R/NR Data Before Benchmarking

- **Cabin Works:** If important cabin works are "hidden" in the R/NR figures, please give details on them. For the benchmark they will be removed from the R/NR data to ensure a fair comparison.

  - **Cabin**
    - **MH:** This should be reported in man-hours.
    - **Material:** This should be reported in your reporting currency.
    - **Subcontracted:** This should be reported in your reporting currency.

- Painting Costs: If important painting costs are "hidden" in the R/NR figures, please give details on them. For the benchmark, they will be removed from the R/NR data to ensure a fair comparison.

  - **Painting**
    - **MH:** This should be reported in man-hours.
    - **Material:** This should be reported in your reporting currency.
    - **Subcontracted:** This should be reported in your reporting currency.

- **Modification Costs:** If important modification costs are "hidden" in the R/NR figures, please give details on them. For the benchmark, they will be removed from the R/NR data to ensure a fair comparison. Please split, where possible, into mandatory and non-mandatory mod costs.

  - **Mandatory Mod**
    - **MH:** This should be reported in man-hours.

        - **Material:** This should be reported in your reporting currency.
        - **Subcontracted:** This should be reported in your reporting currency.

    - **Non-Mandatory Mod**
        - **MH:** This should be reported in man-hours.
        - **Material:** This should be reported in your reporting currency.
        - **Subcontracted:** This should be reported in your reporting currency.

    - **Mandatory + Non-Mandatory Mod**
        - **MH:** If you cannot report Man-Hours for Mandatory and Non-Mandatory Mod separately, please indicate the combination of both.
        - **Material:** If you cannot report Material Costs for Mandatory and Non-Mandatory Mod separately, please indicate the combination of both.
        - **Subcontracted:** If you cannot report Subcontracted Costs for Mandatory and Non-Mandatory Mod separately, please indicate the combination of both.

10.6. Other Items to Isolate from R/NR Data Before Benchmarking

- **Support Shop Costs:** If major support shop costs are "hidden" in the R/NR figures, please give details on them. For the benchmark they will be removed from the R/NR data to ensure a fair comparison.

    - **Support Shop**
        - **MH:** This should be reported in man-hours.
        - **Material:** This should be reported in your reporting currency.
        - **Subcontracted:** This should be reported in your reporting currency.

- **Out-of-Phase Tasks:** If out-of-phase tasks are "hidden" in the R/NR figures, please give details on them. For the benchmark they will be removed from the R/NR data to ensure a fair comparison of similar check task packages.

    - **Out-of-Phase**
        - **MH:** This should be reported in man-hours.
        - **Material:** This should be reported in your reporting currency.
        - **Subcontracted:** This should be reported in your reporting currency.

- **Comments:** If there is a major variation in your maintenance cost, please provide explanation. For example, aircraft phased out, unscheduled events, lease returns etc.

11. Level 2.2 – Detailed Engine Maintenance Events

This tab drills down into the detailed engine maintenance events: removal cause, status of LLP replacement, maintenance policy, engine serial number, rank of ESV, turnaround time, the breakdown of costs and the engine history.

Each row is for one (1) engine shop visit. In Levels 2.2 and 2.3, we have set 10 rows per aircraft type. Should you need more rows to enter data on engine (Level 2.2) and component (Level 2.3) maintenance, you can set up to 25 rows per aircraft.

IMPORTANT: Set the number of rows before entering any data, otherwise all data will be erased when setting the number of rows.

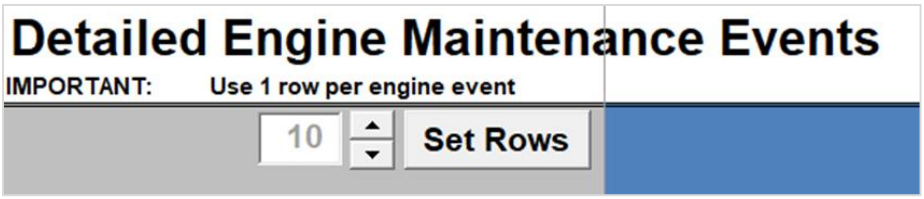


Figure 15. Set the Number of Rows Before Entering Any Data

How to increase the number of rows

Before entering any data in Level 2.2 and 2.3, you can set the number of rows by clicking on the upward facing arrow at the top of the page. Click as many times as needed to reach the number of rows you would like to have (the maximum is 25). Once you have reached the right number of rows, click on Set Rows and the extra rows will appear. You can now enter your data.

11.1. Engine Maintenance Event Details

- **Main Engine Removal Cause/Reason:** Select the cause/reason of removal from the dropdown list. Possible values are:
  - Policy (e.g. return condition to lessor, convenience, staggering, spare rotation, etc.)
  - Performance limitation (EGT margin, stall, N1, N2, etc.)
  - Life-Limited Parts (LLP)
  - Foreign Object Damage (FOD)
  - Mechanical failure, vibrations, oil leak
  - Gearbox

- **LLP Replacement Status:** Select from the dropdown list
  - LLP were replaced
  - No LLP were replaced

- **Maintenance Policy**: Indicate whether engine maintenance is done in-house or subcontracted (i.e. outsourced).

- **Engine Serial Number**: Indicate the serial number of the engine on which this particular shop visit was performed.

- **Rank of ESV**: Indicate the rank of the Engine Shop Visit. It is the number of times (e.g. 1st time, 2nd time, etc.) that the engine has been serviced. It is not related to the work scope of the shop visit.

- **ESV Turnaround Time**: The duration of the engine shop visit (engine reception until engine dispatch) in calendar days.

If LLPs were replaced, please provide the associated cost in column P.

11.2. Engine Maintenance Event Cost

If engine maintenance cost is 0 because the engine is under warranty, indicate it in the comments.

Labor and Material should only be used to **report cost for in-house maintenance**. If your airline buys materials for a subcontractor, please include these material costs in the subcontracted costs.

Subcontracted is outside repair cost including material cost.

- **Labor Cost:** Cost for labor of the engine shop visit. It includes Manual/Direct Labor Wages, Overtime & Social Costs/Benefits and it excludes Overhead.

- **Material Cost (excluding LLPs):** Cost for materials (consumables, expendables, etc.) for the ESV. The costs for Life-Limited Parts must be excluded.

- **Subcontracted Cost:** Cost for repairs performed outside the principal engine overhaul shop.
  E.g. specialist vendor parts, turbine blade repair, etc.

- **Net Cost (Labor + Material + Subcontracted, excluding LLPs):** Combined costs from labor, material and subcontracted of the ESV. Can be omitted if Labor costs and Material costs (excl. LLPs) are filled in individually but must be filled in if Labor/Material cannot be split up.

- **Life-Limited Parts (LLP) Cost:** Cost for Life-Limited Parts that were replaced during the ESV.

11.3. Engine History

- **Time Since New (TSN):** Time in Engine Flight Hours since the engine was new.

- **Cycles Since New (CSN):** Number of Engine Flight Cycles since the engine was new.

- **Time Since Overhaul (TSO):** Time in Engine Flight Hours since the engine was last overhauled.

- **Cycles Since Overhaul (CSO):** Engine Flight Cycles since the engine was last overhauled.

- **Take-Off Derate:** Average take-off derate in % of the thrust.

- **Exhaust-Gas Temperature (EGT) Margin In:** Exhaust gas temperature margin before the ESV.

- **Exhaust-Gas Temperature (EGT) Margin Out:** Exhaust gas temperature margin after the ESV.

12. Level 2.3 – Components

In this tab, we collect data on component maintenance: intervals, yields and number of events. We also collect costs broken down by element (Labor, Material, and Subcontracted).

12.1. Component Maintenance Event Details

- **Component Description:** Please select from the dropdown list
  - Airframe LRUs
  - APU
  - Brakes
  - Cabin Items (e.g. seats, emergency equipment, gallery equipment, etc.)
  - Engine LRUs (ATA Chapter 61 and above)
  - IDG
  - IFE
  - Landing Gear
  - Thrust Reverser
  - Tires
  - Wheels

- **Component OEM:** Indicate the component's manufacturer.

- **Approved Interval:** When applicable, the interval for this check as approved by the OEM MPD and the local authorities.

- **Interval Unit:** The unit of the interval. Please select from the dropdown list:
  - Operating Hours
  - Flight Hours
  - Flight Cycles
  - Months
  - Years

- **Achieved Interval:** Interval recorded since the last similar check. Please enter data in the same unit as the Approved Interval.

- **Check Yield:** Automatically populated field. Check Yield = Achieved Interval / Approved Interval

- **Maintenance Policy:** Indicate whether component maintenance is done in-house, subcontracted (i.e. outsourced) or mixed (i.e. part of maintenance is done in-house, and the rest is subcontracted).

- **Number of Events:** Number of these checks that were performed for this fleet during the reported period.

- **Turnaround Time (Days):** Duration of the shop visit in calendar days.

12.2. Unscheduled or Planned Event

- **Reliability Performance:** As it relates to a specific component.

- **Interval Unit:** Select from the dropdown list
  - Operating Hours
  - Flight Hours
  - Flight Cycles

- **Reliability Measure:** The interval reliability relative to the component
  - MTBUR: Mean Time Between Unscheduled Removals
  - MTBSV: Mean Time Between Shop Visits
  - TSO: Time since Overhaul
  - LPO: Landings per Overhaul

12.3. Component Event Cost

- **Labor Cost:** The cost for labor of the component shop visit.

- **Material Cost:** The cost for materials (consumables, expendables, etc.) for the component shop visit.

- **Subcontracted Cost:** The cost for repairs performed by subcontractors.

- **Total Cost (Labor + Material + Subcontracted):** The combined costs from labor, material and subcontracted of the component shop visit.

- **Cost per Landing/PBH:** Subcontracted repairs often lead to Power-by-the-Hour (PBH) or landing fees contracts. If your airline has such an agreement, please indicate your PBH rate or contract fee per landing here.

- **Fee Unit (in case of PBH):** Select from the dropdown list
  - FC/AC: Flight Cycles per Aircraft
  - CPBL: Cost per Brake Landing
  - FC/Unit: Flight Cycles per Unit
  - FH/AC: per Flight Hours per Aircraft
  - FH/Unit: Flight Hours per Unit
  - OH: Operating Hours (APU)

- **Comments:** Comments help to understand and analyze the costs. Please any relevant information such as:
  - APU P/N and utilization (OH/FC)
  - Scope of Landing gear overhaul (Basic package/basic + out-of-scope/basic + out-of-scope + exchange fee)
  - Contract duration and its perimeter in case of out-sourced services
  - If the event was unscheduled or planned.

13. Maintenance Reserves

This tab is used to report data on maintenance reserves for leased aircraft.

Fleet Code, Aircraft Version, Engine Leased Fleet Size (columns C, D, E and F) are automatically populated with information entered in Airline Fleet Info tab. Maintenance Reserves (MR) Type (column G) is also automatically populated with the following Maintenance Reserves (MR) types:

- Airframe Heavy Check
- APU Maintenance
- Engine LLPs
- Engine Maintenance
- Landing Gear Maintenance
- Thrust Reversers
- Others (Including Propellers)
- Total: This row is automatically populated with the sum of data entered in all the rows above; however, if you are not able to break down the MR by type, you can report the total amount here.

Maintenance Reserves (MR)

Fleet Code	Aircraft Version	Engine	Leased Fleet Size	Maintenance Reserves (MR) Type	Number of Aircraft they apply to	MR Paid to Lessor [USD]
	A330-300	TRENT-700	3	Airframe Heavy Check	1	200,000
	A330-300	TRENT-700	3	APU Maintenance		
	A330-300	TRENT-700	3	Engine LLPs	1	140,000
	A330-300	TRENT-700	3	Engine Maintenance	1	200,000
	A330-300	TRENT-700	3	Landing Gear Maintenance	1	40,000
	A330-300	TRENT-700	3	Thrust Reversers		
	A330-300	TRENT-700	3	Others (including propellers)		
	A330-300	TRENT-700	3	Total		580,000

Figure 16. Maintenance Reserves (MR) Types & Total

The rest of the tab is divided in three (3) sections and comments.

First, you will report the number of aircraft that paid Maintenance Reserves and the amount paid. Then, you will enter the actual cost of the maintenance events. The last section before the Comments is used to report the maintenance event reimbursements.

- **Number of Aircraft the MR apply to:** Indicate the number of leased aircraft that paid MR during the reporting period. It should be less than or equal to the Number of Leased Aircraft reported in column F.

- **MR Paid to Lessor:** Total Maintenance Reserves (MR) paid during the reporting period.
- **Actual Cost of Maintenance:** Total Maintenance Costs only related to leased aircraft for which your airline pays Maintenance Reserves.
- **Number of Maintenance Events:** Number of events related to actual costs (not applicable to LLPs).
- **Maintenance Event Reimbursement:** Total amount reimbursed by Lessor during the reporting period. This applies only to events reported in columns J and K.
- **Number of Maintenance Events Reimbursed:** Number of events related to Lessor reimbursement. Not applicable to LLPs.
- **Comments:** Add any additional useful information

14. Summary and P&O Graphs

The Summary Graphs and P&O Graphs recapitulate several data in a visual way.

14.1. Summary Graphs

The Summary Graphs present direct maintenance cost (i.e. excluding overhead) at aircraft type level:

- Broken down by market segments: Line, Base, Component and Engine
- Broken down by cost elements: Labor, Material and Subcontracted
- $/Flight Hour
- $/Flight Cycle
- $/Aircraft

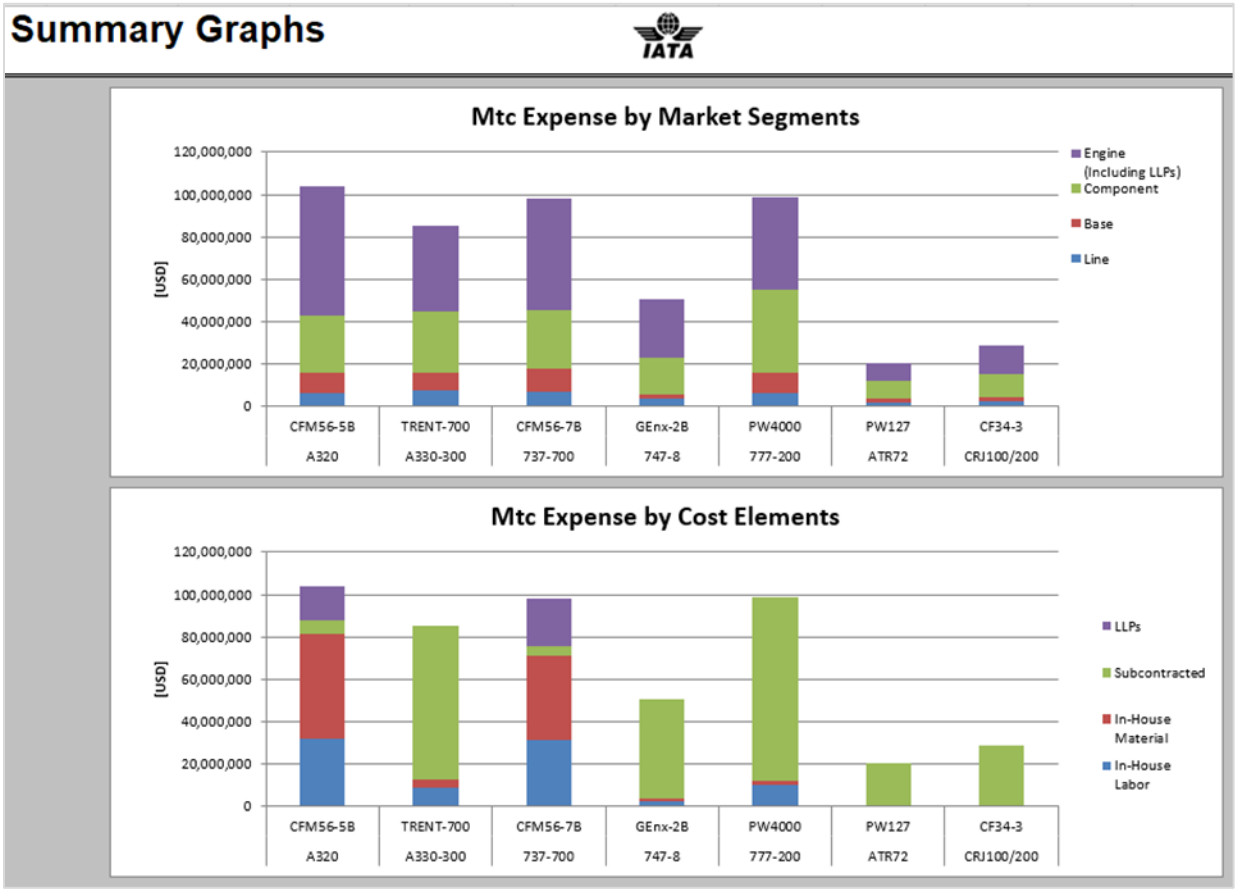


Figure 17. Example of Summary Graphs

These numbers are for illustration purposes only!

14.2. P&O Graphs

The P&O Graphs present personnel and overhead data in a visual way:

- Average number of staff per aircraft (Mechanics and Overhead Staff)
- Technical division cost breakdown:
    - Direct cost (Labor and Non-Labor)
    - Indirect cost (Labor and Non-Labor)

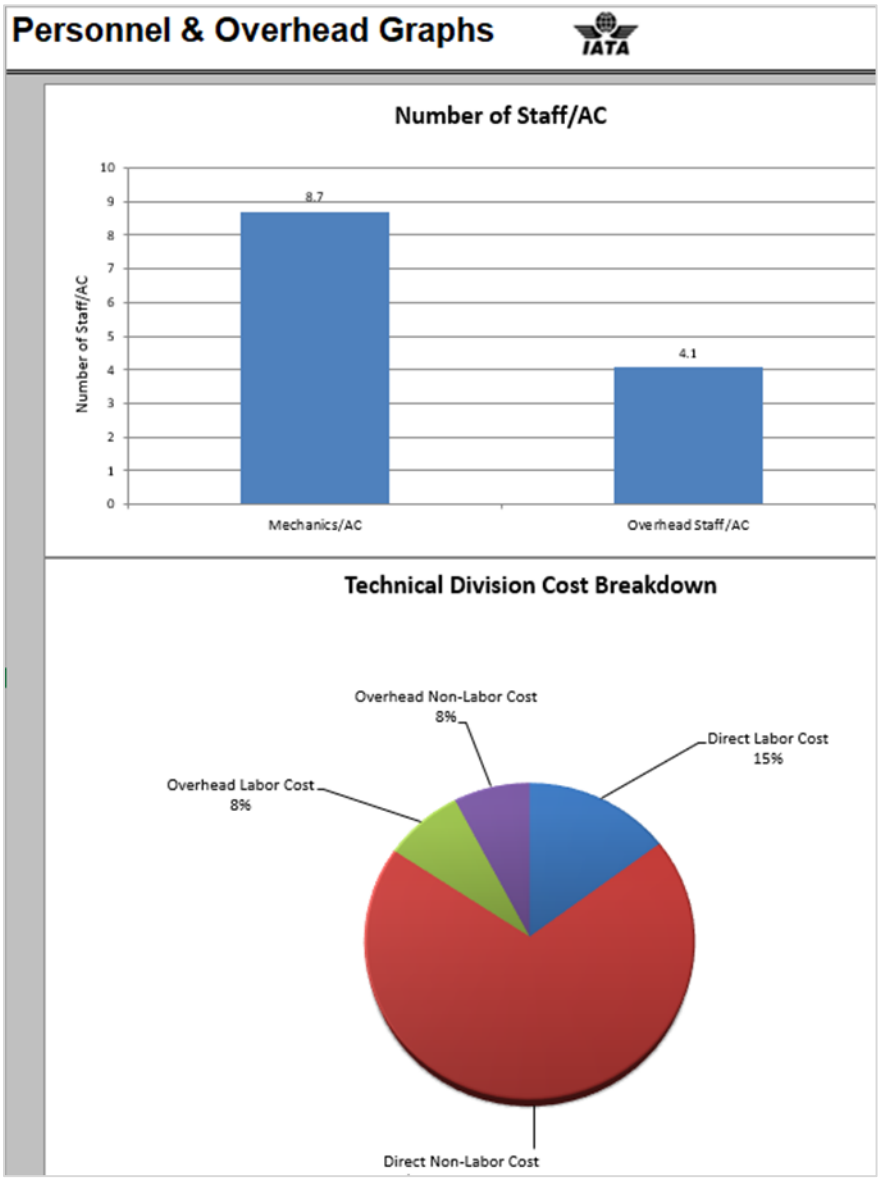


Figure 18. Example of P&O Graph

These numbers are for illustration purposes only!

15. Frequently Asked Questions (FAQ)

This section gathers the questions that we received from users over the years. If you don't find the answer to your question, please contact us at mctg@iata.org

15.1. How to allocate spares that are common to multiple aircraft types?

When spares are common to multiple aircraft types (e.g. A320 family, 737NG), you can allocate the value by number of aircraft (see example of calculation at the end of Section 5.6 Spares and Inventory).

15.2. How to include engine rent costs? Are they related to engine costs or engine spare costs?

Engine rents should be included in Engine Maintenance Costs, as part of the Subcontracted Costs. While the cost to install and remove the spare engine is Line Maintenance cost (unless done in a hangar pre-scheduled environment).

15.3. How to allocate the expense for cabin textile?

My airline has a cabin textile agreement for cleaning, repairing, and changing all textile materials in aircraft, including curtains, carpets, seat covers, etc. We pay a fixed price per aircraft per month. Where can I enter this expense in the toolset?
The expense for cabin textile is part of Line Maintenance Subcontracted Costs only if they are done at A-checks or more frequently. However, if the frequency is over 18 months (C-Check interval), the expense should be entered in Base Maintenance Subcontracted Costs.

15.4. How to allocate the cost of aircraft painting performed separately from C-checks or Heavy Maintenance Visits (HMV)?

Painting costs are Base Maintenance costs and can also be included in Level 2.1 (columns AH to AK).

15.5. Should the cost of aircraft accident/incident damage be considered as a cost in the toolset?

You should not enter the total cost of the incident damage. You should only include what your airline paid, which is the difference between the total cost of damage and what the insurance reimbursed your airline. However, it may take months to get insurance money back. Therefore, it may hit next year's toolset.

15.6. Where to enter indirect costs such as engineering, planning, technical documentation, contract support, etc.?

These indirect costs must be reported on the "Personnel & Overhead" tab: labor costs in Block 3 "Indirect Labor Costs (Overhead)" and other costs in Block 4 "Other Overhead Costs".

15.7. Where to report the employees in the Aircraft Tool & Equipment?

Employees who work in the Aircraft Tool & Equipment department (i.e. GSE Repair Shop, Hangar & Ramp Services, A/C tooling & Store, Ramp Transport, etc.) should be placed in the "Other Services" section, in Block 3 "Indirect Labor Cost (Overhead)" on the "Personnel & Overhead" tab.

15.8. Where to report defect rectifications?

Defect rectification is a very important line maintenance activity, and it doesn't belong to any line check even though it generates very high labor and material costs. Where can I enter this cost in the toolset?
It depends! Line maintenance is for "remove and replace". In certain cases, you may have to rectify defects.

- Case 1: If you replace the component and work on the unserviceable unit while the aircraft is back flying with another part, the cost should be allocated to Component Repair (Level 1 – columns Q to S). This may be difficult to track (see also Case 3 below).
- Case 2: If you work on the part while the aircraft is at the gate, under Line maintenance or operations, the cost is allocated to Line Maintenance (Level 1 – columns F to H).
- Case 3: If the work is done by Line Maintenance mechanics, while the part is in the shop and the aircraft is back flying, the cost is allocated to Line Maintenance (Level 1 – columns F to H), mainly for simplicity purposes; otherwise see Case 1 above.

15.9. Where to report transportation costs related to parts to be repaired

You should include transportation costs either in In-House Material or Subcontracted (Level 1, Component Maintenance, columns R or S), depending on which method is used by your airline (in-house or subcontracted). Transportation costs are part of the direct maintenance expense.
These costs should be directly related to the maintenance work being performed on the aircraft and should not include other transportation costs, such as transportation to and from work, employee travel budgets, etc. In many cases, the airline pays the transportation cost out to the vendor, and the vendor pays the cost of parts shipped to the airline.

15.10. How to report replacement costs of LLPs under warranty?

Our LLP replacement costs were covered by warranty claim credit. How should we report the costs?
You should report the costs after deducing the warranty credit.

15.11. Will my comments in "Tell us about 2022" be published as verbatim?

The comments made in this section will not be published as verbatim and we will not share the names and/or positions of the contributors. Our objective is to identify the common challenges that airlines faced during the past year and report any best practices and innovative solutions.

15.12. In which P&O block to report the various categories of staff?

We have FTEs for production staff as Production Engineer, Job Card Engineers, Training Department , Technical Trainer , Analysts , AOG Desk, MCC, etc. Where should we put those figures?
What about Project Management, Application and Hardware Management as well Process Improvement experts?

These FTEs are indirect labor (or Overhead Staff), they should be reported in Personnel & Overhead - Block 3 or 4:

- Production Engineer and Job Card Engineers ➔ Block 3/Technical and Industrial Engineering
- Training Department and Technical Trainer ➔ Block 4/Training as lump sum with the rest of the Training expenses
- Analysts ➔ it depends on what they analyze and which department they work with/for: Block 3/Technical and Industrial Engineering or Inspection and Quality Control or Production Planning and Control
- AOG Desk and MCC ➔ Block 3/Production Planning and Control
- Project Management, Application and Hardware Management as well Process Improvement ➔ Block 4/IT as a lump sum with the rest of the IT expenses

15.13. Are these activities productive or non-productive time for a mechanic?

Activity	**Productive/Non-Productive Time**
Aircraft door Open/Close work	Productive Time
Briefing for Tasks (conference)	*Non-Productive Time*
Cleaning office and work place	*Non-Productive Time*
Document work (signing)	*Non-Productive Time*
Event (e.g. barbecue, year-end party, etc.)	*Non-Productive Time*
In-house capability review	*Non-Productive Time*
Manual reviews	*Non-Productive Time*
OJT (on the job training)	Productive Time
Preparation for tasks	Productive Time
Standby for aircraft	*Non-Productive Time*
Take a rest	*Non-Productive Time*
Vehicle/Tool Checks	*Non-Productive Time*
Work Order and Tasks	Productive Time

**** If you have any questions, please email us at MCTG@iata.org ****

16. List of Acronyms

AC (A/C)	Aircraft
APU	Auxiliary Power Unit
ASK	Available Seat Kilometer
ASM	Available Seat Mile
ATK	Available Ton Kilometer
ATM	Available Ton Mile
CASK	Cost per Available Seat Kilometer
CPBL	Cost per Brake Landing
CSN	Cycles Since New
CSO	Cycles Since Overhaul
CY	Currency
EGT	Exhaust-Gas Temperature
ESV	Engine Shop Visit
ETOPS	Extended Twin Operations
EUR	Euro
FAQ	Frequently Asked Questions
FC	Flight Cycle
FH	Flight Hour
FOD	Foreign Object
HMV	Heavy Maintenance Visit
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IDG	Integrated Drive Generator
IFE	In-Flight Entertainment
KPI	Key Performance Indicator
LLP	Life Limited Part
LRU	Line Replaceable Unit
MCTG	Maintenance Cost Technical Group
MCX	Aircraft Maintenance Cost Data Exchange Program
MH	Man-Hour
MPD	Maintenance Planning Document

MR	Maintenance Reserves
MTBUR	Mean Time Between Unscheduled Removal
MTBSV	Mean Time Between Shop Visit
N/A	Not Applicable
OH	Operating Hour
OJT	On-the-job Training
PBH	Power By the Hour
P/N	Part Number
P&O	Personnel & Overhead
QEC	Quick Engine Change
R/NR	Routine/Non-Routine
RTS	Return to Service
TSN	Time Since New
TSO	Time Since Overhaul
USD	United State Dollar