



NETL Life Cycle Inventory Data

Process Documentation File

Process Name: Jet Aircraft, 46 Short Tons, Construction
Reference Flow: 1 MJ of Blended Jet Fuel
Brief Description: This unit process quantifies the construction materials required for the construction of an approximately 46 short ton empty weight Boeing 737-800 jet aircraft, per kg of jet fuel.

Section I: Meta Data

Geographical Coverage: US **Region:** N/A
Year Data Best Represents: 2010
Process Type: Manufacturing Process (MP)
Process Scope: Gate-to-Gate Process (GG)
Allocation Applied: No
Completeness: All Relevant Flows Captured

Flows Aggregated in Data Set:

Process Energy Use Energy P&D Material P&D

Relevant Output Flows Included in Data Set:

Releases to Air: Greenhouse Gases Criteria Air Pollutants Other
Releases to Water: Inorganic Emissions Organic Emissions Other
Water Usage: Water Consumption Water Demand (throughput)
Releases to Soil: Inorganic Releases Organic Releases Other

Adjustable Process Parameters:

N/A

Tracked Input Flows:

Aluminum sheet [Metals] *Aluminum sheet metal used for the construction of the airplane*

Tracked Output Flows:

Blended Jet Fuel [Intermediate Product] *Blended jet fuel combusted in the airplane (Reference flow)*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage5_C_Jet_Aircraft_46_ShortTon_2012.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process encompasses the materials and weights of those materials used for the construction of a jet fuel powered commercial airliner. The process is based on a reference flow 1 MJ of blended jet fuel combusted, wherein blended jet fuel is composed of a 1:1 (volume) mixture of F-T jet fuel and conventionally produced jet fuel, as described below and shown in Figure 1. Upstream emissions associated with the production and deliveries of these materials are accounted for outside of the boundary of this unit process. This unit process is used in Life Cycle (LC) Stage #5, which accounts for the combustion of transportation fuels and is the final life cycle stage for blended jet fuel. The unit processes that are upstream of this unit process include operation and construction activities for the production and delivery of blended jet fuel. There are no unit processes downstream of this unit process.

Boundary and Description

The LC boundary of this unit process starts with materials ready for the construction of a jet airplane and ends with an airplane ready for use. The data in this unit process is representative of a mid-duty commercial airliner – specifically a Boeing 737, roughly based on 2000-2006 model years. Mass of the airplane (empty) was used to estimate the total weight of metal contained in the airplane. It was assumed that the entire mass of the airplane comprised sheet aluminum. This is a simplification, and is noted as a data limitation. Additionally, the airplane's fuel consumption rate was used to evaluate anticipated lifetime fuel consumption. The inverse of lifetime fuel consumption was then used to apportion the fraction of the jet airplane constructed per kg of jet fuel combusted, over the lifetime of the airplane. For additional detail regarding calculation procedure, please refer to the DS associated with this unit process.

Figure 1 provides an overview of the boundaries of this unit process. Rectangular boxes represent relevant sub-processes, while trapezoidal boxes indicate upstream data that are outside of the boundaries of this unit process. As shown, upstream resource consumption and emissions to the environment associated with the production and delivery of construction materials are not accounted for in this unit process, but are accounted for by upstream unit processes. **Table 1** shows the breakdown by weights of each material used to construct a passenger vehicle, model year 2005.

Table 1: Material Used to Construct a Diesel Passenger Vehicle

Total Weight of Diesel Vehicle	Weight	Reference
Airplane Mass	41,413 kg	Boeing 2010
Aluminum Mass	41,413 kg	NETL Engineering Judgment
Airplane Lifetime	20 yr	NETL Engineering Judgment
Lifetime Fuel Consumption	305,052,400 kg	Boeing 2010

Table 2 provides a summary of modeled input and output flows. Additional detail regarding input and output flows, including calculation methods, is contained in the associated DS.

Figure 1: Unit Process Scope and Boundary

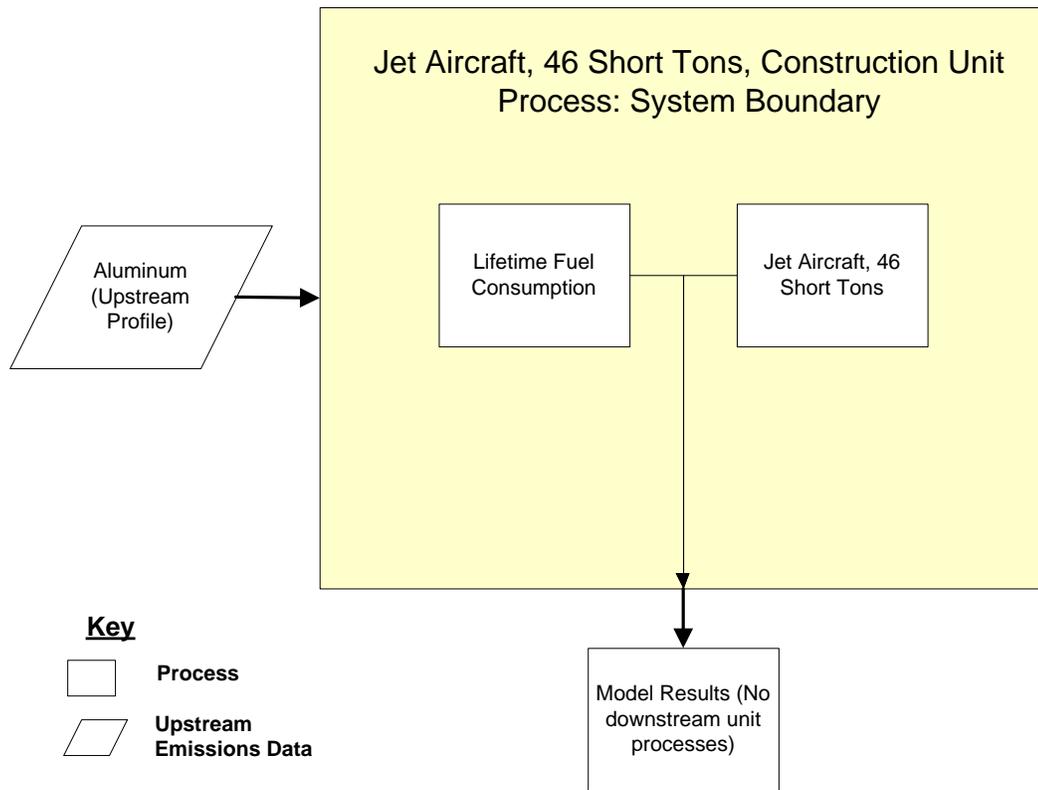


Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Aluminum sheet [Metals]	1.358E-04	kg/kg jet fuel
Outputs		
Blended Jet Fuel [Intermediate Product]	1.00	kg

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows.

Embedded Unit Processes

None.

References

Boeing 2010 Boeing, Inc. 2010. Airplane Description. Available at: <http://www.boeing.com/commercial/airports/acaps/737sec2.pdf> Accessed January 16, 2012.

Section III: Document Control Information

Date Created: May 4, 2012
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