Episode 2
ONE Record
The data model: a digital twin of the air cargo

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Your hosts today

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The data model: a digital twin of the air cargo industry
Tuesday, 30th June 11:00 – 12:30 (CEST)

Crafting ontologies: from physical freight to machine readable data
Tuesday, 7th July 11:00 – 12:30 (CEST)

The ONE Record API: an overview of the key features
Tuesday, 14th July 11:00 – 12:30 (CEST)

Data security: securing the Internet of Logistics
Tuesday, 21st July 11:00 – 12:30 (CEST)

Pilot testing: engaging with the cargo community
Tuesday, 28th July 11:00 – 12:30 (CEST)
The data model: a digital twin of the air cargo

Part 1
Why a data model?

Part 2
What is the scope?

Part 3
What is behind the data model standards?

Part 4
How is it designed?

Part 5
How is this model applied to the air cargo?

Part 6
Q&A
How to participate during the meeting?

• You can only hear the presenters

• Your microphones are disabled

• Use the questions box to interact

• Simply enter your questions in the chat box on the right
This meeting is recorded for future use

The entire recording along with questions will be available shortly after this webinar finishes.

Simply click on the link in the invite for the live event to access it.

The presentations shown today will be available for download on our website:

www.iata.org/one-record
Part 1

ONE Record Insights

Why a data model?
International trade is about moving goods

But also is about information sharing

Each year, more than 7,800 tons of paper documents are processed. It’s the equivalent of 80 Boeing 747 freighters filled with paper.

The Vision
An end-to-end digital logistics and transport supply chain where data is easily and transparently exchanged in a digital ecosystem of air cargo stakeholders, communities, and data platforms.
ONE Record concept

“An end-to-end digital logistics and transport supply chain”
The ONE Record concept is based on 3 pillars enabling to define:

**WHAT**, **HOW**, with **WHOM** data can be shared
<table>
<thead>
<tr>
<th>Challenge</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of interoperability between the different systems</td>
<td>57%</td>
</tr>
<tr>
<td>Lack of data sharing</td>
<td>21%</td>
</tr>
<tr>
<td>Too much paper documentation to process</td>
<td>11%</td>
</tr>
<tr>
<td>Lack of a common &quot;cargo glossary&quot;</td>
<td>6%</td>
</tr>
<tr>
<td>Difficulties to switch to a digital process</td>
<td>6%</td>
</tr>
</tbody>
</table>
Part 2

What is the scope?
ONE Record Data Model: the ambition

Shipper’s Letter of Instruction

Cargo Distribution

CO2 Emission

ULD Tracking

Interactive Cargo

Dangerous Goods / Pharma

Customs (PLACI, ICS2)

Ground Handling

Airline Core Ontology
ONE Record Data Model: the ambition

**Airline Core Ontology**
- Minimal requirements for the transport of general cargo
- Detailed and extensive enough to enable piece-level management and tracking

**Add-ons**
- Sets of data elements required to handle specificities of certain shipments (e.g. Dangerous Goods, Pharmaceutical) and/or operations (e.g. ULD tracking, Interactive Cargo)
Extending the data model and schema

- Ideation process and identification of new data elements and or features
- Assessment of the new topics and priority setting
- Assignment of the selected topic to dedicated focus groups*

<table>
<thead>
<tr>
<th>Priority</th>
<th>Topic</th>
<th>Focus group*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>![Circle]</td>
<td>FG1</td>
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<tr>
<td>2</td>
<td>![Square]</td>
<td>FG2</td>
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<td>4</td>
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<td>FG4</td>
</tr>
<tr>
<td>5</td>
<td>![Line]</td>
<td>FG5</td>
</tr>
</tbody>
</table>

* Small working groups of 3 or 4 people from the ORTF
Development approach

- Business Needs
- Data elements
- Data model & business rules
- JSON schema
ONE Record Insights

Part 3

What is behind the data model standards?
ONE Record Data Model Boot Camp

Boot Camp #1
Geneva
21-24 October 2019

Boot Camp #2
Madrid
28-30 January 2020

Boot Camp #3
Virtual
1 April 2020

Boot Camp #4
Virtual
14 / 16 June 2020
Data Model: Standard components

To support the deployment and the adoption of the ONE Record Data Model, IATA published a set of specification, guidance materials and tools.

Design Principles

Definition of the four design principles

Definition of the logistic objects

Application of the data model to the Master AWB and the House AWB

What is a logistic object?

"An essential element of the cargo supply chain e.g. digital twins, transport movements, etc."
ONE Record conceptual data model

- Transport Means
- Transport Segment
- ULD
- Item
- Piece
- Shipment
- Waybill
- Quote Request
- Booking
- Offers

Product: mandatory, either through Item or directly linked with Piece
Logical Data Model
Use Cases

1. Select a task from the Master Operating Plan (MOP)

Activity | Task
--- | ---
Go to MOP document

2. The stakeholder presented below is the one accountable to make the data available. However other parties (not specified here) can be designated to perform this action (e.g. GHA on behalf of the airline)

Stakeholder: Shipper

The booking is made between the shipper and the forwarder, at this stage this booking is not in the scope of the data model. The shipper ensures that the following LO are created or updated for the shipment: Product, Item, Piece, Dangerous Goods, Transport Segment (Origin and Destination, reference to the pieces), ULD if relevant (creating/updating if he is the owner, linking to existing ULD object otherwise), Security Status, Customs information, Service Request.

In this list the following are optional objects that are not mandatory at this stage: Item, ULD, Security Status, Customs information.

If there is no Item, the Product is directly linked to the Piece.

### Object name | Data type | Description | Mandatory | Data Type | Linkable object
--- | --- | --- | --- | --- | ---
additionalSecurityInfo | T | Ad hoc security statement required by state regulators | 0 | n | E
coload | B | Coload indicator for the pieces (boolean) | 0 | 0 | E
containedPiece | E | Details of contained piece(s) | 0 | n | E

### Attribute | Description | Optional | Cardinality | Data type | Linked object
--- | --- | --- | --- | --- | ---
additionalSecurityInfo | Ad hoc security statement required by state regulators | 0 | n | T | E
coload | Coload indicator for the pieces (boolean) | 0 | 0 | B | E
containedPiece | Details of contained pieces | 0 | n | E | E

customsInfo | Customs details | 0 | n | T | E
dimensions | Dimensions details | 0 | 0 | T | E
dimensions | Dimensions details | 0 | 0 | T | E
goodsDescription | General goods description | 0 | 0 | T | E
height | Height details | 0 | 0 | T | E
length | Length details | 0 | 0 | T | E
weight | Weight details | 0 | 0 | T | E
volume | Volume details | 0 | 0 | T | E

The booking is made between the shipper and the forwarder, at this stage this booking is not in the scope of the data model. The shipper ensures that the following LO are created or updated for the shipment: Product, Item, Piece, Dangerous Goods, Transport Segment (Origin and Destination, reference to the pieces), ULD if relevant (creating/updating if he is the owner, linking to existing ULD object otherwise), Security Status, Customs information, Service Request.

In this list the following are optional objects that are not mandatory at this stage: Item, ULD, Security Status, Customs information.

If there is no Item, the Product is directly linked to the Piece.
Ontology

Developed by the Stanford Center for Biomedical Informatics Research at the Stanford University School of Medicine, Protégé tool is one of the oldest and most widely deployed ontology modelling tools. It was originally conceived as a frame-based modelling tool for rich ontologies following the Open Knowledge Base Connectivity protocol. Later iterations of Protégé have expanded to include a plug-in that is now widely used for OWL and RDF modelling.

https://protege.stanford.edu/
Among the five components of the standard, which one would be the most helpful in your ONE Record implementation?

- **Use Cases**: 49%
- **Logical Data Model**: 32%
- **Ontology**: 11%
- **Conceptual Data Model**: 6%
- **Design Principles**: 2%
ONE Record Insights

Part 4

How is it designed?
To fulfill its purpose, the ONE Record model should meet the below high level requirements:

- Optimize the usage of modern technologies to facilitate data exchange.
- Minimize redundancy of data in the model.
- Find optimal balance in simplicity, flexibility and robustness of the data model.
- Cover the end-to-end supply chain.
Design principles

- Piece-centric
- Physics-oriented: the digital twin concept
- One single source of truth
- Data-driven
Piece-centric

- The Air Cargo industry is shifting from Shipment-level management to **Piece-level management** starting with Piece-level tracking.

- The **Piece** is at the center of the model and deeply linked to the other elements of the cargo supply chain.

**What is a piece?**

“A uniquely identified physical single unit which may form all or a part of a shipment”
Physics-oriented

- Physical entities have **digital twins** in the Data Model (e.g. Airplane, ULDs, etc.)

- Easy understanding of the Data Model and how it interacts with actual operations

- Easy *sharing* and *transparency* of the data throughout the supply chain

**Digital twins**

"digital twin is the "digital replica" of a physical entity"
One single source of truth

**Clear ownership** of data that remains at the source

**Data integrity** and **accuracy** is ensured

**A strong trust** is implied and in favor of replacing paper-based documents
Data-driven

Data, not documents!

• Data is the **core** of ONE Record

• Documents will be the results of **data aggregation**

• Proper **APIs** and **security mechanisms** allow to cover the legal requirements of documents in the current world

Combined with **Semantic Web** and **Linked Data** principles

• **All objects are linked**, directly or indirectly, that is Linked data

• No **redundancy** of data required

• The Semantic is described easily in **machine-readable ontologies**
Are you ready to shift your mindset from shipment level management to piece level management?

- Yes: 33%
- Yes, but we face organization/process constraints: 33%
- Yes, but we face technical constraints: 31%
- No: 4%
How is this model applied to the air cargo?
A model that focuses on the goods ...

Product is mandatory, either through Item or directly linked with Piece.
... has digital twins of physical assets ...

Product is mandatory, either through Item or directly linked with Piece
... and covers the booking process

- Product is mandatory, either through Item or directly linked with Piece
- Allocated on Transport Means
- Contains ULD
- Is loaded on Transport Segment
- Is loaded on (if bulk) ULD
- Can be in Item
- Piece Belongs to Shipment
- Shipment has Waybill
- Waybill has Quote Request
- Leads to Offers
- Leads to Booking
- Booking has ↓
- Offers has ↓
- Quote Request Leads to ↓
The data model through a simplified use case

<table>
<thead>
<tr>
<th></th>
<th>SHIPPER</th>
<th>FORWARDER</th>
<th>FORWARDER</th>
<th>CONSIGNEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prepares cargo for delivery to a customer</td>
<td>At export, accepts shipment into the warehouse, loads onto a flight. At import, hands over shipment to forwarder</td>
<td>Collects shipment and delivers to the consignee</td>
<td>Consignee receives the shipment</td>
</tr>
<tr>
<td>2</td>
<td>Receives the shipment, arranges the booking with the airline and hands over the shipment</td>
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</tbody>
</table>
The data model through a simplified use case

Shipper prepares cargo for delivery to a customer:

- Initialization of “Piece”, “Item”, “Product” and “Shipment” objects and appropriate links
- “ULD” can be used if the shipment is already in a ULD (e.g. pharma ULD)
The data model through a simplified use case

FORWARDER

Receives the shipment, arranges the booking with the airline and hands over the shipment:

- Booking is made between forwarder and shipper, with the creation of “Quote Request”, “Offers”, “Booking” and “Waybill” objects.
- Movement of pieces to carrier domain with “Transport segments”, “Transport Means” and “Events”
- Update of the pieces’ statuses with “Events”
The data model through a simplified use case

AIRLINE / GHA

At export, accepts shipment into the warehouse, loads onto a flight. At import, hands over shipment to forwarder:

- Movement of pieces/ULD into the warehouses with "Transport segments", "Transport Means" and "Events"
- Loading of pieces/ULD onto a flight with "Transport segment" and "Events"
- Departure and Arrival of the flight captured with "Events" and "Transport segment"
- Unloading of pieces from flight and loading of pieces on truck with "Transport segment"
The data model through a simplified use case

**FORWARDER**

Collects shipment and delivers to the consignee:

- Movement of pieces to the forwarder hub with "Transport segments”, “Transport Means” and “Events”
- If a ULD is broken down, the respective “ULD” and “Piece” objects are updated
- Pieces are loaded onto truck for delivery to consignee with “Transport segments”, “Transport Means” and “Events”
The data model through a simplified use case

Consinee receives the shipment:

- Delivery to consinee with "Transport segments" and "Events"
- "Event" is added to the "Piece" to reflect the final delivery
Are you willing to test the ONE Record standard in a pilot project?

Yes: 65%
Yes, but I don't have a budget/the resources for it: 35%
No: 0%

Join at slido.com #1RDM
Deep dive into the ONE Record standard
ONE Record Insights and White Papers

Don’t miss our ONE Record Insights and White Papers

ONE Record Data Model
ONE Record & the power of ontologies
Crafting Ontologies
Object Triple Mapping
Catch the Wave of the Linked Data

https://www.iata.org/one-record/#tab-2
Advance your ONE Record knowledge & skills

Three great events to mark in your calendars

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Series of 6 webinars, every Tuesday from 23 June to 28 July, 11:00 to 12:30 CEST

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