T2RL

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# Type B Messaging Market Analysis

February 2022

# Executive Summary

Type B Messaging is a critical component of an airline's business operations. At its peak in 2019 it is estimated that a total of 188 million messages were sent by airlines per day.

Although an integral part of an airline's infrastructure currently there may be many departments within the organisation that do not fully understand the use of Type B messaging and the value it brings. Many consider it an unavoidable expense and it therefore remains undisputed throughout its contract lifecycle.

T2RL estimates the total yearly cost of Type B messaging by airlines to be between $920 Million and $1.07 Billion[1]. This is substantially overvalued. T2RL estimates that input costs have declined by 90+% over the last thirty years and therefore charges should have followed the same trend.

Traditionally there is a complacency around the use of Type B messaging. Disconnection between commercial and IT departments within an airline can lead to excess messages being sent that drive little value or a diminished return. Contracts with providers are generally adjusted to facilitate cost levels on a unit basis but ignore the underlying message waste and overall business strategy of the airline.

Additionally, different PSS providers handle Type B messaging in different ways. Certain PSSs generate significantly more chargeable Type B messages than others. In some cases the cost of messages can be even more expensive than the related passenger boarded fees.

Airlines often have minimum commitment clauses within their Type B contracts. During the current downturn this has left many of them paying for excess volumes of Type B messages that are not being used. Many airlines are currently exploring all avenues to achieve cost savings and efficiency. An audit and assessment of Type B messaging could be a 'quick-win' for airlines that may not have realised that savings in this area are possible. The following paper analyses the current market for Type B messaging and assesses the challenges and opportunities for airlines in this area.

[1] At 2019 pre-pandemic levels. Note that all costs reported in this document are in US Dollars (USD)

# Overview of Type B Messaging

Before early versions of the internet ever existed, the aviation industry had developed a means to perform data transfers globally via proprietary networks. This was driven not only by the expansion of airlines and operators moving into every corner of the world, but also by the need for them to improve their operations and interaction with business partners such as distributors, airports, traffic control and ground handlers.

The International Air Transport Association (IATA) assigned the name 'Type B' messages to the format of such data transfers. Type A is the real-time interactive communications based on IATA legacy protocols.

Type B messaging predates email by many decades and is still very much in use today, primarily by the air transport and travel-related industries, despite numerous predictions that the internet would displace the need for such proprietary mechanisms. Other industries maintain similar networks such as the SWIFT network used in financial services.

The main operators of Type B messaging were originally ARINC, SITA and AFTN which created private networks to specifically support this type of communication. In recent years, various third-party solution providers have developed internet-based solutions which interconnect to these providers or bypass them completely using direct VPN based internet or peer-to-peer links.

Today the airline industry continues to use Type B teletype messages over ARINC, SITA or AFTN networks as an efficient and secure medium for communicating. Most teletype messages are machine-generated by automated processes. IATA has standardised many teletype message formats throughout the airline industry through its Air-or Cargo-Interchange Message Procedures.

# Aviation Industry usage

The initial form of Type B in the aviation industry has been around since the early 1960s, evolving from teletype technology (TTY) originally developed for railroad use more than 100 years ago.

There is not an airline operator, aerospace manufacturer, civil aviation authority, caterer, airport, ground handler, application service provider or global distribution system for

airline ticketing that has not been using Type B for decades. Despite more modern technology now being available the system is in no danger of being mothballed any time soon. There are simply too many legacy processes tied to this mechanism with the costs of change being exorbitant.

Type B messages are renowned to be highly reliable and secure. This is due to using closed networks and technology where data packets are sent, acknowledged and have error detection. They typically support mission-critical applications such as:

- Passenger booking/reservations including availability status (AVS and NAVS). This accounts for around 92% of all messages sent as shown in the chart below.
- Cargo tracking and manifests for ground handling and customs purposes
- Aircraft maintenance information and ACARS messages
- Airline industry procurement and repair transactions for aircraft (ATA's Spec 2000 standard depends heavily upon Type B messages)
- Check-in and departure control data
- Aircraft flight plans and air traffic control data
- Weight and load-balancing information
- Baggage tracking and tracing information, including Radio Frequency Identification tag support
- Advanced passenger information (API) that is communicated to governments
- IATA clearing house data.

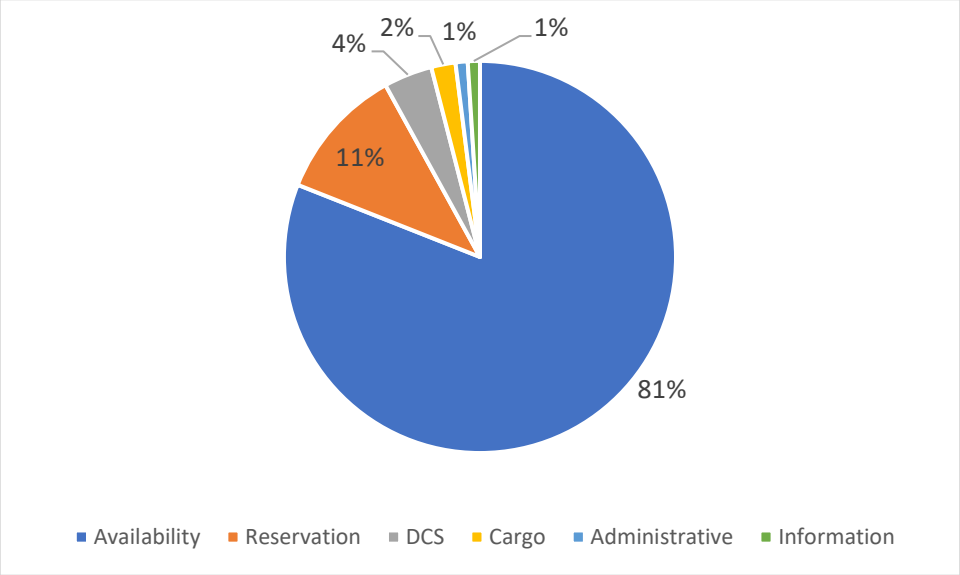


Fig. 1: Aviation Industry Type B usage

# Market Volumes

There are six main providers in the industry today; SITA, ARINC, Amadeus, EDIfly, Lufthansa Systems and AFTN, estimated to be supporting the following daily volumes of delivered messages (pre-Covid-19).

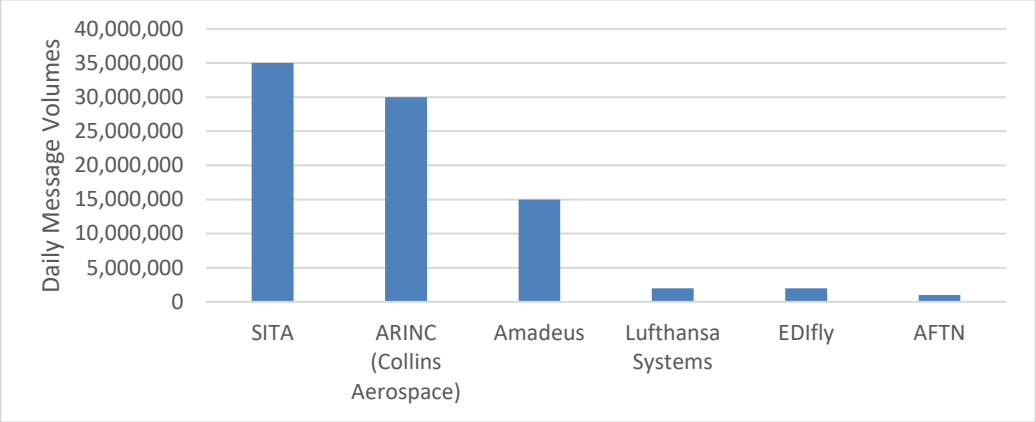


Fig. 2: Daily Message Volume per Provider as per 2019 average volumes

It is further estimated that private peer-to-peer links between major IT systems and GDSs that were implemented to reduce the cost of transferring availability and reservation messages are responsible for around 103 million messages per day during peak times. This has considerably reduced since the start of the Covid-19 pandemic when GDS bookings dropped by around 80% YOY but has since started to pick up.

This equates to an estimated total of 188 million messages being delivered per day at its peak in 2019. Messages are typically charged by providers per MCM (Millions of Characters per Month).

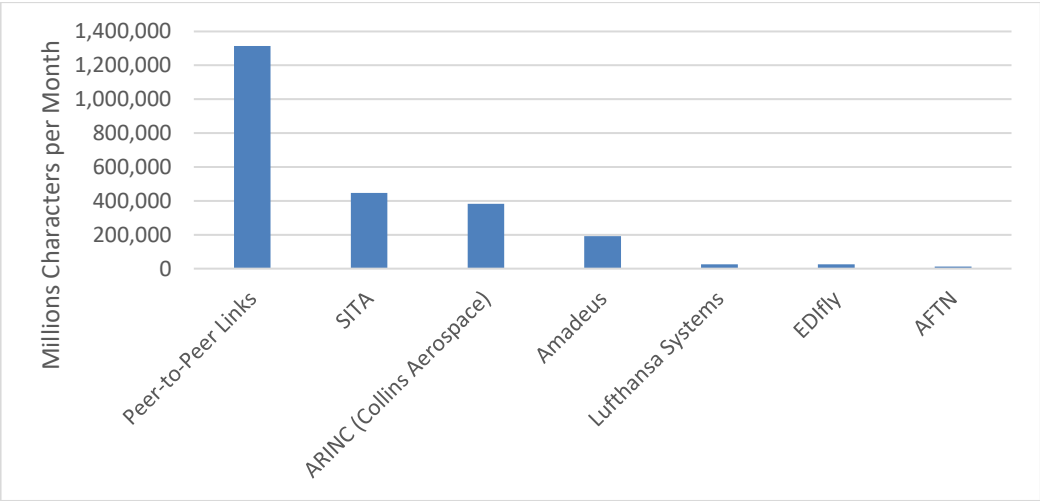


Fig. 3: Millions of Characters sent per Month per Provider as per 2019 average volumes

## The Type B Messaging Market

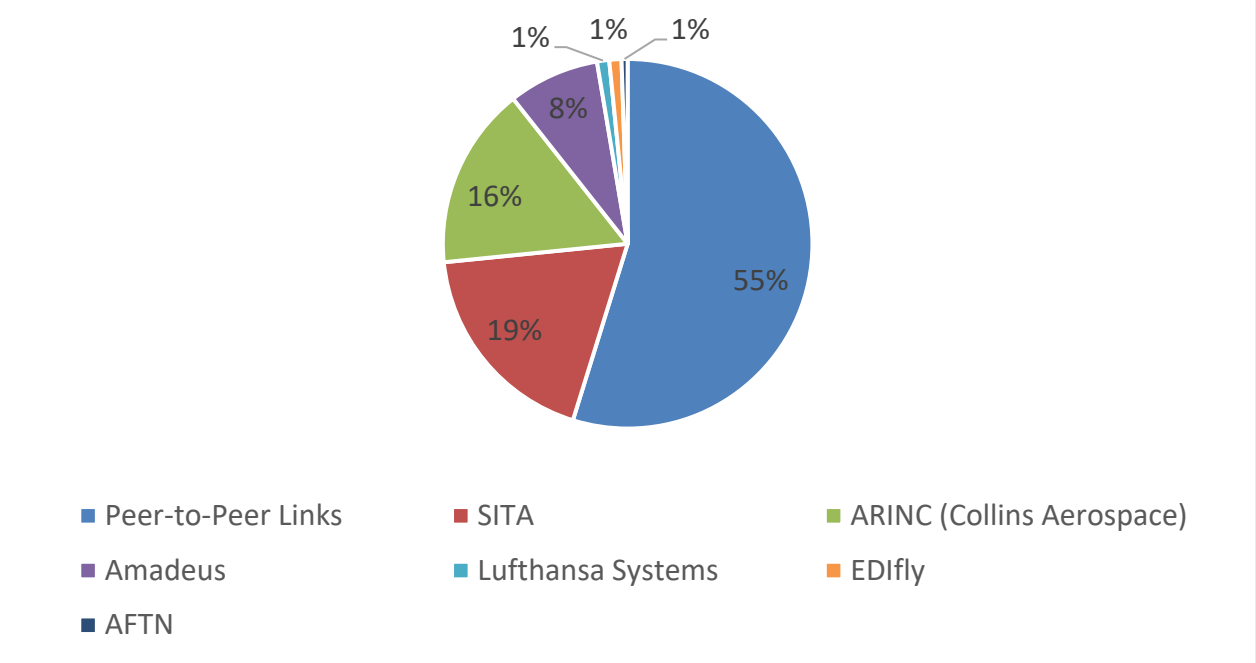


Fig. 4: Current Market Share per Provider as per 2019 average volumes

# Providers

## AFTN

The Aeronautical Fixed Telecommunications Network (AFTN) is a worldwide system of fixed circuits for the exchange of messages and/or digital data between aeronautical stations.

AFTN comprises aviation entities including; ANS (Air Navigation Services) providers, aviation service providers, airport authorities and government agencies. It exchanges information for aircraft operations such as distress messages, urgency messages, flight safety messages, meteorological messages, flight regularity messages and aeronautical administrative messages.

The original AFTN infrastructure consisted of landline teleprinter links between the major centres. Some long distance and international links were based on duplex radioteletype transmissions and leased lines. When it upgraded to CIDIN (Common ICAO Data Interchange Network) it was upgraded to X.25 links at much higher data rates. As the Aeronautical Message Handling System (AMHS) comes online over the next decade, it will switch to X.400 links with either dedicated lines or tunnelled through IP.

## Amadeus

Amadeus provides GDS and IT services to airlines globally and thus has been a provider of Type B messaging since its inception. Amadeus is one of the three major GDS companies that provide the distribution channel to the world's travel agencies. The global market leader in GDS bookings, it processes a huge majority of the peer-to-peer links as detailed above as well as delivering 8% share of the market in Type B messaging services from airlines to other partners in the aviation ecosystem.

In 2002 Amadeus looked at ways of extracting value from the large networks it has accumulated as a part of its GDS business and launched the product known today as Amadeus Message Net. This solution uses the many dedicated and private VPN over internet connections Amadeus had in place and established a full delivery network on top of its internal message switching network as a competitor to SITA and ARINC. It was able to offer highly attractive pricing as the links and messaging infrastructure was essentially a sunk cost of doing its GDS business. It started marketing this to airlines that had become PSS customers as well as potential PSS customers in an effort to improve revenue streams and profitability without increasing the costs of other IT solutions.

Today the Amadeus Message Net product and Message Net Portal are part of the core messaging systems that Amadeus runs. It still uses private dedicated point-to-point networks and VPN over internet connections to provide for end-to-end messaging communications. The Amadeus Message Net Portal allows users to connect via the World Wide Web to send and receive Type B messages securely to other Message Net Portal users or over the Message Net network delivery services.

## ARINC

Aeronautical Radio Incorporated (ARINC), established in 1929, was a major provider of transport communications and systems engineering solutions for eight industries: aviation, airports, defence, government, healthcare, networks, security, and transportation. ARINC has also installed computer data networks in police cars and railroad cars. It is a private company originally owned by many of the world's airlines including American Airlines, Continental Airlines, British Airways, Air France, and SAS. ARINC is now owned by Collins Aerospace. It was historically the main provider of type B messaging services in the Americas while SITA covered the rest of the world.
In 1978 ARINC introduced ACARS (Aircraft Communications Addressing and Reporting System), a datalink system that enables ground stations (airports, aircraft maintenance bases, etc.) to upload data (such as flight plans) and download data (such as fuel quantity,

weight on wheels, flight management system (FMS) data), via an onboard Communications Management Unit (CMU).

## EDIfly (Innovative Software)

Innovative Software S.à.r.l. (ISW) was founded in 2010. Its product, EDIfly, aims to provide seamless integrated messaging for aviation and logistics businesses.

EDIfly is a multi-peer-to-multi-peer network that allows users of Type B to send messages securely (PCI compliant) and reliably over the public internet with non-repudiation. It has been specifically designed to allow a seamless, secure, reliable and backwards compatible exchange of standard Type B messages over the internet between any members of the EDIfly service, whilst maintaining delivery capability with legacy networks.

As new members join the community existing members can automatically exchange messages with them. The net effect aims to reduce TCO for all members as the EDIfly network grows.

EDIfly is growing steadily and now has clients including the Global Distribution Systems handling tens of millions of messages daily.

## SITA

SITA provides IT and telecommunication services to the air transport industry. Founded in 1949 by eleven airlines to bring shared infrastructure cost efficiency through combining their communications networks, SITA was the first company in any industry to handle data traffic in real-time via a packet switched network over common carrier leased lines. It is by far the biggest traditional provider of Type B messaging.

In 1989 computer reservations systems, aerospace manufacturers, tour operators, airfreight forwarders, airport authorities, and other organisations in the air transport industry began joining SITA as members. The company today provides a range of IT solutions having evolved from its early days of providing only network-related services.

SITA currently operates in over two hundred countries and territories, with customers including airlines, airports, air freight, global distribution systems, governments, aerospace, ground handlers and air traffic control.

## Lufthansa Systems

Lufthansa Systems is an information technology service provider for the aviation industry. Headquartered in Raunheim near Frankfurt, the company's portfolio includes "consulting, development and implementation of customised industry solutions as well as the operation of applications in the company's own data centres."

In March 2015, Lufthansa Systems undertook a reorganisation to reform into three operating units: Infrastructure, Airline Solutions (now known as "Lufthansa Systems") and Industry Solutions (now "Lufthansa Industry Solutions"). The Infrastructure unit has subsequently been sold to IBM, while the other two units remain as subsidiaries of the parent company Lufthansa.

Lufthansa Systems, in a similar way to Amadeus, has had to maintain a large private network of connections predominantly for the Lufthansa Group of Airlines. It has built up significant capabilities in point-to-point networks using central open-source messaging systems (MesX) that provide full message broker functions. The MesWeb product is a web-based portal that allows users to send and receive Type B messages and is fully integrated with the message delivery network and Lufthansa Systems Message Broker.

# Underpinning Technology and Restrictions

Being a legacy format, Type B has a strict layout as opposed to more recent types of data and formatting; XML carries message payloads, HTML which is primarily concerned with the visual representation of a webpage or application and SGML which concentrates on how markup languages are used to structure documents.

Type B is deliberately restricted to a maximum message length of 60 lines of 63 characters each, with a limited set of allowed characters; capital characters A to Z, the numbers 0 to 9 and three signs (/ -.). This restriction was driven by the early teletype character sets from which Type B emerged. As well as the line and character limitations, each message must be limited to less than 4 kilobytes of data based on the lowest common denominator principle, TTY.

While this rigidity is detrimental to expanding the capabilities of the standard, it also provides the industry with a convenient short-hand means of distributing data around the world easily, making it ideal for mission-critical processes. Users need to trust such data, so the trade-off is worth the drawbacks. Without a trustable form of global data exchange it would be nearly impossible to operate a modern airline in today's business

environment. A message itself is not difficult to decipher since software and service providers handle the creation and conversion of data as needed.

Type B is a "store-and-forward" mechanism in which message senders transmit their data via their service provider which in turn archives the message for X days (typically seven, but this depends upon the service contract). It is then sent directly to the specified recipient or to a gateway provider if the recipient is not on the same network. The service providers have contractual agreements to guarantee message delivery in such instances and if for some reason the message fails, it can be re-sent a number of times. Hence the store-and-forward feature and concept of PDM (Possible Duplicate Message) header.

The technology utilised to support Type B messaging today has evolved from distributed fully customised switching architecture supporting legacy ALC, AX.25, X.25, TCP/IP using BATAP (type B Application to Application Protocol) to MATIP B and now MQ as the message brokering capabilities. Each is still present to some extent in parts of the global aviation industry with the main protocols being TCP/IP MATIP B and MQ-Series.

# Challenges

## Cost

In today's API and Digital economy the thought of consuming bandwidth based on a cost per megabyte of data is unfathomable, not to mention when that cost of transmission of data may be as much as $3,000 per megabyte.

Average costs for Type B messaging are between $150-175 per MCM (Millions of Characters per Month). To put this into context, to send a typical email measuring around 12 megabytes in size over such a network to 10 recipients would equate to, on average, $18,000 to $21,000. Even at $30 per MCM this would still equate to $3,600. This is clearly unsustainable.

Given Type B is essentially email with an added security layer of complete store and forward capability, the real cost of Type B data transmission should therefore be marginally higher than email is today.

## Security

End-to-end security has never been more critical. Recent years have seen increases in requirements around PII (Personal Identifiable Information) through GDPR (General Data

Protection Regulation) and PCI/DSS v3.2.1 (Payment Card Industry/Data Security Standard) where PAN (Primary Account Numbers) and associated PII (Personally Identifiable Information) cannot be stored or transmitted in an unencrypted or unmasked form.

These restrictions are critical for airlines to maintain certification and compliance under PCI/DSS and GDPR. The certifications enable merchants (airlines) to be able to transact purchases through providers such as Visa, Mastercard, Amex and others securely. Lack of certification for an airline removes the capability to transact purchases electronically and disables all ecommerce bookings, which of course is a major source of booking revenue.

Type B messaging contains clear text PII and PAN details and this puts pressure on certification. Type B networks today have some clear deficits in the area of security of transmission of data/messages including the following;

1. End-to-end encryption for PII protection
2. PCI/DSS Compliancy and Certification
3. Address spoofing protection
4. Billing signature spoofing.

## Reliability

Type B networks today are seen as batch-like non-real-time delivery networks with the inherent design being based on IATA targets of hours and days for delivery. Reliability of access may be confirmed under a network SLA, but end-to-end delivery times of messages are a rarity.

## Messaging Flexibility

Translating Type B messages to other formats such as email, FTP, database read/write and Type X are limited with the legacy providers. Translations are also specific for each connection where multiple connections are required to deliver total flexibility.

## Order of Message Delivery

Order of message delivery is especially critical in availability recaps as this creates the correct order of additions and deductions of availability levels within inventory systems of airlines. In the traditional networks where performance is driven by multiple end-to-end channels sometimes delivery order is not completely secured which has significant business impact to the airline.

# T2RL Analysis of the Market Today and Tomorrow

## Status of the Market Today

T2RL believes that the market is substantially over-valued.

The cost of Type B messaging to the industry carries an inflated legacy where charges are heavily focused on the maintenance of historic cash flows relating to the messaging services rather than reflecting the costs associated with the actual delivery of messages. Where telecommunication services, computer infrastructure and industry IT service charges have seen year-on-year reductions over the last twenty years, Type B messaging charges have remained at similar levels to the year 2000.

Given the volume of Type B messages has significantly increased over that same period the costs per MCM realistically should have reduced during this time. T2RL estimates that input costs have declined by 90+% and therefore charges should have followed the same trend.

To put this into perspective the total Type B charges for the industry today are significant and not to be ignored as a notable contributor to the TCO of the Airline Industry. Based on the estimated messaging volumes detailed above T2RL estimates the total yearly cost to the industry to be in the region of $900 Million – 1.05 Billion[2].

Peer-to-Peer links that are based on established connections for Type A communications also have additional marginal costs. These generally cost the airline between $3 and $4 per MCM. This would add a further estimated $20 Million[3] to the total.

At a total of $920 Million– $1.07 Billion a year as the overall TCO for the industry and with just over 4.6 billion passengers a year[4], this equates to $0.23 per passenger boarded cost to the industry. This takes into account that the passenger business makes up 96% of all messaging sent. The above is based on averages for the whole industry and there will certainly be airlines that will pay less than this and some that will pay much more.

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[2] Taking into account all providers based on an average message size of 230 characters, the total annual market size is estimated to be 6,000 trillion characters/6 million MCM per year and using the average MCM cost of $150-175

3 Based on an average of 7,000 trillion characters a year.

[4] Costs, messages and passenger numbers are based on what is the 'norm' for the industry. Based on 2019 figures.

T2RL believes that this cost is no longer sustainable, especially when for some airlines it is more than the cost of the PSS Services that they procure. In the case of network carriers the costs of messaging can be an incremental uplift on the PSS cost of anywhere between 25% and 50%.

## The Market Tomorrow

T2RL sees the main industry challenge is eliminating waste in Type B messaging services. T2RL assumes the real cost of operating Type B messaging services is more aligned with the cost per MCM of peer-to-peer links and this should be reflected in the charges put to airlines.

The industry needs to aim towards meeting a target of $40-45 Million in cost per year rather than the current $1.07 Billion and creating a strategy to deliver this.  This would mean a cost reduction for the whole Aviation Industry of 96% from where it stands today.

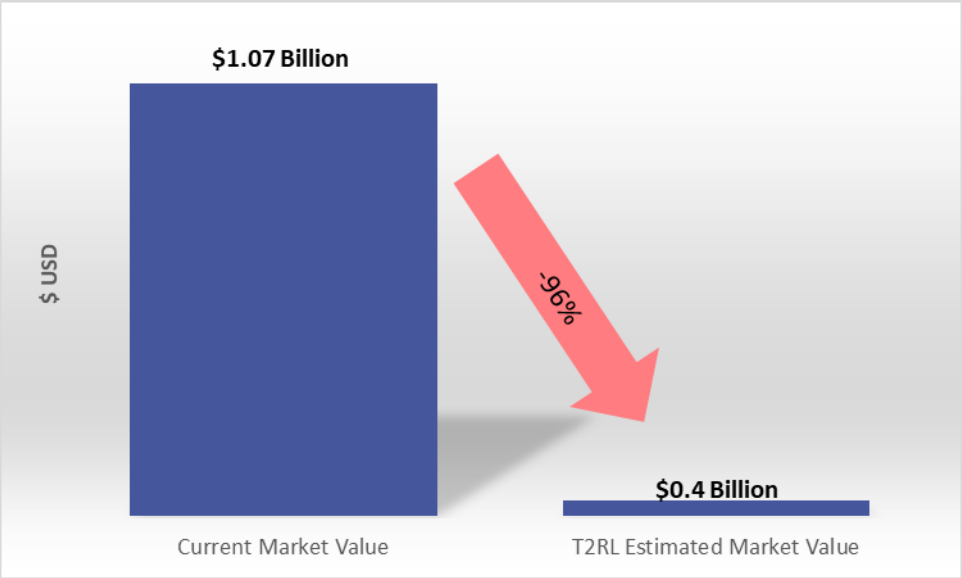


Fig. 5: Current Market Value vs. T2RL Estimated Market Value

## Recommendations

T2RL recommends that airlines not only urgently review their contracts and costs in this area but also undertake a thorough analysis of usage to ensure that it is reflective of the airline's current business model and strategy. Message wastage is a huge contributor to excess costs and in certain airlines has not been reviewed since inception.

Additionally, as the industry evolves in this area providers are expanding the value-added services and capabilities on offer. It is essential that airlines move away from treating Type B messaging with a set-and-forget strategy and become more active in monitoring and choosing providers which best fit their current needs.

T2RL has experience of achieving swift cost savings for airlines in this area and believes this could be a prime avenue for airlines to achieve a 'quick-win' solution in terms of decreasing their TCO.

To find out more please contact: jane.atkinson@t2rl.com.

*Travel Technology Research Ltd, trading as T2RL is an independent research and consulting company that specialises in the market place for airline IT systems. Based on data gathered and analysed since the year 2000 it has defined and tracked classifications of airlines and their IT providers. Its research is used by airlines to enable them to make informed choices of systems and vendors and by the vendors to help them develop products that best meet the current and future needs of the airline industry. For further information, visit our website at www.t2rl.com.*