The Profitable

ECONOMICS OF INFLIGHT CONNECTIVITY

Peter Lemme - March 2019

SEAMLESS
AIR ALLIANCE

CONTENTS

FOREWORD

JACK MANDALA

Chief Executive Officer
Seamless Air Alliance

Simplistic, seamless broadband connectivity in the skies remains a barrier that technology is yet to overcome.

Passengers want to stay connected with friends and family, for business or pleasure, to surf the web, or just to stay up-to-date with their social media.

Connectivity has become a new world lifestyle.

This study welcomes you to read about the mission of the Seamless Air Alliance and presents the positive impact that open standards and industry collaboration can have on the inflight connectivity market.

From Day One the Seamless Air Alliance has been determined to bring industries and technologies together to make connectivity as easy and enjoyable in the skies as it is on the ground.

In a market that continues to struggle to show profit, the combined opportunities presented in this landmark study represent a potential increase in market value from $11.4 to $36.7 billion and follows a significant and powerful first year for the Seamless Air Alliance.

AUTHOR BIOGRAPHY

PETER W. LEMME

Accomplished president, chairman, founder.

Peter Lemme has worked in the aviation technology industry for nearly four decades. He is an accomplished president, chairman, founder and blogger, and brings world-class leadership that integrates multiple suppliers, service providers and regulators.

Peter's track record has produced notable first type-certification of automatic flight controls, satellite communications, aeronautical operational data communications, air-traffic control communications (voice and data), and airline passenger entertainment communications.

Peter began his career at Boeing Commercial Airplane where he spent 16 years, and left as Manager of Terminal Area Projects.

He has since worked for many companies specialising in aviation technology, including Tenzing Communications, Totaport, Mobile Prime Time and AirCloud.

His contribution to aviation technology also includes many voluntary roles. Peter is member and past chairman of the Ku/Ka-band Satcom Subcommittee at SAE-ITC/AEEC, and is also member of the Network Infrastructure and Security Subcommittee. He is an avid blogger on satcom.guru, which provides access to aviation communications technology and news.

Through successive projects, Peter has continued to assemble diverse teams that are able to overcome a myriad of technical, economic, strategic, regulatory, and organisation challenges.

Peter brings deep technical skills to many disciplines, combined with a product-focus that balances the needs of the customer, the partners, and the company, maximises competitiveness, success, satisfaction, and economy, whilst engendering a goal-oriented, collegiate and fun approach to team-building.

EXECUTIVE SUMMARY

The state of inflight connectivity is set for a major upgrade.

Passengers have long suffered with high prices, spotty performance, and difficulty to connect. Airlines have struggled with the high cost of equipping planes, poor performance, and lower net promoter scores. Current inflight connectivity can be a brand-damaging event.

However, the tides are turning. The next wave of performance enhancements from better antennas, modems, and satellite systems is just around the corner. Multi-Tbps capacity is coming online from new and existing connectivity providers.

The wireless market has enjoyed the advantages of standardization through the efforts of 3GPP, GSMA, Wireless Broadband Alliance, Wi-Fi Alliance, and IEEE. Standardization enables interoperability, reduces cost, and simplifies roaming between networks.

The Seamless Air Alliance is a non-profit, standards-based organization that aims to align the inflight industry and usher in a new era of innovation, to make inflight connectivity fast, reliable, and easy-to-access.

This paper begins with a review of the current challenges with inflight connectivity and the passenger experience. Next, the technology behind and Seamless initiatives are described. Finally, the paper concludes with an independent study of the financial impact of these initiatives.

The four areas of impact that have been studied include:

- Take Rates
- Cost per Session
- Recurring Operating Expenses
- Capital Costs

The research shows that even a small step toward these objectives could create $11.4 billion of value across the industry, with an upside to $36.7 billion. Inflight connectivity investments achieve positive cash flow sooner, swinging NPV from negative to positive, and compounding benefits from other revenue sources.

A PASSENGER'S AIRLINE JOURNEY

The search for connectivity never ceases.

The digital onslaught surrounding work and play impacts each of our lives. Passengers are constantly on the move, leaving behind the home or the office to travel to remote destinations.

Information chases everyone even whilst travelling, whether it be through messages from associates, friends or loved ones, or travel details regarding connections and destinations. Yet, there is only a narrow opportunity to respond: when time, space, power, and connectivity align.

Journeys across the world involve discovery, and the responsibility is placed in the hands of the passenger: "How do I get there? What can I see? Where should I eat? What can I do? What should I buy?" Passengers start their journey online before boarding and continue it after disembarking, so there is a need to ensure that connectivity is consistent alongside passenger needs.

Cell phones offer ubiquity, but sometimes struggle at airports with so many people using the networks. Devices other than cell phones must rely on Wi-Fi for a connection. Today, people search for an "SSID" that looks safe, knowing that public Wi-Fi suffers severe security shortcomings if not managed properly.

Malicious actors try to fool people with sophisticated tools and convincing banners, and this can even happen onboard.

Today, telecommunication companies are increasingly using converged networks to deliver the best customer experience. 5G and the latest evolution of Wi-Fi offer great potential in the ongoing efforts toward one smart converged network. Every cell phone has a profile that figures it all out for the user. The development of 802.1x and Passpoint work in a similar manner, permitting secure, reliable, automatic attachment of cell phones to approved Wi-Fi networks using SIM- and certificate-based authentication.

The Seamless Air Alliance is working to achieve converged technology for the good of passengers, by driving more and more collaboration in a more agile way throughout the industry. Passengers on commercial airlines should expect their cell phones to 'just work' like anywhere else. Step-by-step from departure to airport to airplane to airport to destination, every device should be able to manage its connectivity in a Seamless manner.

STATE OF INFLIGHT CONNECTIVITY

LESSONS OF THE PAST

Airlines have been bringing connectivity to passengers for more than 80 years. Whilst not gaining prominence until the 1980's, seatback telephones were the pinnacle of technology in the rush to connect passengers.

The emergence of cell phones changed everything. By 1990, handheld cell phones were pervasive. Newfound mobility brought the opportunity to travel outside of the home region and keep talking. Seatback telephony failed, demand never materialized, costs were a factor. Cell phones filled the void, even if they had to be in airplane mode.

By 2000, instant messaging exploded into use. Email, SMS messaging, and internet access were all offered to passengers. Costs kept prices high, from $7 per minute for 2400 bps to $100,000 per month for about 30 Mbps in just one region. High prices kept passengers from purchasing connectivity onboard, despite their ready interest and willingness to use it – and the first wave of service providers almost all failed.

One provider survived: a clever use of an Inmarsat-signalling channel, to act as a GSM control channel tied to Inmarsat satellite voice service-led ARINC and Telenor to develop the AeroMobile® GSM roaming PicoCell in 2004. AeroMobile developed roaming partner agreements with MNO's around the world, with the goal of ensuring cell phones on an airplane would connect no differently than roaming into any foreign country. AeroMobile and SITAONAIR remain in the market today, offering onboard cellular telephony.

THE CHALLENGES OF TODAY

Passenger interest has shifted from voice to data, from talking to browsing. What do we know about the current state of inflight connectivity?

1. Passengers will use the internet if you give it away for free.
2. Passengers need more and more internet to satisfy their needs as time goes by.
3. Passengers are accustomed to getting internet for free at the airport and at the hotel. Otherwise, they rely on their cell phone for mobile access.
4. Some passengers will pay for the internet access, but the payment heightens their frustration with poor performance.
5. The current practice of high prices, spotty coverage, and poor performance, combined with quirky portals and credit card payments, has limited take rates to 10% or less.
6. Sponsorships have created a value proposition that drives take rate. For example, T-Mobile allows their subscribers service on Gogo equipped airplanes.
7. Airlines and service providers have had limited success with third-party revenue. Targeted advertising and significant sales remain a future endeavour. Most of the revenue comes from passenger service fees.
8. Airline capital costs to install equipment, coupled with ongoing service charges, ongoing maintenance charges that include sparing and repair, operation costs due to weight and drag, training costs, new feature development, and internal staffing all collect more cost than passengers are willing to pay.

THE SEAMLESS AIR ALLIANCE

The ambition of the Alliance is to lay the groundwork for industry players to imagine and implement new services, solutions and business models.

The Alliance aims to create flexible technical and business frameworks, enabling multiple new use-cases:

- Providing open specifications for interoperability
- Integrating with cellular for a frictionless experience
- Standardizing systems to simplify selection and maintenance
- Driving competition and innovation for better performance and lower cost

OPEN STANDARDS

In aviation, changing anything costs a lot. Building every aircraft the same can lower the cost of manufacture, because standard provisions allow airlines to install, swap, and remove equipment by plug and bolt not wire harness, drill and rivet. Standard provisions are especially a factor in retaining value on the airframe when it is sold to the next operator.

The Alliance promotes open standards for integrating new technology, interchangeability, lowering cost of installation, influencing mobile standards that benefit these objectives.

Integration of connectivity products includes suppliers of airplanes and airplane radios, Wi-Fi, and IFE. Every airline is faced with integrating a unique combination of equipment and suppliers with their own special operations and requirements. Standard delineations between parties allows for simpler integration and more sophisticated features.

TECHNOLOGY

Powering the Seamless Air Alliance is a technical arsenal comprising 5G, Wi-Fi, Next Generation Hotspot, Hotspot 2.0, Passpoint, 802.1x EAP, 802.11u, cellular roaming, Mobile Network Operators, satellite antennas, modems and networks.

5G

5G is the latest evolution in cellular technology. Supporting the best user experience, 5G enables data rates as high as 10 Gbps, latency less than 10 ms, massive capacity, and powerful Quality of Service features.

5G does not fundamentally change the onboard cellular roaming environment - it continues to support roaming in an analogous manner. 5G promotes the use of EAP-AKA, a SIM-based authentication method to connect a cell phone to Wi-Fi services. EAP-AKA capability is part of 802.1x and 802.11u.

Network slicing is a 5G concept where each thread of communication related to a "single business purpose" is managed for quality of service. The granular control ensures the greatest satisfaction from the available connectivity for every user. Aeronautical broadband radios facilitate network slicing through adaptation and through controls being developed by SAE/ITC AEEC NIS subcommittee PP848.

Network virtualization, the use of "cloud-based" or edge facilities rather than local appliances, enables much greater flexibility and responsiveness to changing or emerging requirements, especially with equipment installed on mobile platforms.

Key components and features include:

- 5G NR (new radio)
- Enhanced Mobile Broadband eMBB
- Ultra-Reliable Low Latency Communication (URLCC)
- Extended Frequency Bands (450 MHz – 6 GHz) and (24 – 52 GHz)
- Massive Machine Type Communications (MMTC)
- Wi-Fi aggregation
- Small-cell coverage
- Beamforming

HOTSPOT 2.0 AND PASSPOINT

Cell phones may attach to a Wireless Access Point (WAP) using SIM-based authentication (EAP-AKA). Effectively, a WAP extends the cellular footprint through aggregation.

Devices without a SIM card, such as some tablets and laptop computers, can also roam like a cell phone. Instead of using SIM-based authentication, these devices must store a Passpoint profile and security certificate. A Passpoint device recognizes a compatible WLAN and will logon automatically by using bilateral authentication between WAP and Wi-Fi device.

Passpoint is the brand for the certification program operated by Wi-Fi Alliance. Devices that pass this certification testing can be referred to as "Passpoint devices". Passpoint certification is based on the Wi-Fi Alliance Hotspot 2.0 Specification.

Whether through a SIM-based or Passpoint-based attachment, once connected, the device communicates securely over the Wi-Fi channel without any user intervention.

When a Hotspot 2.0 Passpoint device is within the range of a Hotspot 2.0 wireless network, the mobile device will automatically connect to the network and then be authenticated by a Passpoint server. Devices are loaded with a Passpoint security credential beforehand.

SATELLITE ANTENNAS

Antennas designed for installation on airliners must accommodate many requirements that challenge their performance and cost. Emerging phased-array antennas offer lower profile, multi-beam support, and exceptional gain.

Compliance to ARINC 791 and 792 provide a simple means to swap out antennas as new versions become available. The integration of the modem and the new solid-state antennas creates opportunities to move modem functions to the antenna, simplifying the interface as well.

SATELLITE MODEMS

Satellite networks connect a modem on the airplane to a modem on the ground (the hub or teleport). Each Communication Service Provider (CSP) uses a specific modem that is matched to the ground network. Changing requirements may necessitate replacing the modem, which resides inside the ARINC 791/792 Modman.

> **Standards are being prepared to split the Modman into two or three LRUs, which allows a modem to be in its own LRU. This emerging standard will permit more than one modem to be supported, and any modem to be simply plugged in.**

SATELLITE NETWORKS

Geostationary Orbit (GSO) Ku/Ka-band satellite networks have provided high latency broadband communications to airplanes up until now. Low Earth Orbit (LEO) and Mid Earth Orbit (MEO) non-geostationary orbit (NGSO) satellite networks of hundreds and even thousands of space vehicles are being deployed and will bring Tbps of low latency in the coming years.

At least two Ka-band providers and one Ku-band provider cover most of the earth from multiple GSO satellite positions. The GEO High Throughput Satellites (HTS) include beamforming networks and switching to deliver bandwidth to every user.

ROAMING

The Seamless Air Alliance promotes roaming through interworking standards and best practices. Passengers using cellular SIM-based authentication translate value to their home MNO. Each MNO gains easy access to inflight services their subscribers yearn for, through a familiar roaming agreement, and the same is true for Passpoint Wi-Fi subscribers and providers. The Seamless Air Alliance mission is to accommodate as many device types as possible. Authentication is customized for each service, where cellular devices use the SIM and other devices use Passpoint certificates.

The relationships within the Seamless Air Alliance architecture are shown in Figure 1 below. The Airline engages a Communication Service Provider (CSP) to install an onboard LAN, a broadband radio, and radio network. The CSP may use a Wi-Fi access point, a cellular base station or both. The CSP engages a Roaming Partner Network (RPN) to facilitate roaming agreements and billing. The Seamless SkyMNO is a combination of the CSP and the Roaming Partner Network.

The cellular subscriber attaches onboard using either a cellular base station or Wi-Fi access point. The Passpoint subscriber attaches to the onboard Wi-Fi network using 802.11u and 802.1x. The RPN represents the airplane radio network as a visited location. The RPN communicates with either the Home MNO or Passpoint provider as directed. The Home provider authorizes a session.

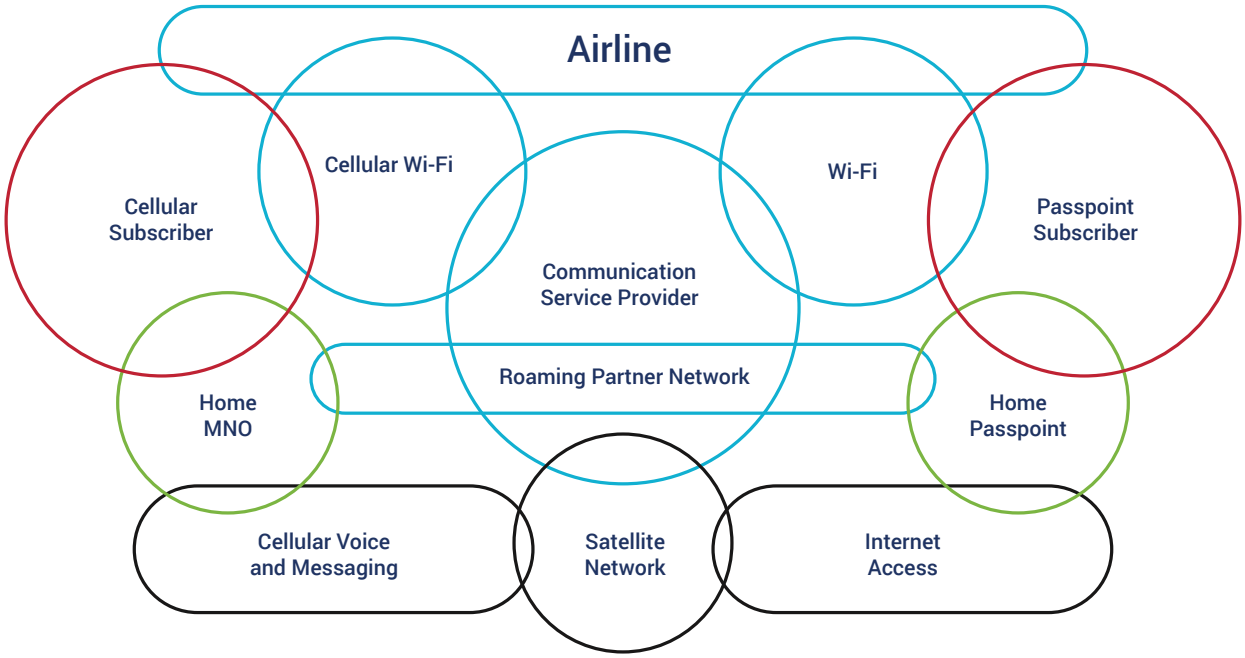


Figure 1: Seamless Roaming Connectivity

Extending a roaming environment involves features that span the onboard network, the radio and the radio network. Standards are necessary to interoperate between the passenger's device, the visited (local) Wi-Fi or Cellular network, and the MNO or Passpoint provider.

Shown in Figures 2 is the combined network architecture along with some of the enabling technology and protocols. The Roaming Partner Network aggregates roaming partners of every style to maximize the pool of subscribers.

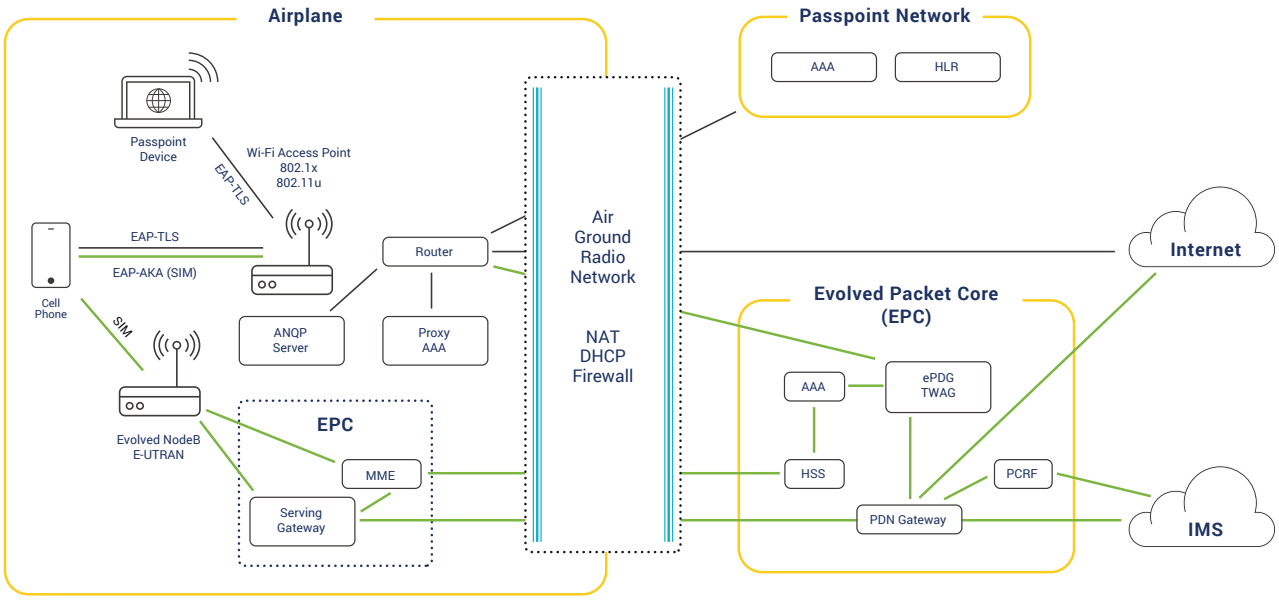


Figure 2: Network Architecture

AKA	Authentication and Key Agreement
ANQP	Access Network Query Protocol
DHCP	Dynamic Host Configuration Profile
EAP	Extensible Authentication Protocol
E-UTRAN	Evolved UMTS Terrestrial Radio Access Network
HSS	Home Subscriber Server
MME	Mobility Management Entity
NAT	Network Address Translation
SIM	Subscriber Identity Module
TLS	Transport Layer Security
AAA	Authentication, Authorization, and Accounting
ePDG	Evolved Packet Data Gateway
HLR	Home Location Register
HSS	Home Subscriber Server
IMS	IP Multimedia System
PCRF	Policy Control and Charging Rules Function
PDN	Packet Data Network
TWAG	Trusted Wireless Access Gateway

FINANCIAL MODEL

An independent study of the cash flow and Net Present Value (NPV) of the inflight connectivity market was created to examine the potential consequences of changes in the assumptions as related to activities of the Seamless Air Alliance. The purpose of the analysis is to scale the relative benefit from each area of improvement. The model analyzes the profit-loss of the airline paying for the aircraft equipage, receiving revenue from passengers and paying for the service costs. The costs and price points are expected to be representative of the marketplace.

The study examines the impact of a 5% year-over-year favorable change from the baseline.

The baseline analysis is done over a period of ten years - from 2019 to 2028 - and assumes a worldwide fleet of 10,000 IFC-enabled aircraft at the beginning and 25,500 aircraft at the end. Take rates increase over time in all cases, and baseline per-session retail prices and costs are assumed to decrease 5% year-over-year. A ten-year NPV is computed based on the resulting cashflow and using a discount rate of 10%.

The world-wide airline connectivity marketplace is complex; this model does not profess to predict the future financial performance of the industry. The model works from a baseline set of assumptions that are intended to best match an “average” connectivity service, including assumptions on take rate, costs, and pricing. The values projected from the baseline with a variation of parameters are best viewed relative to each other, in both ratio and in extent.

FOUR AREAS SEAMLESS WILL IMPACT

The following objectives of the Alliance are studied to reveal their potential market benefit.

Increase Take Rate	Inflight connectivity that is fast, reliable and easy-to-access will improve the passenger experience and drive **higher take rates.**
Reduce Session Cost	A choice of connectivity providers **drives competition** and allows selection of the best solution for performance and cost.
Reduce Opex	Standards simplify equipment installation and maintenance activities across the fleet **reducing ongoing costs** and complexity.
Reduce Capex	Standards create **economy of scale** in the industry, driving innovation and lower costs.

Figure 3: Areas of impact.

IFC TAKE RATE

Overcoming Friction to Increase Take Rate

Friction can be defined as the resistance to motion. Passengers succumb to the slightest friction when it comes to purchasing internet access onboard airplanes. This type of friction comes in many forms, and when inflight connectivity is anything but free, a hurdle of resistance is created.

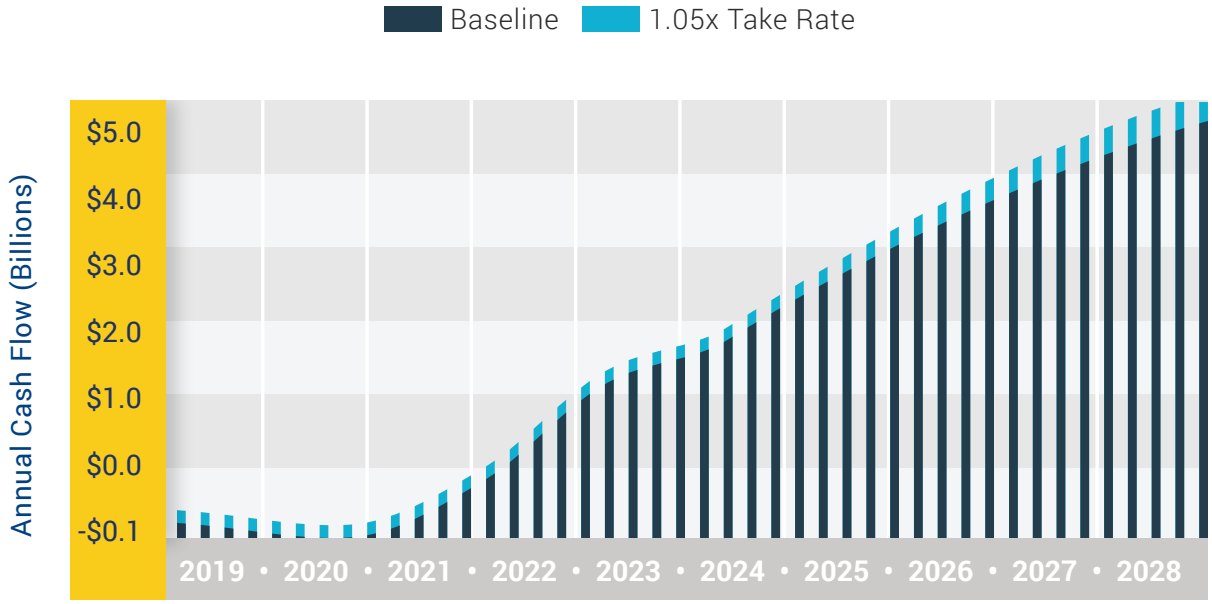
For inflight connectivity, the first form of friction occurs when a passenger is confronted with the traditional inflight connectivity paywall. Entering credit card information on an unfamiliar network and portal, with a host of strangers in close-proximity is a definite form of friction. This is part of the reason pay-per-use aero internet sessions have been unable to achieve take rates over 10% on average.

Seamless will leverage automatic onboard connection through a trusted relationship with the user's cellular or Passpoint provider. Passengers are connected simply and securely using over-the-air encryption and SIM- or certificate-based authentication. This happens in a transparent manner that eliminates the immediate paywall hurdle and streamlines the process of staying connected. Additional laptops, tablets, and other non-SIM devices can easily attach via two-factor authentication or fallback to the traditional paywall model.

A comparison is made from the baseline model assuming the convenience of automatic onboard connection creates a 5% improvement in take rate above the baseline. This results in an increase of $0.9 billion to the NPV.

5% Boost in Take Rate Vs Baseline | Annual Cash Flow

10 YEAR NPV BENEFIT $0.9B



COST PER SESSION

Airplane systems and networks are complex. Avionics and antennas must meet strict environmental and electromagnetic qualification standards whilst minimizing weight and drag. Aircraft are rarely available for extended maintenance; failures must be minimized overall and repaired rapidly.

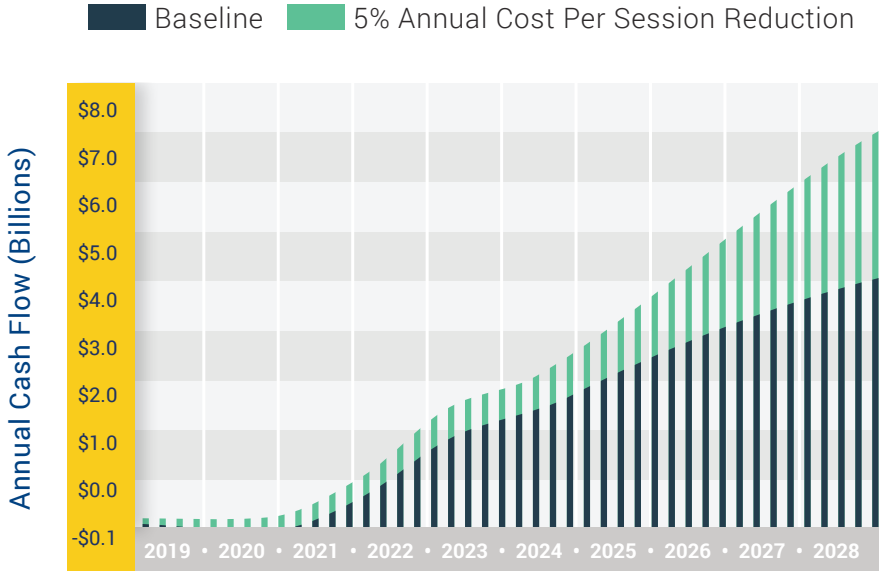
Standards simplify the introduction of new innovations and accelerate the deployment of cost savings and performance enhancements while avoiding vendor lock. Standards allow an interchangeable architecture with provisions and interfaces. More and more of the radio system, and even antennas, are software-defined. These newest features can be deployed rapidly by software update or by plug-and-play. A standards-based installation creates a level playing field for suppliers. Instead of a unique configuration that is locked down by a supplier to stave off competition, a standards-based provision and interface welcomes all suppliers equally.

Considering the emergence of new, cheaper satellite constellations, the price of connectivity is expected to reduce with time. A baseline assumes that session prices decline by 5% per year. Reducing per-session costs is principally related to reducing the cost of "airtime" or "bandwidth" on the radio link. While bandwidth prices are decreasing, users are consuming more data in each session. The opposing dynamics are volatile: new satellite constellations are expected to bring significant capacity and lower prices.

A comparison is made from the baseline model assuming that open standards accelerate the pace of competition, innovation and lower costs by an additional 5% from the baseline. This results in an increase of $6.8 billion to the NPV.

5 % Annual Reduction in Cost per Session Vs Baseline | Annual Cash Flow

10 YEAR NPV BENEFIT $6.8B (BASELINE TAKE RATE)



RECURRING OPERATIONAL EXPENSES

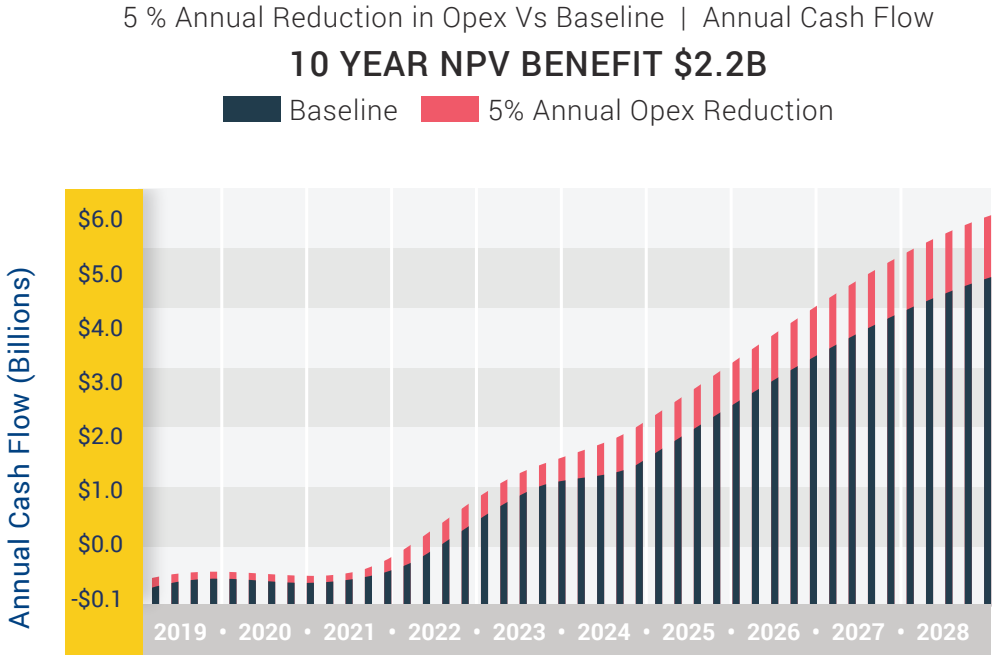
For this model, recurring Operation Expenses (Opex) are those costs to the Communication Service Provider (CSP) and to the airline scaled by the number of airplanes. The CSP and airline operate the equipment on the airplane.

The CSP also operates a radio network and network operations center; provides equipment supply and repair; aircraft installation; data warehousing; engineering and development; quality control; commercial and financial functions; regulatory approvals; the portal and content; network management; network security; and, other functions.

The airline also provides the touch labor in the field for installation and maintenance; marketing support; flight attendants trained to operate the service; adjustments to performance; revised maintenance and service procedures; and, other functions.

Standards simplify system selection, installation, and maintenance, and provides common and complete interface definitions to ensure trouble-free upgrades can be completed in a timely and efficient manner. Aircraft across an airline fleet are in constant change: no two are alike. While the configurations vary, support is best done commonly.

A comparison is made from the baseline model assuming that operational standards enable economic efficiencies that lower costs by an additional 5% from the baseline. This results in an increase of $2.2 billion to the NPV.



CAPITAL EQUIPMENT COSTS

Inflight connectivity requires the installation of a broadband radio, antenna, radome, adapter plate, lugs, fittings, bulkhead penetrations, a wiring harness, and several line-replaceable units (LRU) as described in either ARINC 791 or ARINC 792. The Modman includes the modem and the system manager. The KANDU/KPSU includes the power supply. The KRFU includes the High-Power Amplifier (HPA). ARINC 792 does not use a KRFU and instead the HPA is installed with the aperture. Additional costs include test and certification, labor for installation, and the potential for lost revenue while the aircraft is out of service.

Building or accommodating variation generally drives higher cost. It is preferable to make every installation equivalent using similarity, rather than discovery or invention.

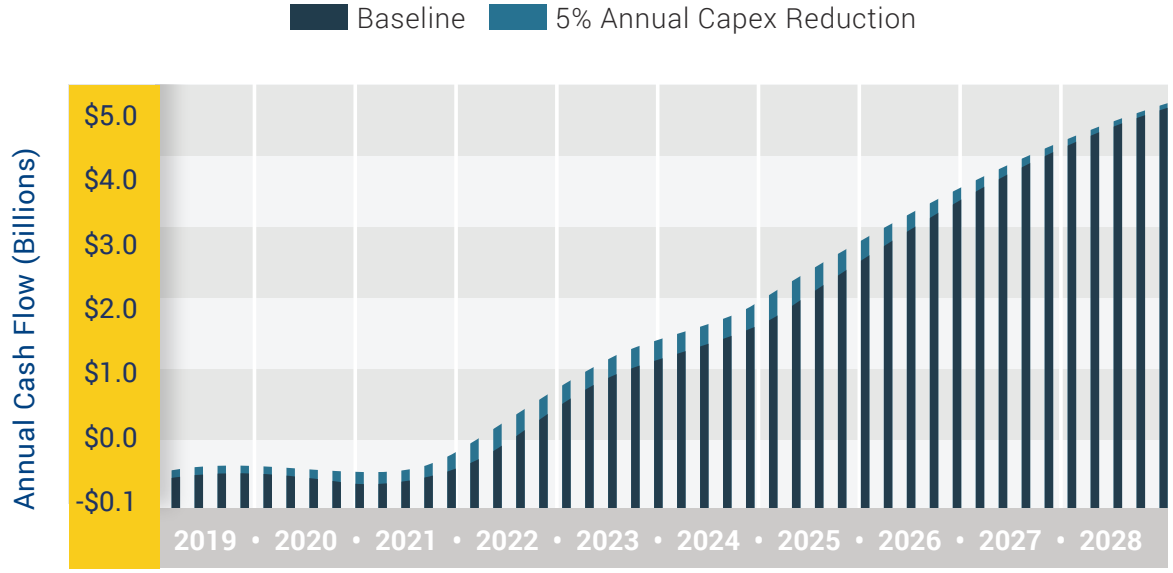
Standard provisions and interfaces provide efficiencies from more rapid installation and repair. Line replaceable units can be replaced simply and quickly.

Using the same parts and interfaces across multiple programs gives rise to economy of scale. Larger development pools mean greater development capacity. Larger spares pools mean parts are most likely to be available. Larger markets allow greater amortization.

A comparison is made from the baseline model assuming that standardized equipment and economies of scale lower costs by 5% from the baseline. This results in an increase of $1.1 billion to the NPV.

5 % Annual Reduction in Capex Vs Baseline | Annual Cash Flow

10 YEAR NPV BENEFIT $1.1B



SUMMARY AND UPSIDE ANALYSIS

Based on a modest ***5% impact*** in the four areas examined, activities of the Seamless Air Alliance present the potential to ***increase*** the value of the inflight connectivity market by ***$11.4 billion*** dollars.

Inflight connectivity investments achieve positive cash flow sooner, swinging NPV from negative to positive, and compounding benefits from other revenue sources.

Increase Take Rate	Inflight connectivity that is fast, reliable and easy-to-access will improve the passenger experience and drive **higher take rates.**
Reduce Session Cost	A choice of connectivity providers **drives competition** and allows selection of the best solution for performance and cost.
Reduce Opex	Standards simplify equipment installation and maintenance activities across the fleet **reducing ongoing costs** and complexity.
Reduce Capex	Standards create **economy of scale** in the industry, driving innovation and lower costs.

$11.4B

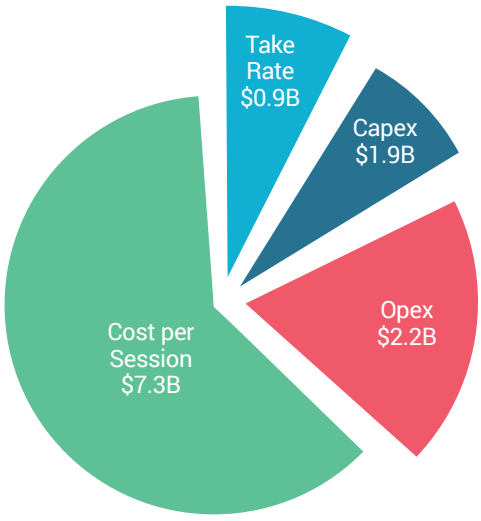


Figure 4: Results of 1.05x on Seamless Initiatives

UPSIDE ANALYSIS

There are significant upsides to the model.

Kevin Rogers, CEO of Panasonic AeroMobile had this to say,

> **When mobile operators make inflight roaming one of their standard destinations, combined with on-board service engagement we can see take up increase 10-fold!**

The analysis in Figures 5 and 6 below present a range of upside scenarios that show the impact of incrementing the Take Rate from the 5% improvement we previously examined up to a 2-fold scenario assuming passengers are twice as likely to use inflight connectivity.

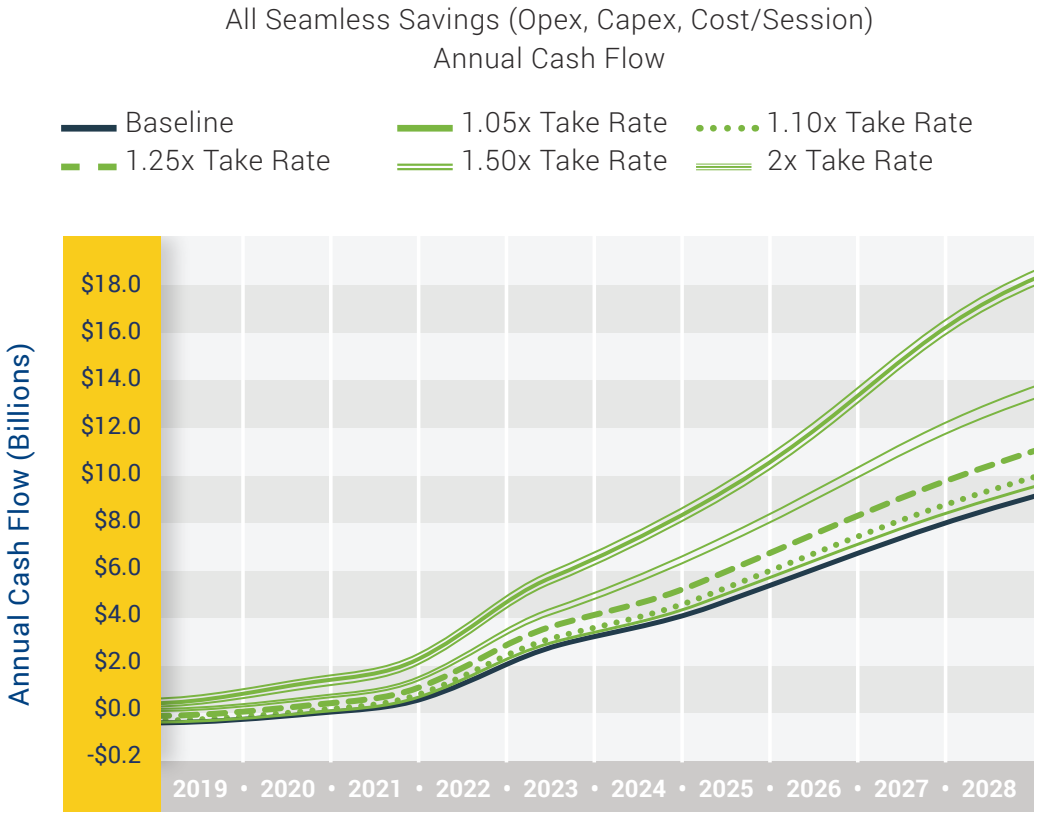
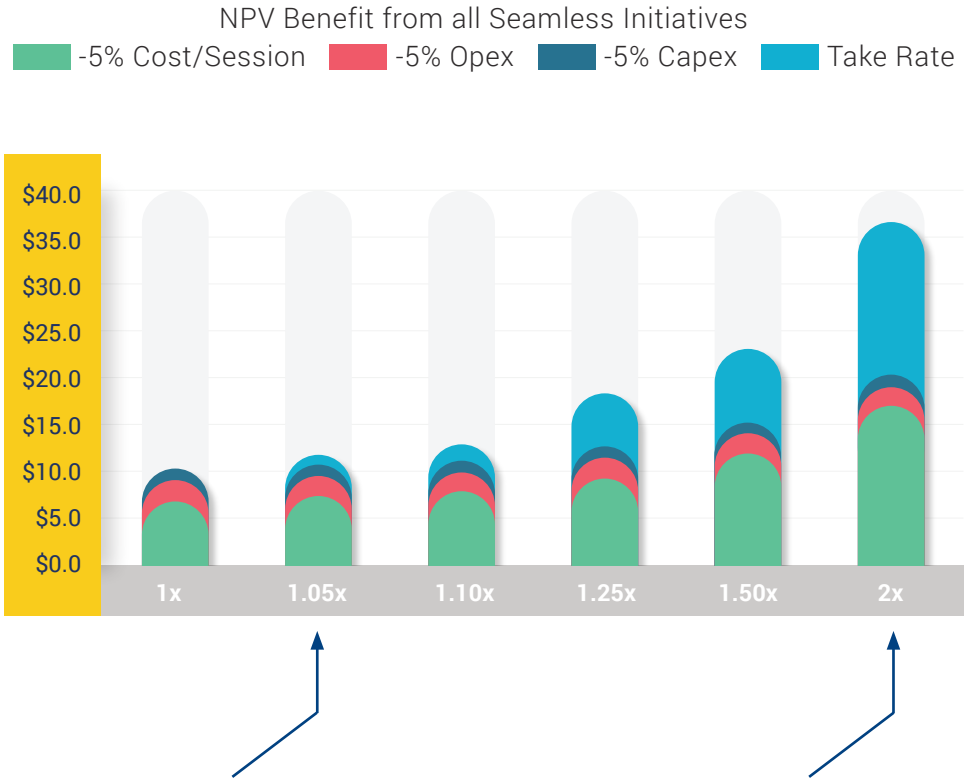


Figure 5: Take Rate Sensitivity Analysis – Cash Flow

Increasing the take rate from 1 to 2x produces dramatic results on annual cash flow.



Assuming a 5% annual improvement in each area increases the IFC market value by a total of

$11.4B

Doubling the Take Rate combined with the 5% improvement in other areas increases the value by a total of

$36.7B

	1x	1.05x	1.10x	1.25x	1.50x	2.x
Take Rate	Baseline	$0.9B	$1.7B	$4.1B	$8.2B	$16.3B
-5% Capex	$1.1B	$1.1B	$1.1B	$1.1B	$1.1B	$1.1B
-5% Opex	$2.2B	$2.2B	$2.2B	$2.2B	$2.2B	$2.2B
-5% Cost/Session	$6.8B	$7.3B	$7.8B	$9.3B	$11.9B	$17.1B
Total	**$10.0B**	**$11.4B**	**$12.8B**	**$16.7B**	**$23.4B**	**$36.7B**

Figure 6: Take Rate Sensitivity Analysis – Benefit

CONCLUSION

The airline connectivity marketplace is growing rapidly, yet customer usage remains minimal. Payment for services is a barrier that 90% of the passengers do not overcome. Enabling cellular or Passpoint subscribers to seamlessly connect onboard creates a completely different dynamic where passengers will increasingly choose to have connectivity.

Increasing the take rate means more passengers are engaged, making the investment in connectivity even more valuable as these returns can be compounded by revenues from sponsorships, advertising, and commissions. A higher take rate also means more passengers are delighted, which should result in greater Net Promoter Scores (NPS) and passenger loyalty.

Seamless Air Alliance campaigns are directed to using open standards and industry collaboration to work together. The Seamless Air Alliance provides a ready forum for the airline connectivity business, the cellular mobile network operator, Hotspot 2.0 (including Passpoint), the broadband networks, and the many standards committees and organizations involved in personal mobile and portable communication.

These findings support that even minor changes to the assumptions underpinning the connectivity market yield significant profitability for the industry. With the addition of higher availability and better performance inflight connectivity is set to be the norm. There is only upside.

Seamless for the Passenger.

Seamless for the Airline.

Seamless for the Mobile Network Operators.

Seamless for the Industry.

Seamless Air Alliance.

DISCLAIMER

This research is intended to outline the results of an independent analysis providing general information and direction only. It is provided for information purposes only and relies on various estimates and assumptions. It is not a commitment to deliver any product or service and should not be relied upon in making business decisions. Any statements contained in this document that are not historical facts are forward-looking statements. All forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from expectations.

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