Analysis & Insight

Aviation Research Report

IATA's CUPPS Standard

A Critical Analysis & Review of Common Use Passenger Processing Systems

BoydGroup INTERNATIONAL
Aviation Forecasting & Strategic Solutions

Note:

The data, analyses, and conclusions contained in this document are based on information and sources deemed reliable as of January 2011, however due to the dynamic nature of the subject matter, and the air transportation industry in general, they cannot be guaranteed. The conclusions and recommendations contained in this document are solely those of Boyd Group International with no editorial input from outside entities, organizations, or other stakeholders.

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1. Introduction

Purpose of this Document

This document provides an overview of common use technology in the airport environment and, specifically, deficiencies in the International Air Transportation Association (IATA) Recommended Practice 1797 for Common Use Passenger Processing Systems (CUPPS).

It is the belief of Boyd Group International that if airlines and airports adopt the CUPPS standard, there are significant negative operational and financial implications. CUPPS will also negatively impact airline passengers who, while not having a seat at the table while the industry debates technology, are in fact the most impacted stakeholder given that they ultimately will be the one who foots the bill in this regard.

Apple Macintosh. Released in 1984, the same year that IATA released the first recommended practice for common use at airports.

IATA developed the first "Recommended Practice" for Common Use Terminal Equipment (CUTE) in 1984.[1] In response to airline complaints regarding shortcomings of these systems and standards (including limited functionality and requirements to support multiple proprietary hardware platform), IATA assigned one of its workgroups to update common use guidelines in 2004.[2] The objective of this group was to develop alternatives that could effectively position the industry to take advantage of "off the shelf" hardware and software solutions, reducing dependency on legacy and proprietary systems, and allow airlines and airports to capitalize on the continuous technological advancements that increasingly come at a rapid fire pace.[3] The resultant Recommended Practice of the group's effort is known as Common Use

[1] A "Recommended Practice" is a recommendation where a mandatory standard is not necessary. In contrast, a "Resolution" is mandatory and is typically issued related to tickets, baggage tags, and handling standards necessary to facilitate a passenger itinerary on more than one airline (i.e., interline travel).

[2] IATA Passenger Experience Management Group (PEMG)

[3] Throughout this document we reference a desire by the airline industry to utilize "off the shelf" hardware and how such will be largely unachievable under the CUPPS standard but mostly achievable using virtualization. It is important to note that this not be construed as an all encompassing statement and it needs to be recognized that certain airline-driven practices will continue to require specialized equipment. An example of such is baggage tag printers which will continue to require specialized printers until such time as the airlines industry adopts a different standard.

Passenger Processing Systems ("CUPPS" for short) and has been incorporated into IATA's Recommended Practice 1797.

In this document, Boyd Group International has attempted to take on the very complicated and technical issues surrounding common use technology, with particular focus on illuminating the shortcomings of CUPPS while illustrating that more functional and economical approaches to common use exist today. In avoiding a document laden with technical jargon, schematic drawings, and other like factors, we are hoping to bring the issues surrounding common use to a very wide audience, which basically includes anyone who sells/provides air transportation or who buys an airline ticket. This includes airline passengers, government policy makers, suppliers to the airport and airline industry, visitor bureaus, airport board members, etc.

This is not a technical document. It is intended to illuminate how IATA's CUPPS approach to common use will impact stakeholders, and illuminate the alternatives that are available today and economically more viable.

Project Approach

To achieve the objectives outlined above, Boyd Group International conducted the following research and analysis:

- Researched available studies and publication from industry trade groups and independent organizations about airport common use passenger processing systems.
- Analyzed the applications of common use processes by non-aviation businesses and government organizations.
- Studied how airlines and airports applied common use practices since the mid-1900s.
- Interviewed airport management and industry suppliers regarding benefits and concerns about the proposed common use standards.
- Reviewed prior Boyd Group International work related to airports changing to a common use environment.

Data Sources

A number of data sources were consulted in the preparation of this document, including but were not limited to the following:

- International Air Transport Association (IATA) — Reviewed document presenting IATA's position and support for industry standards for common use systems, IATA Recommended Practice 1797 defining technical requirements for the proposed IATA Common Use Passenger

Processing System (CUPPS), documentation for Common Use Terminal Equipment (CUTE), the Common Use Self Service (CUSS) system, and publication by other IATA management groups and work groups.

- Air Transport Association (ATA) & Airport Council International (ACI) — Reviewed document presenting position of ATA and ACI in support of CUPPS standard.

- Airport Cooperative Research Program (ACRP), Transportation Research Board (ATB) — ACRP Report 30 "Reference Guide on Understanding Common Use at Airports" and ACRP Synthesis 8 "Common Use Facilities and Equipment at Airports."

- Airport Consulting Council (ACC) — ACC Business Information Technologies publications and "Airport Information Technology & Systems" (IT&S) published as a Best-Practice Guidelines for the Airport Industry.

- Airport Presentations — "Common Use Systems," Oakland International Airport (OAK); "Changing Changi," Singapore's Changi Airport (SIN); "Premises Distribution System," Norman Y. Mineta San Jose International Airport (SJC); "Case Study: Flexible Provisioning Environments," Fresno-Yosemite International Airport (FAT); and other airport publications.

- Vendor Presentations — Publications, websites, and news articles by: ARINC, AirIT, CISCO, IBM, RESA Airport Data Systems, SITA, Ultra Electronics, and Barich, Inc.

Additional information was obtained from industry associations, organizations, and suppliers on the worldwide web. Boyd Group International also utilized its internal library and extensive database of information on airline and airport systems collected over the course of years of work completed on behalf of numerous airline and airport customers.

About Boyd Group International

Founded in 1984, Boyd Group International is a multi-dimensional consulting and research firm focused exclusively on aviation and transportation issues. This firm provides strategic and tactical planning assistance to leading firms across the aviation industry, with a focus on creative approaches that question consensus and illuminate innovative perspectives. This document continues that focus.

Boyd Group International has chosen to be leaders in aviation by taking an active role in the formation of aviation planning, policy, and trend analysis.

The firm's practice extends from strategic planning for rural general aviation airports to assisting global portals such as DFW International and Charlotte in identifying new route development opportunities and preparing data-centric presentations for meetings with airlines. In addition, the firm provides analyses to aircraft manufacturers and vendors to the aviation industry, ranging from global forecasts to accomplishing feasibility analyses for new airliner platforms. Boyd Group International also provides assistance to airlines ranging from small carriers providing service in EAS communities to global carriers, including flag carriers in Europe and Africa, to identify new markets, develop short-term tactical competitive responses, and shape long-term strategic plans. The firms operational, logistics, and organizational experience has also been applied to corporate flight departments, particularly those with high-volume shuttle operations.

Additional information about Boyd Group International is available on the worldwide web: www.AviationPlanning.com.

2. Summary of Key Findings

Common use systems are an important tool in the provision of air transportation that can create significant economic benefits to airlines, airports, and passengers. The future of common use technology is, therefore, important to any person or entity that provides or utilizes commercial air transportation.

There are better approaches to common use that offer greater functionality and flexibility at a lower initial and recurring cost to updating airport common than IATA's CUPPS standard.

By promoting the adaption of CUPPS as an industry standard, IATA's goal is to reduce the costs of common use systems that are incurred by airports and airlines with simultaneously increasing system functionality and reducing dependence on proprietary hardware and software. Unfortunately, CUPPS doesn't fully achieve these objectives. While there are some incremental benefits, CUPPS does not allow commercial aviation to realize the true potential benefit of common use technology.

There are, however, alternative common use systems available today and which provide functionality that is superior to CUPPS at a lower cost. These systems are based on the concept of "virtualization" which has seen rapid growth in recent years, particularly due to improvements in Internet security.

In reviewing data sources and preparing this paper, Boyd Group International came to the following conclusions:

- From the outset, it is important to state that we believe IATA's working group charged with development and implementation of CUPPS standards initiated the process with the best of intentions and with a sincere desire to improve common use technology.
- After seven years of development, IATA's CUPPS standard represents an incremental improvement over current common use systems, but to realize those benefits airports and airlines will have to invest in new hardware, develop custom software applications, and fund complex certification processes. In this context, return on investment becomes an open question.
- Multiple vendors have developed common use systems based on virtualization that allow airlines to realize all the functionality of their own computer systems without the need for special hardware or custom

software solutions. These factors translate into a better solution for common use at a lower cost.

- With virtualization as a viable alternative there is no need for IATA CUPPS or any other standard related to common use at airports. While there are needs for specifications, standards, and common practices in certain areas of commercial air transportation, we do not view common use platforms as one of those areas.

- To the contrary, a key conclusion reached in the preparation of this analysis was that a standard might actually be detrimental to the future of common use, effectively painting the industry into a box by preventing it from capitalizing on technological advances and breakthroughs that other areas of the industry, as well as entirely different industries, are reaping benefits.

Each of the above points is explained further in this document.

With commercial aviation under seemingly perpetual economic pressure, we do not believe that the industry's best interests are served by embarking on a program intended to modernize common use systems but only provides incremental benefits. This is particularly valid given that alternative approaches to common use modernization presently exist, are installed and operating at airports across the globe, and are providing greater functionality at lower cost than does CUPPS.

3. Common Use Technology

In this section, we provide background information on the progression of common use systems in commercial aviation, with particular focus on current technology and the challenges that led to the development of CUPPS.

A Primer On Common Use Technology In Commercial Aviation

The central airport terminal is the most basic and early form of common use, replacing what were previously individual airline wood hangers with a small ticket office that lined muddy airfields. Since the early days, airports have provided common use facilities including ticket counters, gates, and ramp space, primarily by charter airlines and carriers operating an infrequent (i.e., less-than-daily) flight schedule.

At the same time, airlines with daily flight operations would typically enter into long-term agreements (i.e., 20 years) with an airport for "exclusive use" of ticket counters, gates, ramp space, and back office (i.e., operations, baggage make-up, break rooms, office, etc.). This model was most prevalent in the United States, although certainly not exclusive, where large population centers, long distances between cities, family migrations, and income levels facilitated rapid growth in airlines.

The "exclusive use" model became more prevalent during the 1960s as airlines developed their own computer reservation and airport processing systems that depended on dedicated data lines, software code, and specific hardware such as computer terminals and document printers. These included American's Semi-Automatic Business Research Environment (SABRE), Trans World's Programmed Airlines Reservation System (PARS), United's Apollo, and Travicom, the first multi-user system was developed jointly by British Caledonian Airlines and British Airways.

For most people, the Internet represents the most obvious common use technology in their everyday lives. This communication "backbone" is used by governments, corporations, groups, and individuals for corresponding,

conferencing, transactions (buying and selling), and sharing information, data, and ideas. The Internet is widely used because it would be impractical, even for entities which presumably would have unlimited resources such as governments and large corporations, to create their own networks able to "talk" to any computer. This is particularly relevant to the discussion of common use when one considers that alternative approaches are already available to achieve these objectives in a cost-efficient manner and using currently available technology.

In aviation, the goal of common use is effectively the same as that of the Internet: facilitate passenger processing and other operational functions from any airline's IT network utilizing an open (yet secure) communication network. In commercial aviation, common use is typically focused on airports and the tasks that each airline performs in these locations to move a passenger and baggage from the curb, through the terminal, and into their seat.

Prior to common use (particularly in the US), airlines installed their own IT systems at each airport, including data lines from the company's main computing center to each airport location, hardware (modems/routers, dumb terminals, printers, etc.), and data lines within the terminal building.[4] Once installed, this equipment became anchors and airlines were effectively "locked down" to specific ticket counters and departure lounges. This approach was very expensive. For airlines, there was the initial capital cost of installation (which depending on the airport, location, and size of station could easily run deep into six figures), as well as on-going maintenance and support of those systems. This cost was then "baked in" to the economic evaluation of new markets. For airports, it meant that facilities often were not utilized to maximum efficiency and, in some cases, meant airlines desiring entry were locked out due a lack of available space.[5]

[4] In some cases, computer networks were proprietary whereas in others (such as was and remains today often the case with smaller carriers) systems were leased from other airlines or third-party providers.

[5] It is recognized that some airlines leased more ticket counter and/or gate space than was necessary as a competitive tool, effectively locking out potential competitors. For example, a carrier might have 50 or more linear feet of ticket counter for two or three well-timed departures a day at some airports.

In contrast, in a common use environment the airport (typically) provides hardware and, in some cases, software that facilitates an interface between the airline's own (or native) system and the airport's shared (i.e., common) use system.

Common use allows airlines to serve markets without incurring significant IT install costs. This means new business models and expanded route networks that ultimately benefit the consumer.

For airlines, common use allows market entry at a much lower cost and has helped new business models to develop including, for example, Allegiant Air's model of connecting small and mid-size communities with leisure destinations on less-than-daily flights. Common use technology facilitates this model by allowing a "variable cost" structure, meaning they only pay airports for what they use, when they use.

For airports, the ability to shift airline ticket counter positions and/or gates means that passenger throughput in existing facilities can be optimized. This, in turn, can drive an increase in non-aeronautical revenues (i.e., concession and parking revenues, rental car recovery fees, PFCs, terminal advertising, etc.) that lowers costs shouldered by the airlines. The resultant reduction in cost per passenger enplanement (CPE) can, in some cases, determine the economic viability of a market for a specific airline.[6]

Common use has resulted in a fundamental shift in philosophy and strategy for (forward looking) airport managers and directors. Whereas in the past, an airport's goal might be a fully-leased terminal, today it is maximizing passenger throughput. In this context, the relationship between airports and airlines has evolved from one where airports were simply "landlords," providing a functional terminal building and airfield, to a present day role of efficiency expert and IT service provider.[7]

[6] While airport costs are a concern for all airlines, different business models dictate the level of weight such factors play in the economic analysis of specific carriers. Additionally, and again dependent on the specific carrier, markets are also evaluated from their revenue generation potential and the overall role in strategic network development.

[7] In some instances, the concept of "service provider" has been taken much further with authorities establishing companies to provide both above (i.e., passenger service) and below wing (i.e., ramp service) handling.

Current IATA Common Use Deployments

There are two primary IATA "standard" common use technologies currently deployed in airports around the world: CUTE and CUSS.[8] These systems, described below, have multiple shortcomings and as noted earlier were the impetus for development of IATA's CUPPS.

Common Use Terminal Equipment (CUTE)

IATA Recommended Practice 1797 issued in 1984 was the first guideline covering common use technology in the airport environment. Specifically, this document described Common Use Terminal Equipment (CUTE) utilizing emulation technology that, at least in theory, would permit passenger and baggage processing with the "look and feel" of proprietary systems. CUTE technology is agent facing, meaning utilized by the customer service/ground handling agent.

There are two primary factors which inhibits the utility of CUTE to airlines and airports:

- Cost: CUTE requires airlines to utilize software provided by a third-party (i.e., neither the airport nor airline) vendor to connect to their own systems. This typically entails an initial set-up cost, as well as recurring charges related to maintaining and certification of software.
- Functionality: Utilizing a "one size fits all" approach, CUTE forces airlines to forgo functionality available in their own systems and function (or attempt to function) within boundaries of proprietary software. This in turn can inhibit carriers from offering what are unique product components and/or internal business processes to handle customer interactions. In the current era of ancillary revenue, where brand differentiation (particularly targeted toward elite level frequent flyers) can generate significant amounts of incremental revenue, this represents a critical short-coming for CUTE.

As outlined in the next section, while CUPPS is touted as a solution to issues associated with current common use, it fails to resolve these two fundamental and critical shortcomings.

[8] Readers are reminded that despite being the single largest airline market, the United States trails the rest of the world in common use deployment.

Common Use Self Service (CUSS)

IATA Recommended Practice 1706 provides guidelines for applications that run on Common Use Self Service (CUSS) platforms, and specifically CUSS allows a customer to check-in for a flight on participating airlines using shared (i.e., common use) kiosks located virtually anywhere in the airport.

While kiosks are typically in airport check-in lobbies, they can also be found in terminal concourses, remote car rental return facilities, parking garages, and even off-airport locations such as hotel lobbies, public transit stations, etc. The benefit is a reduction in lobby traffic that facilitates increased passenger throughput while minimizing capital expenditures to expand lobby footprints. This is particularly valuable to U.S. airports that in the post-9/11 environment found themselves with lobbies full of TSA baggage screening equipment.[9] Similarly, CUSS reduces necessary floor space as passengers flying on multiple airlines can share units rather than each airline installing their own "branded" kiosks.

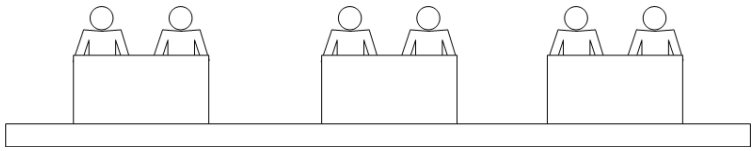
For airlines, the obvious benefit is savings realized by sharing installation and operating costs associated with kiosks. Much larger savings, however, are realized through lower passenger processing and handling costs, primarily in the form of lower labor costs. Alternatively, simple transactions are handled by lesser skilled and lower paid agents (i.e., ground handling companies), freeing up more experienced agents to handle customers with more complicated issues or focus on elite level frequent flyers and premium fare customers.

[9] Inline baggage screening takes the explosive detection systems (EDS) out of airline lobbies and incorporates into conveyor systems behind airlines ticket counters. This restores space that was previously designated for passenger queues, traffic circulation, and/or retail, as well as increases the baggage screening process both in terms of time and manpower requirements. While some existing lobbies/ticketing areas have been modified to incorporate inline screening (and inline screening has been incorporated into all new US airport construction), most airports in the US do not have inline screening.

Example of Kiosk Efficiency

Reduced Manpower Requirements

Six check-in positions requiring six agents



Six check-in positions requiring two agents

Agents can float back and forth between positions as customers check themselves in – 67% labor requirement reduction

The big complaint against CUSS is one shared with the CUTE Recommended Practice: limited functionality. This limits the ability of airlines to offer – and for consumers to take advantage of – product enhancements, such as priority security screening lines, preferred seating, or the ability to purchase additional frequent flyer program credit. Simply put, revenue earning opportunities are missed and passengers cannot customize their travel experience because of limited functionality with CUSS.

Ancillary revenues can be just as important as base fares when it comes to determining profit or loss for some airlines. CUSS prevents airlines from maximizing these - and potential future revenue - opportunities.

This becomes a larger issue when the recent push by airlines to generate ancillary revenue and promote unique brand elements is considered. The recent trend in buy-on-board food items is a good example. After nearly a decade of teaching passengers to eat before they get on the plane (either because onboard cupboards were bare or that offered for sale had the shelf-life and taste equivalency to bomb shelter rations), some airlines now offer healthier and higher quality choices. Unfortunately, by time most passengers learn of the new food options (flight attendant announcement, IFE, onboard magazine, seat pocket menu, etc.) they've already eaten their $7 nitrate dog while running through the airport concourse. Result: missed opportunity for both airline and passenger. In a more flexible IT environment, a passenger could have the option of pre-ordering food at a kiosk when they check-in

which, in turn, would increase the odds that their first choice would be available.[10] For the airline, this translates into customer expectations being met, lower costs through better inventory management, and better capture of incremental revenue opportunities.

Self service technology has been a hallmark of airline cost reduction over the past decade, beginning with Internet booking engines that bypass GDS, self-service kiosks, online check-in and boarding pass printing, and most recently mobile boarding "documents," which are effectively bar codes sent via email to smart phones. This is what technology is supposed to accomplish, yet the limited functionality inherent in CUSS (as well as CUTE) limits the revenue upside (and cost savings) that can be achieved.

CUPPS Intended to Address Shortcomings of CUTE & CUSS

In response to the functionality and cost issues of CUTE and CUSS (including costs associated with writing applications that connected with multiple common use systems), airlines began looking for a better solution. More specifically, they wanted a solution that would reduce dependence on proprietary hardware and software, and facilitate increased use of off the shelf technology including PCs, printers, and software.[11]

To address these issues, in 2004 IATA charged the CUSS Management Group with updating Recommended Practice 1797. Thus was the genesis of CUPPS. CUPPS was intended to provide a "detailed technical specification" for hardware and software dictating specific compliance requirements.[12] IATA's documentation states the following:

> *"The IATA Recommended Practice governing Common Use Terminal Equipment (CUTE), RP 1797, does not include a technical specification. As a result, there is a proliferation of unique vendor-specific platforms and/or implementation*

[10] Use of the word "flexible" is deliberate and we'll come back to that shortly.

[11] We would also note the proliferation of tablet computers in recent months in response to the success of Apple's Ipad. Assuming that an open IT platform is utilized to take advantage of such an opportunity, it is possible that in the near future roving airport ambassadors could be wandering through terminals and parking garages, functioning as mobile check-in kiosks.

[12] IATA CUPSS Fact Sheet, available at:
http://www.cupps.aero/LinkClick.aspx?fileticket=o_ETOqMO-24%3d&tabid=101&mid=458

methodologies. This has made support of airline applications and airport environments difficult and expensive:

- *There are at least seven CUTE platform suppliers. Airlines are now managing multiple variations of their passenger processing applications, such as check-in and boarding control. This requires several costly certifications with each vendor. The risk is that more platforms will enter the market, resulting in even more cost for no added value.*
- *Technologies will continue to evolve, and requires that customer processing standards also evolve.*
- *There is no broad industry standard for common use.*

In 2004, the Joint Passenger Services Conference (JPSC) gave the CUSS Management Group the mandate to overhaul Recommended Practice 1797."[13]

As the document states "technologies will continue to evolve, and requires that customer processing standards also evolve." To this point, we would note that this document is being prepared in early 2011, nearly seven years after the CUPPS overhaul was initiated. During that same time, Microsoft has released two updates to Windows XP, introduced Windows Vista and 7 to the desktop market, and Windows Server 2008 to the server market.[14] CUPPS, on the other hand, is still being tested, while the prophecy of technology continuing to evolve becoming reality.

CUPPS Is Not The Only, Or Even Best, Solution To Common Use Issues

In positioning CUPPS as a "standard", IATA is making Recommended Practice 1797 the *de facto* single solution to common use issues facing the airlines and airports. Further to this point, IATA has used the adoption of RP 1797 by both the Air Transport Association (RP 1797) and Airports Council International (RP 500A07) as additional validation of the CUPPS solution.

The reality, however, is that multiple vendors are currently marketing and have installed alternative solutions that interact with an airline's existing

[13] IATA CUPSS Fact Sheet, available at:
http://www.cupps.aero/LinkClick.aspx?fileticket=o_ETOqMO-24%3d&tabid=101&mid=458

[14] Windows XP Media Edition 2005 (October 2004), Windows XP Professional Edition (April 2005), Windows Vista for Business (November 2006), Windows Vista for Home (January 2007), Windows Home Service (November 2007), Windows Server 2008 (February 2008), Windows 7 (October 2009).

computer system based on the concept of "virtualization" and utilizing commercial off the shelf (COTS) PCs and printers. "Virtualization" solutions represent a more flexible, practical, and economical approach to achieving the benefits of common use than does CUTE, CUSS, and even CUPPS ("virtualization" is explained later in this document).

Finally, it is important to note that we believe IATA's working group had the best of intentions and were focused on utilizing the "latest and greatest" technologically solutions when they embarked on the CUPPS development process. Unfortunately, as a result of advances in technology, CUPPS is a solution for a problem which no longer exists. Simply put, by the time CUPPS is ready for full-scale deployment the airline industry for which it was intended will have, literally and figuratively, flown by.

4. IATA CUPPS Standard

Introduction

CUPPS Recommended Practice 1797 is the IATA "standard" both for proprietary (i.e., space controlled by individual airlines) and common use environments (i.e., space controlled by the airport for use by multiple airlines). It was intended to address industry concerns surrounding common use (i.e., CUTE and CUSS) and the reliance on proprietary hardware and software. The position of IATA and its member airlines was that multiple vendors produced inconsistencies that negated many of the benefits of common use systems, making them a technical and financial challenge for both airlines and airports.

Through development and implementation of single standard, IATA's goal with CUPPS was to reduce costs and increase functionality of common use technology at airports.

Unfortunately, CUPPS fails on both accounts.

With the adaption of CUPPS, IATA aims to dictate one standard for common use systems and, in turn, reduce cost to airports and airlines. Unfortunately, while the objectives were admirable when this process began, they have not been achieved.[15] Moreover, advances in technology – and particularly virtualization solutions – have negated the need for CUPPS. Indeed, changes in technology have at least one international airline looking at next generation common use technology even before the CUPPS standard has been deployed on a wide basis.

IATA Recommended Practice 1797 (CUPPS) Goals

IATA's CUPPS RP 1797 standard sets out how airlines can access their own computer network using a custom software solution (but nonetheless to CUPPS standards) as a "bridge" to an airport's CUPPS platform. An additional goal was to be flexible and allow airlines and airports to utilize off the shelf PCs and printers.

With this approach, CUPPS sets out to facilitate rather than mandate airline specific business practices. Unfortunately, because of the long lead times and expense associated with certification of both hardware and software

[15] We would also note that CUPPS was originally intended to be both agent facing (replacing CUTE) and customer facing (CUSS). As it currently stands, CUSS is not included in the current standard however could be added later.

combined with evolving airline business models, CUPPS does not achieve this goal. In fact, if implemented on widespread basis, CUPPS could very likely be a limiting factor in achieving this very primary objective.

Finally, IATA's goal for CUPPS is for it to become the single common use standard for airports to use in both a proprietary (space controlled by a single airline) and a common use environment (space controlled by the airport for use by multiple airlines). In this way, IATA would provide the one certification for all airport common use programs and, in turn, an airline would need to adapt to one standard instead of many – thereby, reducing cost to airlines.

As we'll outline over the following pages, CUPPS unfortunately fails to meet many of the objectives set by IATA. In particular, it fails to resolve many of the complaints of CUTE and CUSS.

CUPPS – Technically Speaking

In theory, IATA's CUPPS standards provide any airline the ability to connect to their own network and operating applications from any CUPPS certified workstation. This statement has a critical qualification: the airline must invest time and money in the development and certification of a software application to work with the CUPPS hardware.

Single Hardware Standard

CUPPS establishes a single standard for hardware deployed in common use environments. In addition to terminal and printer hardware, CUPPS also includes standards for voice communication (IP telephony configuration) and may, at some future date, be extended to include the airline's gate information display system (GIDS) and other airport signage systems. While CUPPS makes allowances for various printers, PCs, and components, the requirement to meet specific standards prevents airlines from utilizing off the shelf equipment.

Each supplier and individual piece of hardware must be certified by an independent entity that is selected and approved by IATA. The cost of this

approval process is then built into the hardware, increasing costs associated with common use. Moreover, because of this certification process the pool of potential suppliers is limited and, therefore, artificially lowers competitive market forces which would be associated with being able to utilize off the shelf equipment.

It is also important to note that CUPPS certification is valid for, on average, three years at the end of which the hardware must be recertified, including compliance with any changes in certification standards during the intervening period that may occur. In this context, the higher costs CUPPS are not a one-time hit, but recurring. Another factor for consideration is that airport IT management contracts are typically for five years (60 months). This means that CUPPS certification and IT contracts are difficult, if not impossible, to align. End result: more, even unnecessary, cost and complexity.[16]

Software Requirements

From a software perspective, CUPPS is intended to support an "open architecture" environment that would allow airlines the ability to access data and applications within their own systems from any kiosk or workstation in an airport (provided it is CUPPS compliant).

CUPPS uses "emulation" technology, a concept developed in the 1950's by IBM. Unfortunately, the airline industry of the 1950's doesn't exist anymore.

CUPPS utilizes emulation which makes one system behave like, or imitate, a different system. The term "emulator" was coined by IBM in 1957, referring to the use of obsolete hardware and software in present day technology environment. Simulation works in the following manner:

> *System A is installed at an airport and is given inputs normally used for System B, which is not located at the airport. System A produces the same result as System B.*

It is important to point out that emulation should not be perceived as a simple transaction of commands or machine instructions. To achieve emulation, a complete operating system working on a machine that, bluntly, was never designed to run it is required. Within this framework, emulation normally carries a performance and overhead penalty that reduces

[16] Some elements and components have different certification periods.

throughput of data, equating to slower transactions and less efficient processing of passengers and baggage.

A key deficiency of emulation (and a primary reason for the development of CUPPS in the first place) is limited functionality. Given this, CUPPS will not give airlines full use of their own system's passenger and baggage processing features, as well as other brand-specific elements, that they sought when CUPPS development began seven years ago.

CUPPS requires airlines to develop a software application that links their own system with the common use hardware. Moreover, while IATA promotes CUPPS as a single standard, it is highly unlikely that a single application will work across (or be compliant with) the multiple hardware platforms. In this context, airlines will still have to incur the time and cost of developing (not to mention certifying) more than one software application to interface with the various CUPPS IT platforms. For some airlines this will represent an insurmountable cost, particularly small national carriers from developing countries that try to enter large gateway markets (i.e., London, New York, Frankfurt, Tokyo, Los Angeles) in competition with mature, well-capitalized airlines that have extensive and experienced IT departments.

Airlines will be required to develop and certify one or more unique software applications to connect their own computer systems with CUPPS platforms.

CUPPS Certification Procedure

As outlined, IATA's CUPPS is intended to allow airline access to their computer system on an airport's common hardware. This is accomplished by way of emulation, facilitated by software that the airline is responsible for developing (either internally or by contracting with a third-party).

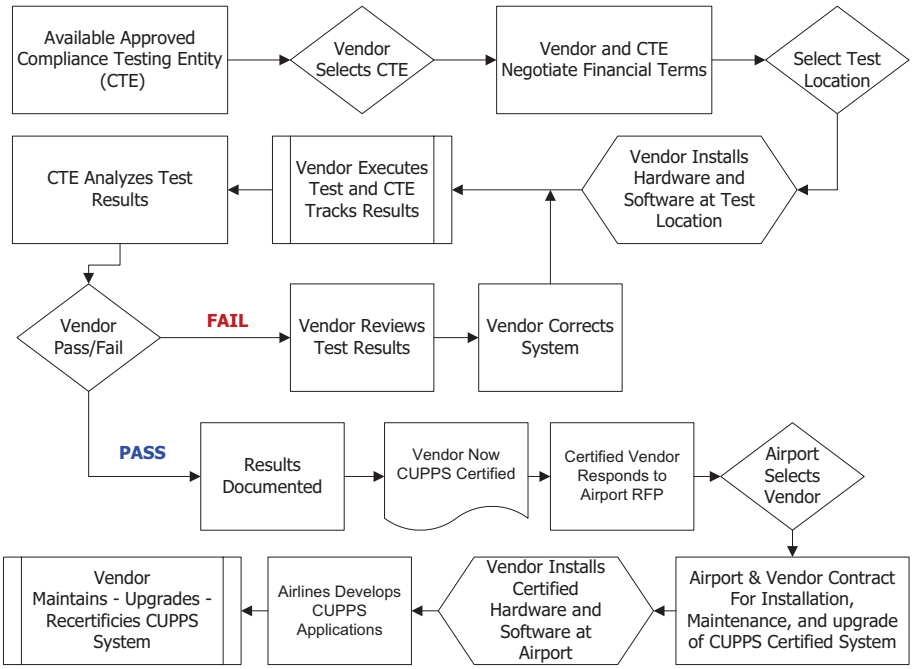
Software and hardware will require CUPPS certification to ensure that they adhere to established standards, including interface definitions, storage requirements, and performance parameters. Certification is also intended to ensure that one application does not interfere with others running on the same platform. CUPPS certification standards are outlined in Recommended

Practice 1797 for reference by CUPPS platform (hardware and networking) suppliers, application (software) providers, airlines, and airports.[17]

Testing and certification of CUPPS components (both hardware and software) will be accomplished by independent Compliance Testing Entities (CTE) that are selected and/or approved by the IATA CUPPS committee. The cost of the certification is the responsibility of the hardware vendor or software developer (which translates to the airlines), including periodic certification renewal as well as certification of changes/upgrades to the CUPPS standard as may be dictated from time to time.[18]

The graphic below diagrams the CUPPS certification and system purchase process. While this paper is not a technical document, the diagram is useful in illustrating the complex nature of certifying and acquiring a CUPPS system and point out the fact that increased complexity almost certainly means increased costs.

CUPPS Vendor Certification and Airport Purchase/Installation



The complexity of CUPPS certification for both hardware and software will result in higher costs for airports, airlines, and ultimately, passengers.

[17] Vendors wishing to play in the CUPPS arena must purchase detailed Technical Specifications and Technical Standards from IATA.

[18] As noted earlier, generally certification is valid for three years although certain components may have different certification periods as specified in the CUPPS Technical Specification.

The cost of certification will be included in pricing for CUPPS platforms, meaning it is paid for by the airport that installs the system, then recouped in user fees charged to airlines, and ultimately underwritten by passengers in the form of higher fares.

Because of the time and money that certification requires, it is likely to limit the number of vendors willing to venture into the CUPPS arena. This will prevent airlines, airports, and their passengers from realizing the benefits of hyper competition, including pricing and innovation.[19] To illustrate this point, only a handful of vendors have been active in the CUPPS initiative, including development of technical specifications and pilot programs to test the standard in "real world" airport environments.[20] These vendors include ARINC, SITA, Ultra Electronics, and RESA. In contrast, many more vendors are active in the CUSS and CUTE arena.

Notwithstanding the above issues, IATA can't be faulted for including a certification requirement. CUPPS is a standard and not a specific design that includes a detailed list of prescribed parts (or lines of code in the case of software). This means that, in theory, any hardware can be utilized on a CUPPS installation provided of course that it be certified.

Given advances in technology and communication, the fundamental flaw of CUPPS is the assumption that a detailed standard for the next generation of airport common use systems is even needed.

It also underscores a fundamental flaw of CUPPS: a detailed standard is not needed. As will be outlined in the next section, advances in technology (and particularly virtualization) result in common use systems being available today that provide much better functionality, lower costs, true ability to use off the shelf hardware, and no barriers to entry that will, in turn, ensure more competitors keeping pricing down and innovation flowing than will be the case with IATA's CUPPS.

[19] By its very nature as a "standard", innovation will likely be stifled in the CUPPS environment.

[20] We will refrain from delving into our concerns about vendors participating in development of technical specifications that are recommended for an entire industry, other than to say that when combined with certification requirements this is likely to discourage a number of potential vendors and, therefore, underscores our concerns regarding competitive pricing and innovation.

Recap

When fully-operational and deployed, IATA's CUPPS standard will offer improvements over the CUTE and CUSS common use systems that are widely used today. Unfortunately, CUPPS does not effectively address two major shortcomings of current common use systems: cost and functionality.

CUPPS will incur cost penalties a result of certification requirements for both hardware and software. In addition, airlines and airports will be required to pay for periodic certification and upgrades for equipment and systems. The requirement for certification will likely limit the number of CUPPS vendors thus reducing the potential benefits that could be realized from a highly competitive marketplace, both in terms of pricing and the industry being able to take advantage of technology advances. These cost penalties will trickle down to the credit card statements of airline passengers and travel budgets of companies, as ultimately it is the traveling public that will pay for CUPPS.

Advances in technology, particularly virtualization, have eliminated the need for common use systems based on "standards" and that require certification.

Due to development based on emulation, a process that is over a half a century old, CUPPS fails to allow airlines to achieve functionality that is equivalent to their own computer systems. This weakness will become increasingly more relevant in coming years given the continued evolution of airline business models, including a focus on ancillary revenues (particularly in the US domestic market) and emergence of global alliances.

In summary, while IATA's CUPPS standard represents an incremental improvement over CUTE common use systems currently deployed, it does not meet many of the objectives established by IATA when the project started in 2004.[21] Bluntly, CUPPS represents an obsolete approach to addressing the shortcomings of current common use systems largely, although not entirely, due to advancements in technology and computing that occur at a rapid, and seemingly ever accelerating, pace.

The same technological advances that drives CUPPS obsolescence, however, has also resulted in the emergence of new common use systems that are

[21] As noted, CUPPS was originally intended to also replace CUSS; however this has been placed on the backburner for the present time.

available at a lower cost, offer better functionality, utilize off the shelf hardware (translating into lower initial and recurring costs), and sufficiently flexible to accommodate changing airline business models as well as take advantage of ongoing innovations in computing and communications. Equally as important, through heavy use of virtualization and open architecture, the need for airlines to develop and certify a unique software application is eliminated. These new systems are described in the next section of this document.

5. Alternative to CUPPS: Virtualization

The CUPPS Non-Standard

Throughout the development and testing phases of the IATA system, the term CUPPS has been freely tossed about in trade publications, corporation presentations, and IATA's own documentation. This has resulted in a perception that the IATA CUPPS standard is the premier, if not only viable, common use system available to airlines and airports able to meet the industry's need in the coming decades. In some way, the CUPPS acronym has become synonymous with common use technology in the air transportation environment in much the same way that the "Kleenex®" brand has morphed to become a generic term for facial tissue or "Xerox®" has become a generic term for photocopy.[22]

Perceptions of CUPPS as the *de facto* singular option for common use passenger processing is incorrect due to technological advances that make significantly less expensive and much more flexible systems available to both airports and airlines, yet accomplish the intended objectives of the IATA working group that developed the standard.

In this section, we explain the alternatives to IATA's CUPPS standard with particular emphasis on virtualization. As will be explained in more detail over the following pages, virtualization provides the foundation for common use systems that can provide commercial aviation with all of the improvements over CUSS and CUTE that CUPPS aimed for but was unable to achieve, and at a lower cost.

Introduction to Virtualization

As has been alluded throughout the document, a viable alternative to CUPPS exists for airport common use that provides better functionality at a lower cost and which is already deployed and proven at airports around the world. This approach is known as "virtualization" but also goes by terms such as

[22] Kleenex and Xerox are registered trademarks of Kimberly-Clark Worldwide, Inc. and Xerox Corporation, respectively.

Flexible Provisioning Environments (FPE) and Dynamic Provisioning Environment (DPE).

Acceptance of virtualization is widespread and similar applications are being mass marketed to homes and businesses.

In simple terms, virtualization entails networking computers together to display a virtual (mirrored instead of actual) image of an airline's own computer system on an airport's common use equipment installation. Many people today have some experience with virtualization, either through a remote desktop application that now comes installed on Windows 7 or through third-party software which allows users to access their home computer via an Internet IP address.[23]

The primary advantage of virtualization is that because it is a mirrored image, it provides the full functionality of an airline's native system. Additionally, these systems are presently deployed in a number of airports utilizing off the shelf hardware and do not require certification nor customer airline applications for each system vendor. In this context, virtualization achieves two primary goals that were set for CUPPS but which it failed to achieve: functionality and lower costs.

Common use systems based on virtualization have emerged as viable alternatives to mandated standards as a direct result of recent advancements in network security that now rivals rigid CUPPS-style certified systems. Such security advancements are a prime example of how advancements in the hyper competitive technology sector have eclipsed and negated the need for a CUPPS-style standard.

Virtualization Deployments & Benefits

Common use systems based on the virtualization platform are in service at airports around the world, ranging from Seattle-Tacoma International Airport (USA) to Antalya International Airport (Turkey), and from Asheville Regional Airport (USA) to Cairo International Airport (Egypt).

Virtualization is taking hold at these and other airports because it offers significant benefits for all three of the primary common use stakeholders.

[23] Example software products include GoToMyPC.com and Access Remote PC

Benefits to Airports

- Presently proven and deployed, and does not require expensive and time-consuming certification process.
- Systems available from multiple suppliers, ensuring that competitive market forces keep prices low and innovation flowing.
- Flexible provisioning is scalable meaning it is economically viable for any size airport.
- Resulting efficient use of terminal and ability to enter a market effectively with "plug and play" IT translate into an effective marketing tool for airports to retain existing and recruit new service.

Benefits to Airlines

- Eliminates dependency on proprietary software and hardware and no need for specialized applications and/or certification.
- Airlines can upgrade their native software as needed without the need to comply with an imposed standard and timelines common to legacy common use systems.
- Airlines retain responsibility for their data processes and links to the airport's common infrastructure.
- In "preferred" or "exclusive" use areas, airlines still have the flexibility of installing their own PCs and printers.
- Improvements in network security, and specifically controlled links, address security concerns that airlines previously had with respect to linking their passenger reservation system to virtual common use platform.
- Supports an individual airline's unique brand and service components, meaning that the check-in process that occurs in Timbuktu mirrors that in London and Chicago.

Benefits to Passengers

- Passengers receive the same level of service from their favorite airline, no matter how large or small the airport may be.
- Airports providing airlines with flexible, low cost common use systems have the advantage when retaining and recruiting airlines, meaning more choice of airlines and brands, as well as greater competitive dynamic that contributes to market pricing discipline.

6. Recap

In this document, Boyd Group International has analyzed IATA's CUPPS standard for common use technology at airports. In this process, we outlined the shortcomings of earlier common use systems that provided the impetus for development of CUPPS, reviewed the basics of CUPPS standards and requirements, reviewed why CUPPS does not meet industry needs, and provided an overview of alternative common use systems with lower costs and better functionality.

CUPPS is a solution to a problem that no longer exists.

There is little doubt that earlier common use systems need to be replaced or that IATA's working group embarked on this process with the best of intentions. However, the *process* became the *project* and during the intervening period technological advances have negated the need for CUPPS. It is the view of Boyd Group International that the interests of commercial aviation and its passengers are not served with a rigid and complex standard for common use systems based on obsolete approaches, but rather one that allows airlines and airports to ability to capitalize on the innovations and cost benefits afforded by continual advances in computers, software, and particularly Internet security.

Based on the analysis conducted herein, Boyd Group International would urge any airport planning to embark on a common use system implementation (either new or update of existing system) to take the time to fully examine IT requirements across the airport (i.e., airlines, concessions, other tenants, and airport operations) and compare the capabilities of the two primary platform options (i.e., CUPPS and virtualization) to meet those needs. While this can be a time consuming process, particularly when there is the easy out option of adopting an alphabet group endorsed standard and hiring a consultant to prepare an RFP, we believe the end result will be a common use deployment that meets current needs and is positioned to accommodate changing business models and continued advancements in technology.

Key Points: IATA CUPPS Standard v Virtualization

Hopefully this document effectively makes the case that virtualization represents a more complete and economic approach to common use in commercial aviation than the IATA CUPPS standard. The table below provides a quick reference recap of the major points, summarizing the primary differences between IATA's CUPPS standard and alternative systems utilizing virtualization.

IATA CUPPS	Virtualization
Does not address industry complaints about costs of current common use systems associated with managing multiple proprietary software and hardware platforms	Virtualization allows use of off the shelf hardware, typical computer networking configurations, and no unique software requirement
CUPPS is a detailed standard with limited flexibility	Open architecture design permits commercial aviation to take full advantage of the latest and greatest that technology has to offer.
CUPPS is a unique standard developed specifically by and for commercial aviation	Virtualization is deployed across multiple industries and even in our homes through common programs such as remote desktop and gotomypc.com
CUPPS forces airlines to conduct their business processes within the framework of limited functionality	Virtualization gives screen "look and feel" of airlines own system, eliminating need to compromise business processes or product offerings
CUPPS use of emulation results in limited functionality, meaning it fails to address to primary complaint of airlines about current common use systems	Virtualization allows airline to have the full "branded" experience of their own computer system on common use platforms
Requirement for airlines develop, certify, and support special software application to link own computer systems with CUPPS	No special software requirements except that provided by vendor as part of system
Certification process for both software and hardware to established standard and conducted by approved/selected third-party Compliance Testing Entity (CTE)	No formal certification requirement
Limited number of "certified" vendors means reduced number of competitor and ability to extract premium pricing	No barriers other than those typical of a start-up business (i.e., capital, competency, etc.)

IATA CUPPS	Virtualization
Certification required to be renewed every three years, with some variances for specific components	No formal certification requirement
Closed network provides high degree of system security	Enhancements to Internet security in recent years provide high degree of system security
CUPPS is agent facing only; customer facing systems are planned for later	Virtualization can be configured as either agent facing or customer facing
Higher costs associated with CUPPS will trickle down to airline passengers	Cost benefits associated with virtualization mean lower costs to airlines and airport, and ultimately passengers
IATA CUPPS is the recommended practice (standard) for the implementation of next generation, agent facing common use systems	Virtualization proves that a standard is not necessary to achieve the industry's goals for common use technology, and it can be accomplished at a lower cost