Emd Exchange In Ndc: Closing The Servicing Gap Between Direct And Indirect Airline Channels

Mukul Kumar Gaur

Independent Researcher, USA

Abstract
Electronic Miscellaneous Documents are important tools in the management of ancillary revenue in the airline industry, but their exchange process is notably less evolved in the current distribution structure. Whereas New Distribution Capability has brought about enhancements in the creation of offers and the initial purchase process of ancillary products, the servicing of these sales post-processing has less evolved when compared to the sophistication in the front-end merchandising process. Certain asymmetries arise in the operations of the servicing from the viewpoint of the airline's frontend and intermediated distribution, where the servicing of the ancillary products has to be pursued through different means by the customers. The servicing of these products is complex from a technical aspect, which arises from the different business cycles associated with ticket and non-ticket products, including their inventory types, dependency on coupons, and accounting treatment. Straight-line coupon structures make the servicing scenarios manageable, while the multi-coupon structure brings about exponentially increased levels of complexity associated with the partial usage process and the mixed financially related outcomes. Currently available order-centric distribution infrastructures provide conducive means of generating simplicity in servicing operations by defining the manipulation of associated documents in the context of logical modifications of orders. However, complete automation in the process demands enhanced levels of governance in areas associated with current taxes, revenue recognition standards, reconciliation of settlement processing, and management of operations-related risks. Capability parity in the distribution channel is the primary infrastructure prerequisite in the context of the sustainable multi-channel distribution of ancillary revenue streams.

Keywords: Electronic Miscellaneous Documents, Ancillary Exchange Automation, Order-Centric Servicing Architecture, Multi-Channel Distribution Parity, Revenue Recognition Compliance.

1. Introduction: The Ancillary Servicing Challenge in Modern Airline Distribution

The aviation industry has noticed a paradigm shift in the way revenues are generated; ancillary revenue has now turned out to be a vital element in commercial viability. According to industry studies, ancillary revenue includes various services like seat assignments, baggage allowance options, priority boarding services, lounge access services, and in-flight catering services; this includes a progressively complex way of revenue generation compared to traditional pricing models [1]. The importance of these services has prompted the development of thorough merchandising capabilities across various sales channels. Yet,

although the initial purchase/offer creation phase has been effectively revamped with contemporary delivery solutions, the fulfillment phase remains vastly unexplored.

Modern distribution capabilities have enabled new philosophies in airline retail, but there is a pressing need to address functional shortcomings in servicing workflows that arise during a shift from traditional distribution infrastructure to more contemporary designs [2]. The issue is not merely related to technical integration specifications, including disparate processing patterns of ancillary items at different stages of their lifecycle when compared to traditional ticket items. Even though significant improvements have been made by airlines in upgrading their front-end servicing in airline merchandizing, the back-end servicing infrastructure for ancillary changes/exchanges has not stepped up to meet these advancements. This is leading to a problematic scenario wherein customers, having accessed airline products/services through new distribution mechanisms, face a lack of servicing options that push them towards new mechanisms in order to make changes.

This servicing gap becomes even more apparent in the context of Electronic Miscellaneous Documents, which are the accounting instruments of the ancillary purchases. These are in contrast to the traditional tickets in the sense that they denote the non-flight inventory items, which have a separate lifecycle [3]. It should be noted that the process of managing such documents through exchange increases the complexity level of the operations to the extent that most of the distribution infrastructures have been taking a long time to address these issues. A lack of proper exchange facilities in the context of the ancillary documents of the airline translates into a gap in the level of sophistication of the initial experience of the purchase to the level of the servicing experience.

2. Technical Architecture of EMD Exchange Operations

Electronic Miscellaneous Documents are accountable documents that help airlines generate revenue through ancillary services while correctly managing financial controls and settlement processes. The complexity of the architecture of the exchange process of such documents lies in the inherent differences from traditional ticket arrangements. As per the technical specification of the document, such documents can be issued together as flight coupons or separate documents that facilitate both obligatory ancillary fees and ancillary services on an optional basis [3]. The exchange process should handle the inherent properties of ancillary inventory based on attributes such as flight segments that are time-bound or consume ancillaries in a manner different from traditional ticketing.

There are complex operational tasks in the technical implementation of exchange processes. If an ancillary product needs to be changed, there are assessments of the current status of the related document, applicability of exchange conditions, financial consequences in the form of add-collect values or refund amounts, and preparation of the corresponding documents for the new setup [5]. This requires the coordinated operation of different system components, such as inventory, pricing engines, financial accounts, and exchange systems. This problem becomes more complex by taking into consideration the possibility of the ancillary products being purchased independently of the initial ticket, by different vendors in the distribution channel, or with different conditions of exchange compared to the initial flight reservation.

The incorporation of these exchange functionalities into distribution networks has to address data models and transaction processing in a sophisticated manner. Studies on ancillary revenue management show that there are complexities in developing pricing models for ancillary services, taking into consideration dynamic patterns, segmentation, and competitive positioning [4]. When ancillary services, which are dynamically priced, need to be exchanged, it has to factor in current pricing rules, along with accurate accounting for the exchange value of the initial purchase, which may be in different pricing periods or scenarios. The technology architecture has to offer real-time support for price computation, rule processing, and accounting in customer-convenient transaction cycles, while keeping audit trails and accounting norms in mind.

This extends even to dealing with scenarios where the ancillary product has partial use or is associated with flights that include multiple segments. The system has to determine which part of the ancillary has been used and what residual value can be exchanged for a refund.

This level of state management can only be achieved through advanced data representation that can be readily adjusted to work with the variability associated with offering ancillary products. This can range from use-once products, such as lounge access, to multiple-segment applications associated with luggage allowance on flights that include multiple segments. The system architecture, therefore, has to strike a balance between implementing full functionality and performance considerations that distribution partners implement as part of flight operations.

Table 1: Technical Architecture Components in EMD Exchange Systems [3-5]

Architecture Component	Document-Centric Model	Order-Centric Model
Primary System Record	Individual Documents (Tickets/EMDs)	Unified Order Object
Inventory Management	Segment-Specific Tracking	Journey-Level Integration
Pricing Engine	Static Fare Rules	Dynamic Real-Time Calculation
Financial Accounting	Document-Level Posting	Order-Item Level Processing
Settlement Processing	Multi-Document Reconciliation	Single Order Settlement
State Management	Coupon Status Tracking	Order Item Lifecycle

3. Operational Complexity: Mono-Coupon and Multi-Coupon Exchange Patterns

The level of operational complexity in the exchange workflow also differs depending on the coupon structure of the ancillary document. In mono-coupon exchanges, the ancillary products being exchanged relate to a single flight, for example, a choice for a single leg of travel or a baggage allowance for a single flight, and usually constitute simple servicing scenarios requiring the execution of an exchange logic that assesses the original purchase, the price for the adjustment, and the difference in cost. From the perspective of settlement and accounting infrastructure, the processing would also entail documenting the exchange, proper posting, and calculation of commissions for agents in the transaction [5].

In multi-coupon exchanges, there is exponential complexity arising from interactions between various flight segments, states of consumption, and financial outcomes for individual coupons. In scenarios where the ancillary service crosses various flight segments, for example, round-trip baggage allowances and seat choices in connecting flights, a single exchange requires the evaluation of every individual coupon while being logically consistent in a whole document. In the merchandising landscape within the industries, signs point to greater usage of packaged services in flights, which culminate in increased complexities in interactions and must be addressed during exchanges [6]. It gets even more complicated if some parts of travel have actually occurred while others have not, hence requiring distinctions to be made in evaluation approaches for both flown and unflown coupons.

In multicoupon situations, the calculations performed for compensation require complex rule engines that include handling complex logical expressions under different states. As a passenger alters plans involving different segments, the engine must identify which coupons need to be refunded, which ones need to be reused, and which ones qualify for refund requests. As indicated, the complexity of the process is evident, considering that different segments are priced differently, bought under different promotional schemes, or exchanged under different policies. According to studies involving ancillary pricing techniques, the airline uses complex segmentation methods for handling voluntary airline offerings, and this implies that exchange values will differ from original purchase values due to changes that trigger market conditions [4].

The operational process for multi-coupon exchange needs to incorporate cases related to consumption in part and complex patterns of use, too. In this case, where the customer has accessed the onward part of the return leg on a round-trip baggage entitlement with the need

to make any changes to that return flight, the process needs to accurately reflect the value assigned to the part that has been accessed, provide proper accounting to record the complete exchange transaction, and determine exchange conditions based upon the part not used yet. The level of complexity in these scenarios has impacted the slow adoption rate in most systems related to the complete multi-coupon exchange process in the industry.

Table 2: Operational Complexity Levels in EMD Exchange Scenarios [5, 6]

Exchange Type	Segment Configuration	Consumption Pattern	Financial Calculation Complexity	Settlement Requirement
Mono-Coupon Single-Segment	Single Flight Leg	Complete or Unused	Simple Price Differential	Single Transaction Record
Mono-Coupon Multi-Product	Single Flight Leg	Bundled Services	Moderate with Product Dependencies	Multiple Commission Calculations
Multi-Coupon Round-Trip	Outbound/Inbound Segments	Partial Flown/Unflown States	Complex Mixed Valuations	Segmented Financial Posting
Multi-Coupon Multi-Segment	Connecting Flights	Varied Usage Across Segments	High with Differential Pricing	Multi-Party Reconciliation
Multi-Coupon Bundled Package	Multiple Segments	Mixed Product Consumption	Very High with Interdependencies	Complex Commission Distribution

4. Channel Parity and Distribution Strategy Implications

Lack of total exchange functionality between the distribution channels sets the stage for inherent operational asymmetries, which have a direct effect on the commercial airline strategy and cost structures. The conventional distribution model has served as the traditional workflow for total servicing, with predefined task sets for document change, financial settlement, and reporting purposes [5]. This traditional workflow is often absent in the initial phases of the modern distribution models, thus giving rise to the functionality disparity, thereby encouraging the airlines to resort to some makeshift solution(s) or refer the customer to another servicing option. The functional disparity hampers the concept of multi-channel distribution, as the agencies and other middle-agent entities cannot facilitate identical servicing for the customers as the direct channels.

The operational implications associated with these gaps are even broader, extending beyond the customer experience realm into core cost economies. If indirect channels cannot perform additional services, customers will need to contact airline call centers or visit their counters for servicing. Best practices for implementation planning consider that for new distribution schemes to be successfully taken up, consideration needs to be comprehensive, encompassing post-sale servicing capacities, not just primary transactions [2]. This escalation of servicing requests to direct channels will raise the cost of operations for carriers, since call center and counter-service costs are significantly higher for individual transactions as compared to self-service modifications done via the web or even agent-assisted modifications. The variability of this experience will also lead to customer satisfaction issues, potentially inhibiting future indirect purchases.

This affects the strategy on the partnerships and technology to invest in. For the airlines to decide on the distribution strategy to adopt, the merchandising and the servicing capabilities of the distribution channels are to be considered. In airline retailing maturity, full servicing capabilities would be the advanced stages of the transformation in distribution. This would need advanced integration between the systems used by the airlines and the distribution companies [9]. Failure to offer the same servicing capabilities across the distribution channels

may limit the airline's expansion into partnerships on the indirect distribution and the ancillary products offered on some distribution channels.

To achieve functional equivalence through various channels, investments are needed in technology infrastructure, business process change, and/or partner-enablement activities. Carriers must have servicing infrastructure to support the full life-cycle management of any ancillary, regardless of the servicing acquisition channel, while their respective servicing partners must deliver the technology interfaces and business processes required to effect an exchange transaction. The attainment of channel parity for servicing ancillaries is an essential step towards fully embracing an omnichannel approach to airline retailing, whereby functionalities and servicing levels are similar, regardless of the servicing channel chosen by the consumer. Such groundwork will permit carriers to optimize their respective servicing models, regardless of their chosen distribution strategy, owing to differences in purely commercial considerations, as opposed to technological constraints.

Table 3: Channel Distribution Capability Gaps and Cost Implications [2, 5, 9]

Distribution Channel	Exchange Capability Status	Customer Servicing Route	Cost per Transaction Type	Customer Satisfaction Impact
Direct Airline Website	Full EMD Exchange Support	Self-Service Digital	Low - Automated Processing	High - Immediate Resolution
Direct Mobile Application	Full EMD Exchange Support	Self-Service Mobile	Low - Automated Processing	High - Convenient Access
Traditional GDS	Partial EMD Exchange	Agent-Assisted or Redirect	Medium - Manual Intervention	Medium - Delayed Processing
Early NDC Implementation	Limited EMD Exchange	Call Center Redirect	High-Voice Channel Costs	Low - Channel Switching Required
Offline Travel Agency	No EMD Exchange Capability	Airline Counter Required	Very High - Physical Location	Very Low - Multiple Touchpoints
Modern NDC with Parity	Full EMD Exchange Support	Agent-Processed Digital	Medium - Integrated System	High - Seamless Experience

5. Order-Centric Servicing Architecture and Retail Transformation

Modern-day airline retailing systems are witnessing an adoption momentum towards order-centric constructs, which redefine the fundamental linkage between commercial transaction processing and documentation for fulfillment. In current documentation-centric systems, tickets and supporting documentation were essentially the key systemic records, and sophisticated linkage logic was required to connect associated documents for supporting multiple accountable instruments for commercial transactions. In contrast, in order-centric systems, "the order object is defined foremost as a commercial document, where documents represent fulfillment objects synthesized from an order [7]." This effectively enables orders in commercial systems to represent commercial documents, with documents themselves being fulfillment objects synthesized from orders, thus allowing air carriers to track customer purchases through common order documents, including all constituent parts for a journey, such as flights, ancillary, and commercial terms.

The order management framework makes servicing operations more intuitive by performing modifications at a logical level of order items instead of working with documents one by one. When a customer places an ancillary exchange in an order-oriented scenario, the system applies the modification to the corresponding order items, calculating the required

modifications in documents automatically [7]. The abstraction makes the servicing process more accessible to customers as well as airline personnel, as in this case, the process is centered on the commercial action rather than working with documents. The order-oriented method can also provide more complex bundling mechanisms for ancillary services, considering several ancillary services packaged within one order structure.

There has been a lot of research on dynamic pricing methodological design, which shows that modern airline revenue management has become more automated, with continuous pricing adjusted in real-time in response to market changes or demand signals [8]. By offering these dynamic pricing strategies in conjunction with order-based service, airlines can now execute present market pricing on exchange transactions with preserved full commercial insight into the original terms of acquisition. The order account maintains the full commercial insight offered by the original transaction, which helps with intelligent pricing decisions, including considerations of, for example, loyalty status, original method of acquisition, remaining time until departure, or immediate availability in order to acquire. Alignment of airline operations with mainstream e-commerce practices can be achieved by the paradigm shift that focuses on order-centric architecture. This is because modifying orders is seen as a regular retail capability within mainstream e-commerce. In conventional online retail aimed at consumers, customers demand capabilities that allow them to modify orders and even choose delivery options through self-service portals without needing any know-how about fulfillment processes [7]. Airlines can therefore allow more self-service capabilities by adopting such paradigms and meeting customer expectations formed on the basis of experiences with other online retailers. The system also helps the airline make use of payment and relationship management systems.

Table 4: Order Management Framework Benefits and Integration Requirements [7, 8]

Order-Centric Feature	Traditional Document Model Challenge	Order Model Solution	Customer Benefit	System Integration Requirement
Unified Commercial Record	Multiple Disconnected Documents	Single Order Object	Simplified Purchase View	CRM Platform Integration
Logical Item Modification	Complex Document Manipulation	Order-Item Level Changes	Intuitive Self-Service	Payment Gateway Connectivity
Dynamic Repricing Integration	Static Historical Pricing	Real-Time Market Pricing	Transparent Current Valuations	Revenue Management System Link
Bundle Management	Individual Product Tracking	Package-Level Operations	Cohesive Service Offerings	Merchandising Engine Integration
Loyalty Context Preservation	Separate Profile Lookup	Embedded Customer Data	Personalized Exchange Terms	Loyalty Management System
Multi-Channel Consistency	Channel-Specific Rules	Uniform Order Processing	Consistent Experience	Omnichannel Platform Integration

6. Governance, Risk Management, and Compliance Frameworks

The automation of ancillary exchange transactions brings with it a set of management challenges that not only cover the enabling functionality but also cover regulatory considerations, accuracy of financial transactions, and risk management. Tax calculation emerges as a highly critical control point that may be affected by the complex regulatory requirements associated with the sale of ancillary products across international borders.

Standards used in the industry clearly point to the requirement that accurate tax processing should be based on the right determination and calculation of the tax based on the value of the transaction and its reporting to the relevant tax authorities [11]. Failure to accurately perform the tax calculation in a transaction related to an exchange may end up with penalties and restatements above the transaction value. The regulations on revenue recognition introduce additional governance complexities for the processes involved in ancillary exchanges. The accounting systems stipulate that revenue should be recognized while satisfying performance obligations, which for ancillary services might happen at different dates from the primary air transportation. The rules applicable for settlement and revenue recognition stipulate that the dates and amounts for revenue recognition should reflect the service delivery dates and the satisfaction of the obligations outlined in the contract [12].

The complexities involved in exchanges result in complexities for revenue recognition, whereby there might be reversals in previously recorded revenue, new performance obligations with different characteristics, and deferring revenue recognition into future periods. This requires that the governance structure automatically provide financial postings that ensure revenue recognition regulations are continuously met. A reconciliation of settlement would be another essential control area, and this would be more prominent when transactions are routed through the use of indirect channels. The settlement system itself would have to properly credit transactions, commissions, and fees between the airlines, distribution companies, and the payment facilitators, with the entire settlement system requiring audit trails for reconciliation purposes [11].

In cases where the ancillary transactions are for refund or add-collect payments, the settlement system would be more complicated, taking into consideration the usage of several financial instruments, as well as the types of payment instruments with differing processing times for debit and credit transactions. However, the governance structure must further take into consideration operational risks such as system glitches, incorrect interpretation of policies, and fraudulent practices. Controls should incorporate validation rules to ensure that transactions are valid, approval rules to address exceptions that go beyond predetermined thresholds, and monitoring rules that flag suspicious trends needing further investigation [12]. While audit trail considerations go beyond recording transactions to capturing decision-making criteria, rule firing, and system states that impacted the output, such a comprehensive audit trail would address both internal control purposes and external audit requirements, such that the airlines would be able to show that the exchange transactions passed through the system as per predetermined policies and regulatory guidelines. There would be a convergence of these governance features that would turn auxiliary exchange into a business process that, while automated, executes within acceptable governance constraints.

Conclusion

Merge Capabilities for the exchange of electronic Miscellaneous Documents are the necessary infrastructural difference that needs to be bridged for the airline industry to fully attain omnichannel retail equality. The technical complexity of ancillary servicing, specifically involving multi-coupon exchanges, has led, over time, to functional differences that have imposed inefficient servicing paths upon, as well as incremental operational costs for, the airline industry. Current order-centric solutions for the airline industry offer paradigms for conceptual simplifications of ancillary exchanges, viewing these changes instead as commonplace retail modifications, rather than document handling processes. These, however, need to be enabled by fully encompassing sets of infrastructural designs that emphasize tax integrity, revenue integrity, operational settlement reconciliations, and operational risk-feature management. The complete automation of ancillary exchanges would then enable the airline industry to fully enable the optimization of these paths from operational-cost centers towards fully managed retail revenue processes, including dynamic repricing programs and self-service capabilities. As such, fully functional ancillary exchanges will increasingly become prerequisite infrastructures that are no longer niceties, but necessary airline infrastructures, particularly with the airline industry fully integrating all other order-centric processes for fully enabled omnichannel retailers.

References

[1] Sheridan Stavac, Christian Hylander, and Gustavo Bruno Giannetti, "Driving growth with airline ancillaries," Mastercard Services, 2025. [Online]. Available: https://www.mastercardservices.com/en/industries/airlines/insights/driving-growth-airline-ancillaries

[2] NDC Partnership, "Planning for NDC Implementation: A Quick-Start Guide." [Online]. Available: https://ndcpartnership.org/knowledge-portal/climate-toolbox/planning-ndc-implementation-quick-start-guide

[3] Thai-Amadeus South East Asia Training Centre, "Electronic Miscellaneous Document (EMD)." [Online]. Available: https://www.thaiamadeus.com/THILA/file/emd.pdf

[4] Andreas Wittmer, Nicole Oberlin, "Ancillary Revenue Pricing," ResearchGate, 2015. [Online]. Available: https://www.researchgate.net/publication/340482454_ANCILLARY_REVENUE_PRICING

[5] International Air Transport Association, "BSP Manual for Agents," 2021. [Online]. Available: https://www.iata.org/contentassets/bfacf03f8e914960898e262df2777352/bsp-manual-for-agents.pdf

[6] Amadeus, "Merchandising '17: Trends in Airline Ancillaries." [Online]. Available: https://amadeus.com/documents/en/airlines/research-report/merchandising-17-trends-in-airline-ancillaries.pdf

[7] Salesforce Labs, "Order Management Order Entry Framework." [Online]. Available: https://appexchange.salesforce.com/appxListingDetail?listingId=a0N4V00000IktxzUAB

[8] Thomas Fiig et al., "Dynamic pricing of airline offers," Journal of Revenue and Pricing Management, 2018. [Online]. Available: https://www.iata.org/contentassets/0688c780d9ad4a4fadb461b479d64e0d/dynamic-pricing--of-airline-offers.pdf

[9] Pratra, "A Guide to IATA ARM (Airline Retailing Maturity) Index," 2023. [Online]. Available: https://www.pratra.com/blog/a-guide-to-iata-airline-retailing-maturity-index

[10] International Air Transport Association, "Airline Distribution Standards," 2022. [Online]. Available: https://www.iata.org/contentassets/c33c192da39a42fcac34cb5ac81fd2ea/ads_ab_2022_02-joint-iata-atpco-notification-ccd-list.pdf

[11] International Air Transport Association, "Settlement and Accounting Standards Board." [Online]. Available: https://www.iata.org/en/about/corporate-structure/passenger-standards-conference/pasb/

[12] SAP, "Mastering the Basic Concepts of Settlement and Revenue Recognition." [Online]. Available: https://learning.sap.com/learning-journeys/exploring-sap-agricultural-contract-management/mastering-the-basic-concepts-of-settlement-and-revenue-recognition