

**AGREEMENT
AEROBAHN SURFACE MANAGEMENT SYSTEM**

THIS AGREEMENT, is made and entered into as of the date stated on the signature page (“Effective Date”), by and between the **CITY AND COUNTY OF DENVER**, a municipal corporation of the State of Colorado (“City”), Party of the First Part, and **SAAB SENSIS CORPORATION**, a Delaware corporation (“Contractor”) authorized to do business in the State of Colorado Party of the Second Part;

WITNESSETH:

WHEREAS, the City owns and operates Denver International Airport (“DEN” or the “Airport”), and uses the Saab Sensis Airport Surface Management System – Aerobahn (“Aerobahn”) airfield traffic management system and Surveillance System; and

WHEREAS, DEN will require professional services for continued use and maintenance of Aerobahn and such other work as may be requested by the City, at the Airport; and

WHEREAS, the Contractor is qualified and ready, willing and able to provide the requested services to the City, in accordance with the terms of this Agreement;

NOW, THEREFORE, for and in consideration of the premises and other good and valuable consideration, the parties hereto agree as follows:

1. LINE OF AUTHORITY:

The City and County of Denver Department of Aviation's Chief Executive Officer (CEO), or her designee or successor in function (hereinafter referred to as the “CEO”) authorizes and directs all work performed under this Agreement. Until otherwise notified by the CEO, the City's Senior Vice President for Airport Operations (“SVP”) is designated as the authorized representative of the CEO through whom services performed under this Agreement shall be directed and coordinated. The SVP will designate the Project Manager under this Agreement. Administrative reports, memoranda, correspondence and other submittals required of the Contractor shall be processed in accordance with the SVP’s directions.

2. SCOPE OF WORK:

A. General: The Contractor shall, upon receipt of a written Notice to Proceed from the SVP, commence the Work as authorized by the City and shall furnish all of the technical, administrative, professional and other labor; all supplies and materials, equipment, printing, vehicles, local travel, office space and facilities, testing and analyses, calculations, and any other facilities or resources required to perform the services, complete all work and produce all of the deliverables described and set forth in this Agreement, including the attached **Exhibit A**, “Service Description,” and all of the other exhibits, appendices and attachments to this Agreement (collectively referred to in this Agreement as the “Service Description” or “Work”).

B. Professional Responsibility; Standard and Remedies:

1. Contractor's Performance: The Contractor shall faithfully perform the Work required under this Agreement in accordance with standards of care, skill, training, diligence and judgment provided by competent professionals who perform work of a similar nature to the Work described in this Agreement. Contractor shall provide to the City in a timely manner all designs, documents, submittals and services necessary to achieve completion of the Work in accordance with Milestone Dates established for authorized Work. All designs, documents, submittals and services provided by Contractor shall be:

a) Fully coordinated and integrated with related work being performed by the Contractor's subcontractors, the City, and the City's Contractors, and all of their respective suppliers and subcontractors of any tier; and

b) Checked for compliance with applicable laws, ordinances, codes, rules, regulations and current industry standards applicable to the Work. Codes and laws are often subject to differing interpretations. Contractor will use due diligence to ascertain interpretations which will be acceptable to the City and relevant regulatory authorities.

2. Acts and Omissions: The Contractor shall be liable to the City for acts and omissions of Contractor's employees, contractors, subcontractors, agents and any other party with whom the Contractor contracts to perform any portion of the Work, including any design elements of any authorized Work.

3. City's Remedies: In the event Contractor fails to comply with any provisions of Sections 1 or 2, above, Contractor shall be liable to the City for all costs of correcting the Work, without additional compensation, including but not limited to:

a) All costs of correcting and replacing any affected design documents, including reproducible drawings;

b) All removal and replacement costs of any improvements or other work installed or performed pursuant to and in accordance with design documents containing errors or omissions; and

c) Additional costs incurred by the City or its other Contractors or contractors, if any, arising out of such defective Work.

These remedies are in addition to, and do not limit the provisions and requirements of Section 16- Insurance, and Section 17 – Defense and Indemnification, below.

C. Schedule Overview and Contingencies:

1. Contractor will provide its Aerobahn Service (“Aerobahn”) and Surveillance Maintenance to the City at Denver International Airport (“DEN”) for a period of sixty (60) months beginning January 1, 2019 and concluding December 31, 2023 (“Aerobahn Period of Performance”), subject to the schedule and assumptions contained herein.

2. The Parties recognize the Surveillance System utilized and installed by the City at “DEN” under Agreement CE 91378 is independent of the FAA’s ASDE-X System (“ASDE-X”). The City’s utilization of the Federal Aviation Administration (“FAA”) “ASDE-X” system will only be made available to the City through the means of an executed and approved “FAA” Memorandum of Agreement (“MOA”) authorizing the receipt of data from the FAA’s “ASDE-X” system.

3. The Contractor will ensure the coverage area of the Aerobahn Service as of the Effective Date. The cost associated with rectifying degradation in Service that occurs as a result of a temporary or permanent change in the physical configuration of the airport (such as construction or a new terminal or runway) will be the responsibility of the City.

4. Any additional cost to reconfigure equipment, network and/or software in the event the FAA imposes any changes to the FAA data policy is the responsibility of the City.

D. Diligence: The Contractor acknowledges that time is of the essence in the performance of its services under this agreement and that the City of Denver may suffer damages if the Project is delayed as a result of the Contractor’s failure to provide its services in a timely and diligent manner. Contractor shall perform the Work described herein in a timely manner and as directed by the SVP or his authorized representatives.

E. Exclusions: The FAA’s control of the data distribution cabinet extends to dictating who may or may not access the data feed from the cabinet. City recognizes and understands that the FAA may grant parties other than City access to the data feed from the data distribution cabinet without seeking City’s permission. Such access will not include access to data received from the supplemental remote units installed by City. The Parties recognize that the Aerobahn Service is fed data from the FAA’s ASDE-X System. Contractor shall have no liability to City with respect to the quality and/or availability of such data which will be dictated by the FAA’s ASDE-X maintenance philosophy with respect to maintenance windows, response times, and spare parts stockpiling.

3. COMPENSATION AND PAYMENT:

A. Fee: The City agrees to pay the Contractor for the performance and completion of all of the Work as described in **Exhibit A** and the Contractor agrees to accept as its full and only compensation that Work, a total amount of **Three Million Two Hundred-Forty Thousand Dollars and Zero Cents (\$3,240,000.00)**. Payment to the Contractor will be in accordance with the provisions herein and as more fully described in **Exhibit B**, “Service Description Pricing”, attached hereto, and will be made solely and exclusively from funds appropriated and otherwise lawfully made available for the purposes of this Agreement from the City and County of Denver Funds of the Airport System. The City has no obligation to make payments from any other fund

or source or to make additional appropriations or allocations to such fund or funds to satisfy such costs or other obligations, nor is the City under any obligation to amend this Agreement to increase the Maximum Contract Liability.

B. Additional Services: The Contractor may also perform services, hereinafter referred to as "Additional Services," which relate to the subject matter of this Agreement, but which the SVP determines to be not described in the **Exhibit A** or in excess of the requirements of the **Exhibit A**. The Contractor shall be compensated for such Additional Services only if the services and the amount of fees and reimbursable expenses for the services are agreed to by the Parties and have been authorized in writing in advance by the SVP. The total amount of fees and reimbursable expense costs for Additional Services shall not cause this Agreement to exceed the Maximum Contract Liability set forth herein, and in no event shall the approval of Additional Services and the cost of performing them be deemed to constitute an agreement by the City to an increase in the Maximum Contract Liability.

C. Scheduling, Progress Reports and Invoices: Payments shall be made to Contractor based upon invoices and receipts submitted by Contractor which have been approved by the City, and subject to the maximum contract liability. Each such invoice shall bear the signature of an authorized officer of the Contractor certifying that the information set forth in the invoice is true and correct. The Contractor agrees that the City shall not be liable for the payment of taxes, late charges, interest or penalties of any nature, except for any additional amounts that the City may be required to pay under the City's prompt payment ordinance D.R.M.C. § 20-107, *et seq.*

D. The City reserves the right to reject and not pay any invoice or part thereof where the CEO determines that the amount invoiced to date exceeds the amount which should be paid based upon its determination of the Work which has been performed. The City, however, shall pay any undisputed items contained in the invoice. Disputes concerning payments under the provisions of this contract shall be resolved by administrative hearing pursuant to the procedures of Section 5-17, Revised Municipal Code.

E. Travel expenses shall be reimbursed, at cost, for travel approved by the SVP, as follows:

All reimbursable travel shall have received prior written approval of the SVP or his authorized representative.

- A. Vehicle rental costs will be allowed only if it can be demonstrated that such rental costs afforded the most economical travel method available, taking into consideration the element of time. Use of such vehicle for personal travel shall not be included.
- B. No reimbursement shall be approved for air fare costs greater than the most economical rate available to the traveler at the time of his or her trip. Hourly billing rates for the traveler shall not be billed for any period of time for which the trip was extended for personal convenience.

- C. Meals for travelers shall be limited to the current GSA per day per person rate for the Denver metro area.
- D. Sleeping accommodation costs shall be limited to a reasonable amount, taking into account costs of alternate accommodations in the location and other relevant factors.
- E. Personal expenses such as personal telephone expenses and non-business entertainment shall not be included.

Any cost not listed in or incurred in accordance with this Section as a Reimbursable Expense shall be presumed to be included in the Contractor's Billing Rate and therefore not separately reimbursable.

4. MAXIMUM CONTRACT LIABILITY; FUNDING:

A. Any other provision of this Agreement notwithstanding, in no event shall the City be liable for payment for services rendered and expenses incurred by the Contractor, including the Fee set forth above and any additional services requested and authorized by the City, under the terms of this Agreement for any amount in excess of the sum of **Three Million Two Hundred-Forty Thousand Dollars and Zero Cents (\$3,240,000.00)**. The Maximum Contract Liability may only be increased by amendment to this Agreement.

5. TERM:

The Term of this Agreement shall commence on the Effective Date, January 1, 2019, and shall terminate at the end of sixty (60) months later on December 31, 2023, unless sooner terminated. The Term of this Agreement may only be increased by amendment to this Agreement.

6. SUBCONTRACTORS:

A. Although the Contractor may retain, hire and contract with outside subcontractors, no final agreement or contract with any such subcontractor shall be entered into without the prior written consent of the SVP or his authorized representative. Requests for such approval must be made in writing and include a description of the nature and extent of the services to be provided, the name, address and professional experience of the proposed subcontractor, and any other information requested by the SVP. Any final agreement or contract with an approved subcontractor must contain a valid and binding provision whereby the subcontractor waives any and all rights to make any claim of payment against the City or to file or claim any lien or encumbrance against any City property arising out of the performance or non-performance of the contract.

B. Because the Contractor's represented professional qualifications are a consideration to the City in entering into this Agreement, the SVP shall have the right to reject any proposed outside subcontractor deemed by him, in his sole discretion, to be unqualified or unsuitable for any reason to perform the proposed services, and the SVP shall have the right to

limit the number of outside subcontractors, or to limit the percentage of Work to be performed by them, all in his sole and absolute discretion.

C. The Contractor shall not retain any sub Contractor to perform work under this Agreement if the Contractor is aware, after a reasonable written inquiry has been made, that the subcontractor is connected with the sale or promotion of equipment or material which is or may be used on work related to or following on from this Agreement, or that any other conflict of interest exists.

7 PERSONNEL ASSIGNMENTS:

A. The Contractor shall assign a Project Manager to this Project that has experience and knowledge satisfactory to the City. The Project Manager shall be the contact person in dealing with the City's Project Manager on matters concerning this Project and shall have the authority to act for the Contractor's organization. Contractor's designated Project Manager shall remain assigned on this contract during the entire contract term, while in the employ of the Contractor, or, until such time that his performance is deemed unsatisfactory by the City and a formal written request is submitted which requests the removal of the Contractor's Project Manager.

B. The Contractor may submit and the City will consider a request for reassignment of a Project Manager, should the Contractor deem it to be in the best interest of the City, the best interest of the Contractor's organization or in the best interest of the Contractor's Project Manager.

C. If the City allows the removal of a Project Manager, the replacement Project Manager must have, at least, similar or equal experience and qualifications to that of the original Project Manager. The replacement Project Manager's assignment is subject to the approval of the SVP.

D. All key professional personnel identified by the Contractor will be assigned by the Contractor or subcontractors to perform work under the Work. The SVP must approve additional personnel in writing. It is the intent of the parties hereto that all key professional personnel be engaged to perform their specialty for all such services required by the Work, and that the Contractor's and the sub Contractor's key professional personnel be retained for the life of this Agreement to the extent practicable and to the extent that such services maximize the quality of work performed hereunder.

E. If the Contractor decides to replace any of its key professional personnel, it shall notify the SVP in writing of the changes it desires to make. No such replacement shall be made until the replacement is approved in writing by the SVP, which approval shall not be unreasonably withheld. The SVP shall respond to the Contractor's written notice regarding replacement of key professional personnel within fifteen days after the SVP receives the list of key professional personnel, which the Contractor desires to replace. If the SVP or his designated representative does not respond within that time, the listed personnel shall be deemed to be approved.

F. If, during the term of this Agreement, the SVP determines that the performance of approved key personnel is not acceptable, he shall notify the Contractor, and he may give the Contractor notice of the period of time, which the SVP considers reasonable to correct such performance. If the SVP notifies the Contractor that certain of its key personnel should be reassigned, the Contractor will use its best efforts to obtain adequate substitute personnel within ten days from the date of the SVP notice.

8. STATUS OF CONTRACTOR:

It is agreed and understood by and between the parties hereto that the status of the Contractor shall be that of an independent contractor retained on a contractual basis to perform professional or technical services for limited periods of time as described in Section 9.1.1(E)(x) of the Charter of the City and County of Denver, and it is not intended, nor shall it be construed, that the Contractor or its personnel are employees or officers of the City under Chapter 18 of the Revised Municipal Code for any purpose whatsoever.

9. NO AUTHORITY TO BIND CITY TO CONTRACTS:

The Contractor has no authority to bind the City on any contractual matters. Final approval of all contractual matters which obligate the City must be by the City as required by Charter and Ordinance.

10. ASSIGNMENT:

The Contractor shall not assign, pledge or transfer its duties and rights under this Agreement, in whole or in part, without first obtaining the written consent of the CEO. Any attempt by the Contractor to assign or transfer its rights hereunder without such prior written consent shall, at the option of the CEO, automatically terminate this Agreement and all rights of the Contractor hereunder. Such consent may be granted or denied at the sole and absolute discretion of the CEO.

11. CONFLICT OF INTEREST:

The Contractor agrees that it and its subsidiaries, affiliates, subcontractors, principals, or employees will not engage in any transaction, activity or conduct which would result in a conflict of interest. The Contractor represents that it has disclosed any and all current or potential conflicts of interest. A conflict of interest shall include transactions, activities, or conduct that would affect the judgment, actions or work of the Contractor by placing the Contractor's own interests, or the interest of any party with whom the Contractor has a contractual arrangement, in conflict with those of the City. The City, in its sole discretion, shall determine the existence of a conflict of interest and may terminate this Agreement if such a conflict exists, after it has given the Contractor written notice which describes such conflict. The Contractor shall have thirty days after the notice is received in which to eliminate or cure the conflict of interest in a manner which is acceptable to the City.

12. NO DISCRIMINATION IN EMPLOYMENT:

In connection with the performance of work under this Agreement, the Contractor agrees not to fail or refuse to hire, discharge, promote or demote, or to discriminate in matters of compensation, terms, conditions or privileges of employment against any person otherwise qualified, solely because of race, color, religion, national origin, gender, age, military status, sexual orientation, marital status, or physical or mental disability; and the Contractor further agrees to insert the foregoing provision in all subcontracts hereunder.

13. DSBO GOALS:

The Contractor is subject to the City's ordinance, DRMC Chapter 28, Article III (MBE/WBE Ordinance) which prohibits discrimination in the awarding of contracts and subcontracts and directs the DSBO Director to establish goals for MBE and WBE participation in the preconstruction and construction of City-owned facilities. The goal for this Agreement is zero percent (0%). Project goals must be met with certified MBE and WBE participants or by demonstrating good faith efforts under the MBE/WBE Ordinance. The Contractor must comply with the terms and conditions of the MBE/WBE Ordinance in soliciting and contracting with its subcontractors and subcontractors in administering the performance of the work hereunder. It shall be an ongoing, affirmative obligation of the Contractor to maintain, at a minimum, compliance with the originally achieved level of MBE/WBE participation upon which this Agreement was awarded (0%), for the duration of this Agreement, unless the City initiates a material alteration to the Work.

14. PROMPT PAY:

The Contractor is subject to D.R.M.C. Section 20-112 wherein the Contractor is to pay its subcontractors in a timely fashion. A payment is timely if it is mailed to the subcontractor no later than seven days after receipt of any payment from City. Any late payments are subject to a late payment penalty as provided for in the prompt pay ordinance (Section 20-107 through 20-118).

15. INSURANCE:

A. The Contractor shall obtain and keep in force during the entire term of this Agreement, all of the insurance policies described in the City's form of insurance certificate which is attached to this Agreement as **Exhibit C** and incorporated herein. Such insurance coverage includes workers' compensation and employer liability, commercial general liability, business automobile liability, and if appropriate, professional liability. Upon execution of this Agreement, the Contractor shall submit to the City an ACORD form, which specifies the issuing company or companies, policy numbers and policy periods for each required coverage.

B. The City's acceptance of any submitted insurance certificate is subject to the approval of the City's Risk Management Administrator. All coverage requirements specified in the certificate shall be enforced unless waived or otherwise modified in writing by the City's Risk Management Administrator.

C. All certificates required by this Agreement shall be sent directly to Denver International Airport, Risk Management, Airport Office Building, Room 8810, 8500 Peña Boulevard, Denver, Colorado 80249. The City Project/Agreement number and project description shall be noted on the certificate of insurance. The City reserves the right to require complete, certified copies of all insurance policies required by this Agreement at any time.

D. The Contractor shall comply with all conditions and requirements set forth in the insurance certificate for each required coverage during all periods in which coverage is in effect.

E. Unless specifically excepted in writing by the City's Risk Management Administrator, the Contractor shall include all subconsultants performing services hereunder as insureds under each required policy or shall furnish a separate certificate for each subconsultant if requested by City. All coverages for subconsultants shall be subject to all of the requirements set forth in the form certificate and the Contractor shall insure that each subconsultant complies with all of the coverage requirements.

F. The parties hereto understand and agree that the City and County of Denver, its officers, officials and employees, are relying on, and do not waive or intend to waive by any provisions of this agreement, the monetary limitations or any other rights, immunities and protections provided by the Colorado Governmental Immunity Act, §§ 24-10-101 to 120, C.R.S., or otherwise available to the City and County of Denver, its officers, officials and employees.

G. The insurance coverage forms specified in this Agreement are the minimum requirements, and these requirements do not lessen or limit the liability of the Consultant under the terms of this Agreement, including the Indemnification provisions herein. The Consultant shall maintain, at its own expense, any additional kinds and amounts of insurance that it may deem necessary to cover its obligations and liabilities under this Agreement.

16. DEFENSE AND INDEMNIFICATION:

A. To the fullest extent permitted by law, the Contractor hereby agrees to defend, indemnify, reimburse and hold harmless City, its appointed and elected officials, agents and employees for, from and against all actions, cause of action, liabilities, claims, suits, judgments, liens, awards, and damages to the extent such action, cause of action liabilities, claims, suits, judgments, liens, awards, and damages were caused by the negligent or intentional acts of the Contractor ("Claims"). Provided in each case that City shall (1) provide Contractor prompt notice of any Claims that could result in indemnification hereunder; (2) permit Contractor to conduct the defense, resolution, or other handling of any Claims with mutually acceptable legal counsel; and (3) reasonably cooperate with Contractor in such defense, resolution or other handling of any Claims. Contractor's indemnification obligation is specifically limited to those instances arising from wrongful acts or omissions of Contractor for all elements of this section.

B. Insurance coverage requirements specified in this Agreement shall in no way lessen or limit the liability of the Contractor under the terms of this indemnification obligation. The Contractor shall obtain, at its own expense, any additional insurance that it deems necessary for the City's protection.

C. This defense and indemnification obligation shall survive the expiration or termination of this Agreement for a period of six (6) calendar years from the date of this Agreement.

17. LIMITATION OF LIABILITY:

In no event shall either party's aggregate liability (including any liability of its affiliates, or its or their directors, officers, employees, shareholders, representatives, and agents) to the other party for any consequential, indirect, incidental, punitive or special damages, including without limitation loss of profits, interest, service or business interruption, relating to the performance of this contract exceed an amount three (3) times the Maximum Contract Liability of this Agreement.

18. EXCLUSION OF WARRANTIES:

All warranties expressed or implied are excluded from this Agreement as they may apply to the AEROBAHN software except as specifically provided in **Exhibit A**. Specifically, no implied warranty of merchantability or fitness for a particular purpose is provided with regard to the Aerobahn software under this Agreement.

19. COORDINATION OF SERVICES:

The Contractor agrees to perform its work under this Agreement in accordance with the operational requirements of DEN, and all work and movement of personnel or equipment on areas included within the DEN site shall be subject to the regulations and restrictions established by the City or its authorized agents.

20. COMPLIANCE WITH ALL LAWS AND REGULATIONS:

All of the work performed under this Agreement by the Contractor shall comply with all applicable laws, rules, regulations and codes of the United States and the State of Colorado, the charter, ordinances and rules and regulations of the City and County of Denver, and all Denver International Airport Rules and Regulations.

21. WAIVER OF C.R.S. 13-20-802, et. seq.:

Notwithstanding any other provision of this Agreement, the Contractor specifically waives all the provisions of Chapter 8 of Article 20 of Title 13, Colorado Revised Statutes (also designated C.R.S. 13-20-802, et. seq.) relating to any design and construction defects in the Project under this Agreement.

22. COMPLIANCE WITH PATENT, TRADEMARK, COPYRIGHT AND SOFTWARE LICENSING LAWS:

A. The Contractor agrees that all work performed under this Agreement shall comply with all applicable patent, trademark, copyright and software licensing laws, rules, regulations

and codes of the United States. The Contractor will not utilize any protected patent, trademark or copyright in performance of its work unless it has obtained proper permission and all releases and other necessary documents. If the Contractor prepares any design documents which specify any material, equipment, process or procedure which is protected, the Contractor shall disclose such patents, trademarks and copyrights in the construction drawings or specifications.

B. The Contractor further agrees to release, indemnify and save harmless the City, its officers, agents and employees, pursuant to Paragraph 16, "Defense and Indemnification," from any and all claims, damages, suits, costs, expenses, liabilities, actions or proceedings of any kind or nature whatsoever, of or by anyone whomsoever, in any way resulting from, or arising out of, directly or indirectly, the performance of work under this Agreement which violates or infringes upon any patent, trademark, copyright or software license protected by law, except in cases where the Contractor's personnel are working under the direction of City personnel and do not have direct knowledge or control of information regarding patents, trademarks, copyrights and software licensing.

23. TAXES AND COSTS:

1. The Contractor, at its own expense, shall promptly pay, when due, all taxes, bills, debts and obligations it incurs performing work under this Agreement and shall allow no lien, mortgage, judgment or execution to be filed against land, facilities or improvements owned by the City.

2. The City shall provide to Contractor, at no cost, all necessary clearances and permits necessary to install and/or deliver the additional remote units required for the Tracking System and/or Aerobahn under this Agreement. Where such clearances, permits, leases, or fees of a similar nature are required to be obtained and paid for directly by Contractor, the City shall reimburse Contractor the actual cost of such items.

3. The City affirms that it is a tax-exempt entity under the Laws of the State of Colorado and this purchase qualifies for the Denver and Colorado sales tax exemption for sales to the United States government, the State of Colorado, its departments and institutions, and its political subdivisions (county and local governmental, school districts and special districts); is a government purchase used only in an official governmental capacity; and will be paid directly by a government agency. Taking into account the City's status, Contractor confirms that all Charges are inclusive of all taxes, levies, duties and assessments ("Taxes") of every nature in effect as of the Effective Date and due in connection with its performance of its obligations under this Agreement. Contractor is responsible for payment of such Taxes to the appropriate governmental authority.

24. OWNERSHIP OF WORK PRODUCT:

All plans, drawings, reports, other submittals, and other documents submitted to the City or its authorized agents by the Contractor shall become and are the property of the City, and the City may, without restriction, make use of such documents and underlying concepts as it sees fit.

The Contractor shall not be liable for any damage which may result from the City's use of such documents for purposes other than those described in this Agreement.

25. ADVERTISING AND PUBLIC DISCLOSURES:

The Contractor shall not include any reference to this Agreement or to work performed hereunder in any of its advertising or public relations materials without first obtaining the written approval of the CEO. Any oral presentation or written materials related to DEN shall include only presentation materials, work product, and technical data which have been accepted by the City, and designs and renderings, if any, which have been accepted by the City. The CEO shall be notified in advance of the date and time of any such presentations. Nothing herein, however, shall preclude the Contractor's use of this contract and its component parts in GSA form 254 or 255 presentations, or the transmittal of any information to officials of the City, including without limitation, the Mayor, the CEO, any member or members of City Council, and the Auditor.

26. COLORADO OPEN RECORDS ACT:

The Contractor acknowledges that the City is subject to the provisions of the Colorado Open Records Act, Colorado Revised Statutes §24-72-201 et seq., and the Contractor agrees that it will fully cooperate with the City in the event of a request or lawsuit arising under such act for the disclosure of any materials or information which the Contractor asserts is confidential and exempt from disclosure. Any other provision of this Agreement notwithstanding, including exhibits, attachments and other documents incorporated into this Agreement by reference, all materials, records and information provided by the Contractor to the City shall be considered confidential by the City only to the extent provided in the Open Records Act, and the Contractor agrees that any disclosure of information by the City consistent with the provisions of the Open Records Act shall result in no liability of the City.

27. USE, POSSESSION OR SALE OF ALCOHOL OR DRUGS:

The Contractor and Contractor's agents shall cooperate and comply with the provisions of the City and County of Denver Executive Order No. 94 and Attachment A thereto concerning the use, possession or sale of alcohol or drugs. Violation of these provisions or refusal to cooperate with implementation of the policy can result in the City's barring the Contractor and Contractor's agents from City facilities or participating in City operations.

28. CITY SMOKING POLICY:

Contractor acknowledges that smoking is not permitted in Airport buildings and facilities except for designated Airport Smoking Concessions, and so agrees that it will prohibit smoking by its employees and the public in indoor areas and within 15 feet of entryways of the Airport Premises, except as may otherwise be permitted by the Colorado Clean Indoor Air Act, C.R.S. §§ 25-14-201 to 209. Contractor and its officers, agents, and employees shall cooperate and comply with the provisions of the Denver Revised Municipal Code, §§ 24-301 to 317 et. seq., the Colorado Clean Indoor Air Act, C.R.S. §§ 25-14-201 to 209, City's Executive Order No. 99 dated December 1, 1993, and Executive Order No. 13 dated July 31, 2002.

29. EXAMINATION OF RECORDS:

The Contractor agrees that the City's duly authorized representatives, including the City's Auditor, shall, until the expiration of three (3) years after the final payment under this Agreement, have access to and the right to examine any directly pertinent books, documents, papers and records of the Contractor involving this Agreement.

30. INFORMATION FURNISHED BY CITY:

The City will furnish to the Contractor available information concerning DEN and any such other matters that may be necessary or useful in connection with the work to be performed by the Contractor under this Contract. The Contractor shall be responsible for the verification of the information provided to the Contractor.

31. CITY REVIEW OF PROCEDURES:

The Contractor agrees that, upon request of the SVP, at any time during the term of the Agreement or three years thereafter, it will make full disclosure to the City of the means, methods, and procedures used in performance of services hereunder.

32. TERMINATION:

A. The City has the right to terminate this Agreement without cause on thirty (30) days written notice to the Contractor, and with cause on ten (10) days written notice to the Contractor. However, nothing herein shall be construed as giving the Contractor the right to perform services under this Agreement beyond the time when such services become unsatisfactory to the CEO.

B. If the Contractor is discharged before all the services contemplated hereunder have been completed, or if the Contractor's services are for any reason terminated, stopped or discontinued because of the inability of the Contractor to provide service under this Agreement, the Contractor shall be paid only for those services satisfactorily performed prior to the time of termination.

C. If this Agreement is terminated, the City shall take possession of all materials, equipment, tools and facilities owned by the City which the Contractor is using by whatever method it deems expedient, and the Contractor shall deliver to the City all drafts or other documents it has completed or partially completed under this Agreement, together with all other items, materials and documents which have been paid for by the City, and these documents and materials shall be the property of the City.

D. Upon termination of this Agreement by the City, the Contractor shall have no claim of any kind whatsoever against the City by reason of such termination or by reason of any act incidental thereto, except as follows: if the termination is for the convenience of the City the Contractor shall be entitled to reimbursement for the reasonable cost of the Work to the date of

termination, including multiplier, and reasonable costs of orderly termination, provided request for such reimbursement is made no later than six (6) months from the effective date of termination. The Contractor shall not be entitled to loss of anticipated profits or any other consequential damages as a result of any such termination for convenience, and in no event shall the total sums paid exceed the Contract Amount.

33. SURVIVAL OF CERTAIN CONTRACT PROVISIONS:

The parties understand and agree that all terms and conditions of this Agreement, including any warranty provision, which by reasonable implication contemplate continued performance or compliance beyond the termination of this Agreement (by expiration of the term or otherwise) shall survive such termination and shall continue to be enforceable as provided herein.

34. NOTICES:

Notwithstanding any other provision of this Agreement, notices concerning termination of this Agreement, notices of alleged or actual violations of the terms of this Agreement, and other notices of similar importance shall be made as follows:

by Contractor to: City and County of Denver Department of
Aviation - CEO
Denver International Airport
8500 Peña Boulevard, 9th Floor
Denver, Colorado 80249-6340

And by City to: Kathy Selmsler
Senior Contracts Manager
Saab Sensis Corporation
85 Collamer Crossings
East Syracuse, NY 13057

Said notices shall be delivered personally during normal business hours to the appropriate office above or by prepaid U.S. certified mail, return receipt requested. Mailed notices shall be deemed effective upon deposit with the U.S. Postal Service. Either party may from time to time designate substitute addresses or persons where and to whom such notices are to be mailed or delivered, but such substitutions shall not be effective until actual receipt of written notification thereof.

35. RIGHTS AND REMEDIES NOT WAIVED:

In no event shall any payment by the City hereunder constitute or be construed to be a waiver by the City of any breach of covenant or default which may then exist on the part of the Contractor, and the making of any such payment when any such breach or default shall exist shall not impair or prejudice any right or remedy available to the City with respect to such breach or default; and no assent, expressed or implied, to any breach of any one or more covenants,

provisions or conditions of this Agreement shall be deemed or taken to be a waiver of any other breach.

36. NO THIRD PARTY BENEFICIARIES:

It is expressly understood and agreed that enforcement of the terms and conditions of this Agreement and all rights of action relating to such enforcement shall be strictly reserved to the City and the Contractor, and nothing contained in this Agreement shall give or allow any such claim or right of action by any other or third person on such Agreement. It is the express intention of the City and the Contractor that any person other than the City or the Contractor receiving services or benefits under this Agreement shall be deemed to be an incidental beneficiary only.

37. GOVERNING LAW; BOND ORDINANCES; VENUE:

A. This Agreement is made under and shall be governed by the law of Colorado. Each and every term, provision or condition herein is subject to the provisions of Colorado law, the Charter of the City and County of Denver, and the ordinances and regulations enacted pursuant thereto.

B. This Agreement is in all respects subject and subordinate to any and all City bond ordinances applicable to the Denver Municipal Airport System and to any other bond ordinances which amend, supplement, or replace such bond ordinances.

C. Venue for any action arising hereunder shall be in the City and County of Denver, Colorado.

38. SOFTWARE LICENSES AND DATA CONFIDENTIALITY:

A. Software Licenses

1. Contractor grants to Owner a non-exclusive, non-transferable (except as specifically set forth herein), limited license for the Term of this Agreement, as set forth in Section 5 above, to use Aerobahn for the City's business purposes to include affiliated companies and or marketing partners in accordance with the terms and conditions of this Agreement (the "License").

2. Beginning on the Service Commencement Date, Contractor will grant the City access to Aerobahn ("Seats") in accordance with **Exhibit A**. "User" or "Seat" shall mean each individual viewing the Aerobahn system on a display. No right is granted herewith to stream the Aerobahn display to multiple displays. For the removal of doubt, Aerobahn is the licensed software and the Tracking System is hardware (owned by the FAA and Owner) which feeds into Aerobahn. To ensure there is no disruption in service, and appropriate, timely response to technical and related Service inquiries is provided, Owner must provide written notification of any additional Seats at least 15 business days prior to the effective date to ensure

that the appropriate level of access is provided, and the Seats are integrated into the Service Communication Plan.

3. In the event City requires more than allocated number Seats defined per **Exhibit A**, additional seats can be obtained for a negotiated rate not to exceed \$2,500USD/month/seat which must be agreed to in writing by the Parties.

4. Contractor recognizes that it is the intention of the City to sublicense the Aerobahn Service to various other end-users. Both parties recognize the City's utilization of the FAA's ASDE-X Surveillance system for such sublicensing activities are subject to the execution by the City and the sub licensee of the FAA's Memorandum of Agreement (MOA) and FAA Order No. 1200.22E and the approval of said documents by the FAA.

5. Should the City sublicense the Aerobahn Service to third parties (e.g. airlines at DEN), Contractor agrees to separately negotiate with such third parties the acquisition of additional seats; and the development of an interface between the third parties flight planning system and the Aerobahn System. The Aerobahn System will filter the information available to each user based on system defined permissions. Also, the system will filter out all other competitive and performance information that is inappropriate to display. The system will ensure that only authorized users can access each organization's data via web service, reports, and queries. Access to proprietary, competitive data elements will be restricted to ensure that only the "owner" of a data element will be able to see the element unless otherwise authorized by the "owner".

6. Contractor shall request the City's consent, of which the City will not unreasonably withhold, to enter into separate and independent agreements with other third parties (e.g. airport tenants, stakeholders or airlines at DEN) to augment the existing Aerobahn service with additional data sources and/or provision for additional seats for use outside of the Agreement for Aerobahn Surface Management System Design, Installation and Deployment (CE91378) or this agreement.

B. Data Confidentiality and Rights

1. Confidentiality. For the purpose of this Agreement, confidential information means any information, knowledge and data marked "Confidential Information" or "Proprietary Information" or similar legend. All oral and/or visual disclosures of Confidential Information shall be designated as confidential at the time of disclosure, and be summarized, in writing, by the disclosing Party and given to the receiving Party within thirty (30) days of such oral and/or visual disclosures.

The disclosing Party agrees to make known to the receiving Party, and the receiving Party agrees to receive Confidential Information solely for the purposes of this Agreement. All Confidential Information delivered pursuant to this Agreement:

- a) shall not be distributed, disclosed, or disseminated in any way or form by the receiving Party to anyone except its own employees, corporate

partners, affiliates and alliance partners who have a need to know said Confidential Information;

b) shall be treated by the receiving Party with the same degree of care to avoid disclosure to any third Party as is used with respect to the receiving Party's own information of like importance which is to be kept confidential.

These obligations shall not apply, however, to any information which:

a) is already in the public domain or becomes available to the public through no breach of this Agreement by the receiving Party; or

b) was in the receiving Party's possession prior to receipt from the disclosing Party; or

c) is received by the receiving Party independently from a third Party free to disclose such information; or

d) is subsequently independently developed by the receiving Party as proven by its written records; or

e) is disclosed when such disclosure is compelled pursuant to legal, judicial, or administrative proceeding, or otherwise required by law, subject to the receiving Party giving all reasonable prior notice to the disclosing Party to allow the disclosing Party to seek protective or other court orders.

Upon the request from the disclosing Party, the receiving Party shall return to the disclosing Party all Confidential Information, or if directed by the disclosing Party, shall destroy such Confidential Information.

C. Data Rights / Intellectual Property

All Intellectual Property, defined to mean all information, data and technology (including all ideas, discoveries, inventions, methods techniques and processes, designs, improvements and innovations, all specifications, requirements, software and other works of authorship, and all know-how), whether or not patentable and whether or not reduced to practice, as it relates to Aerobahn and associated software and hardware is the sole property of Saab Sensis Corporation. This agreement in no way transfers ownership of Aerobahn and associated software or intellectual property related thereto from Saab Sensis to Owner.

39. PREVAILING WAGES:

Employees of the Contractor or its subcontractors may be subject to the payment of prevailing wages pursuant to D.R.M.C. 20-76, depending upon the nature of the Work. By executing this Agreement, the Contractor covenants that it is familiar with this Code Section and is prepared to pay or cause to be paid prevailing wages, if any, applicable to the work conducted

by the Contractor's or its subcontractor's employees. The schedule of prevailing wage is periodically updated and Contractor is responsible for payment of then current prevailing wage. The Contractor may obtain a current schedule of prevailing wage rates at any time from the City Auditor's Office.

40. NO EMPLOYMENT OF ILLEGAL ALIENS TO PERFORM WORK UNDER THE AGREEMENT:

- (a) The Agreement is subject to Article 17.5 of Title 8, Colorado Revised Statutes, and Den. Rev. Mun. Code 20-90 and the Contractor is liable for any violations as provided in said statute and ordinance.
- (b) The Contractor certifies that:
 - (1) At the time of its execution of this Agreement, it does not knowingly employ or contract with an illegal alien who will perform work under this Agreement.
 - (2) It will participate in the E-Verify Program, as defined in § 8-17.5-101(3.7), C.R.S., to confirm the employment eligibility of all employees who are newly hired for employment to perform work under this Agreement.
- (c) The Contractor also agrees and represents that:
 - (1) It shall not knowingly employ or contract with an illegal alien to perform work under the Agreement.
 - (2) It shall not enter into a contract with a subcontractor or subconsultant that fails to certify to the Contractor that it shall not knowingly employ or contract with an illegal alien to perform work under the Agreement.
 - (3) It has confirmed the employment eligibility of all employees who are newly hired for employment to perform work under this Agreement, through participation in the E-Verify Program.
 - (4) It is prohibited from using either the E-Verify Program or the Department Program procedures to undertake pre-employment screening of job applicants while performing its obligations under the Agreement, and it has complied with all federal requirements regarding the use of the E-Verify program, including, by way of example, requirements related to employee notification and preservation of employee rights.
 - (5) If it obtains actual knowledge that a subcontractor or subconsultant performing work under the Agreement knowingly employs or contracts with an illegal alien, it will notify such subcontractor and the City within three days. The Contractor will also then terminate such subcontractor or subconsultant if within three days after such notice the subcontractor or subconsultant does not stop employing or contracting with the

illegal alien, unless during such three day period the subcontractor or subcontractor provides information to establish that the subcontractor or subconsultant has not knowingly employed or contracted with an illegal alien.

- (6) It will comply with any reasonable request made in the course of an investigation by the Colorado Department of Labor and Employment under authority of § 8-17.5-102(5), C.R.S. or the City Auditor under authority of Den. Rev. Mun. Code 20-90.3.

41. PARAGRAPH HEADINGS:

The captions and headings set forth herein are for convenience of reference only, and shall not be construed so as to define or limit the terms and provisions hereof.

42. CONTRACT DOCUMENTS; ORDER OF PRECEDENCE:

This Agreement consists of Sections 1 through 49 which precede the signature page, and the following attachments which are incorporated herein and made a part hereof by reference (the "Contract Documents"):

| | |
|-----------------|-----------------------------|
| Appendices | Standard Federal Assurances |
| Exhibit A: | Service Description |
| Exhibit B: | Service Description Pricing |
| Exhibit C: | Certificate of Insurance |
| Attachments A-D | |

In the event of an irreconcilable conflict between a provision of Sections 1 through 49 and any of the listed attachments or between provisions of any attachments, such that it is impossible to give effect to both, the order of precedence to determine which document shall control to resolve such conflict, is as follows, in descending order:

| |
|------------------------------|
| Appendices |
| Sections 1 through 49 hereof |
| Exhibit A |
| Exhibit B |
| Exhibit C |
| Attachments A-D |

43. AGREEMENT AS COMPLETE INTEGRATION; AMENDMENTS:

This Agreement is intended as the complete integration of all understandings between the parties. No prior or contemporaneous addition, deletion, or other amendment hereto shall have any force or affect whatsoever, unless embodied herein in writing. No subsequent novation, renewal, addition, deletion, or other amendment hereto shall have any force or effect unless embodied in a written amendatory or other agreement properly executed by the parties. This Agreement and any amendments shall be binding upon the parties, their successors and assigns.

44. INUREMENT:

The rights and obligations of the parties herein set forth shall inure to the benefit of and be binding upon the parties hereto and their respective successors and assigns permitted under this Agreement.

45. FORCE MAJEURE:

Neither party shall be liable for any failure to perform any of its obligations hereunder due to or caused by, in whole or in part, fire, strikes, lockouts, unusual delay by common carriers, unavoidable casualties, war, riots, acts of terrorism, acts of civil or military authority, acts of God, judicial action, or any other causes beyond the control of the parties. Both parties shall have the duty to take reasonable actions to mitigate or prevent further delays or losses resulting from such causes.

46. SEVERABILITY; ENTIRE AGREEMENT:

If any part, portion or provision of this Agreement shall be found or declared null, void, or unenforceable for any reason whatsoever by any court of competent jurisdiction or any governmental agency having applicable authority, only such part, portion, or provision shall be affected thereby and all other parts, portions and provisions of this Agreement shall remain in full force and effect. The Contract Documents form the entire agreement between the parties and are fully binding on the parties. No oral representations or other agreements have been made except as specifically stated in the Contract Documents.

47. COUNTERPARTS OF THIS AGREEMENT:

This Agreement may be executed in counterparts, each of which shall be deemed to be an original of this Agreement.

48. ELECTRONIC SIGNATURES AND ELECTRONIC RECORDS:

Contractor consents to the use of electronic signatures by the City. The Agreement, and any other documents requiring a signature hereunder, may be signed electronically by the City in the manner specified by the City. The Parties agree not to deny the legal effect or enforceability of the Agreement solely because it is in electronic form or because an electronic record was used in its formation. The Parties agree not to object to the admissibility of the Agreement in the form of an electronic record, or a paper copy of an electronic document, or a paper copy of a document bearing an electronic signature, on the ground that it is an electronic record or electronic signature or that it is not in its original form or is not an original.

49. CITY EXECUTION OF AGREEMENT:

This Agreement is expressly subject to and shall not be or become effective or binding on the City until it has been approved by City Council, if so required by law, and fully executed by all signatories of the City and County of Denver.

[Signatures on Following Page]

Contract Control Number:

IN WITNESS WHEREOF, the parties have set their hands and affixed their seals at Denver, Colorado as of

SEAL

CITY AND COUNTY OF DENVER

ATTEST:

By _____

APPROVED AS TO FORM:

REGISTERED AND COUNTERSIGNED:

By _____

By _____

By _____





Surveillance Maintenance

Exhibit A – Aerobahn Extended Service and Maintenance

Document # 19696

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1 General Overview of Service

The following outlines the scope of Extended Aerobahn Service and Surveillance Maintenance for Denver International Airport (DIA) in accordance with the work performed and procured under: Agreement for Aerobahn Surface Management System Design, Installation and Deployment (CE91378) dated 22 Jun 2010; and maintained thereafter, under Agreement for Aerobahn Surface Management System Extended Aerobahn Service and Surveillance Maintenance Agreement number PLANE201310869 dated 1 January 2014.

This document outlines the scope of service defined as Service Description to include the following:

- Aerobahn Extended Service
- Surveillance Maintenance
- Aerobahn Deice Manager
- Global Flight Manager
- Flight Arrival Monitor
- Airport Status Dashboard

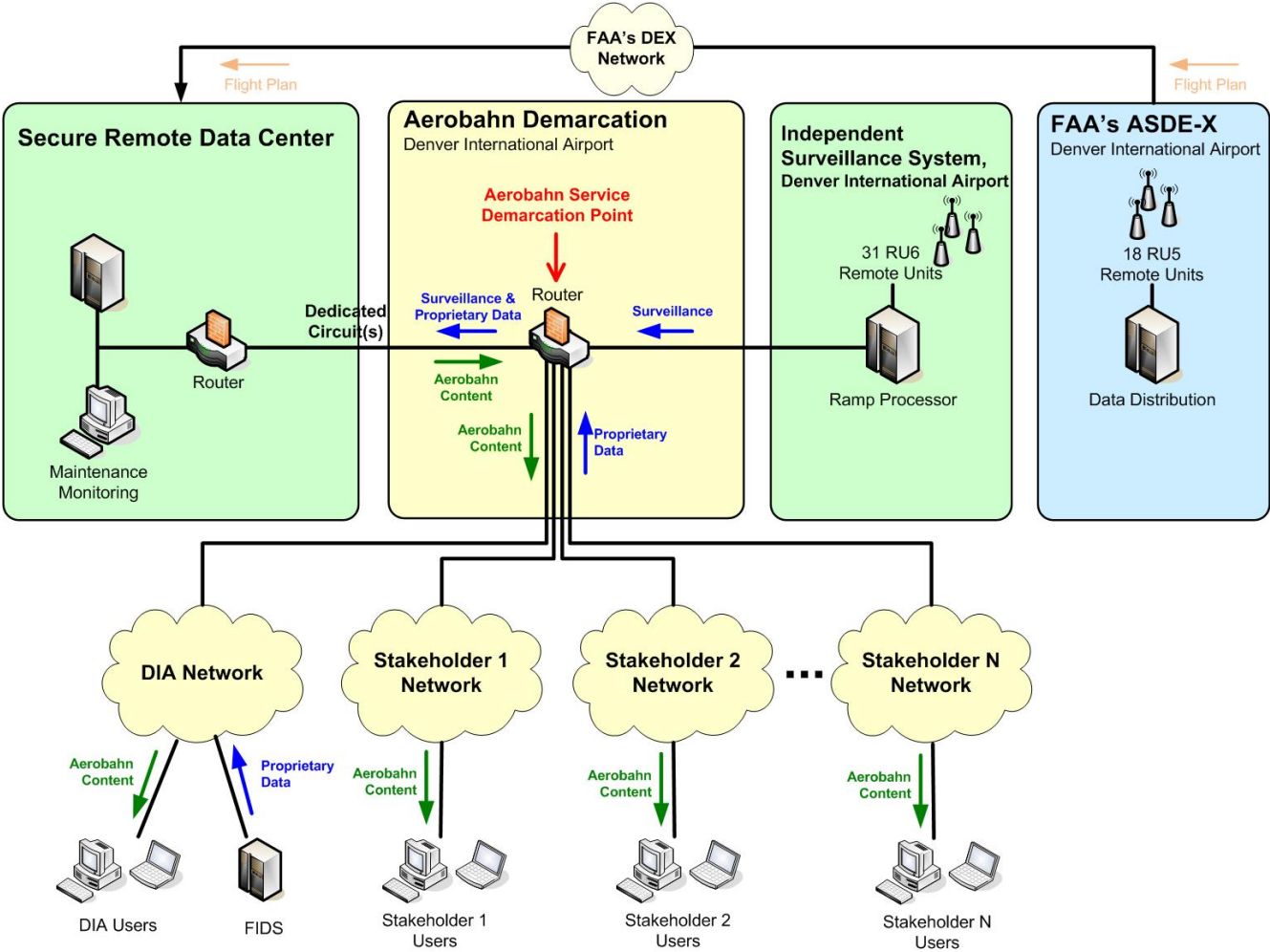
2 Aerobahn Extended Service

2.1 High Level Overview

Figure 1 outlines responsibility by Party:

- Contractor: Owns and maintains the Aerobahn Service and all of the equipment up to the Demarcation point at the City.
- City: Owns and maintains its' IT infrastructure and the Aerobahn Surveillance system with 3rd level support provided by Contractor.
- FAA: Owns and maintains the ASDE-X system.

Figure 1 - Responsibility by Party



2.2 Aerobahn Extended Service Elements

The following table summarizes the extended service elements included with the Aerobahn Extended Service.

Figure 2 - Aerobahn Extended Service Elements

| Element | Description |
|------------------------------|---|
| Product Access | TaxiView, OpsView, Deice Manager, Global Flight Manager, Flight Arrival Monitor and Airport Status Dashboard. |
| System/Service Access | The City will have access to the following: <ul style="list-style-type: none"> ○ 27 simultaneous log-in “Seats” for the Aerobahn DEN System; ○ 12 additional seats available for use by the Deice House facility during deicing season; and |



| Element | Description |
|---|---|
| | <ul style="list-style-type: none"> ○ 10 additional seats available for use by the City, the FAA or any other non-airline application. Utilization of seats by an airline subject to prior written consent by the Contractor. |
| 24x7 Customer Service | Around the clock access to Contractor by Authorized City Users. |
| Aerobahn Communications Plan | The existing Communications plan will be used and will be updated as required over the life of the Service. This is a written plan describing how actions will be taken during the duration of the service. |
| User Account Administration | Addition and deletions of User accounts. |
| Annual User Group Meetings | An interactive face-to-face meeting where the Aerobahn Service is discussed and action items assigned. |
| Aerobahn Hosting | Primary, Secondary, Shadow and test services are hosted at secure remote data center. |
| Data Back-up and Disaster Recoverability | Aerobahn data is backed up, stored, and restored as needed. The system will retain data online for reports and playback for a two year rolling time period. Data will be retained offline for a maximum of five years. |
| 99% Availability | The Contractor will strive for a system availability of 99%. Availability is calculated on a monthly bases, with exception of the elapsed time of scheduled maintenance activities taking place between the hours of 12:00 midnight MST/MDT to 5:00 a.m. MST/MDT. |
| Software Updates | Contractor is committed to ensure that our software works as intended. The City will be appraised of the planned updates well in advance of deployment. Updates will be scheduled for installation during non-peak hours, and all deployment activities will be well coordinated by the Provider's Service Delivery Manager, with the appropriate the City personnel. |
| Annual Software Upgrades | Annual upgrades of functionality. Contractor will perform an annual software upgrade. The City will be appraised of upgrades well in advance of deployment. Upgrades will be scheduled for installation during non-peak hours, and all deployment activities will be well coordinated by the Contractor Service Delivery Manager, with the appropriate the City personnel. |
| Annual Refresher Training | Annual onsite refresher training to ensures users are aware of the functionality of the product. The training will include a morning and afternoon session. |
| Communication Circuits | Maintain current agreements with communication circuit providers for circuits between the City and Contractor. |
| Deicing Manager | The City will have access to the Aerobahn Deice Manager from within Aerobahn. |

| Element | Description |
|-------------------------------------|---|
| | Contractor will provide deicing module maintenance and upgrade For detailed product information please refer to Attachment A, Product Description – Deice Manager |
| Predictive Suite Maintenance | Contractor will provide predictive suite maintenance and optimization. |
| Airport Status Dashboard | The City will have access to the Airport Status Dashboard product from within Aerobahn. For detailed product information please refer to Attachment B, Product Description – Airport Status Dashboard. |
| Global Flight Manager (GFM) | The City will have access to the new Global Flight Manager (GFM) product for five (5) licenses. For detailed product information please refer to Attachment C, Product Description – Global Flight Manager |
| Flight Arrival Monitor (FAM) | The City will have access to the new Flight Arrival Monitor (FAM) product for five (5) licenses. For detailed product information please refer to Attachment D, Product Description – Flight Arrival Monitor |

3 Surveillance Maintenance

The following table summarizes the service elements which are applicable to the Aerobahn Surveillance System. As of the Effective Date of the Agreement the Contractor will continue to support the current Multilateration Surveillance System owned by the City. Contractor will support all components of the City’s owned Multilateration Surveillance System govern under and for the duration of the Agreement.

Figure 3 - Aerobahn Surveillance Service Elements

| Element | Description |
|---------------------------------------|---|
| 24x7 Customer Service | Around the clock access to Contractor by Authorized City Users. |
| Remote Maintenance | Contractor will have the ability to remotely access the Aerobahn Surveillance System for diagnosis and maintenance. |
| Local Monitoring | The City will have the ability to monitor the system performance and call Contractor. |
| Technical Support | Contractor will provide remote technical support to the City site technicians to assist in resolution of system issues. |
| Repair/Replace of Failed units | Contractor will provide hardware repair or replacement services for equipment returned. |
| On-Site Support | If required, Contractor is available to travel to DIA on a Time and Materials basis for the Surveillance System. |
| Communication Circuits | Maintain current agreements with communication circuit providers for circuits between the City and Contractor. |



3.1 Contractor Logistics Support (CLS) for the Surveillance System

3.1.1 Introduction

This section provides the overall scope of effort and service level response times for the CLS portion for the Surveillance System. Key elements include:

- Customer Service and Project Management
- Hardware Replacement/Repair
- Technical Support
- Engineering Services (Time & Materials)

Support services are all initiated by contacting Contractor Customer Service.

3.2 Customer Service and Project Management

Contractor shall provide a single point of contact, by phone and email, to quickly log, track and route all issues and requests from assignment through closure. All issues and requests are assigned a Customer Problem Report (CPR) number to ensure responsive support to both critical and non-critical issues. Customer service is available 24 a day, 7 days a week, 365 days a year.

3.3 Hardware Replacement/Repair

Contractor will provide hardware repair or replacement services for equipment returned by the City. This covers both critical and non-critical failures. If Contractor chooses to provide a replacement part, the failed item must be received by Contractor within 30 days from date the City receives the replacement part or the City will be billed for the full value of the replacement part.

For failures that are system critical and for which the City does not have a spare on site, Contractor ships a replacement part within 3 business days of notification. For non-critical failures, Contractor repairs the failed part within 45 days of receiving the failed part at Contractor. Contractor reserves the right to provide functionally compatible replacements for any Contractor-supported equipment.

Installation of hardware and/or loading of new software builds is the responsibility of the City and should be performed according to the Maintenance Training and Maintenance Manuals, both of which were previously provided by Contractor to the City. If the City desires Contractor to perform the hardware replacement or software update, requiring an on-site visit, the labor and T&L to complete this task will be covered under Section 3.5 Engineering Services.

3.4 Technical Support

Contractor will provide remote technical support to the City site technicians to assist in resolution of system issues that prevent the MDS system from meeting specified performance requirements resulting from a system defect (i.e., hardware failure or software bug). This would not include system performance issues caused by the City personnel or environment changes such as new building construction, bad aircraft transponders, interference due to new radars, and other changes to the operating environment on or around the airport which are beyond the control of Contractor. Resolution of these issues is covered under Section 3.5 Engineering Services. Technical Support is provided by a qualified Contractor engineer via phone, email, or other electronic means. For critical issues, Contractor begins resolution within 1 business day of notification. For non-critical issues, Contractor contacts the customer within 10 business days to determine a mutually beneficial resolution plan/schedule.

3.5 Engineering Services (Time & Materials)

Engineering services may be requested on a time and material basis. This may include system performance analyses, on-site technical support, or general engineering analysis desired by the City. This may also include system performance issues that are caused by the City personnel or environment changes on or around the airport.

For instances when the City requests Contractor Technical Support on-site, this support will be billed at the fixed daily labor rate to include travel time as well as travel and living expenses. A 15% administrative expense will be added to travel and living costs only.

This option provides a contract vehicle to define and implement Additional Services or engineering services requests in an expeditious manner.

3.6 Shipping

ALL goods shipped to Denver International Airport (including CD ROM, software, documents, hardware etc.) must be sent to the following address:

Ultimate Consignee:

Denver International Airport
TBD
Denver, Colorado Zip Code

Contractor is responsible for shipping parts from Contractor Service Center to the City’s premises. All repair, replacement or new purchase transactions will ship via Contractor approved carriers.

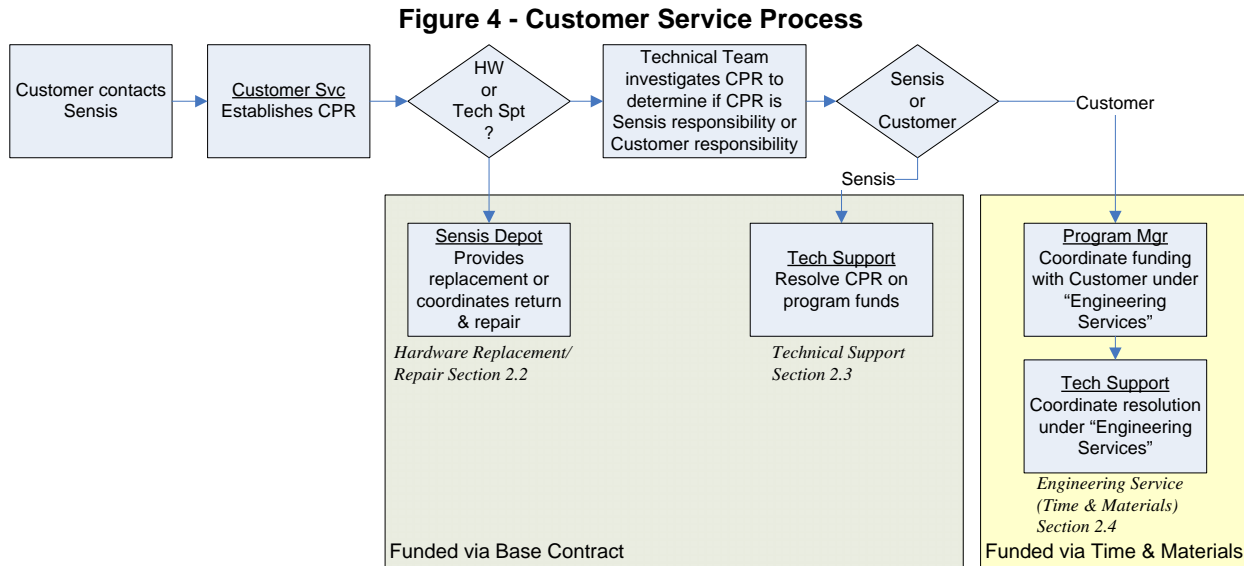
The City is responsible for shipping parts from the City’s site to Contractor Service Center.

The City is responsible for the ultimate payment of all taxes including stamp charges, licenses, duties, and governmental exactions by whatever name, which may be assessed or levied outside the United States on or on account of the work performed hereunder.



3.7 The Customer Service Process

The Customer Service process used by Contractor is the foundation of guaranteeing the support necessary to address all needs of our customers. Figure 4 provides a high-level overview of the Customer Service process and the funding vehicles that support key support elements.



3.8 Customer Problem Report

The Customer Problem Report (CPR) is used by Contractor Corporation as the primary means to initiate all support actions for our customers including repair, replacement and technical support. The electronic CPR form will be provided to the City to facilitate electronic submittal if desired.

3.9 Customer Service Response Process Summary

Upon receipt of a customer call or email at the Contractor Customer Service, a customer service representative logs the request into the Product Support Database. The Customer Service representative then assigns and dispatches assistance depending upon the type of request and service level selected. For each CPR form sent by the City, Contractor shall inform the City about the CPR number and confirm the critical or non-critical status of the CPR within 1 business day.

If the request is for hardware support, Contractor` Customer Service coordinates the replacement or repair of the failed hardware.

If the request is for technical support, a technical support representative will be assigned to evaluate the issue. If the issue is determined to be the result of a Contractor system defect, the technical support representative will respond to the City Point of Contact (POC), investigate the issue, resolve the issue, and update the Contractor Product Support Database to reflect the results.



If it is determined that the issue is not the result of a Contractor system defect (and therefore out-of-scope), a customer service representative will notify the City POC and provide an estimate of the number of hours required to address the issue. Contractor will not begin working on this issue until approval is received from the POC. If, during this effort, the Contractor technical support representative determines that resolving the issue will require additional hours over-and-above the original estimate, the technical support representative will cease working the issue. A new estimate will then be provided to the City POC. Work will resume once approval is received from the City.

3.10 Customer Service Availability and Contact Information

- a. Customer would complete a CPR form before contacting Contractor.
- b. Customer would contact Contractor with the details of the CPR
 - i. Telephone + 1 315 445 5000
 - ii. Contractor Customer Service availability is as follows
 1. 24x7x365 days
 2. Calls are answered by a Customer Service representative Monday through Friday from 08:00 hours to 17:00 hours EST/EDT in the USA.
 3. Calls are answered by a voice mail system at all other times.
Press 1 for immediate assistance.
The call will be immediately directed to a customer service representative.
Press 2 for next-business-day assistance.
The caller will be prompted to leave a message, and the call will be returned at the start of the next business day in the USA defined as Monday through Friday from 08:00 hours to 17:00 hours EST/EDT in the USA.
- c. Email: customerservice@saabsensis.com.
 - i. Emails receive a response within one (1) USA business day defined as Monday through Friday from 08:00 hours to 17:00 hours EST/EDT in the USA.





SAAB

Surveillance Maintenance

Exhibit B – Service Description - Pricing

Document # 19696

Rev 3: 4 April 2018

Rev 2: 15 March 2018

Rev 1: 21 September 2017

12 September 2017

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Figure 1 - Pricing 1



1 Pricing for Aerobahn Extended Service and Surveillance Maintenance

Figure 1 - Pricing

| Terms | |
|---|-----------------|
| Effective Date - Service Start Date | January 1, 2019 |
| Term of the Service | 60 months |
| Monthly Price Includes: | \$54,000 |
| <ul style="list-style-type: none"> • Customer Service • Aerobahn Service (49 Licenses) • Aerobahn Surveillance System Maintenance • Deice Manager • Airport Status Dashboard • Global Flight Manager (5 Licenses) • Flight Arrival Monitor | |

1.1 Payment Terms and Schedule of Fees

Payment for this Agreement shall be as follows:

- Invoices will be billed monthly prior to the beginning of each month.
- Engineering services (as applicable) will be billed on a Time and Materials basis.
- Travel (as requested), will be billed in accordance with the terms and conditions of the Agreement Aerobahn Surface Management System.
- Payment Terms – In accordance with terms and conditions of the Agreement Aerobahn Surface Management System, specifically City and County of Denver Prompt Pay Ordinance.
- All prices are stated in U.S. Dollars.



**CITY AND COUNTY OF DENVER
INSURANCE REQUIREMENTS FOR THE DEPARTMENT OF AVIATION**

Certificate Holder Information:

CITY AND COUNTY OF DENVER
Attn: Risk Management, Suite 8810
Manager of Aviation
Denver International Airport
8500 Peña Boulevard, Room 8810
Denver CO 80249

CONTRACT NAME & NUMBER TO WHICH THIS INSURANCE APPLIES: 201839841 Aerobahn Extended Services

I. MANDATORY COVERAGE

Colorado Workers' Compensation and Employer Liability Coverage

Coverage: COLORADO Workers' Compensation

Minimum Limits of Liability (In Thousands)

WC Limits: \$100, \$500, \$100

And Employer's Liability Limits:

Any Policy issued under this section must contain, include or provide for the following:

1. All States Coverage or Colorado listed as a covered state for the Workers' Compensation
2. Waiver of Subrogation and Rights of Recovery against the City and County of Denver (the "City"), its officers, officials and employees.

Commercial General Liability Coverage

Coverage: Commercial General Liability (coverage at least as broad as that provided by ISO form CG0001 or equivalent)

Minimum Limits of Liability (In Thousands):

| | |
|--|---------|
| Each Occurrence: | \$1,000 |
| General Aggregate Limit: | \$2,000 |
| Products-Completed Operations Aggregate Limit: | \$2,000 |
| Personal & Advertising Injury: | \$1,000 |
| Fire Damage Legal - Any one fire: | \$1,000 |

Any Policy issued under this section must contain, include or provide for the following:

1. City, its officers, officials and employees as additional insureds, per ISO form CG2010 and CG 2037 or equivalents.
2. Coverage for defense costs of additional insureds outside the limits of insurance, per CG0001.
3. Liability assumed under an Insured Contract (Contractual Liability).
4. The full limits of coverage must be dedicated to apply to this project/location, per ISO form CG2503 or equivalent.
5. Waiver of Subrogation and Rights of Recovery, per ISO form CG2404 or equivalent.
6. Separation of Insureds Provision required
7. General Aggregate Limit Applies Per: Policy ___ Project ___ Location ____, if applicable

Business Automobile Liability Coverage

Coverage: Business Automobile Liability (coverage at least as broad as ISO form CA0001)

Minimum Limits of Liability (In Thousands): Combined Single Limit \$1,000

Any Policy issued under this section must contain, include or provide for the following:

1. Symbol 1, coverage for any auto. If no autos are owned, Symbols 8 & 9, (Hired and Non-owned) auto liability.
2. If this contract involves the transport of hazardous cargo such as fuel, solvents or other hazardous materials may occur, then Broadened Pollution Endorsement, per ISO form CA 9948 or equivalent and MCS 90 are required.

II. ADDITIONAL COVERAGE

Umbrella Liability

Coverage:

Umbrella Liability, Non Restricted Area

Minimum Limits of Liability (In Thousands)

Each Occurrence and aggregate

\$1,000

Any Policy issued under this section must contain, include or provide for the following:

1. City, its officers, officials and employees as additional insureds.
2. Coverage in excess of, and at least as broad as, the primary policies in sections WC-1, CGL-1, and BAL-1.
3. **If operations include unescorted airside access at DIA, then a \$9 million Umbrella Limit is required.**

Professional Liability only as applicable Information Technology Contracts

Coverage: Professional Liability including Cyber Liability for Errors and Omissions

(If contract involves software development, computer consulting, website design/programming, multi-media designers, integrated computer system design, data management, and other computer service providers.)

Minimum Limits of Liability (In Thousands)

Per Claim

\$1,000

Any Policy issued under this section must contain, include or provide for the following:

1. The insurance shall provide coverage for the following risks:
 - a. Liability arising from theft, dissemination and / or use of confidential information (a defined term including but not limited to bank account, credit card account, personal information such as name, address, social security numbers, etc. information) stored or transmitted in electronic form
 - b. Network Security Liability arising from the unauthorized access to, use of or tampering with computer systems including hacker attacks, inability of an authorized third party, to gain access to your services including denial of service, unless caused by a mechanical or electrical failure
 - c. Liability arising from the introduction of a computer virus into, or otherwise causing damage to, a customer's or third person's computer, computer system, network or similar computer related property and the data, software, and programs thereon.
2. Policies written on a claims-made basis must remain in full force and effect in accordance with CRS 13-80-104. The Insured warrants that any retroactive date under the policy shall precede the effective date of this Contract; and that either continuous coverage will be maintained or an extended discovery period will be exercised for a period of two (2) years beginning at the time work under the Contract is completed.
3. Any cancellation notice required herein may be provided by either certified or regular mail.
4. The policy shall be endorsed to include the City, its elected officials, officers and employees as additional insureds with respect to liability arising out of the activities performed by, or on behalf of the Insured
5. Coverage must include intellectual property offenses related to internet.

III. ADDITIONAL CONDITIONS

It is understood and agreed, for the benefit of the City, that the following additional conditions shall apply to all coverage specified herein

- All coverage provided herein shall be primary and any insurance maintained by the City shall be considered excess.
- With the exception of professional liability and auto liability, a Waiver of Subrogation and Rights of Recovery against the City, its officers, officials and employees is required for each coverage period.
- The City shall have the right to verify or confirm, at any time, all coverage, information or representations contained herein, and the insured and its undersigned agent shall promptly and fully cooperate in any such audit the City may elect to undertake.
- Advice of renewal is required.
- All insurance companies issuing policies hereunder must carry at least an A -VI rating from A.M. Best Company or obtain a written waiver of this requirement from the City's Risk Administrator.
- Compliance with coverage requirement by equivalent herein must be approved in writing by the City's Risk Administrator prior to contract execution.
- No changes, modifications or interlineations on this document shall be allowed without the review and approval of the Risk Administrator prior to contract execution.

NOTICE OF CANCELLATION

It is understood and agreed that should any Policy issued hereunder be cancelled or non-renewed before the expiration date thereof, or sustain a material change in coverage adverse to the City, the issuing company or its authorized Agent shall give notice to the Department of Aviation in accordance with policy provisions.

APPENDIX

Federal Aviation Administration Required Contract Provisions

ALL CONTRACTS – NON-AIP FUNDED

Federal laws and regulations require that recipients of federal assistance (Sponsors) include specific contract provisions in certain contracts, requests for proposals, or invitations to bid.

Certain provisions must be included in all sponsor contracts, regardless of whether or not the contracts are federally-funded. This requirement was established when a sponsor accepted the Airport Improvement Program (AIP) grant assurances.

As used in these Contract Provisions, “Sponsor” means The City and County of Denver, Department of Aviation, and “Contractor” or “Consultant” means the Party of the Second Part as set forth in Contract Number **PLANE 201839841**.

GENERAL CIVIL RIGHTS PROVISIONS

The contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the contractor and subtier contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

Compliance with Nondiscrimination Requirements

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor”) agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts And Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.
3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor’s obligations under this contract and the Nondiscrimination Acts And Authorities on the grounds of race, color, or national origin.

APPENDIX

Federal Aviation Administration Required Contract Provisions

ALL CONTRACTS – NON-AIP FUNDED

4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts And Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:
 - a. Withholding payments to the contractor under the contract until the contractor complies; and/or
 - b. Cancelling, terminating, or suspending a contract, in whole or in part.
6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination In Federally-Assisted Programs of The Department of Transportation—Effectuation of Title VI of The Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

APPENDIX

Federal Aviation Administration Required Contract Provisions

ALL CONTRACTS – NON-AIP FUNDED

- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 *et seq.*), as amended, (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 *et seq.*), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration’s Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 *et seq.*).

FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers.

The [*contractor / consultant*] has full responsibility to monitor compliance to the referenced statute or regulation. The [*contractor / consultant*] must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division

APPENDIX

Federal Aviation Administration Required Contract Provisions

ALL CONTRACTS – NON-AIP FUNDED

OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). Contractor must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.



SAAB

Aerobahn De-icing Manager (ICE-MAN) Product Description

Date: 05/05/2017

Note – This Product Description is aligned with Aerobahn Software Release 09.00.00

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KEY TERMS

| Abbreviation | Description |
|---------------------|---------------------------------|
| AOBT | Actual Off Block Time |
| ATOT | Actual Takeoff Time |
| AZET | Actual De-ice Pad Entry Time |
| AZQT | Actual De-ice Queue Entry Time |
| AZXT | Actual De-ice Pad Exit Time |
| EOBT | Estimated Off Block Time |
| ETOT | Estimated Takeoff Time |
| EZET | Estimated De-ice Pad Entry Time |
| EZXT | Estimated De-ice Pad Exit Time |
| ROBT | Recommended Off Block Time |
| SOBT | Scheduled Off Block Time |
| STOT | Scheduled Takeoff Time |
| TZQT | Target De-ice Queue Entry Time |
| TOBT | Target Off Block Time |
| TTOT | Target Takeoff Time |

1 PRODUCT NEED

Airport operations during winter weather events are often unpredictable, leading to extended de-icing and taxi out times for flight's. With a lack of information available on expected de-icing queue times and pad occupancy times, aircraft operators do not know when to board passengers and push back from the gate. Additionally, the general first come first serve nature with which de-icing pads are often managed forces flights to push back as soon as possible in order to obtain a position in the de-icing queue.

Combined with a lack of overall situational awareness and accurate metrics, suboptimal decisions are made. These decisions lead to reduced customer satisfaction and increased costs from fuel, delays, lost prioritization opportunities, and secondary de-icing events.

2 PRODUCT OVERVIEW

The Aerobahn De-icing Manager (ICE-MAN) is designed to support, automate and make the de-icing management process as efficient as possible. The product provides airport operators, airline personnel, ramp controllers, and de-icing operators tools to plan, monitor, predict, and report on the flow of aircraft into and out of the de-icing pads at an airport. Furthermore, all stakeholders are provided a clear understanding of what the plan and performance is for each de-icing pad and flight. Automatic and flight specific recommended off block times help minimize de-icing queues and taxi out times, allowing aircraft to hold at the gate when possible without sacrificing their place in line or diminishing the overall throughput.

The Aerobahn ICE-MAN provides scheduling and sequencing of aircraft into centralized de-icing pads. Flights are proactively assigned and sequenced to individual de-icing pads and bays in order to reserve a place in the de-icing queue regardless of each flight's physical location on the airfield. This enables aircraft to wait at the gate or in an alternative location for their turn to enter the de-icing queue (much like the departure metering concept). Once a virtual de-icing queue is built, Aerobahn's state of the art capabilities, such as its state and workflow modeling and predictive engine, calculate the key milestones in the de-icing process. This includes the estimated and actual de-icing queue arrival times, de-icing pad entry times, de-icing durations, de-icing pad exit times, and recommended off block time for every flight assigned to the de-icing schedule.

The general Aerobahn De-icing Manager process consists of the following:

1. The De-icing Manager determines whether or not each flight will de-ice.
2. The De-icing Manager determines the key de-ice times, location, and estimated de-ice duration for each flight that is expected to de-ice
3. The De-icing Manager proactively assigns and sequences each flight into individual de-icing pads and bays.
4. The De-icing Manager displays a Recommended Off Block Time for each flight to assist flight operators meet the de-icing plan
5. Taking into account other factors and priorities, flight operators determine when to push back (Actual Off Block Time)
6. The De-icing Manager observes the de-ice process and updates the aircraft de-ice workflow.

7. Flight operators manually update the de-ice workflow with additional state information not automatically supplied to the system (e.g., configuration complete, spray start, etc.).

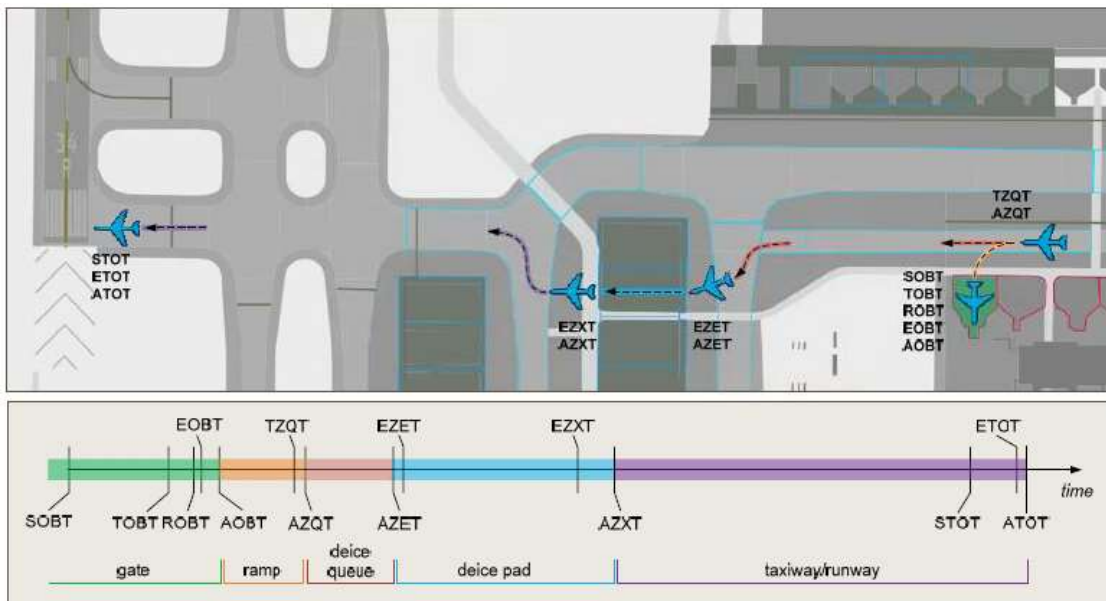


FIGURE 1 – THE DE-ICING MANAGEMENT PROCESS (GENERALIZED)

3 PRODUCT DETAILS

The Aerobahn De-icing Manager leverages airport surface surveillance and flight data to support, automate and streamline the de-icing management process. Some of the key user features are:

- Activate de-icing workflows;
- Change de-icing status for individual flights;
- Track de-icing queue lengths and occupancy times;
- Record de-icing process milestones;
- Search for particular flights; and
- Reporting for post operation analysis.

To deliver accurate, reliable data that is adapted to each user’s needs, the Aerobahn De-icing Manager utilizes the fundamental capabilities of the Aerobahn Platform, such as:

- Data Integration;
- Workflow and event processing;
- Flight predictions and;
- User Management.

Figure 2 below illustrates the Aerobahn De-icing Manager product:



FIGURE 2 – AEROBAHN ICE-MAN PRODUCT TOOLS AND CAPABILITIES

NOTE – The Aerobahn De-icing Manager (ICE-MAN) is a stand-alone tool for management of de-icing operations. However, there are great benefits of combining the de-icing tools with the Aerobahn Surface Manager (SMAN) tools and capabilities (see Figure 3), e.g. the Map Display, to further enhance the situational awareness and efficiency of the de-icing and airport operations. Please see Aerobahn SMAN Product Description for more details.

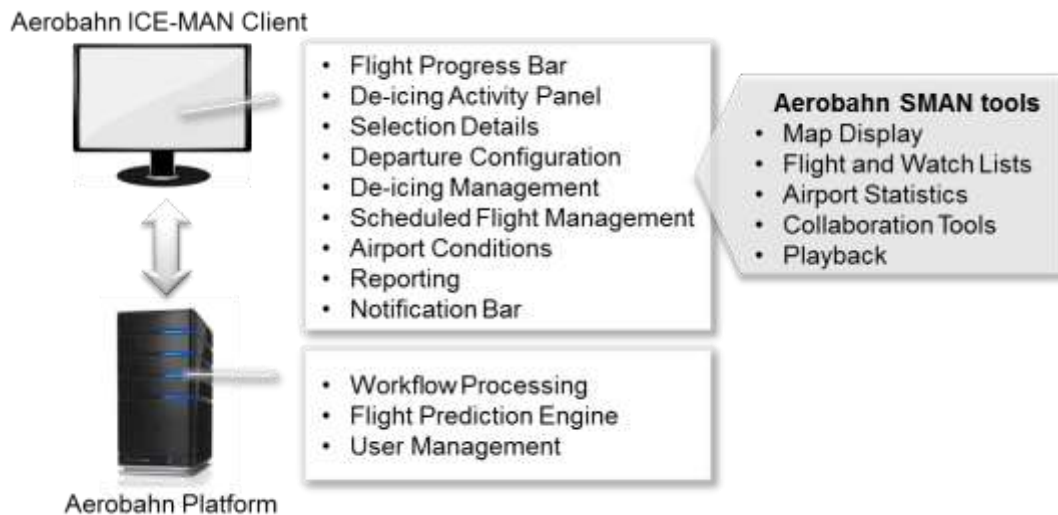


FIGURE 3 – SMAN COMPLEMENTARY CLIENT TOOLS

3.1 AEROBAHN DE-ICING MANAGER CLIENT

The Aerobahn De-icing Manager Client provides the user with a framework of tools to configure and manage the de-icing operations. Figure 4 depicts the main client tools (marked with **bold text**) in an example layout. Please note that the layout can be tailored to the user’s preferences.

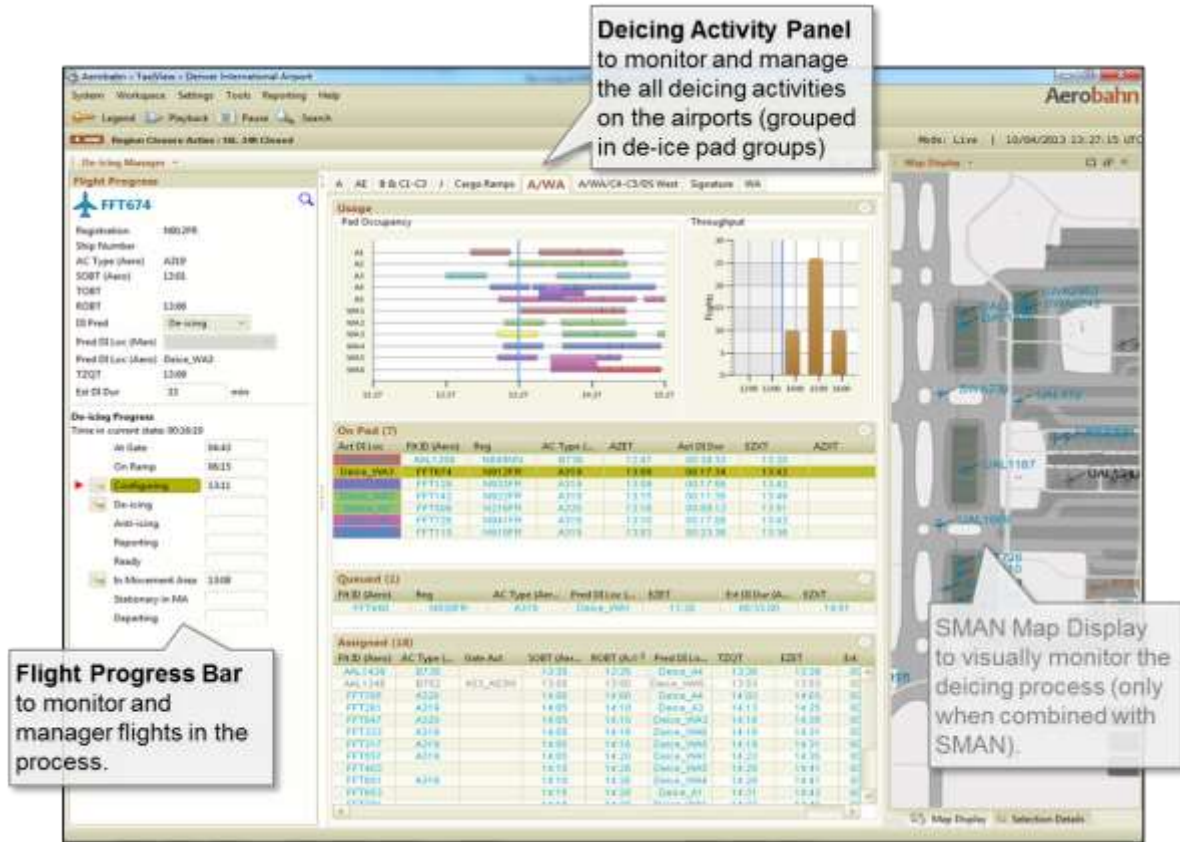
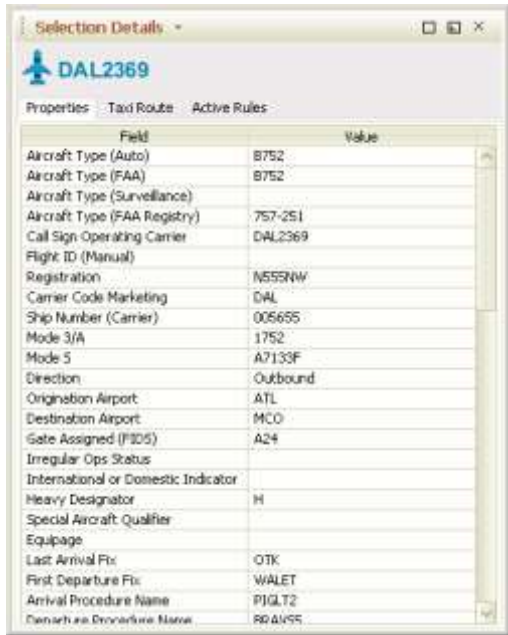
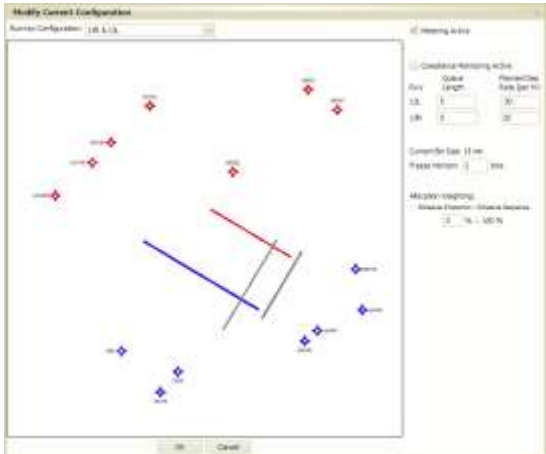

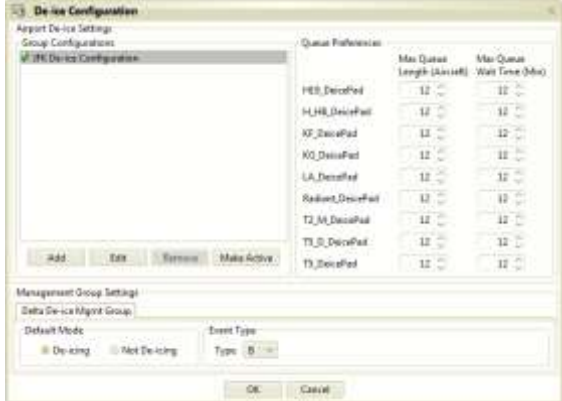


FIGURE 4 – AEROBAHN ICE-MAN CLIENT EXAMPLE LAYOUT

3.1.1 ICE-MAN CONFIGURATION, MANAGEMENT AND MONITORING TOOLS

| Tool/Feature | Description of Feature | Example |
|---------------------------------------|--|---------|
| <p>Flight Progress Bar</p> | <p>The Flight Progress Bar focuses on an individual flight and allows the user to change de-icing status for that flight, activate de-icing workflows and search for specific flights.</p> <p>In the example, information for flight FFT674 is displayed in relation to its de-icing status and workflow progress. The flight is in the state of “Configuring” and can be transitioned to “De-icing” or “In Movement Area”.</p> <p>The workflows are set up through rules and automatic workflow-state transitions, and the user can change workflow state transition times manually as needed to reflect actual conditions.</p> | |
| <p>De-icing Activity Panel</p> | <p>The De-icing Activity Panel focuses on activity in one de-ice pad group or on a selected group of de-ice bays shown on a custom tab at a time (in the example the selected tab is the group “AWA”).</p> <p>Each tab provides controls for one pad group or for a selected grouping of pads and bays. A tab is divided into collapsible sections:</p> <ul style="list-style-type: none"> • Usage charts that represent de-icing pad occupancy and de-icing pad throughput • On Pad table that identifies flights associated with that pad group or-on custom tabs-with selected pads and are currently in the "On Pad" de-ice state. | |

| Tool/Feature | Description of Feature | Example | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------|---|--|-------|-------|----------------------|------|---------------------|------|------------------------------|--|------------------------------|---------|-----------------------------|---------|--------------------|--|--------------|--------|------------------------|-----|-----------------------|--------|----------|------|--------|--------|-----------|----------|---------------------|-----|---------------------|-----|----------------------|-----|----------------------|--|-------------------------------------|--|------------------|---|----------------------------|--|-----------|--|------------------|-----|---------------------|-------|------------------------|--------|--------------------------|---------|
| | <ul style="list-style-type: none"> Queued table that identifies flights associated with that pad group or-on custom tabs-with selected pads and are currently in the "Queued" de-ice state An Assigned table that identifies flights associated with that pad group or-on custom tabs-with selected pads and are currently in the "Assigned" de-ice state | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Selection Details | <p>The Selection Details tool provides an expanded list of information about a selected target including flight and aircraft information, taxi route, and active rules that are applied to the aircraft.</p> <p>Can be docked like any other tool for ready access and the data fields presented can be selected and ordered by the user.</p> |  <p>The screenshot shows a window titled "Selection Details" for flight DAL2369. It has tabs for "Properties", "Taxi Route", and "Active Rules". The "Properties" tab is active, displaying a table of fields and values:</p> <table border="1"> <thead> <tr> <th>Field</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>Aircraft Type (Auto)</td><td>B752</td></tr> <tr><td>Aircraft Type (FAA)</td><td>B752</td></tr> <tr><td>Aircraft Type (Surveillance)</td><td></td></tr> <tr><td>Aircraft Type (FAA Registry)</td><td>757-251</td></tr> <tr><td>Call Sign Operating Carrier</td><td>DAL2369</td></tr> <tr><td>Flight ID (Manual)</td><td></td></tr> <tr><td>Registration</td><td>N559NW</td></tr> <tr><td>Carrier Code Marketing</td><td>DAL</td></tr> <tr><td>Ship Number (Carrier)</td><td>005655</td></tr> <tr><td>Mode 3/A</td><td>1752</td></tr> <tr><td>Mode S</td><td>A7133F</td></tr> <tr><td>Direction</td><td>Outbound</td></tr> <tr><td>Origination Airport</td><td>ATL</td></tr> <tr><td>Destination Airport</td><td>MCO</td></tr> <tr><td>Gate Assigned (FIDS)</td><td>A24</td></tr> <tr><td>Irregular Ops Status</td><td></td></tr> <tr><td>International or Domestic Indicator</td><td></td></tr> <tr><td>Heavy Designator</td><td>H</td></tr> <tr><td>Special Aircraft Qualifier</td><td></td></tr> <tr><td>Equipment</td><td></td></tr> <tr><td>Last Arrival Fix</td><td>OTK</td></tr> <tr><td>First Departure Fix</td><td>WALET</td></tr> <tr><td>Arrival Procedure Name</td><td>PJGL72</td></tr> <tr><td>Departure Procedure Name</td><td>RR01V55</td></tr> </tbody> </table> | Field | Value | Aircraft Type (Auto) | B752 | Aircraft Type (FAA) | B752 | Aircraft Type (Surveillance) | | Aircraft Type (FAA Registry) | 757-251 | Call Sign Operating Carrier | DAL2369 | Flight ID (Manual) | | Registration | N559NW | Carrier Code Marketing | DAL | Ship Number (Carrier) | 005655 | Mode 3/A | 1752 | Mode S | A7133F | Direction | Outbound | Origination Airport | ATL | Destination Airport | MCO | Gate Assigned (FIDS) | A24 | Irregular Ops Status | | International or Domestic Indicator | | Heavy Designator | H | Special Aircraft Qualifier | | Equipment | | Last Arrival Fix | OTK | First Departure Fix | WALET | Arrival Procedure Name | PJGL72 | Departure Procedure Name | RR01V55 |
| Field | Value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aircraft Type (Auto) | B752 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aircraft Type (FAA) | B752 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aircraft Type (Surveillance) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aircraft Type (FAA Registry) | 757-251 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Call Sign Operating Carrier | DAL2369 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flight ID (Manual) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Registration | N559NW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Carrier Code Marketing | DAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ship Number (Carrier) | 005655 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mode 3/A | 1752 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mode S | A7133F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Direction | Outbound | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Origination Airport | ATL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Destination Airport | MCO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gate Assigned (FIDS) | A24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Irregular Ops Status | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| International or Domestic Indicator | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Heavy Designator | H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Special Aircraft Qualifier | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Equipment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Last Arrival Fix | OTK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| First Departure Fix | WALET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arrival Procedure Name | PJGL72 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Departure Procedure Name | RR01V55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Departure Configuration | <p>The Departure Configuration tool allows designated supervisors to:</p> <ul style="list-style-type: none"> Configure which runways are currently or scheduled to be active for departures Which departure fixes or TMA exit points are associated with each runway What the planned departure rates are |  <p>The screenshot shows a "Modify Current Configuration" window. It features a central diagram of a runway with various navigation points marked by red diamonds and blue diamonds. To the right of the diagram are several control panels, including a "Conditional Monitoring Active" section with "On" and "Off" buttons, and a "Modify Monitoring" section with "Monitor" and "Unmonitor" buttons. The window title is "Modify Current Configuration" and the subtitle is "Runway Configuration: (R, L, C)".</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Tool/Feature | Description of Feature | Example | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|---|--|--|-----------------------------|---------------------------|--------------|----|----|--------------|----|----|-------------|----|----|-------------|----|----|-------------|----|----|------------------|----|----|---------------|----|----|---------------|----|----|-------------|----|----|
| Region Closures | <p>The De-Icing Manager relies on estimated taxi out times for departing aircraft to accurately determine the optimal off block time, it utilizes an intelligent variable taxi time algorithm. When portions of the airfield are closed, users can input this information into the system via the Region Closure tool at which point all suggested routes and taxi time estimates will exclude closed regions. The region closure tool can also be used to input departure fix closures, which will inform the sequencing algorithms that certain flights will not be able to depart until the fix is reopened. Regions can be closed during a certain time periods or “until further notice”.</p> <p>The closures can be done either by selecting regions in the Map Display or by region selections in a list.</p> <p>The input dialog for entering new region closures is shown in the example column.</p> |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| De-icing Management | <p>The De-icing Management Tool allows authorized users to input the current de-icing conditions at the airport. When de-icing is either detected automatically, or manually indicated within the dialog, then ICE-MAN will take into consideration the specified parameters when forecasting each flights taxi time. Within Aerobahn ICE-MAN, an average de-icing duration reference table is maintained, it maps the de-icing conditions (light, medium, severe), ramp, runway, and aircraft type to an average expected de-icing time. Aerobahn’s variable taxi time</p> |  <table border="1" data-bbox="1133 1339 1393 1570"> <thead> <tr> <th></th> <th>Max Queue Length (Aircraft)</th> <th>Max Queue Wait Time (Min)</th> </tr> </thead> <tbody> <tr><td>HEB_DeicePat</td><td>12</td><td>12</td></tr> <tr><td>HJH_DeicePat</td><td>12</td><td>12</td></tr> <tr><td>XZ_DeicePat</td><td>12</td><td>12</td></tr> <tr><td>KO_DeicePat</td><td>12</td><td>12</td></tr> <tr><td>LA_DeicePat</td><td>12</td><td>12</td></tr> <tr><td>Radiant_DeicePat</td><td>12</td><td>12</td></tr> <tr><td>T2_M_DeicePat</td><td>12</td><td>12</td></tr> <tr><td>T3_D_DeicePat</td><td>12</td><td>12</td></tr> <tr><td>T3_DeicePat</td><td>12</td><td>12</td></tr> </tbody> </table> | | Max Queue Length (Aircraft) | Max Queue Wait Time (Min) | HEB_DeicePat | 12 | 12 | HJH_DeicePat | 12 | 12 | XZ_DeicePat | 12 | 12 | KO_DeicePat | 12 | 12 | LA_DeicePat | 12 | 12 | Radiant_DeicePat | 12 | 12 | T2_M_DeicePat | 12 | 12 | T3_D_DeicePat | 12 | 12 | T3_DeicePat | 12 | 12 |
| | Max Queue Length (Aircraft) | Max Queue Wait Time (Min) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HEB_DeicePat | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HJH_DeicePat | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| XZ_DeicePat | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KO_DeicePat | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LA_DeicePat | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radiant_DeicePat | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T2_M_DeicePat | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3_D_DeicePat | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T3_DeicePat | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Tool/Feature | Description of Feature | Example |
|------------------------------------|--|---------|
| | <p>prediction looks up the average de-icing time for each departure and additionally accounts for the desired de-icing queue parameters to determine the appropriate TSAT or ROBT for each flight.</p> <p>The deicing requirement can also individually be set for any flight via the Map Display flight context menu (only applicable when SMAN tools and features are available)</p> | |
| Scheduled Flight Management | <p>The Scheduled Flight Management Tool is the HMI for manually adding, editing, or cancelling a flight in the system.</p> <p>Automated data feeds typically take care of the majority of flight schedule changes but users can always make end of the line corrections.</p> | |

TABLE 1 – DE-ICING MANAGEMENT TOOLS/FEATURES

3.1.2 AIRPORT CONDITIONS

The Airport Condition tools allow users to get important information and notifications about airport conditions. The Airport Conditions tools available for the ICE-MAN are described in Table 2.

| Tool/Feature | Description of Feature | Example |
|---------------------|--|---------|
| NOTAM Viewer | <p>The NOTAM Viewer provides the user with a list of the active and scheduled NOTAMs for a site.</p> | |


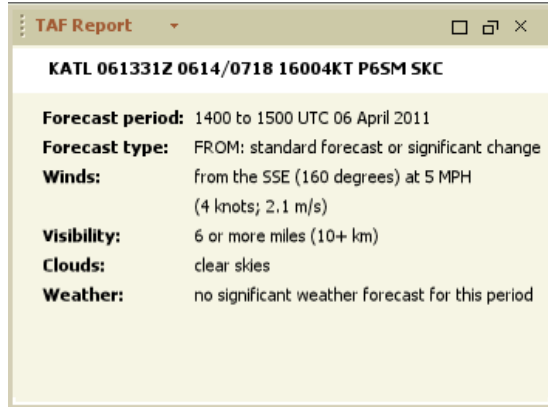
| Tool/Feature | Description of Feature | Example |
|----------------------|---|---|
| <p>METARs</p> | <p>Displays the METAR reports using an available weather data source.</p> |  |
| <p>TAFs</p> | <p>Displays the TAF Reports using an available weather data source.</p> |  |

TABLE 2 – AIRPORT CONDITION TOOLS/FEATURES

3.1.3 REPORTING

The Aerobahn De-icing Manager comes with extensive reporting capabilities where users can query its rich set of operational data on demand or schedule automated reports for regular delivery. These reports help provide users with:

- A more detailed understanding of airport resource usage related to de-icing management;
- The ability to better forecast the impact of future operational events;
- Valuable data to improve de-icing management planning;
- The identification of trends and recurring operational problems;
- And insight into how irregular operations are managed.

Aerobahn has the ability for the user to use the standard reports that have been provided (see Table 4 for details), or the users can create their own custom reports based upon the data sets and provided visualizations within the reporting function (see Table 4 for details)

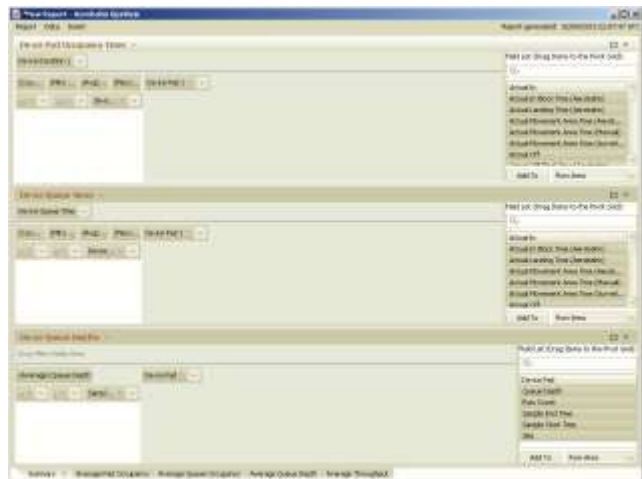
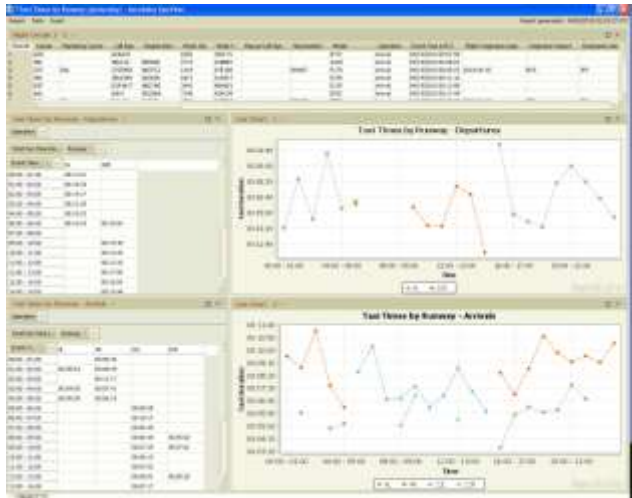
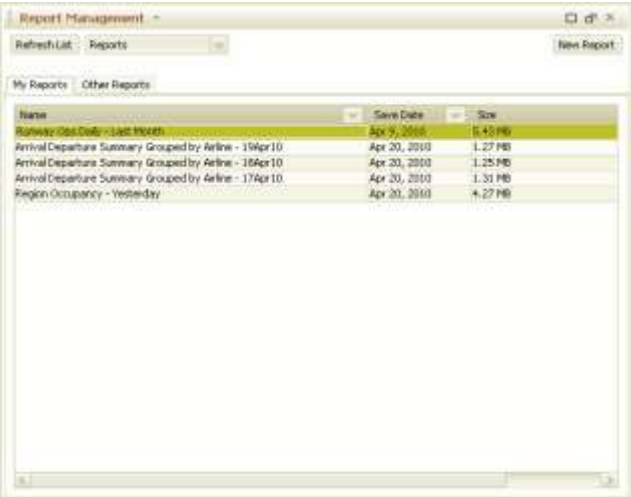

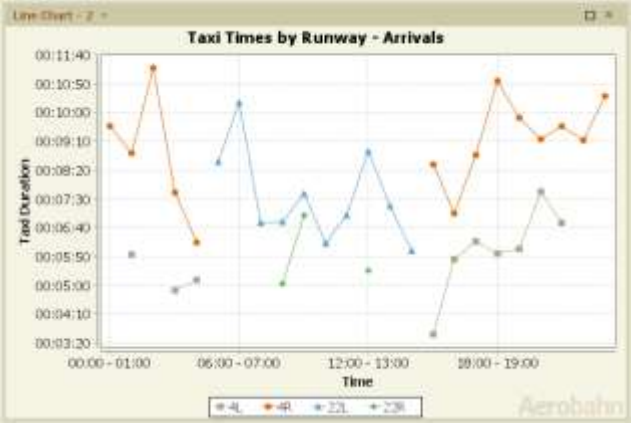
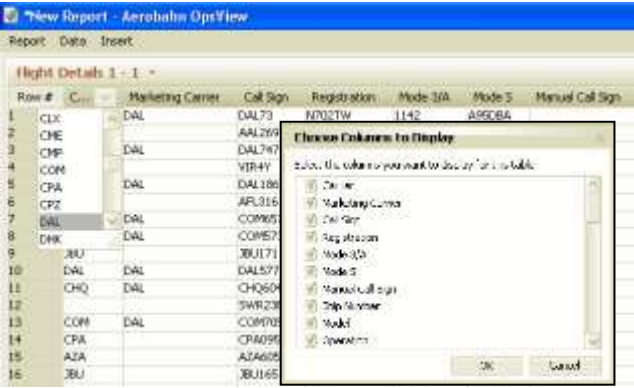


| Report | Description | Example |
|------------------------|---|--|
| De-Ice Activity Report | Provides users with detailed records of de-icing activity including de-ice queue times by pad, average pad occupancy, average queue depth and average throughput. |  |

TABLE 3 – STANDARD REPORT(S)

| Tools/Feature | Description/Use | Example |
|---------------|--|--|
| Reports | <p>Reports consist of sets of data, pivot tables, and graphs, all of which can be viewed and manipulated directly within the Aerobahn client application.</p> <p>User can custom design new ones that fully align with their unique needs. Report data can also be exported for use outside of Aerobahn.</p> |  |

| | | |
|---------------------------------|---|--|
| <p>Report Management</p> | <p>The Report Manager allows user to view their list of saved reports, report types, quick reports, and scheduled reports. User can load, share, rename, or delete any report from this tool.</p> |  |
| <p>Pivot Tables</p> | <p>Within Aerobahn reports, users can create powerful pivot tables similar to those in Microsoft Excel to aggregate and summarize data.</p> |  |
| <p>Graphs</p> | <p>Graphs transform tabular data into more intuitive visualizations. Users can create bar, line, and pie charts.</p> |  |

| | | |
|--|---|--|
| <p>Data Sorting and Filtering</p> | <p>For any report table within Aerobahn De-Icing Manager, users can select what data columns they want to see and how they want them sorted, letting users quickly find what's important.</p> |  |
| <p>Customized Report Parameters</p> | <p>Aerobahn provides the ability to customize reports before they are executed, allowing users to specific filters such as:</p> <ul style="list-style-type: none"> • Time of Day • Call Sign • Airline • Runway <p>This filtering allows users to access the metrics that have the most relevance to their need to reduce report execution time and data clutter.</p> |  |
| <p>Report Scheduling</p> | <p>Aerobahn De-Icing Manager provides flexible report scheduling capabilities so that users can automatically run reports on a daily, weekly, monthly, quarterly, or yearly basis. This allows airport stakeholders to use a single source of accurate, timely data to develop metrics for quantifiable measurement of the performance of the airport airside operation and share them with other users.</p> |  |


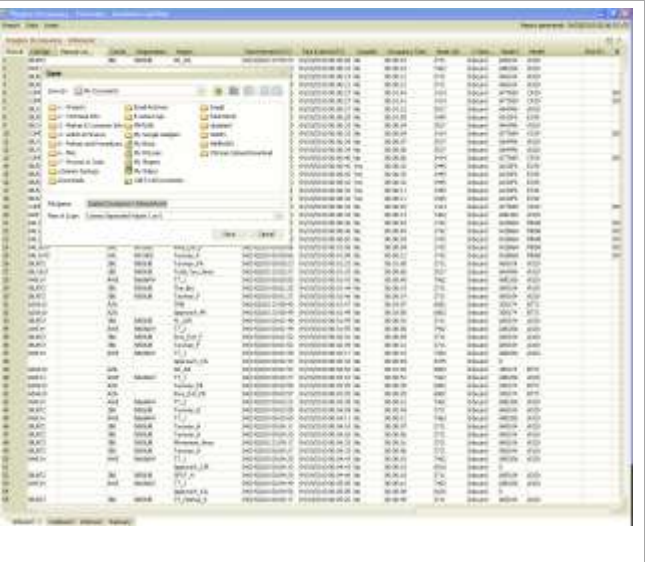
| | | |
|-----------------------------|--|---|
| <p>Quick Reports</p> | <p>Quick reports provide fast and easy access to a user's favorite saved reports and report types.</p> |  |
| <p>Data Export</p> | <p>All Aerobahn report data can be exported via a CSV file to other programs such as Microsoft Excel and Microsoft Access. This allows users to perform manipulate beyond what is capable in Aerobahn and merge the data with other outside sources.</p> |  |

TABLE 4 – REPORTING TOOLS/FEATURES

3.1.4 NOTIFICATION BAR

The Notification Bar is a workspace toolbar that collects and merges airport status updates from automated data feeds and various Aerobahn tools into a centralized log. It provides users a single, easy to find, reference point for critical information.

Individual users can customize what categories of information they are interested, and how they want the updates displayed. This greatly reduces information noise and only requires user attention when it is warranted. The following two figures (see Figure 5 and Figure 6) depict the Notification Bar expanded to see a few detailed updates along with the settings dialog for customizing a user's subscription policy.



FIGURE 5 – NOTIFICATION BAR

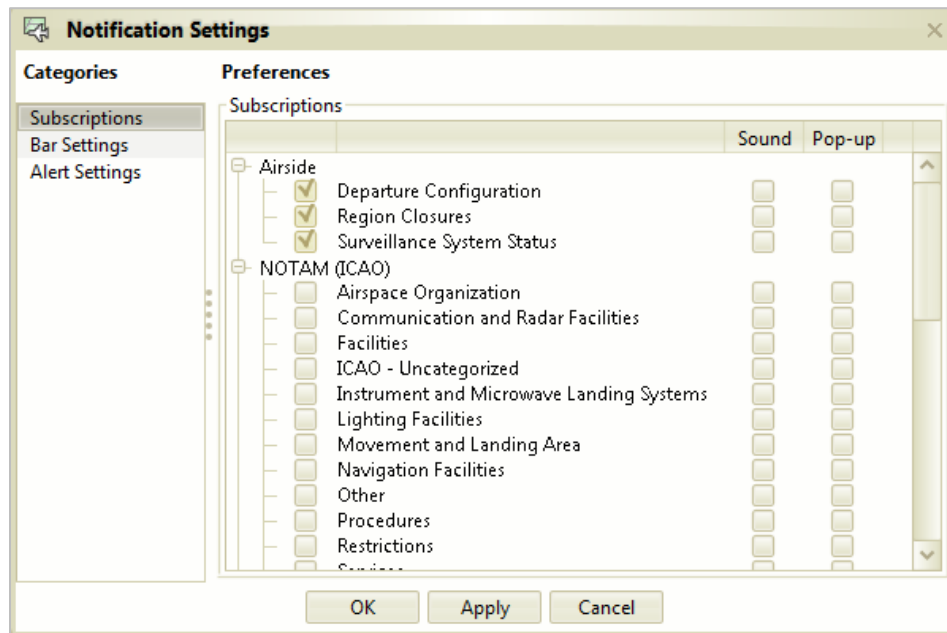


FIGURE 6 – NOTIFICATION BAR SUBSCRIPTION SETTINGS

3.2 AEROBAHN PLATFORM

For the ICE-MAN Client tools to deliver accurate, reliable data that is adapted to each user’s needs, capabilities in the Aerobahn Platform are utilized. The core capabilities that provide the user with unique features are the Workflow and Event Processing, Flight Prediction as well as advanced User Management administration.

3.2.1 WORKFLOW PROCESSING

The Aerobahn Platform does more than just aggregate raw data; it helps turn it into actionable information. Once all of the raw inputs are correlated, Aerobahn applies its state-of-the-art algorithms to derive discrete flight states and events. Among the most powerful of these, is Aerobahn’s ability to combine aircraft surveillance with high fidelity airport maps in order to generate region occupancy information and record objective event times such as actual off block times, de-icing entry times, and

runway line-up times. This is a surprisingly complex task given that surveillance is inherently imperfect and often contains positional “jitter” around important areas like gates and de-icing pads.

Aerobahn’s Workflow Processing capabilities enable the ICE-MAN tools to manage the de-icing management process proactively, predictable and efficient manner. It provides the functionality to define process events/states, prerequisite(s) for entering states, set-up and execute automatic state transitions as well setting up rules for entering and exiting process states.

3.2.2 FLIGHT PREDICTION ENGINE

The Aerobahn De-icing Manager relies on Aerobahn’s Flight Prediction Engine capability that provides advanced flight and traffic predictions. This flight prediction capability utilizes a machine learning algorithm to estimate taxi paths, taxi waypoint times, in block times, off block times, and take off times as applicable (see Figure 7 as an example). Estimates account for historically and recently observed taxi paths and times, updated flight information, and current surface congestion if surface surveillance is available. For every flight, the prediction engine uses the best source to estimate where the flight will start and end taxiing, queries its growing database of historical and recent observations based on the current airport configuration, and adjusts for current surface delays to determine the surface trajectory and taxi time.



FIGURE 7 – VISUALIZATION OF A PREDICTED TAXI PATH

The Flight Prediction Engine also allows for manual inputs/changes to the taxi path. This is done via simple selection of the target and opening up the “Add Taxi Way” window. This enables the user to change the taxi path as desired and once applied the Flight Prediction Engine takes this into account when calculating estimates. The example below illustrates how this can be applied.

1. The figure show the predicted taxi path for the flight.
NOTE - Green indicates the completed taxi path and turquoise indicates the predicted taxi path for the flight.



2. By selecting a flight and accessing the “Add Taxi Way” window, new waypoints can be selected and applied. The figure to the right shows how the new taxi way is enabled after entering two new waypoints.



3. After applying the new manually entered taxiway the Flight Prediction Engine takes this into account.



TABLE 5 – EXAMPLE OF ENTERING MANUAL WAY POINT TO THE TAXI PATH

3.2.3 USER MANAGEMENT

Making the right decision on the airport surface doesn’t just require information from disparate systems; it requires numerous individuals across different organizations to have access to that information. The Aerobahn Platform provides a robust hierarchical user access control system. Within Aerobahn, all users are organized within a user group tree structure. Fine grained settings and permissions can be set for any group or individual user, allowing easy role based permissions as well as allowing user management to be delegated down the hierarchy. Users and groups can be restricted as to what data fields they have access to, what tools and visualizations they can see, and what actions they can perform, allowing multiple stakeholder organizations to utilize a common platform while still securing proprietary information and important workflow operations.

4 PRODUCT BENEFITS

With the Aerobahn De-icing Manager, all stakeholders are provided a clear understanding of what the plan and performance is for each de-icing pad and flight. Automatic and flight specific recommended off block times help minimize de-icing queues and taxi out times, allowing aircraft to hold at the gate when possible without sacrificing their place in line or diminishing the overall throughput.

Like all Aerobahn products, the Aerobahn De-icing Manager benefits from its tight integration into the Aerobahn Platform, providing users seamless interaction with the full Aerobahn tool suite. Furthermore, the Aerobahn De-icing Manager establishes a foundation for further de-icing process automation in the future. In Table 6 the main benefits of the Aerobahn De-icing Manager are summarized.

| Benefit | How | Impacted customer/stakeholder |
|---|---|---|
| Better predictability | The Aerobahn De-icing Manager delivers the situational awareness, flight information and tools that all participants in the de-icing process need to better prepare for and manage the de-icing process in a proactive manner. | <ul style="list-style-type: none"> • Airline (AOC and aircrew) • Airport • ANSP (ATCO) • RAMP (controllers) • De-icing companies |
| Increased measurability of the operations | With capabilities to record, replay and measure events the Aerobahn De-icing Manager provides information so that the stakeholders better understand what the plan and performance is for each de-icing pad and flight. | <ul style="list-style-type: none"> • Airlines • Airport • ANSP • RAMP • De-icing companies |
| Lower costs | The Aerobahn De-icing Manager calculates ROBT (Recommended Off Block Time) to minimize de-ice queuing and taxi out times, allowing aircraft to hold at the gate while waiting for their turn in the de-icing process without sacrificing priority or throughput leading to lower cost by lowering fuel burn | <ul style="list-style-type: none"> • Airline |

| | | |
|--|---|--|
| Minimizing risk for loss in departure throughput | By making a plan for the de-icing events and minimizing the risks of having unforeseen/unpredicted events by using the Aerobahn De-icing Manager the risk of losing departure throughput is less. | <ul style="list-style-type: none"> • Airport • ANSP • Airline |
| Better utilization of infrastructure and resources | The Aerobahn De-icing Manager helps the actors to plan the usage of infrastructure and resources in the most efficient way. | <ul style="list-style-type: none"> • Airport • De-icing companies |

TABLE 6 – SUMMARY OF DE-ICING MANAGER BENEFITS



SAAB

Aerobahn Airport Status Dashboard (ASD) Product Description

Date: 05/05/2017

Note – This Product Description is aligned with Aerobahn Software Release 09.00.00

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1 PRODUCT NEED

Airports consist of a complex network of resources, each of which has an impact on the overall performance of the operation. This array of resources includes the airspace, runways, taxiways, deicing pads, terminals, ground transportation infrastructure, other airports, hotels, and many others. And while different stakeholders are responsible for managing different resources, it is essential that everyone shares and communicates information across organizational boundaries in order to effectively operate. The difficulty however, is that information is often scattered between systems and tools without an efficient mechanism to collaborate or highlight critical components. This lack of shared and accurate information limits the ability to properly plan and forecast operations, which in turn degrades operational performance and ultimately increases costs for all stakeholders at an airport. Given the number of stakeholders involved and the diverse impact of information and collaboration, the responsibility for overall airport performance and coordination amongst stakeholders often falls on the airport operator or an airline at one of their major hubs.

2 PRODUCT OVERVIEW

Aerobahn Airport Status Dashboard (ASD) is an Aerobahn product that provides a set of tools to collect, record, distribute, and alert on status information for all of the key components of airport operations. The ASD provides two primary components to users and those are the:

1. The **Airport Status Dashboard Tool** that provides the user with a comprehensive workspace and features to manage and configure the information that shall be collected and distributed as well as setting up different “information views” based on user preference and access. An example of the Airport Status Dashboard Tool is shown in Figure 2 below.
2. The **Airport Status Dashboard Web Portal** is an easily accessible portal for retrieving status information from a standard web browser on your mobile device, tablet or laptop. The Airport Status Web Portal allows limited public access without supplying login credentials or full access when authorized user credentials are provided. Information within the Portal mimics the content and look and feel of the Aerobahn Status Dashboard Tool but with layouts optimized for the web and mobile devices.

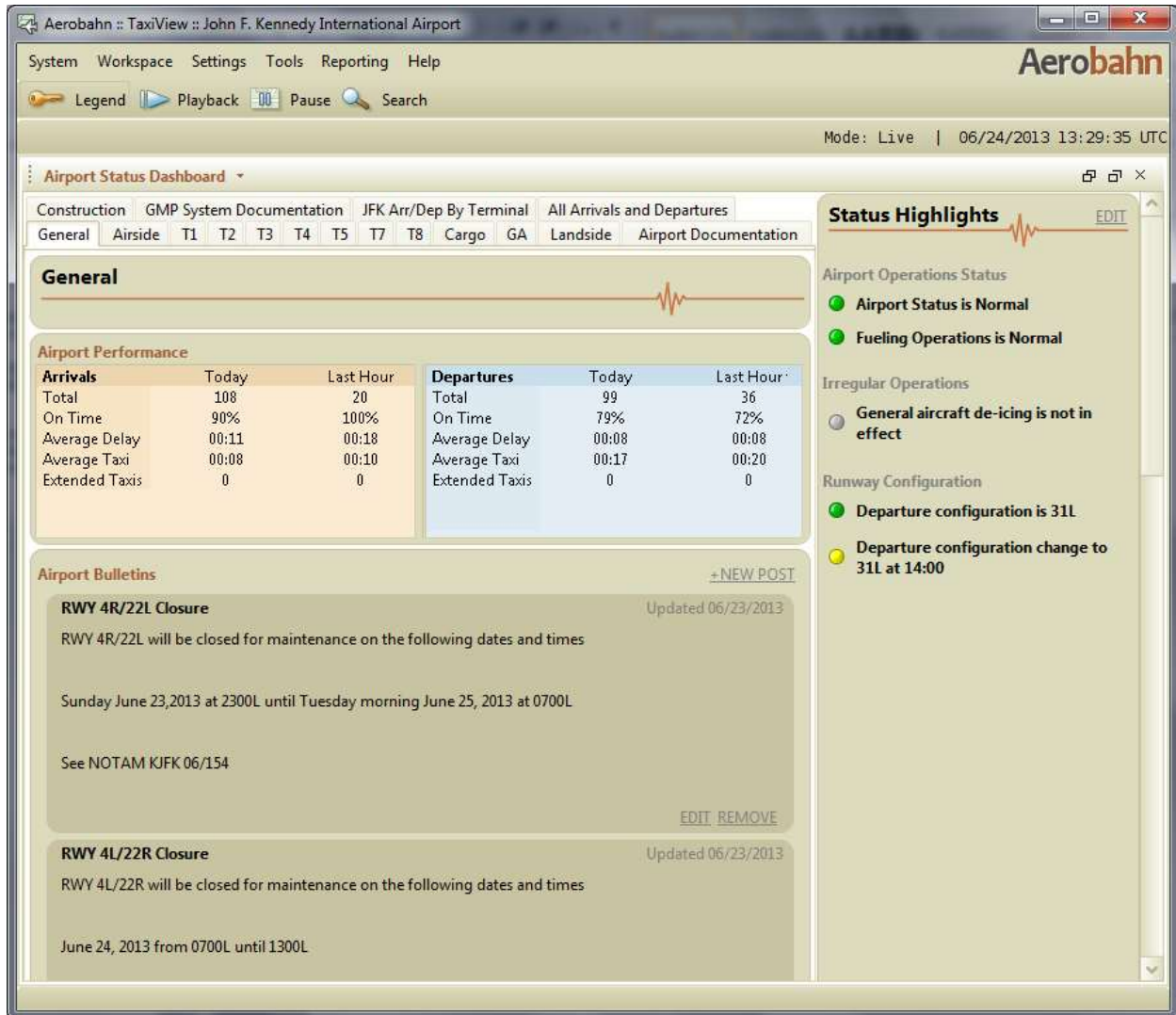


FIGURE 1 –AIRPORT STATUS DASHBOARD TOOL

3 PRODUCT DETAILS

3.1 AIRPORT STATUS DASHBOARD TOOL

The Airport Status Dashboard Tool (ASD Tool) is a one-stop shop for all of the latest airport status information and key performance indicators. It is also the tool that is used to set-up the information that is to be displayed and shared amongst stakeholders that shall have access, either through the actual ASD Tool or the ASD Web Portal (see chapter 3.2).

The ASD Tool in itself consists of two main “windows/panes”. The first, located at the right side of the dashboard tool always contains the most important set of high level status highlights. The list and grouping of highlights is fully customizable for each airport. Individual elements can either indicate a good/bad status using a red/green indicator or an inactive/active status using a grey/yellow indicator. Permissions to view or edit highlights can be controlled at the grouping level.

The second and more detailed status information is displayed through widgets to the left on the dashboard and is organized by category, each of which is separated into different tabs along the top of the ASD Tool. Again, the list and grouping of information is fully customizable for each airport. Figure 2 illustrates an Airport Status Dashboard Tool example which shows some status highlights, different widgets used to display more details info as well as how information is grouped by using tabs.

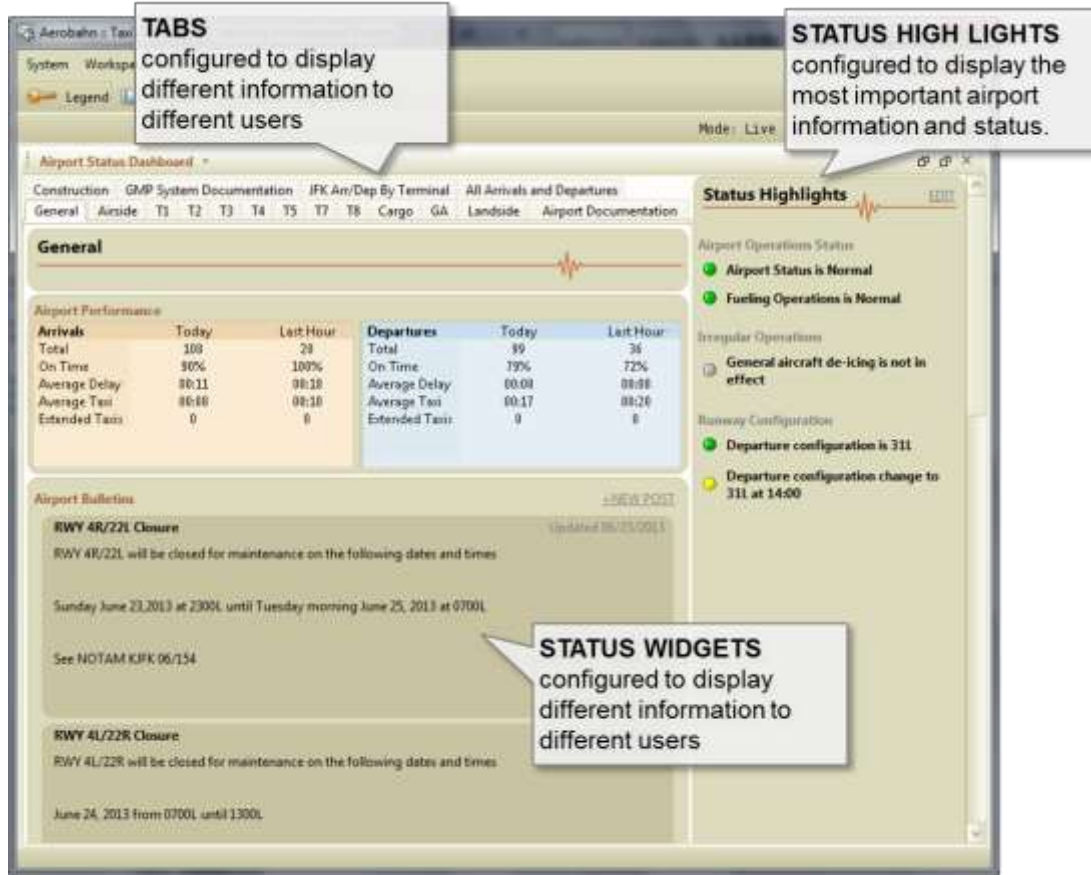


FIGURE 2 – E XAMPLE AIRPORT STATUS DASHBOARD CONFIGURATION

3.1.1 STATUS WIDGETS

As illustrated in Figure 2 above each tab can contain any number of status widgets based on what information needs to be managed and shared at a specific airport. The current status widgets available for inclusion are individually detailed in the following sections. All widget titles are configurable at the system level.

3.1.1.1 Airport Performance Widget

The Airport Performance Widget is an automatically populated summary of key performance indicators for the current day, along with a projection for the next hour. The data feeding this widget is calculated using the Aerobahn Platform’s existing surveillance and data processing algorithms. If the Aerobahn Predictive Engine optional add-on is procured, then additional forecast metrics will be available.

| Airport Performance | | | | | |
|---------------------|-------|-----------|----------------|-------|-----------|
| Arrivals | | | Departures | | |
| | Today | Last Hour | | Today | Last Hour |
| Total | 108 | 20 | Total | 99 | 36 |
| On Time | 90% | 100% | On Time | 79% | 72% |
| Average Delay | 00:11 | 00:18 | Average Delay | 00:08 | 00:08 |
| Average Taxi | 00:08 | 00:10 | Average Taxi | 00:17 | 00:20 |
| Extended Taxis | 0 | 0 | Extended Taxis | 0 | 0 |

FIGURE 3 – AIRPORT PERFORMANCE WIDGET EXAMPLE

3.1.1.2 Flight List Widget

The Flight List Widget is another automatically populated widget that provides a list of active or upcoming arrivals and departures.

| Terminal 1 Flights | | | | | | | | | | | |
|--------------------|------|------|-------|-------|------|------------|------|----|-------|-------|------|
| Arrivals | | | | | | Departures | | | | | |
| Flt ID | Orig | AC | SIBT | EIBT | AIBT | Flt ID | Dest | AC | SOBT | EOBT | AOBT |
| SVA23 | RUH | B772 | 15:30 | 16:07 | | THY4 | IST | | 16:50 | 16:53 | |
| JAL6 | NRT | B77W | 15:15 | 15:18 | | | | | | | |
| THY3 | IST | A333 | 15:20 | 15:10 | | | | | | | |
| DLH400 | FRA | A388 | 16:50 | 16:45 | | | | | | | |
| AMX408 | MEX | B737 | 17:00 | | | | | | | | |
| BEL501 | BRU | A333 | 16:15 | 16:16 | | | | | | | |
| AFL100 | SVO | A333 | 16:20 | 16:00 | | | | | | | |

FIGURE 4 – FLIGHT LIST WIDGET EXAMPLE

3.1.1.3 Runway Status Widget

The Runway Status Widget is a condensed aggregation of several automatic and manual data inputs. It summarizes the status of each runway along with its current planned and actual throughput.

| Runway Status | | |
|--------------------|---------------------------------|---|
| 13R - 31L OPEN | Departures Actual 38 Plan 42 | |
| 22L - 4R CLOSED | | Closures ● Closed starting at 06/24/2013 03:00 until 06/25/2013 11:00. |
| 31R - 13L OPEN | Arrivals Actual 16 | |
| 22R - 4L CLOSED | | Closures ● Closed starting at 06/24/2013 11:00 until 06/24/2013 17:00. |

FIGURE 5 – RUNWAY STATUS WIDGET EXAMPLE

3.1.1.4 Airfield and Fix Closure Widget

The Airfield and Fix Closure Widget is a summary of all Aerobahn Region Closures that are active or currently scheduled within the Region Closure Tool.

| Airfield and Region Closures | | | | |
|------------------------------|---------------------------------|------------------|------------------|----------|
| | Closure Name | Closed From | Closed Until | NOTAM... |
| ⊘ | TW FB clsd b'twn TWYs FA & Y... | 06/18/2013 16:23 | UFN | |
| ⊘ | TW D clsd b'twn TW C & Ram... | 06/18/2013 18:11 | UFN | |
| ⊘ | RWY 4R/22L | 06/24/2013 03:00 | 06/25/2013 11:00 | 06/154 |
| ⊘ | RWY 4L/22R | 06/24/2013 11:00 | 06/24/2013 17:00 | 06/155 |

FIGURE 6 – AIRFIELD AND FIX CLOSURES WIDGET EXAMPLE

3.1.1.5 NOTAM Widget

The NOTAM Widget provides a tabular list of all of the current airport NOTAMs and is automatically populated via an FAA data feed. It also includes a URL link to the FAA NOTAM Manager where authorized users can update, add, and remove NOTAMs.

| NOTAMs | | | | FAA NOTAM MANAGER | |
|--------|----------|--|------------------|-----------------------------------|------------------|
| US # | Sub-c... | NOTAM Text | Effective Time | ↓ | Expire Time |
| 06/334 | Taxiway | IJFK 06/334 JFK TWY TB CLSD BTWN TWY B WEF 1206290300-1206291100 | 06/29/2012 03:00 | | 06/29/2012 11:00 |
| 06/335 | Taxiway | IJFK 06/335 JFK TWY B CLSD BTN TWY T AND TWY U WEF 1206290300-1206291100 | 06/29/2012 03:00 | | 06/29/2012 11:00 |

FIGURE 7 – NOTAM WIDGET EXAMPLE

3.1.1.6 Bulletin Widget

The Bulletin Widget supports free-form posts and file attachments for conveying a variety of information. Bulletins can be added, edited, removed, and reordered by authorized users.

[+NEW POST](#)

Taxiway J Construction Bulletin Posted June 27, 2012

New construction project started on Taxiway J. Please see attachment for full details.

Construction Bulletin for Taxiway J - June 2012.pdf

↑ ↓ [EDIT](#) [REMOVE](#)

Aerobahn Maintenance Event Posted June 27, 2012

Aerobahn service will be unavailable tonight for approximately 1 hour starting at 0100 EDT while the system is upgraded. If you have any problems after the upgrade please call Saab Sensis Customer Support.

↑ ↓ [EDIT](#) [REMOVE](#)

FIGURE 8 – BULLETIN WIDGET EXAMPLE

3.1.1.7 Itemized Status Widget

The Itemized Status Widget allows for the status of one or more individual items to be set to routine or non-routine along with a free-form explanation. Multiple Itemized Status Widgets can be used to visually group related items and also allow for different permissions to be assigned to different groups.

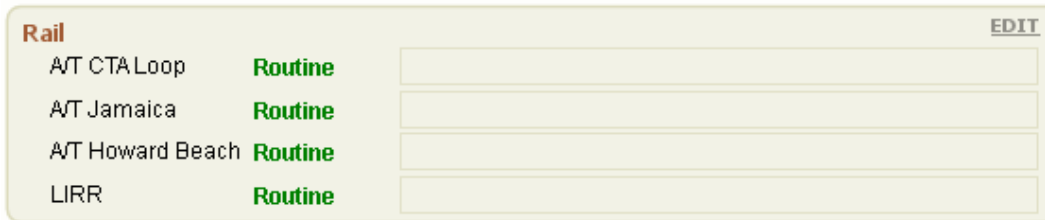


FIGURE 9 – ITEMIZED STATUS WIDGET

3.1.1.8 Free-form Text Widget

The Free-Form Text Widget is a catch-all mechanism for users to input status information without rigid constraints.



FIGURE 10 – FREE-FORM TEXT WIDGET EXAMPLE

3.1.1.9 Web Links Widget

The Web Links Widget simply allows for important URL Shortcuts to be provided within the Airport Status Dashboard for quick reference.



FIGURE 11 – WEB LINKS WIDGET EXAMPLE

3.2 AIRPORT STATUS DASHBOARD WEB PORTAL

The Airport Status Dashboard Web Portal simplifies access to the wealth of information managed within Aerobahn Airport Dashboard. Users can access public information without any login credentials, or they can supply credentials for full access. The Web Portal shows the same information as the Airport Status Dashboard, but does so outside of the standard Aerobahn client application to facilitate quick access using a laptop, tablet or any type of mobile device with a web-browser.

4 COMPREHENSIVE EXAMPLES

The configuration of the Airport Status Dashboard Tool and Airport Status Web Portal is done by Saab Sensis in consultation with the customer. It is performed at the system level to provide a consistent view to all users and to enable system wide permissions to establish who can view and edit which elements.

The configuration covers what data categories and tabs are available, and what status widgets are included under each of them. The following series of images represent a typical Airport Dashboard configuration.

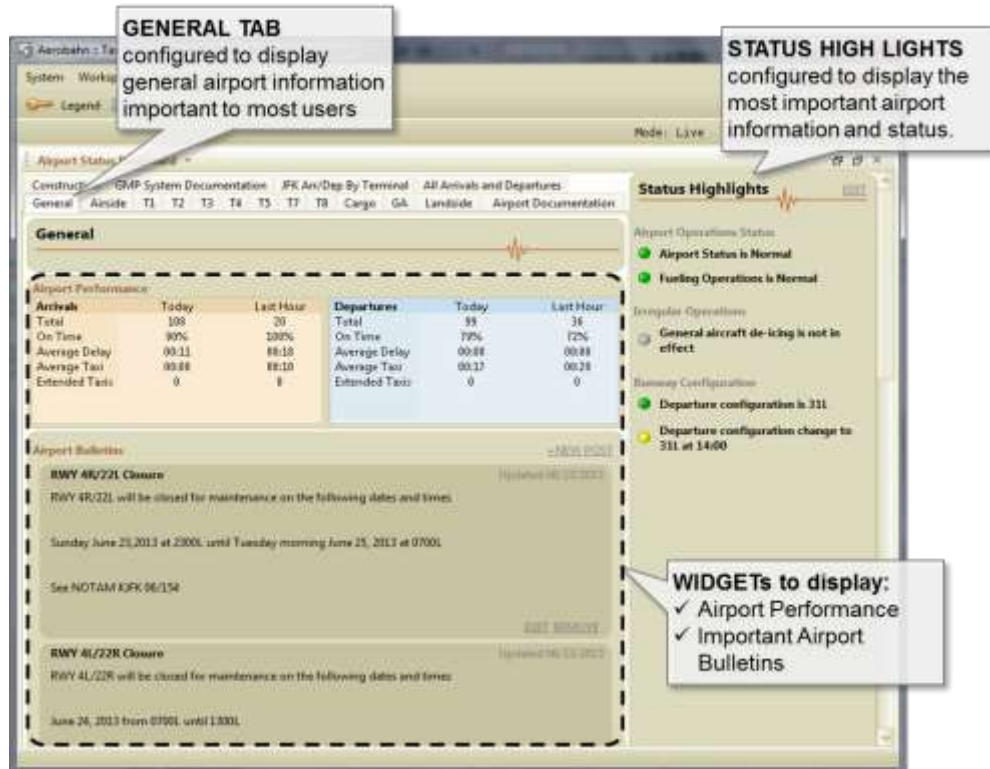


FIGURE 12 – AIRPORT STATUS DASHBOARD COMPREHENSIVE EXAMPLE 1

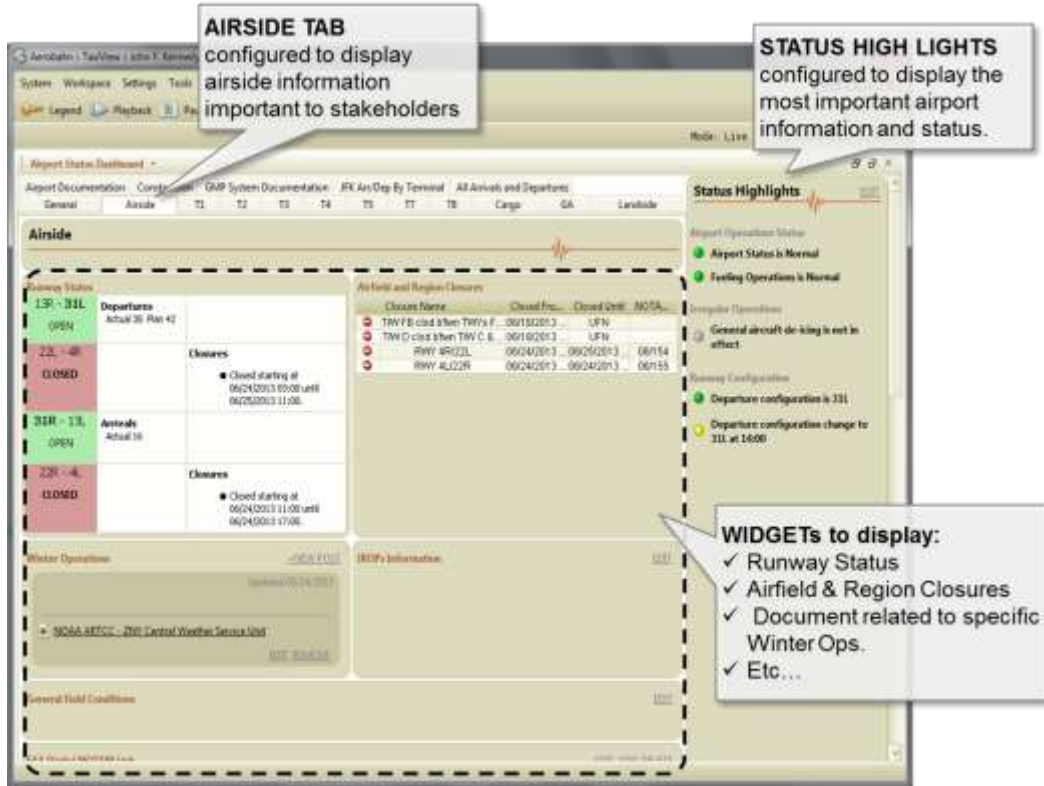


FIGURE 13 – AIRPORT STATUS DASHBOARD COMPREHENSIVE EXAMPLE 2

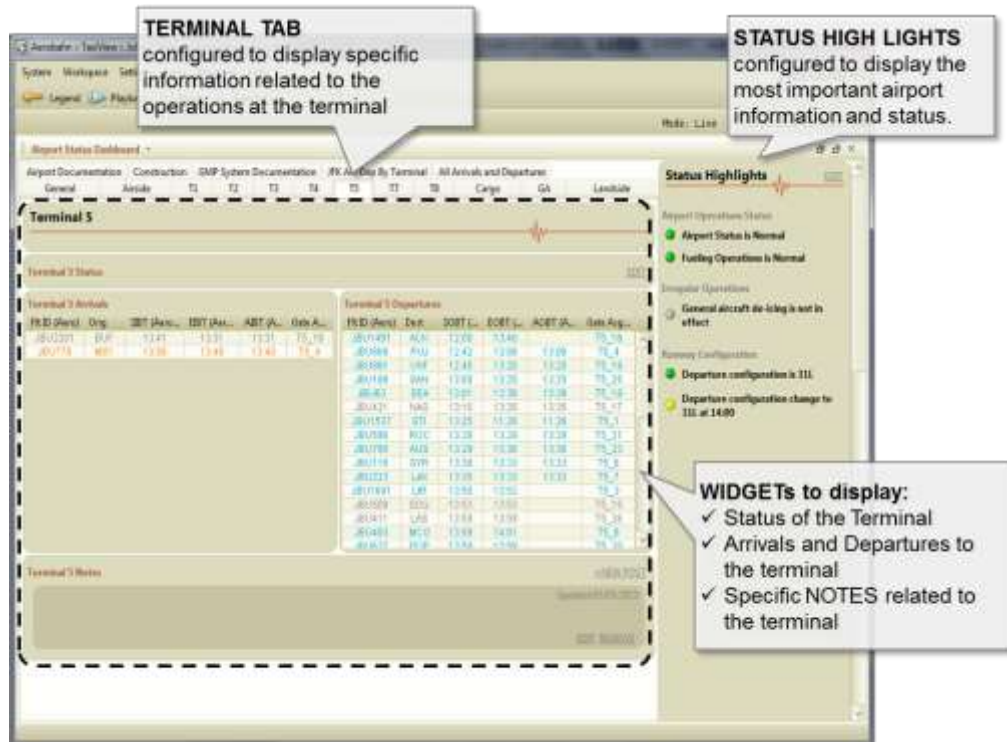


FIGURE 14 – AIRPORT STATUS DASHBOARD COMPREHENSIVE EXAMPLE 3

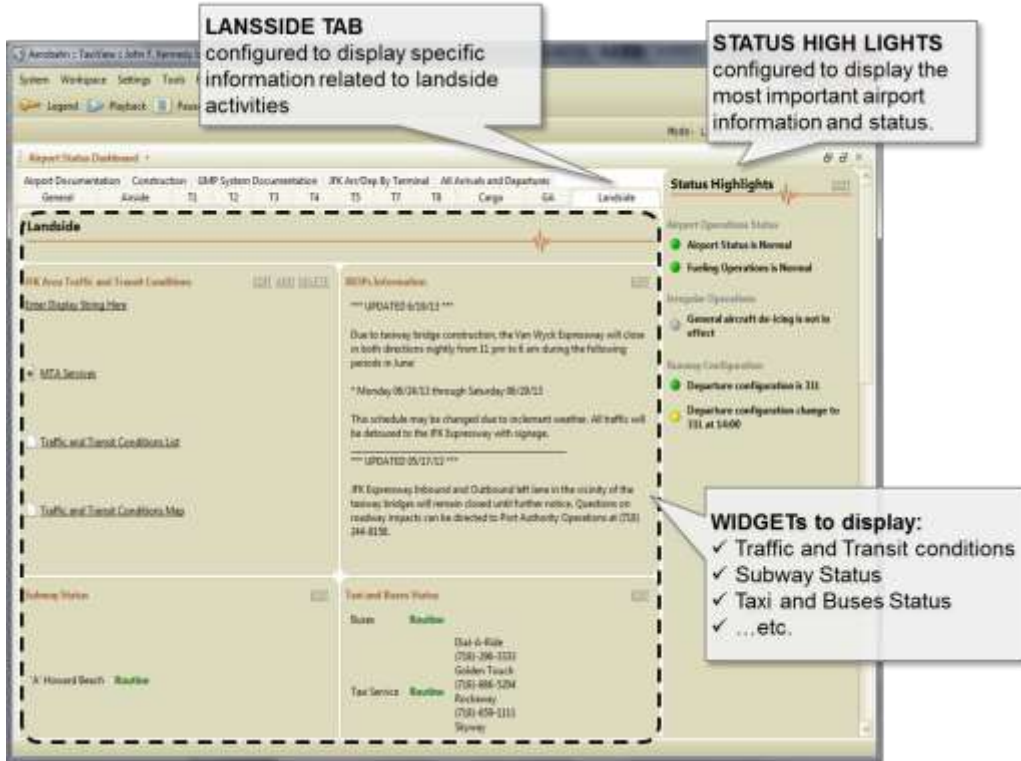


FIGURE 15 – AIRPORT STATUS DASHBOARD COMPREHENSIVE EXAMPLE 4

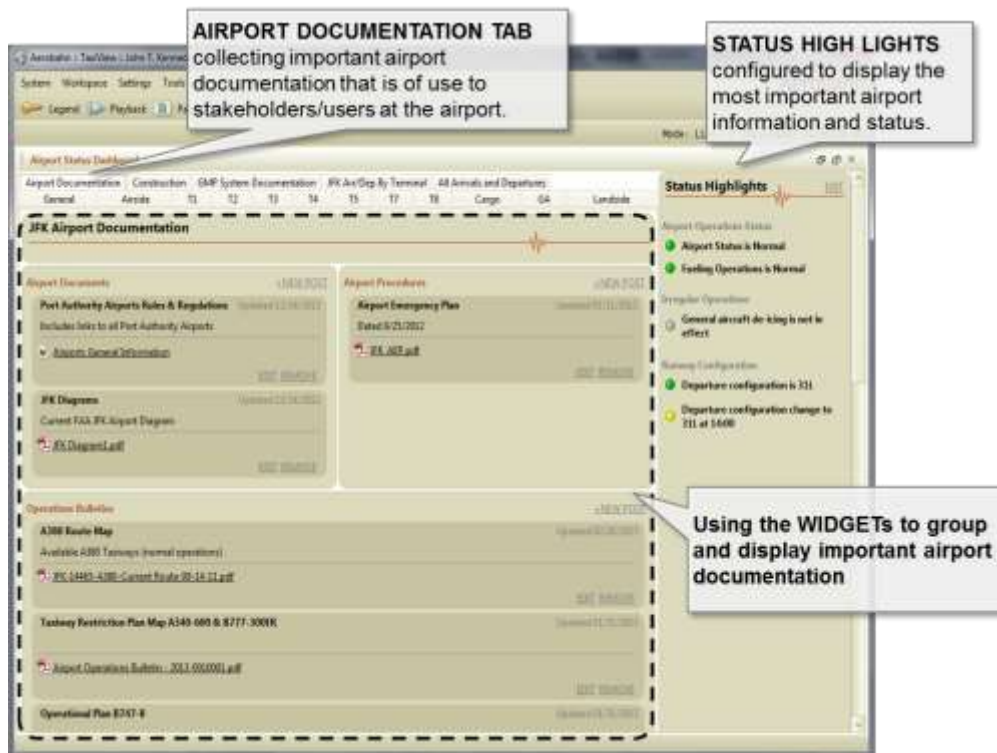


FIGURE 16 – AIRPORT STATUS DASHBOARD COMPREHENSIVE EXAMPLE 5

5 PRODUCT BENEFITS

Improved information sharing regarding the current conditions of all major elements of an airport's operation provides a more efficient overall operation, allowing commercial users to make more informed business decisions, better plan and predict their performance, reduce costs, and provide a superior customer experience. Although these benefits of collaborative information sharing are generally accepted, they are hard to discretely quantify and allot to individual organizations. A University of Michigan study on the benefits of collaboration identified that collaboration:

- Generates smarter decisions through:
 - An improved understanding of complex, cross-boundary problems through shared information
 - A richer understanding of the values at stake by enabling stakeholders to articulate and discuss them
 - Higher priority on problem solving rather than procedural decision making
 - Higher priority on achieving joint gains rather than minimally satisfying decisions
 - Higher priority on proactive decision making rather than reactive
- Produces more durable decisions by building support for decisions so that they are not appealed endlessly
- Fosters action by
 - Enabling action across boundaries defined by geography, authority, values, and perceptions
 - Mobilizing shared resources (people, information, authority, funding, and expertise) to get work done

These benefits, and the information sharing required to achieve them, are directly enabled for airport operations stakeholders by Aerobahn Airport Status Dashboard.



SAAB

Aerobahn Global Flight Manager (GMAN) Product Description

Date: 10/10/2016

Note – This Product Description is aligned with Aerobahn Global Flight Manager TRIAL version

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1 PRODUCT OVERVIEW

The Aerobahn Global Flight Manager is an easy-to-use web-based decision support tool for managing a network of flights and airports. Users can seamlessly search, monitor and track flight progress in the en-route, terminal and surface segments. The Global Flight Manager enables users to identify, avoid, and manage disruptions like flight diversions and holds pro-actively and in real-time. Avoiding diversions will help airlines save significant costs and help airports take proactive measures to accommodate diversions and anticipate delays due to holds. IATA estimates that the cost of a wide body aircraft diversion is approximately \$100,000. Some of the other key features and benefits of the Aerobahn Global Flight Manager are:

- ✓ The intuitive application user interface and tools minimizes the need for end-user training and associated costs
- ✓ Seamless access to airport and flight information makes it applicable for a variety of users and functions, reducing the need for multiple tools and thereby lowering overall costs
- ✓ Easy access via PCs and tablets, making it ideal for enterprise wide use by multiple end users – independent of the function in their organization. This ensures lower costs for training as well as application support.
- ✓ It is provided as Software as a Service (SaaS) and does not require new hardware, minimizing installation and implementation costs.

The Aerobahn Global Flight Manager (GMAN) utilizes a state-of-the-art data integration platform, the Aerobahn Global Platform, which enables the seamless connection of airport-centric and specific flight-phase-centric information, such as en-route, terminal and surface surveillance, flight schedules and flight plans, airport delays, and weather.

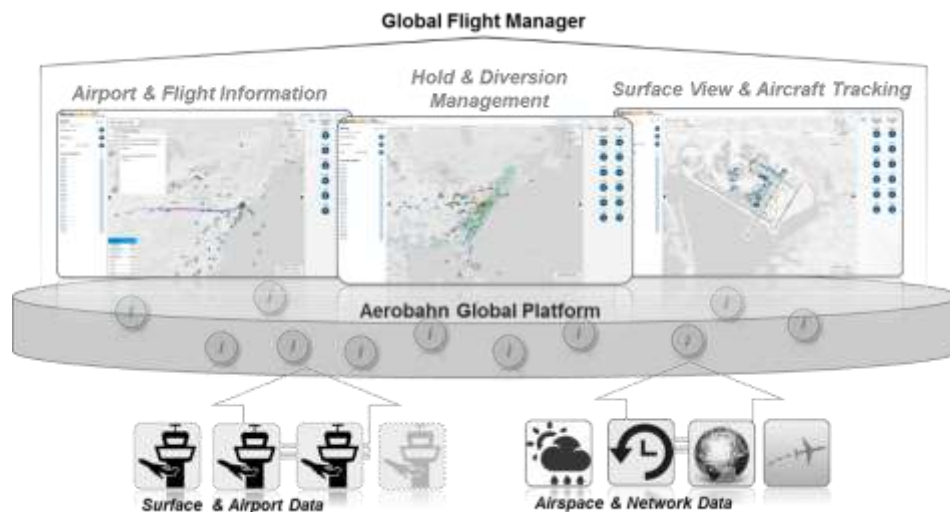


FIGURE 1 – GMAN CAPABILITIES & GLOBAL PLATFORM

2 PRODUCT FEATURES

The Aerobahn Global Flight Manager allows the user to access a number of tools and features to identify, monitor and manage airborne holds and diversions. It also allows for monitoring of flights from gate-to-gate, with the ability to drill down into any flight and retrieve more detailed information. The primary tools and features in the application are:

- **Hold & Diversion Information** – provides the situation of holds and diversions in the entire air traffic system, either at the complete network level or at airports configured by the user. Feature is described in section 2.1
- **Airport Details** – provides critical hold and diversion information at a selected airport. It also provides a list of favorite airports for quick information and “go-to airport” access. The list of “favorites” is configurable. Feature is described in 2.2
- **Map Display** - provides the immediate situational awareness and capability to monitor flights. Within the map display, there are a number of tools to visualize the flights on the map and allow the user to highlight information of interest. Feature is described in section 2.3
- **Flight Details** - provides more in-depth information about a selected flight, e.g. its Estimated Landing Time (ELDT). Feature is described in section 2.4
- **Advanced Search** – this provides the user with the capability to search for any flight that is airborne or on ground as well as airports. Feature is described in section 2.5
- **Information Windows** – different information windows enable the user to view and assess a variety of information to support decision-making. The following information windows are available:
 - **Airport Delays** – provides delay information for all airports that are currently experiencing delays. The information provided is obtained from the FAA and includes delay type, delay reason, and average and max delay time. Feature is described in section 2.6.1
 - **Hold Stack** – provides details about the airborne hold stacks at the selected airport (if holds are occurring). Feature is described in 2.6.2
 - **Flights** – provides details of the aircraft holding or aircraft that are diverting to/ from a selected airport. Information shown is dependent on the user’s choice. Feature is described in section 2.6.3
- **Settings** - allows the user to set personalized preferences in the application. Feature is described in section 2.7
- **User** - allows the user to change the password and log out of the Global Flight Manager. Feature is described in section 2.8

The application user interface (UI) depicted in Figure 2 highlights where different tools and features are located. In Figure 3, Figure 4 and, Figure 5 other examples of the UI are included to show different layouts with the side widgets hidden as well as with the pre-defined dark color scheme.

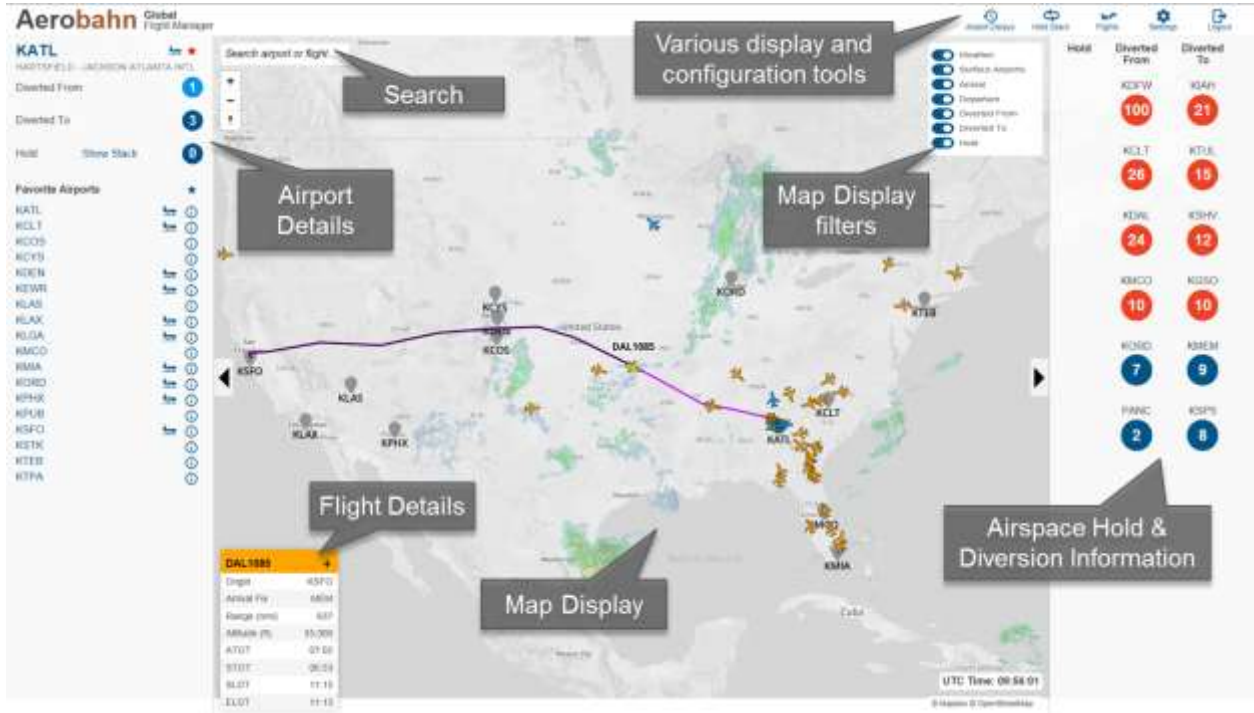


FIGURE 2 – GLOBAL FLIGHT MANAGER USER INTERFACE: TOOLS AND FEATURES

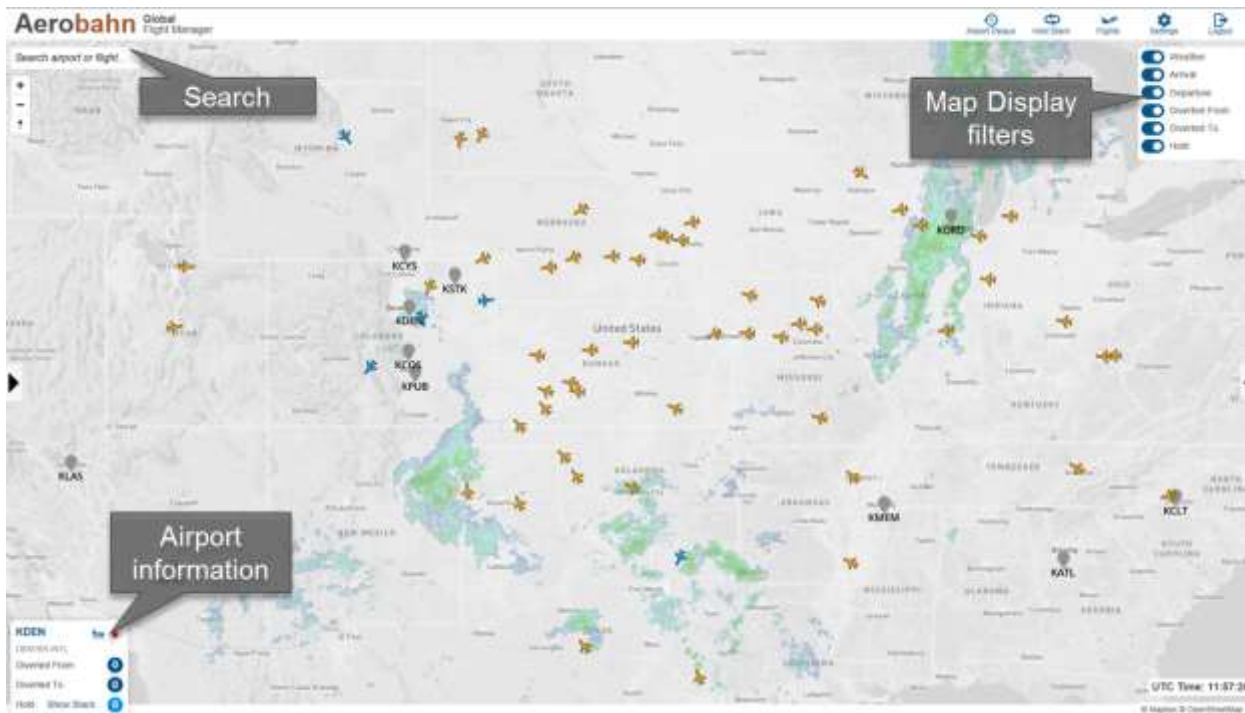


FIGURE 3 – GLOBAL FLIGHT MANAGER USER INTERFACE: HIDDEN WIDGETS



FIGURE 4 – GLOBAL FLIGHT MANAGER USER INTERFACE: SURFACE VIEW IN 3D

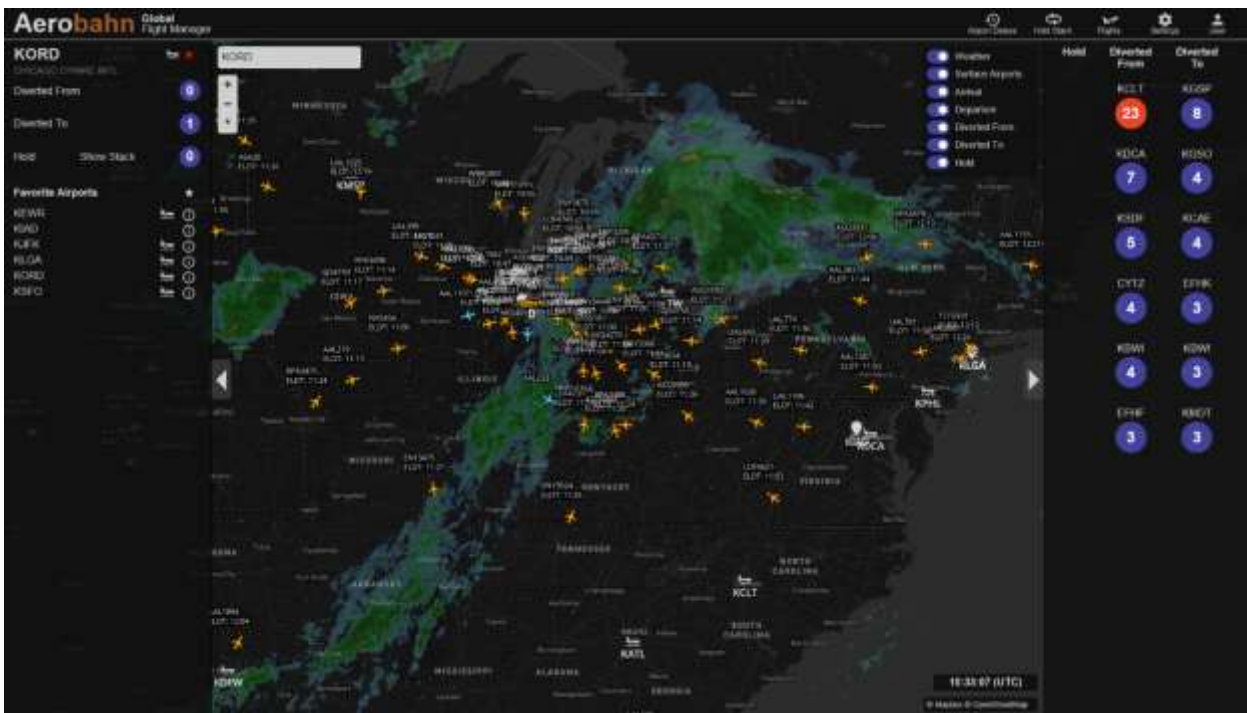


FIGURE 5 – GLOBAL FLIGHT MANAGER USER INTERFACE: DARK THEME

Example utilizing Global Flight Manager information and tools applied for diversion management: Figure 6 illustrates an example where holds are occurring at Charlotte Douglas International Airport (KCLT). When this occurs the user can use the Global Flight Manager information and tools to either:

- **Prevent diversions** by taking action to avoid diversions in real time and land at the intended destination or;
- **Optimize diversions** by taking action to reduce the cost and/or disruption of an unavoidable diversion and optimize the diversion recovery or;
- **Prioritize diversions** by taking action to ensure that a high-value flight (e.g., wide-body international or a transcontinental domestic with multiple connections) lands at the intended destination and a lower-value flight (e.g., narrow body point to point with few connections) is diverted

In order to assess the situation, the user can easily access the detailed holding stack information by opening the Hold Stack window to get information about flights holding, which are grouped in the individual stacks. In addition, the Flights window can be accessed to provide more details about the flights holding at KCLT. Selecting a flight in the list will also highlight the flight in the map display (in the example AAL148 is selected). It will also open up the Flight Details widget that provides additional flight information (see lower left-hand side of the UI). All this information can be used to make proactive diversion decisions and optimize costs.

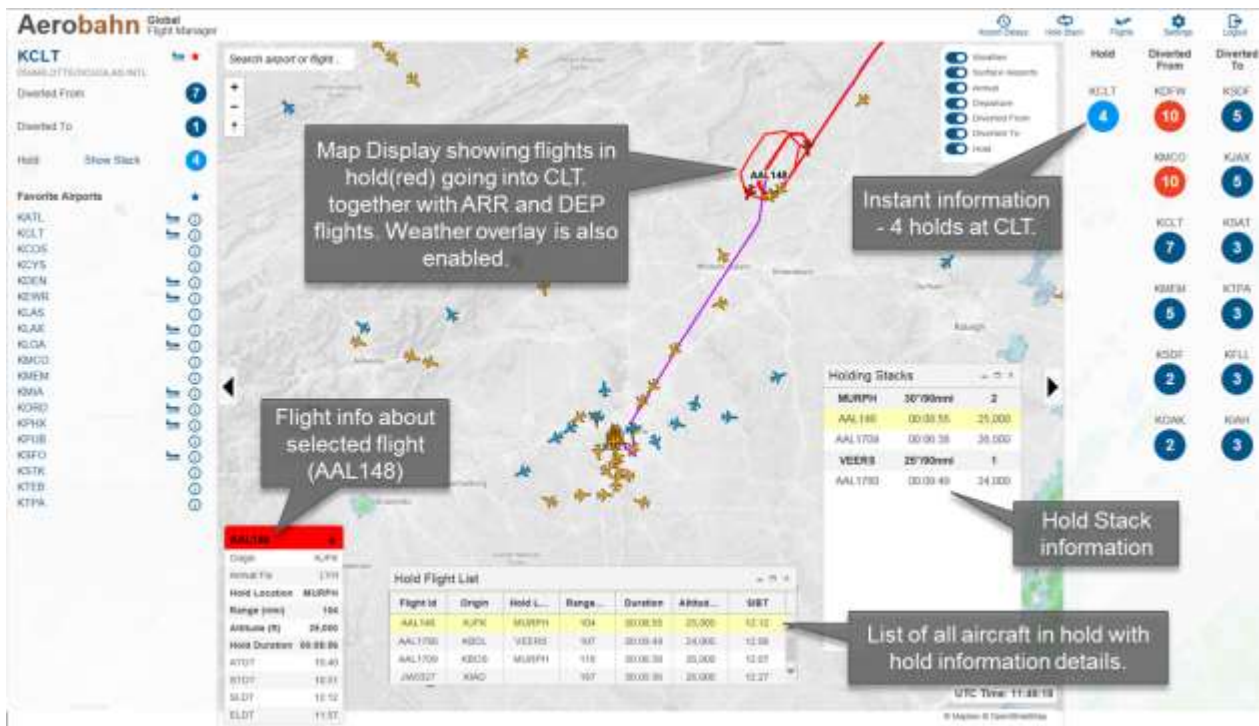


FIGURE 6 – EXAMPLE OF HOLD INFORMATION AT KCLT HIGHLIGHTING MULTIPLE TOOLS

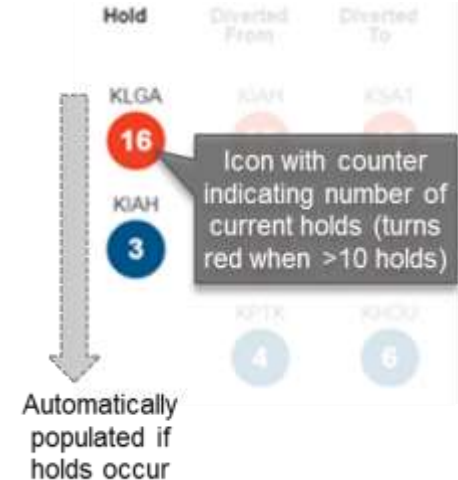
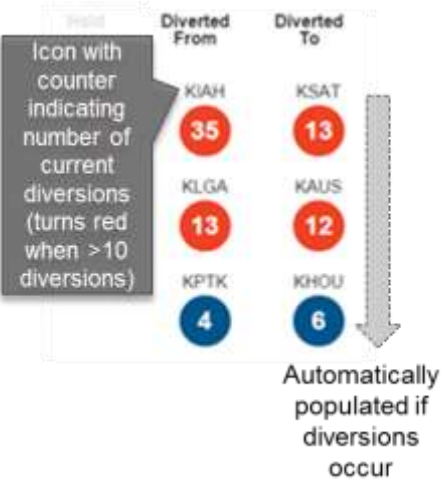
2.1 HOLD & DIVERSION INFORMATION

The Hold & Diversion Information tool is a multi-purpose information “dashboard”. It enables the user to access hold and diversion information based on the user’s preference in terms of what airport(s) to show and how many that should be listed. Users can configure the tool to either display hold and diversion information at:

- Network level, which means that users can see all holds and diversion in the network

- Pre-selected airports, which means that users can see all holds and diversion at those specific airports.

With the information provided the user immediately gets an understanding of what is ongoing in relation to hold and diversions affecting his/her operations at the airports of interest.

| Tool/Feature | Description | Example |
|---|--|--|
| <p>Automatic Hold Information</p> | <p>Based on the user’s settings (see section 2.7 for details) the hold information show can vary between:</p> <ul style="list-style-type: none"> • Hold information at network level • Hold information at user selected airports <p>Holds are automatically shown under the “hold column” when they occur, e.g. if there is a hold at LaGuardia airport this will then be automatically shown with the circular “Icon” and the Airport ICAO Code (i.e. KLGA).</p> <p>The icon is also color coded with the default color of blue. When going above 10 holds it turns red.</p> <p>When there are no holds occurring the icon will automatically disappear.</p> |  |
| <p>Automatic Diversion To and From Information</p> | <p>Along the same principles as for the holds, the diversion TO and FROM are automatically shown under the two columns “Diversion From” or “Diversion To” when they occur.</p> <p>The icon is also color coded with the default color of blue. When going above a threshold set to 10 diversions it turns red.</p> <p>When there are no diversions occurring the icon will automatically disappear.</p> |  |

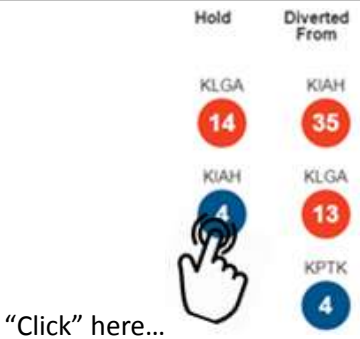
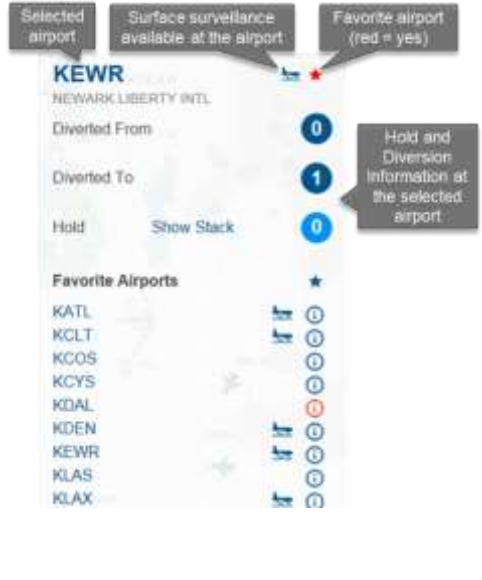
| | | |
|---|---|---|
| <p>Automatic “zoom to” airport</p> | <p>In addition to the information provided the user can also “click” the icon and automatically “zoom to” the selected airport, i.e. if the user clicks the “Hold” icon it directly zooms to that airport (To KIAH in the example illustrated).</p> |  <p>“Click” here...</p> |
|---|---|---|

TABLE 1 – HOLD & DIVERSION INFORMATION TOOLS/FEATURES

2.2 AIRPORT DETAILS

The Airport Details provides the user with the capability to get collected information about a specifically selected airport and allows the user to create a favorite list of airports for “quick access”.

| Tool/Feature | Description | Example |
|---|--|---|
| <p>Airport Details & “Show Stack” <i>(populated if there are holds at the airport)</i></p> | <p>After selecting an airport (e.g. via the search tool/feature, see section 2.5) it will be shown at the top of the Airport Details area. The user is provided with details about:</p> <ul style="list-style-type: none"> • Number of Diverted From • Number of Diverted To • Number of Holds <p>In addition the user can select that airport to be a “favorite” by marking the “star icon”.</p> <p>If there are holds occurring, the user can access detailed information about the holds by “clicking” the “Show Stack” – this will open the “Hold Stack” window (see section 2.6.2)</p> |  |

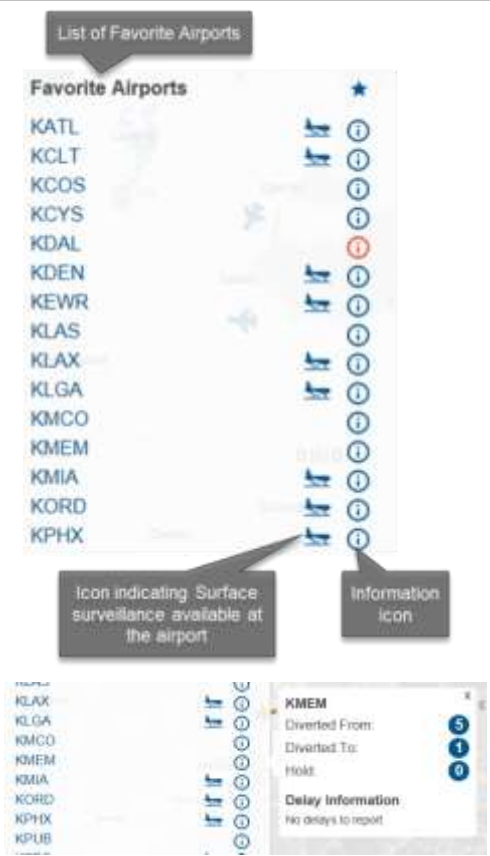
| | | |
|---|--|---|
| <p>Favorite Airports & “Quick Information”</p> | <p>All airports that have been selected as a favorite (see “Airport Details” tool/feature above) will be listed in the “Favorite Airport” list.</p> <p>By “clicking” an airport in the list the application instantly “zooms” to the selected airport in the Map Display and shows the selected airport in the “Airport Details” tool.</p> <p>By clicking the “information” icon associated with the airport in the list users get access to critical information like holds, diversions, delays etc. without actually selecting that airport (see example illustration for KMEM on the right)</p> <p>NOTE – a “red” marked information icon indicates that there are delays occurring at the airport and information about the delay is available.</p> <p>If an airport has an “aircraft icon” next to it surface surveillance is available. The user can zoom into the airport by “clicking” the icon and going directly to the airport surface.</p> |  |
|---|--|---|

TABLE 2 – AIRPORT SELECTION DETAILS TOOLS/FEATURES

2.3 MAP DISPLAY

The Map Display provides immediate situational awareness and the ability to monitor flights through all phases. It provides a number of tools and features to visualize the flights on the map and allows the user to highlight information of interest. Figure 7 illustrates the Map Display, which are described in more detail in Table 3.

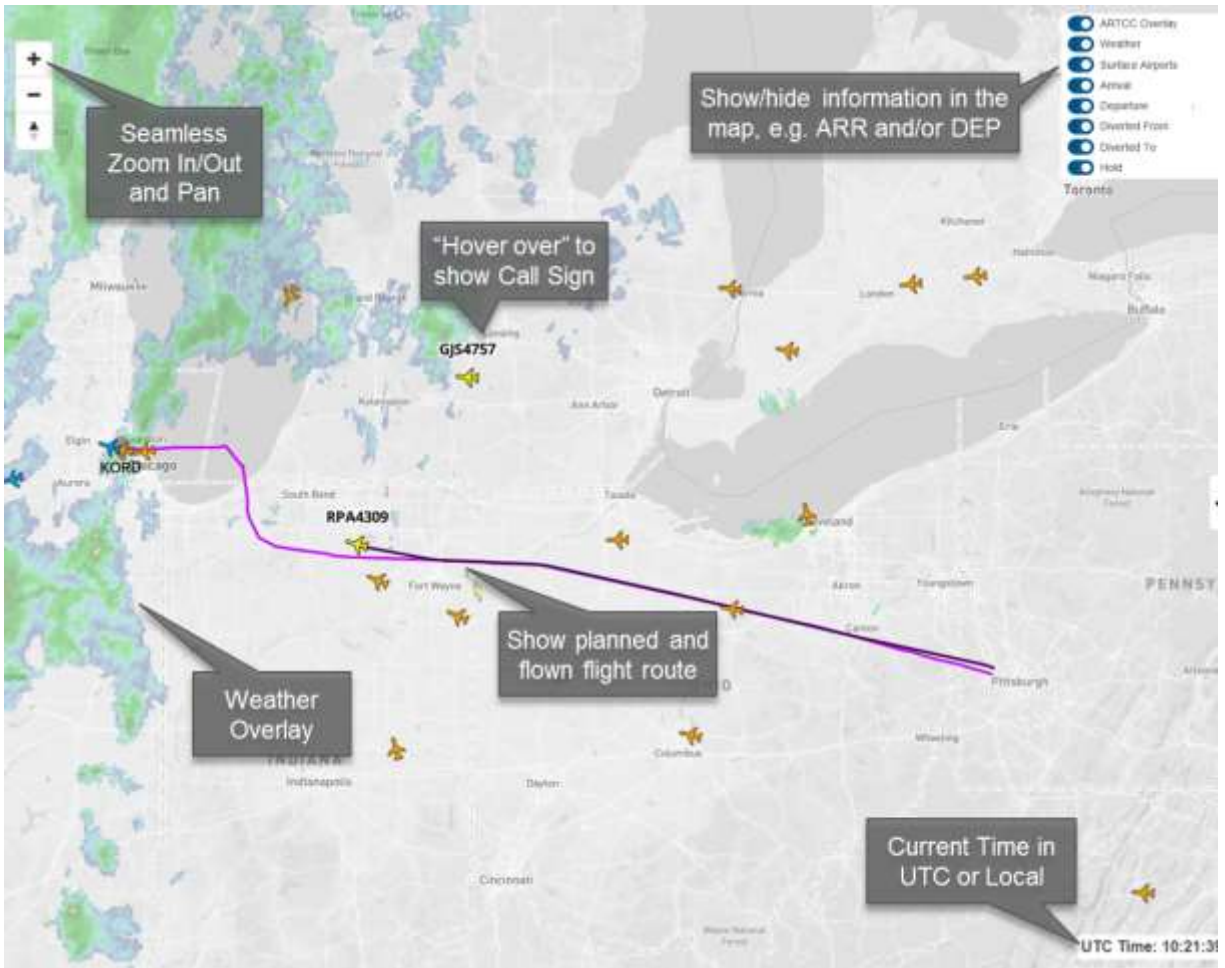
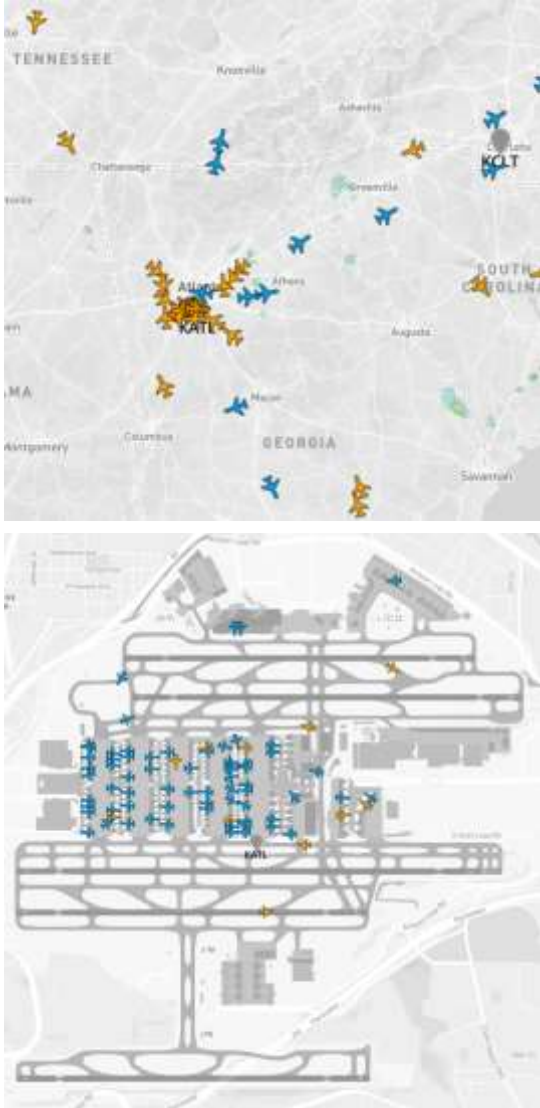








FIGURE 7 – TOOLS/FEATURES OF THE MAP DISPLAY

| Tool/Feature | Description | Example |
|--|--|---|
| <p>Display of Flights in real time in different phases of flight.</p> | <p>En-route, terminal and airport surface¹ flights can be displayed on the Map Display in real time.</p> <p>The flights are displayed as arriving or departing aircraft (blue for departing and amber for arriving).</p> <p>The flights displayed are dependent on what airport that has been selected by the user.</p> <p>In the example to the right, arriving and departing traffic at Atlanta International Airport are shown.</p> <p>The illustration below on the right shows the surface view in the Map Display at Atlanta International Airport.</p> |  |

¹ Currently this capability is limited to sites where Aerobahn Surface Manager is implemented.

| | | |
|--|--|--|
| <p>Visualization of planned and flown flight track.</p> | <p>By selecting a specific flight the planned as well as the flown flight track is displayed as an overlay in the Map Display.</p> <p>This provides an immediate understating of where the flight is going/coming from and how it has flown in the airspace.</p> <p>Planned flight track is displayed in a light purple color and the actual flown track is shown in dark purple.</p> <p>NOTE – the visualization of the flight route is configurable, please read section 2.7 for more info.</p> |  |
| <p>Show/hide Arrival and/or Departure Flights</p> | <p>In the Map Display the user can choose to display:</p> <ul style="list-style-type: none"> • All arriving and departing flights to a selected airport • All arriving and no departing flights to a selected airport • No arriving and all departing flights to a selected airport. <p>Selecting what to show is done easily by using the “sliders” in the upper right corner of the Map Display.</p> |  |
| <p>Show/hide Holds at an airport</p> | <p>In the Map Display the user can choose to display all holds at a selected airport (NOTE – holds will only appear if there actually are holds taking place at the airport).</p> <p>The flight(s) in holding will be visually displayed in the Map Display in light red and the flight track will also be shown.</p> <p>To visually show holds in the Map Display this has to be enabled by enabling the “Hold” slider.</p> <p>NOTE – the visualization of the flight route is configurable, please read section 2.7 for more info.</p> <p>To access more information/details about the flights in holding please read more about the tool/feature “Flight List” in section 2.2</p> |  |

| | | |
|---|--|--|
| <p>Show/hide diversions to and from an airport</p> | <p>In the Map Display the user can choose to display all diversions FROM and/or TO a selected airport (NOTE – diversions will only appear if there actually are diversions to or from the selected airport).</p> <p>By enabling the “Diverted From” and/or “Diverted To” sliders on the Map Display the user can choose what to display.</p> <p>The flight(s) will be visually displayed in dark red and the flight track will also be shown.</p> <p>NOTE – the visualization of the flight route is configurable, please read section 2.7 for more info.</p> <p>To access more information/details about the flights that are diverted please read more about the tool/feature “Flight List” in section 2.2</p> |  |
| <p>Surface Airports</p> | <p>In the Map Display, the user can choose to show all the airports that currently have visualization of surface targets. By selecting this option airport with surface target information are shown in the Map Display with at specific icon (see image on the right)</p> |  |
| <p>Weather overlay</p> | <p>In the Map Display, the user can choose to show/hide weather information.</p> <p>The weather information is based on NOAA’s National Weather Service Doppler Radar Mosaic data.</p> |  |

| | | |
|-----------------------------------|--|--|
| <p>ARTCC overlay</p> | <p>In the Map Display the user can choose to show/hide the Air route Traffic Control Centre (applicable in the FAA National Air Space).</p> | |
| <p>Pan and Zoom in/out</p> | <p>The Map Display supports seamless pan and zoom in/out functionality. The user can use multiple ways of zooming in /out by using:</p> <ul style="list-style-type: none"> • The zoom in/out icons in the Map Display (works in any platform) • The mouse scroll wheel (works on a Windows platform) • The pinch in/out finger motions on a touch display (works on any platform supporting touch display functionality). | |
| <p>Flight Datablock</p> | <p>By “hovering over” or selecting a flight the Call Sign of the aircraft is displayed as default setting.</p> <p>The user can choose to show the Datablock at all times and also select what data to show in the Datablock. Details on how to configure this are documented in section 2.7</p> | |

TABLE 3 – MAP DISPLAY TOOL/FEATURES

2.4 FLIGHT DETAILS

The Flight Details tool provides the user access to more detailed flight information. This information becomes available when selecting a specific flight, either through the Map Display or in the Flights list.

Once a flight is selected, the Flight Details tool is displayed in the lower left corner of the application user interface as a pop-up widget.



| Tool/Feature | Description | Example |
|------------------------------|--|--|
| <p>Flight Details</p> | <p>By “clicking” and aircraft in the Map Display or in the Flights list the “Flight Details” tool will open up (at the lower left hand corner in the UI). The information provided is:</p> <ul style="list-style-type: none"> • Flight ID (ICAO or IATA code) • Origin/Departure Airport • Diversion Information (only if flight is diverted) • Hold Duration in hh:mm:ss (only when in hold)Arrival Fix (at Destination Airport) • Range (Nm) from Destination Airport • Altitude (ft) • Important time information e.g.: <ul style="list-style-type: none"> • Actual Take Off Time (ATOT) • Scheduled Take Off Time (STOT) • Scheduled Landing Time (SLDT) • Estimated Landing Time (ELDT) <p>NOTE – the information provided can vary dependent on what information that is available for the selected flight. E.g. for a departing flight the Arrival Fix at the DEST airport might be missing this data filed is therefore not shown, until the info is available.</p> | <p>DEP Flight information</p>  <p>ARR flight information</p>  |

TABLE 4 – FLIGHT INFORMATION TOOLS/FEATURES

2.5 ADVANCED SEARCH

The Search feature allows the user to search for any flight or airport. When listed in the search tool the user can choose the airport or flight and the Map Display will automatically “zoom to” the selected airport or flight. If an airport is selected, it will also automatically be displayed in the Airport Details (see section 2.2)

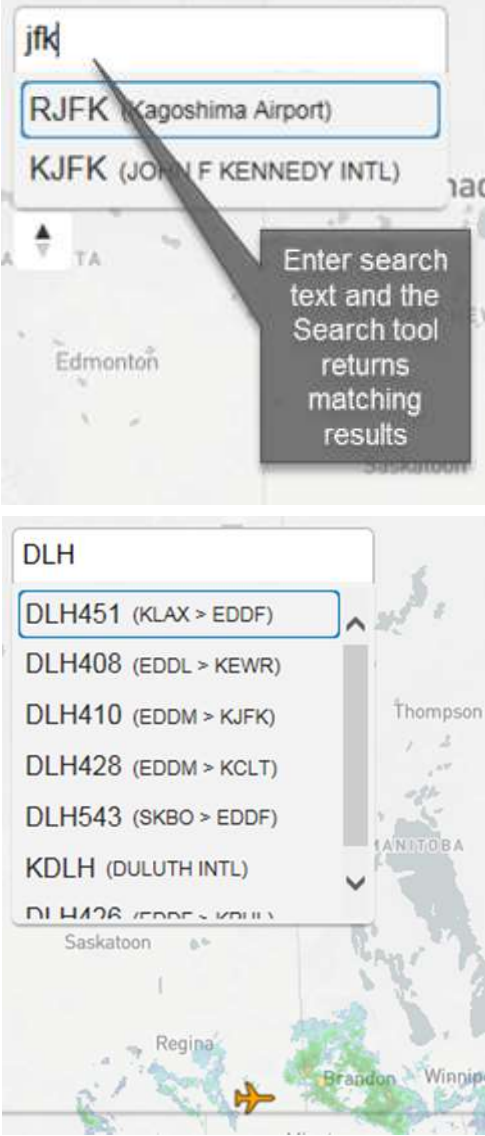
| Tool/Feature | Description | Example |
|----------------------|---|---|
| <p>Search</p> | <p>In the Search tool the user can enter free text to search for an airport or a flight anywhere in the network (i.e. en-route or on ground). For flights, the departure and arrival airports are shown in parenthesis. If a flight is on ground an icon will be displayed as well. By “choosing” an airport air flight the user is directly zoomed to that choice</p> <p>The search tool will list all possible airports and/or flights matching the combination of letters and/or numbers the user enters.</p> <p>It will also match the airport name with the ICAO code, e.g. if the users enters “Kennedy” the search tool will return “KJFK”.</p> <p>The examples to the right shoes how the search tools returns results when typing in JFK as well as DLH.</p> |  |

TABLE 5 – SEARCH TOOLS/FEATURES

2.6 INFORMATION WINDOWS

The different information windows enable the user to view and assess various information that is relevant for decision-making. These windows are accessed via the menu at the top right hand corner in the application UI. Figure 8 highlights the menu and shows the Flights list window open in the application as an example. Multiple windows can be opened at the same time and can be changed in size and positioned in any way the user prefers.

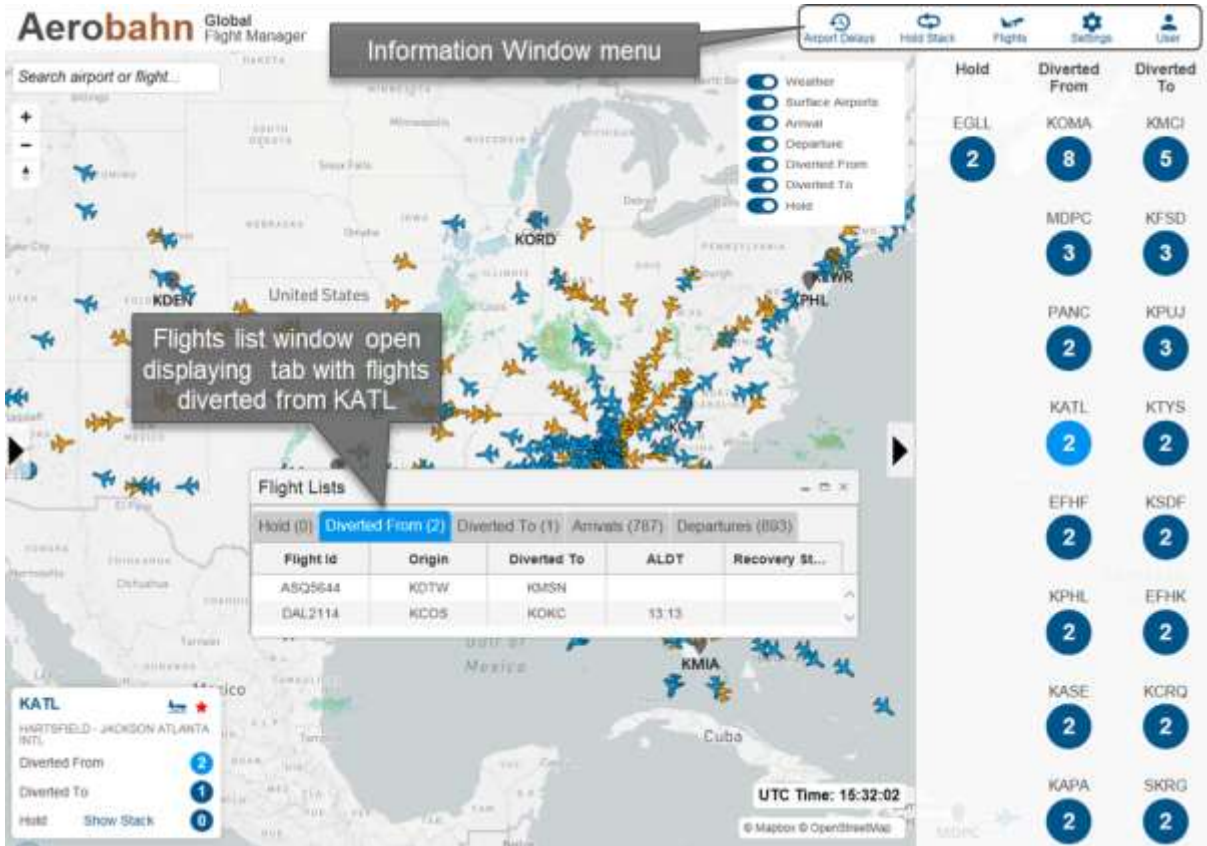


FIGURE 8 – ACCESSING THE INFORMATION WINDOWS

2.6.1 AIRPORT DELAYS WINDOW

The Airport Delays window provides detailed delay information for all airports that are affected by some kind of delay. Information is based on FAA Air Traffic Control issued delays.

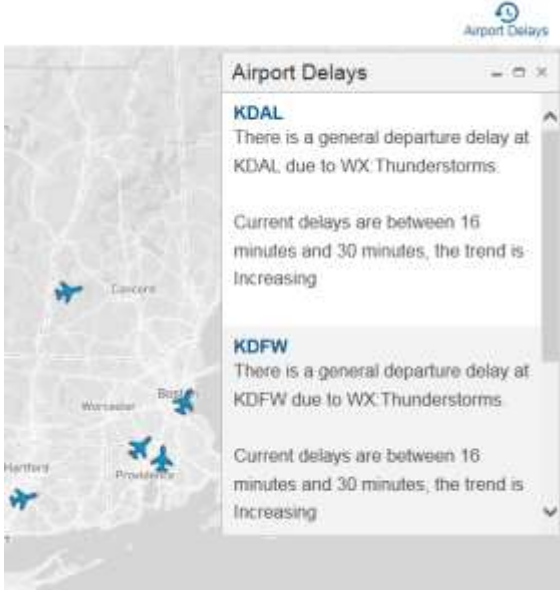

| Tool/Feature | Description | Example |
|------------------------------|--|--|
| <p>Airport Delays</p> | <p>By “clicking” the Airport Delays icon a window will be displayed in the user interface showing all airports that currently are affected by delays. The information shown is:</p> <ul style="list-style-type: none"> • Delay type • Reason • Average delay time • Max delay time • Trend • Type <p>In the example, two airports are currently experiencing delays and the Airport Delay window displays that information by airport.</p> |  |

TABLE 6 – AIRPORT DELAYS WINDOW

2.6.2 HOLD STACK WINDOW

The Hold Stack window provides detailed information about the holds occurring at the selected airport.

| Tool/Feature | Description | Example | | | | | | | | | | | | | | | | | | |
|--------------------------|---|---|----------------|--|--|--------------|------------------|----------|--------|----------|--------|---------|----------|--------|--------------|------------------|----------|---------|----------|--------|
| <p>Hold Stack</p> | <p>By “clicking” the “Hold Stack” icon (or “Show Stack” in the Airport Details tool) the Hold Stack window is displayed in the user interface showing all the holds currently occurring at the selected airport.</p> <p>The information presented is organized per “hold stack” as shown in the example on the right. As the Hold Stack window shows there are holds occurring at MURPH and VEERS (at KMEM airport). At MURPH, two aircraft are in the holding patterns and at VEERS, one aircraft is holding. The location of the hold stacks is also displayed.</p> <p>For each aircraft the hold duration (hh:mm:ss) and the altitude (feet) is presented.</p> |  <table border="1" data-bbox="954 1199 1328 1738"> <thead> <tr> <th colspan="3">Holding Stacks</th> </tr> </thead> <tbody> <tr> <td>MURPH</td> <td>30°/90nmi</td> <td>2</td> </tr> <tr> <td>AAL148</td> <td>00:08:55</td> <td>25,000</td> </tr> <tr> <td>AAL1709</td> <td>00:06:38</td> <td>26,000</td> </tr> <tr> <td>VEERS</td> <td>25°/90nmi</td> <td>1</td> </tr> <tr> <td>AAL1780</td> <td>00:09:49</td> <td>24,000</td> </tr> </tbody> </table> | Holding Stacks | | | MURPH | 30°/90nmi | 2 | AAL148 | 00:08:55 | 25,000 | AAL1709 | 00:06:38 | 26,000 | VEERS | 25°/90nmi | 1 | AAL1780 | 00:09:49 | 24,000 |
| Holding Stacks | | | | | | | | | | | | | | | | | | | | |
| MURPH | 30°/90nmi | 2 | | | | | | | | | | | | | | | | | | |
| AAL148 | 00:08:55 | 25,000 | | | | | | | | | | | | | | | | | | |
| AAL1709 | 00:06:38 | 26,000 | | | | | | | | | | | | | | | | | | |
| VEERS | 25°/90nmi | 1 | | | | | | | | | | | | | | | | | | |
| AAL1780 | 00:09:49 | 24,000 | | | | | | | | | | | | | | | | | | |

| | | |
|--|---|--|
| | To access more information about the aircraft holding users can access the “Flights” window (see section 2.6.3) | |
|--|---|--|

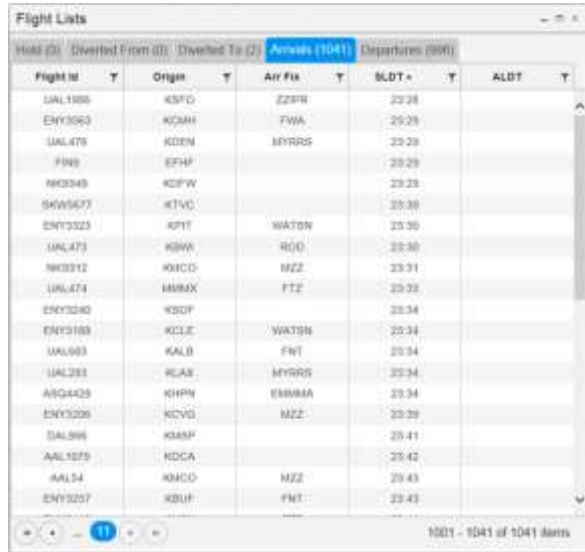
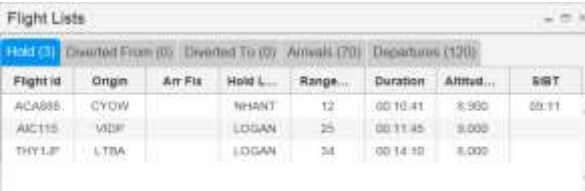
TABLE 7 – HOLD STACK WINDOW


2.6.3 FLIGHT LISTS WINDOW

The Flight Lists window provides detailed information about flights that are:

- Holding
- Diverted (to or from an airport)
- Arriving or departing

The information populating the list is based on the user’s choice of airport, i.e. if the user has chosen John F Kennedy airport information related to JFK will be shown in the Flights Window. The lists also allow for filtering and sorting of the flights (please see Table 8 for details).

| Tool/Feature | Description | Example |
|---|---|--|
| Flight Lists window basics | <p>By “clicking” the “Flights” icon in the menu Flight Lists window is opened. The user gets access to the following information via different tabs:</p> <ul style="list-style-type: none"> • Flights holding • Flights diverted TO • Flights diverted FROM • Arriving flights • Departing flights <p>The user can also filter and sort the information displayed in each column.</p> <p>The example to the right shows the Arrival tab.</p> |  |
| Flight Lists window displaying information about holding flights | <p>By “clicking” the “Hold” tab in the Flights window all flights that are currently holding at the chosen airport are displayed. Each flight in the list will have the following information:</p> <ul style="list-style-type: none"> • Flight ID |  |

| | <ul style="list-style-type: none"> • Origin airport • Arrival Fix • Hold Location • Range (nm) from arrival airport • Duration in holding (hh:mm:ss) • Altitude (ft) • Scheduled In-Block Time (SIBT) <p>Each column in the list can be filtered or sorted in ascending or descending order.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|-----------|-----------------|---------------|------|-----------------|--------|------|------|-------|--|--------|------|------|-------|--|--------|------|------|-------|--|--------|------|------|--|--|
| <p>Flight Lists window displaying Diversion TO or Diversion FROM information</p> | <p>By “clicking” the “Diverted to” or “Diverted from” tab in the Flight Lists window all flights that are diverting or have diverted TO or FROM the chosen airport are displayed.</p> <p>Each flight in the Diversion FROM tab will have the following information:</p> <ul style="list-style-type: none"> • Flight ID • Origin Airport • Diverted TO Airport • Actual Landing Time (if landed) • Recovery Status (if available) <p>Each flight in the Diversion TO tab will have the following information:</p> <ul style="list-style-type: none"> • Flight ID • Origin Airport • Diverted FROM Airport • Actual Landing Time (if landed) • Recovery Status (if available) <p>Each column in the list can be filtered or sorted in ascending or descending order.</p> |  <table border="1"> <thead> <tr> <th>Flight Id</th> <th>Origin</th> <th>Diverted From</th> <th>ALDT</th> <th>Recovery Status</th> </tr> </thead> <tbody> <tr> <td>EJA758</td> <td>KOCT</td> <td>KESN</td> <td>22:50</td> <td></td> </tr> <tr> <td>EJAD51</td> <td>KONA</td> <td>KJFK</td> <td>22:54</td> <td></td> </tr> <tr> <td>LXJ520</td> <td>KGAL</td> <td>KAVL</td> <td>23:09</td> <td></td> </tr> <tr> <td>EJA232</td> <td>KMMU</td> <td>KORV</td> <td></td> <td></td> </tr> </tbody> </table> | Flight Id | Origin | Diverted From | ALDT | Recovery Status | EJA758 | KOCT | KESN | 22:50 | | EJAD51 | KONA | KJFK | 22:54 | | LXJ520 | KGAL | KAVL | 23:09 | | EJA232 | KMMU | KORV | | |
| Flight Id | Origin | Diverted From | ALDT | Recovery Status | | | | | | | | | | | | | | | | | | | | | | | |
| EJA758 | KOCT | KESN | 22:50 | | | | | | | | | | | | | | | | | | | | | | | | |
| EJAD51 | KONA | KJFK | 22:54 | | | | | | | | | | | | | | | | | | | | | | | | |
| LXJ520 | KGAL | KAVL | 23:09 | | | | | | | | | | | | | | | | | | | | | | | | |
| EJA232 | KMMU | KORV | | | | | | | | | | | | | | | | | | | | | | | | | |

| <p>Flights Window displaying information about arrivals and departures</p> | <p>By “clicking” the “Arrivals” or “Departures” tab in the Flight Lists window all flights arriving or departing will be shown in the respective lists.</p> <p>The list shown to the right is displaying all departures at the airport.</p> | <table border="1"> <thead> <tr> <th>Flight Id</th> <th>Dest</th> <th>Dep Fix</th> <th>SOBT</th> <th>ATOT</th> </tr> </thead> <tbody> <tr><td>SKW4676</td><td>KCVG</td><td>EARND</td><td>11:25</td><td>11:45</td></tr> <tr><td>TCF5932</td><td>KLGA</td><td>MOBLE</td><td>11:30</td><td>11:40</td></tr> <tr><td>UAL1417</td><td>KFLL</td><td>EARND</td><td>11:30</td><td>11:58</td></tr> <tr><td>ASQ4362</td><td>CYUL</td><td>EBAKE</td><td>11:33</td><td>11:57</td></tr> <tr style="background-color: #007bff; color: white;"><td>DAL2050</td><td>KDTW</td><td>RAYNR</td><td>11:34</td><td>11:41</td></tr> <tr><td>SKW5652</td><td>KBNA</td><td>CMSKY</td><td>11:36</td><td>11:51</td></tr> <tr><td>ASQ3865</td><td>KSTL</td><td>BACEN</td><td>11:40</td><td>11:54</td></tr> <tr><td>DAL814</td><td>KMSP</td><td>PMPKN</td><td>11:40</td><td>11:55</td></tr> <tr><td>UAL476</td><td>CYYZ</td><td>EBAKE</td><td>11:45</td><td>11:51</td></tr> <tr><td>DAL1477</td><td>KATL</td><td>EARND</td><td>11:45</td><td></td></tr> <tr><td>FFT1310</td><td>KMIA</td><td>DENNT</td><td>11:45</td><td>12:01</td></tr> <tr><td>FDX3807</td><td>KOAK</td><td></td><td>11:45</td><td>12:01</td></tr> <tr><td>NKS943</td><td>KACY</td><td></td><td>11:49</td><td></td></tr> <tr><td>UAL771</td><td>KDFW</td><td>BACEN</td><td>11:50</td><td></td></tr> <tr><td>SKW5544</td><td>CYOW</td><td></td><td>11:50</td><td></td></tr> <tr><td>UAL1988</td><td>KSFO</td><td>PMPKN</td><td>11:50</td><td></td></tr> <tr><td>ENY3572</td><td>KIND</td><td>EARND</td><td>11:55</td><td></td></tr> <tr><td>RPA4559</td><td>KATL</td><td>EARND</td><td>11:55</td><td></td></tr> <tr><td>ASQ4453</td><td>KBHM</td><td>BACEN</td><td>11:57</td><td></td></tr> <tr><td>ACA535</td><td>CYVR</td><td>MYKIE</td><td>12:00</td><td></td></tr> <tr><td>FFT80</td><td>MDPC</td><td>MOBLE</td><td>12:00</td><td></td></tr> <tr><td>ENY3534</td><td>CYYZ</td><td>EBAKE</td><td>12:00</td><td></td></tr> </tbody> </table> | Flight Id | Dest | Dep Fix | SOBT | ATOT | SKW4676 | KCVG | EARND | 11:25 | 11:45 | TCF5932 | KLGA | MOBLE | 11:30 | 11:40 | UAL1417 | KFLL | EARND | 11:30 | 11:58 | ASQ4362 | CYUL | EBAKE | 11:33 | 11:57 | DAL2050 | KDTW | RAYNR | 11:34 | 11:41 | SKW5652 | KBNA | CMSKY | 11:36 | 11:51 | ASQ3865 | KSTL | BACEN | 11:40 | 11:54 | DAL814 | KMSP | PMPKN | 11:40 | 11:55 | UAL476 | CYYZ | EBAKE | 11:45 | 11:51 | DAL1477 | KATL | EARND | 11:45 | | FFT1310 | KMIA | DENNT | 11:45 | 12:01 | FDX3807 | KOAK | | 11:45 | 12:01 | NKS943 | KACY | | 11:49 | | UAL771 | KDFW | BACEN | 11:50 | | SKW5544 | CYOW | | 11:50 | | UAL1988 | KSFO | PMPKN | 11:50 | | ENY3572 | KIND | EARND | 11:55 | | RPA4559 | KATL | EARND | 11:55 | | ASQ4453 | KBHM | BACEN | 11:57 | | ACA535 | CYVR | MYKIE | 12:00 | | FFT80 | MDPC | MOBLE | 12:00 | | ENY3534 | CYYZ | EBAKE | 12:00 | |
|---|---|--|-----------|-------|---------|------|------|---------|------|-------|-------|-------|---------|------|-------|-------|-------|---------|------|-------|-------|-------|---------|------|-------|-------|-------|---------|------|-------|-------|-------|---------|------|-------|-------|-------|---------|------|-------|-------|-------|--------|------|-------|-------|-------|--------|------|-------|-------|-------|---------|------|-------|-------|--|---------|------|-------|-------|-------|---------|------|--|-------|-------|--------|------|--|-------|--|--------|------|-------|-------|--|---------|------|--|-------|--|---------|------|-------|-------|--|---------|------|-------|-------|--|---------|------|-------|-------|--|---------|------|-------|-------|--|--------|------|-------|-------|--|-------|------|-------|-------|--|---------|------|-------|-------|--|
| Flight Id | Dest | Dep Fix | SOBT | ATOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SKW4676 | KCVG | EARND | 11:25 | 11:45 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TCF5932 | KLGA | MOBLE | 11:30 | 11:40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UAL1417 | KFLL | EARND | 11:30 | 11:58 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ASQ4362 | CYUL | EBAKE | 11:33 | 11:57 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DAL2050 | KDTW | RAYNR | 11:34 | 11:41 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SKW5652 | KBNA | CMSKY | 11:36 | 11:51 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ASQ3865 | KSTL | BACEN | 11:40 | 11:54 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DAL814 | KMSP | PMPKN | 11:40 | 11:55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UAL476 | CYYZ | EBAKE | 11:45 | 11:51 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DAL1477 | KATL | EARND | 11:45 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FFT1310 | KMIA | DENNT | 11:45 | 12:01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FDX3807 | KOAK | | 11:45 | 12:01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NKS943 | KACY | | 11:49 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UAL771 | KDFW | BACEN | 11:50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SKW5544 | CYOW | | 11:50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UAL1988 | KSFO | PMPKN | 11:50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENY3572 | KIND | EARND | 11:55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RPA4559 | KATL | EARND | 11:55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ASQ4453 | KBHM | BACEN | 11:57 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACA535 | CYVR | MYKIE | 12:00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FFT80 | MDPC | MOBLE | 12:00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENY3534 | CYYZ | EBAKE | 12:00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

TABLE 8 – FLIGHT LISTS WINDOW

2.7 SETTINGS

The Settings tools allow the user to set personalized preferences in the application. The following settings can be applied:

- **Look and Feel settings**
 - Select a “light” or “dark” color theme
 - Select time zone to the UTC or Local time at selected airport
- **Map settings**
 - Show/hide the datablock of a flight and tailor what to show in the datablock
 - Show aircraft routes and tailor what routes to show
- **Counts settings**
 - Configuring what airports are shown in the Hold & Diversion Information tool (tool is described in section 2.1).
- **Favorite Airports**
 - Configure what airport(s) to show in the favorite list

| Tool/Feature | Description | Example |
|---|--|---|
| Look and Feel - set color themes | The user can change the color theme to be either a pre-configured “light” or “dark” theme. | Color Theme: Light Dark |
| Look and Feel - set timezone | The user can change the time zone to be either UTC or local time at the selected airport | Timezone: UTC Local |

Map Settings – configure datablock

The user can select to show/not show the Datablock for the flights in the Map Display.

By selecting “Off” no Datablock are visible in the Map Display.

By selecting “On” the Datablock is visible in the Map Display. The user also needs to configure what data to show in the Datablock by selecting elements in the drop down menu. The following data elements are available:

- Callsign
- Origination
- Destination
- Actual Take Off Time(ATOT)
- Estimated Take Off Time (ETOT)
- Scheduled Landing Time (SLDT)
- Estimated Landing Time (ELDT)
- Arrival Fix
- Departure Fix



Map Settings – configure flight routes

The user can select what flight routes to show in the Map Display

The options are to show:

- “All”
- “None”
- “Custom”

For the “Custom” option the user can select what routes to show as follows:

- Flights in airborne holding
- Flights that are Diverting From
- Flight that are Diverting To
- Flight that has been selected



Configure what information to display in the “Hold & Diversion Information” tool

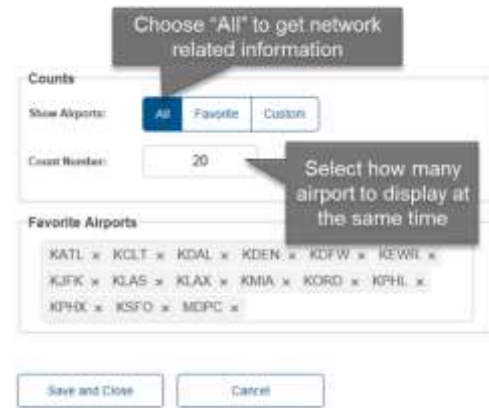
The user can configure what hold and diversion information to display in the “Hold & Diversion Information” tool.

The options are to display holds and diversion at:

- Network level
- User selected airports, which either can be the same as the list of favorite airports or a custom made list.

In the illustrations to the right, the different configuration options are exemplified.

Choose “All”:



Counts

Show Airports: All Favorite Custom

Count Number: 20

Favorite Airports

KATL x KCLT x KDAL x KDEN x KDFW x KEWR x
 KJFK x KLAS x KLAX x KMIA x KORD x KPHL x
 KPHX x KSFO x MDPC x

Save and Close Cancel

Choose “Favorite”:



Counts

Show Airports: All Favorite Custom

Count Number: 15

Favorite Airports

KATL x KCLT x KDAL x KDEN x KDFW x KEWR x
 KJFK x KLAS x KLAX x KMIA x KORD x KPHL x
 KPHX x KSFO x MDPC x

Save and Close

Choose “Custom”:



Counts

Show Airports: All Favorite Custom

Count Number: KSYR x

Favorite Airports

KATL x
 KJFK x
 KPHX x

Save and Close Cancel

TABLE 9 – SETTINGS

2.8 USER

The User tool allows the user to change the password and log out of the Global Flight Manager.

3 PRODUCT BENEFITS

| Benefit | How | Impacted customer/stakeholder |
|---|--|--|
| Proactive management of upcoming diversions. | By getting information about holds in the network, the user will be able to detect upcoming diversion situations. This will allow for proactive decision making on diversions optimizing fuel burn and holding delays. | <ul style="list-style-type: none"> • Airlines • Passengers |
| Prevent “Expect Further Clearance” (EFC) diversions | By providing more accurate information about when the aircraft(s) will leave airborne holding users can make better diversion decisions and lower costs related to them. | <ul style="list-style-type: none"> • Airlines • Airport operator |
| Prioritize flight in hold/diversion situations. | Make more informed decisions based on better awareness of if and for how long aircraft are holding. Also allow multiple aircrafts from the same company to be prioritized for a diversion or landing. | <ul style="list-style-type: none"> • Airlines • Passengers |
| Accurate information about current diversion situation, network wide. | The information provided via the Global Flight Manager will allow for a more precise understanding of the current hold and diversion situation network wide. This will allow airports to also be informed about diversions to their airport so they can take proactive measures to accommodate the incoming traffic. | <ul style="list-style-type: none"> • Airport Operators |

TABLE 10 – BENEFITS TO STAKEHOLDERS



SAAB

Aerobahn Flight Arrival Monitor Product Description

Date: 07/24/2016

Note – This Product Description is aligned with Aerobahn Flight Arrival Monitor, TRIAL Version

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1 PRODUCT OVERVIEW

The Aerobahn Flight Arrival Monitor is an easy-to-use web-based application that provides accurate and reliable information and notifications about when flights are arriving, have landed and are taxiing to their designated gate/stand. The Flight Arrival Monitor provides airline and airport staff, including ground handling agents, both situational awareness and customized alerts about key flight arrival events, including flight landing and proximity to gate notifications. Awareness of these key events allows key stakeholders to assign and deploy resources at the right time and location to ensure a more efficient and timely handling of the aircraft arrival and turn process.



FIGURE 1 – FLIGHT ARRIVAL MONITOR OVERVIEW

Some of the other key features and benefits of the Aerobahn Flight Arrival Monitor include:

- ✓ An intuitive user interface that minimizes the need for end-user training and associated costs
- ✓ Easy access via PCs and tablets, making it ideal for enterprise wide use by multiple users – this ensures lower costs for training as well as application support.
- ✓ Minimal client hardware requirements to run the web-based application. It will work on any PC or tablet that has a web browser, which eliminates additional cost for new hardware or upgrades.
- ✓ A Software as a Service (SaaS) application, which minimizes installation and implementation costs.

2 PRODUCT FEATURES

The Aerobahn Flight Arrival Monitor is very easy to set-up and use. The user interface has two key tools/features: surveillance-based notification of flight landing time and alert generation for flight proximity to parking position. It also has customized User Settings:

- The Map Display – Provides Users with visual awareness about arriving flight and associated information
- Notifications – enables the user to receive notifications/alerts (both visual and audio) about arriving flights
- User Settings – Allows the user to configure the application to meet specific needs.

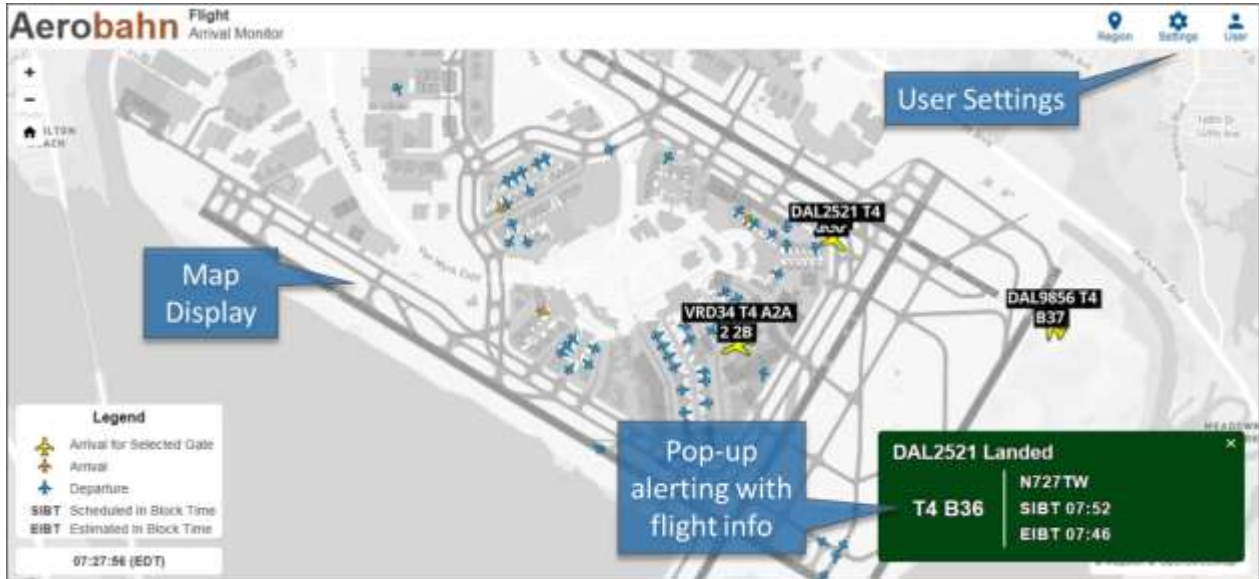


FIGURE 2 – FLIGHT ARRIVAL MONITOR PRIMARY TOOLS

2.1 MAP DISPLAY

The Map Display provides the basic awareness of all flights on the airport surface (including both arrivals and departures). Based on the configuration set by the user, it will also highlight specific arrival flights that have landed and are taxiing to selected gates/stands. Figure 3 and Table 1 give a more detailed description on the Map Display and its functionality.

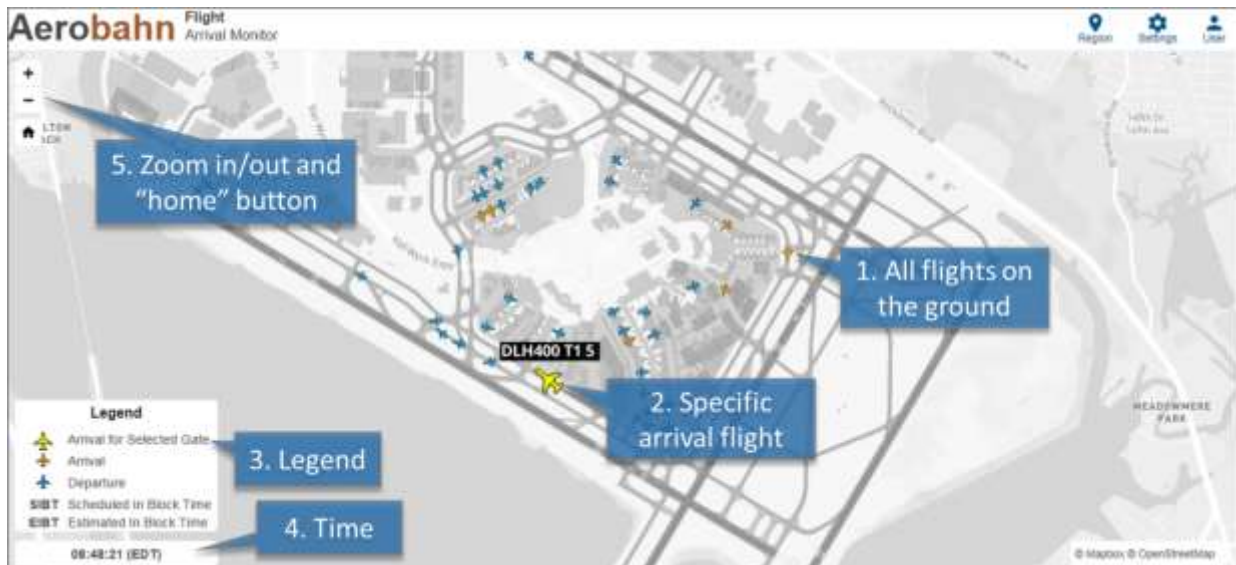


FIGURE 3 – THE MAP DISPLAY FUNCTIONALITY

| Item | Description |
|------|---|
| 1 | All Flights on the Ground - The Map Display shows all the departing and arriving flights currently on the ground (either parked at gate/stand or taxing in or out). |
| 2 | Specific Arrival Flight - The Map Display highlights specific arriving flights with a separate icon and data tag associated with the flight. The highlighting of a flight is based on the user’s setting in the application. How the settings are configured is described in section 2.3 |
| 3 | Legend - The Map Display will always show the legend that provides information about flight icon descriptions and abbreviations used in the application. |
| 4 | Time - The Map Display will always display of current time. The current time is shown in the local time at the airport. |
| 5 | Zoom In / Out - The Map Display has zoom in/out capability as well as a “home” button allowing the user to go directly back to the “default” zoom level. |

TABLE 1 – THE MAP DISPLAY FUNCTIONALITY

2.2 NOTIFICATIONS

Flight Arrival Monitor Users are presented with both visual and audio alerts notifications. For an arriving flight these notifications can be triggered by different events based on user settings (how to do the set-up is described in section 2.3). The three events that will trigger a notification for an arriving flight are:

1. Aircraft has landed
2. Aircraft is at a certain proximity distance from a gate
3. Aircraft is at a certain proximity time from a gate

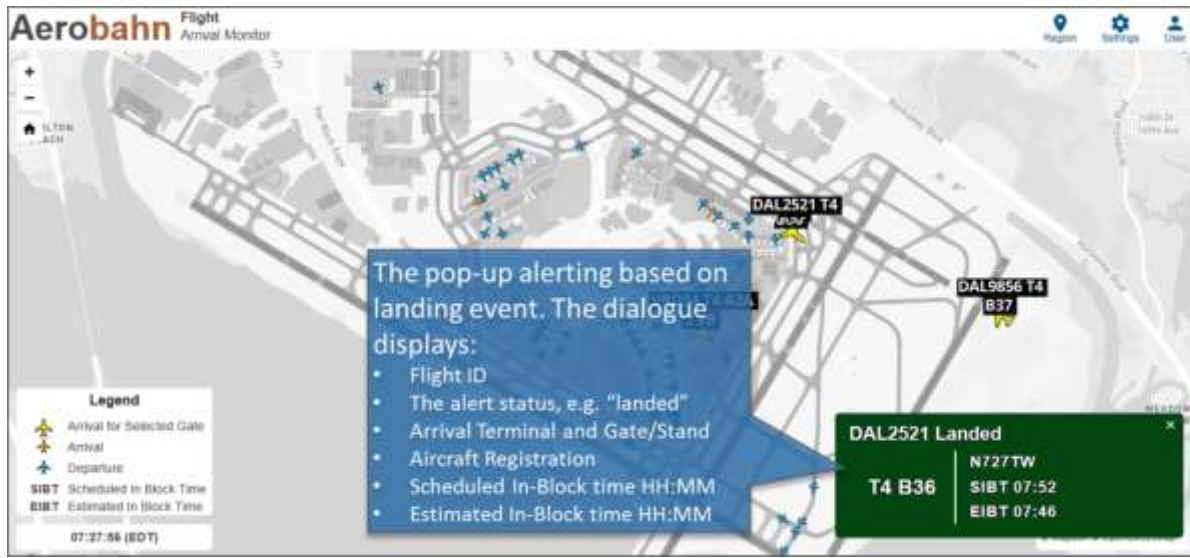
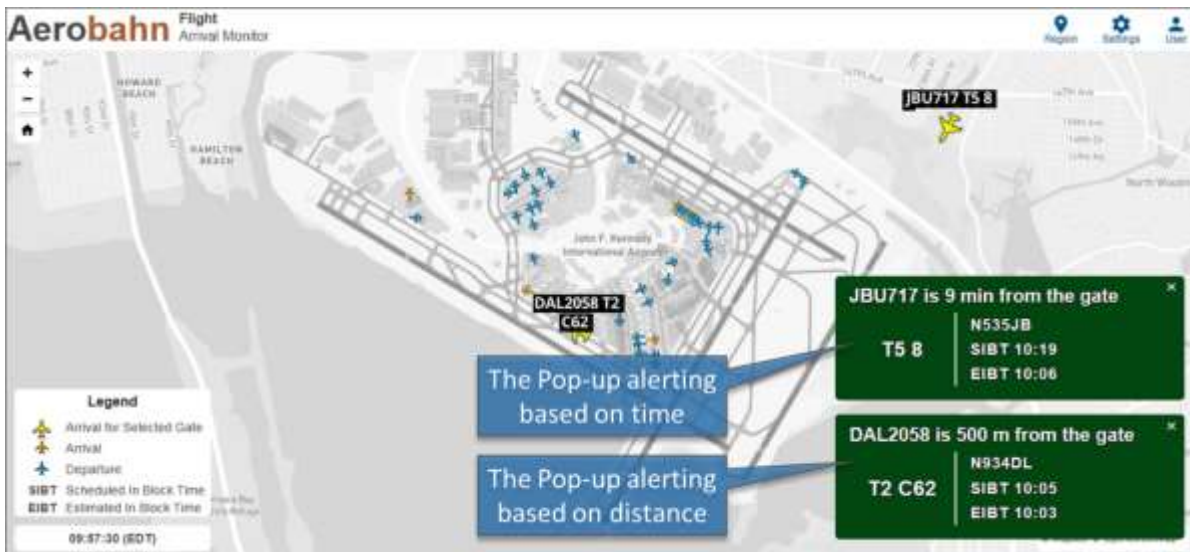
NOTE - These alerts can be combined or used separately depending the user’s preference.

2.2.1 POP-UP NOTIFICATIONS

When a pop-up alert dialogue is highlighted in the application, it will present key information about the arrival flight. The information presented is:

- Flight ID
- The alert status, e.g. “landed”
- Arrival Terminal and Gate/Stand
- Aircraft Registration
- Scheduled In-Block Time (SOBT) in HH:MM
- Estimated In-Block Time (EIBT) in HH:MM

Figure 4 and Figure 5 show two examples of how the pop-alert dialogues are presented in the application for arriving flights that have landed, are at a certain distance from gate in meters, and distance from gate in reference to time.


FIGURE 4 – POP-UP ALERT DIALOGUE FOR A LANDED FLIGHT

FIGURE 5 – POP-UP ALERT DIALOGUE ALERTING BASED ON DISTANCE AND TIME TO GATE

2.2.2 AUDIO NOTIFICATIONS

An audio notification is triggered based on the same criteria as the on-screen pop-up alerts. When triggered, the application will “call out” the flight ID and the “event” that triggered the alert. As an example, we have DAL2521 that has landed (see Figure 4 above). The audio notification will call out “Delta Airlines 2521 has landed”.

NOTE – the volume of the call out is based on the volume set on the computer and/or any external audio equipment connected to the computer running the Flight Arrival Monitor. There is no volume adjustment within the application itself, but volume may be controlled using any basic audio system, including TV monitors equipped with volume control.

2.3 USER SETTINGS

2.3.1 REGIONS AND NOTIFICATIONS

Customized region-based triggers, thresholds and notifications are created in two simple steps:

1. The first step is to select the region of interest about which the User requires an alert. For example, the terminal and or gate/stand destination for arriving flights.
2. The second step is to set up how the notifications will be triggered.

Figure 6 illustrates how the regions are set up and Figure 7 illustrates the set-up of notifications/alerts.

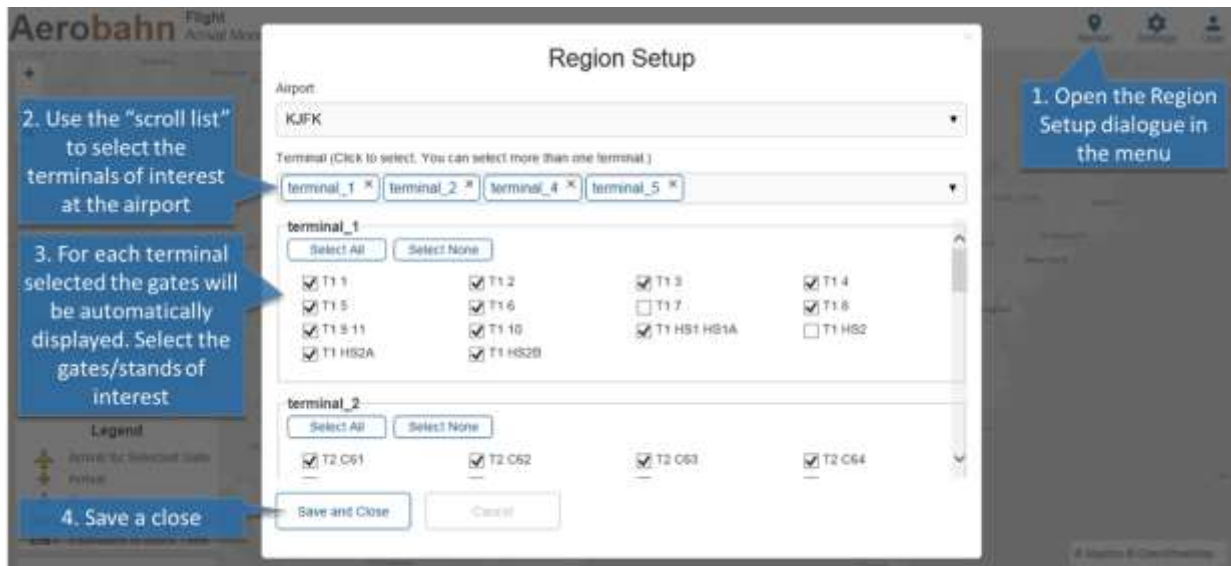


FIGURE 6 – SETTING THE REGIONS OF INTEREST

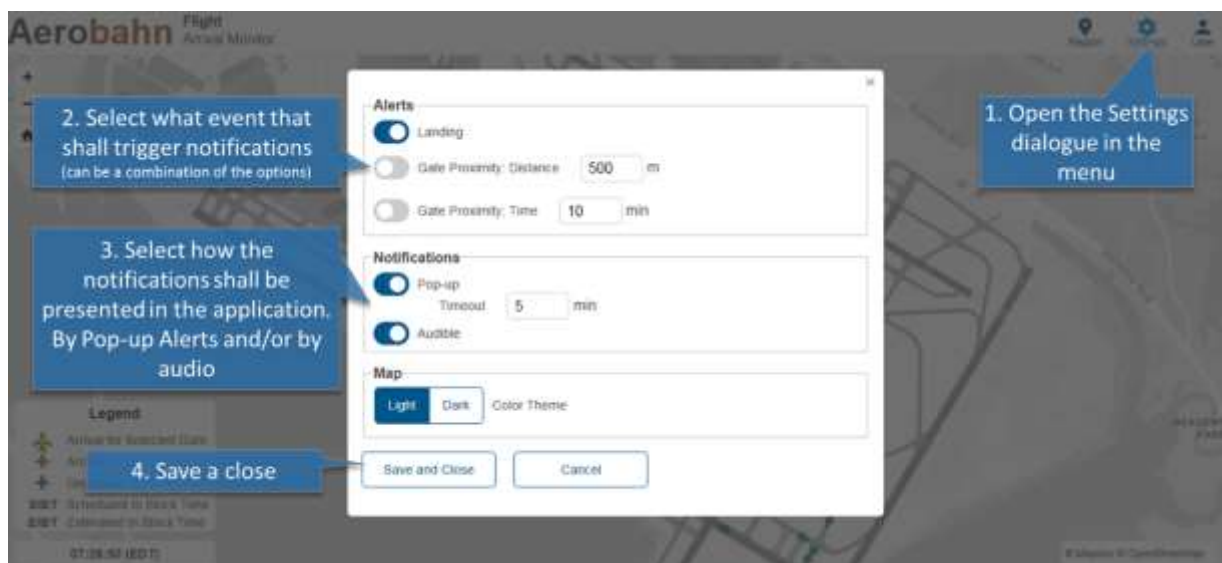


FIGURE 7 – SETTING THE CRITERIA FOR NOTIFICATIONS

2.3.2 OTHER SETTINGS

The user can also select the color scheme in the application to a pre-set “light” or “dark” scheme. A user can also change his/her password.

3 PRODUCT BENEFITS

| Benefit | How | Impacted customer/stakeholder |
|---|--|---|
| More efficient disembarking and turn around process | By getting accurate information about when the aircraft has landed and clear indications on where it is and where is going, ground staff can prepare and be on-time at the right place to handle the disembarking and turn around process. | <ul style="list-style-type: none"> • Airline • Airport • Ground Handlers • Passengers |

TABLE 2 – BENEFITS TO STAKEHOLDERS