

DFS Deutsche Flugsicherung GmbH

German Air Navigation Services

ICAO GRSS Montreal 24th-26th of May 2011

Technical Solutions for Preventing Runway Incursions

Aerodrome Controllers Perspective

M. Rulffs



DFS Deutsche Flugsicherung



Basic Role of Controller and Flightcrew in Aerodrome Control

Visual acquisition of traffic on the manoeuvring area from control tower and flight deck.



Technical Systems to be used in Aerodrome Control

To be installed to:

- Assist the controller in performing his duties in low visibility
- Support controllers in decision making process
- Increase situational awareness of the controller
- Increase aerodrome throughput
- Reduce runway related incidents
- Alert the controller in case of separation infringements

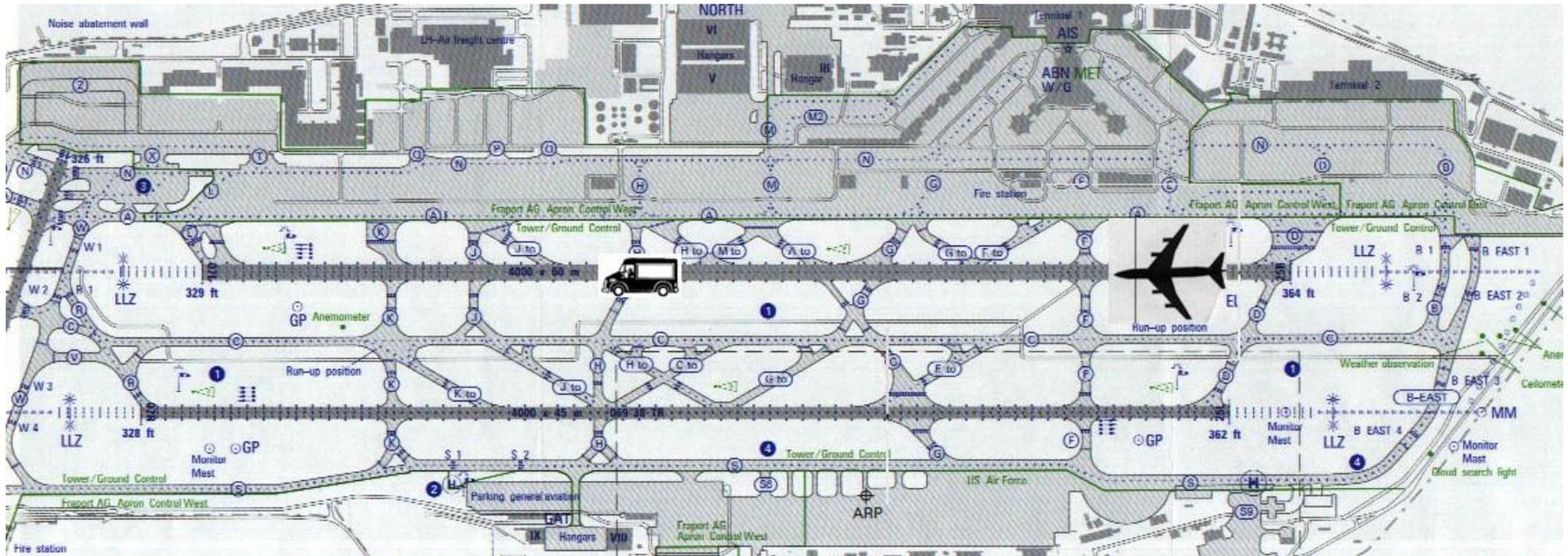
Examples of Technical Systems available for Aerodrome Control

- Lighting systems like stopbars, runway guard lights
- Electronic systems using inductive loop technology
- Primary surface movement radar
- A-SMGCS
- Multilateration
- 75 MHz Sensor technology
- Methods to show an occupied runway

A-SMGCS Requirements of the Aerodrome Controller

- Accurate display of all traffic on the manoeuvring area
- Monitoring system for traffic on the manoeuvring area
- Confirmation of pilots reports
- Confirmation of compliance to issued ATC-clearances
- Reliable alerting device
- Last resort safety tool

Runway Accident Frankfurt / Germany 30 Years ago



Inspection car cleared onto the runway (600 m visibility), forgotten by the controller, subsequently cleared a 747 for take-off.

Consequence



Lessons learned:

Introduce SMR, all vehicles on the runway on VHF TWR-frequency.

25 Years later, Munich Intl. Airport / Germany

LUFTHANDBUCH DEUTSCHLAND
AIP GERMANY

AD 2 EDDM 2-6
2 SEP 2004

FLUGPLATZKARTE - ICAO
AERODROME CHART - ICAO

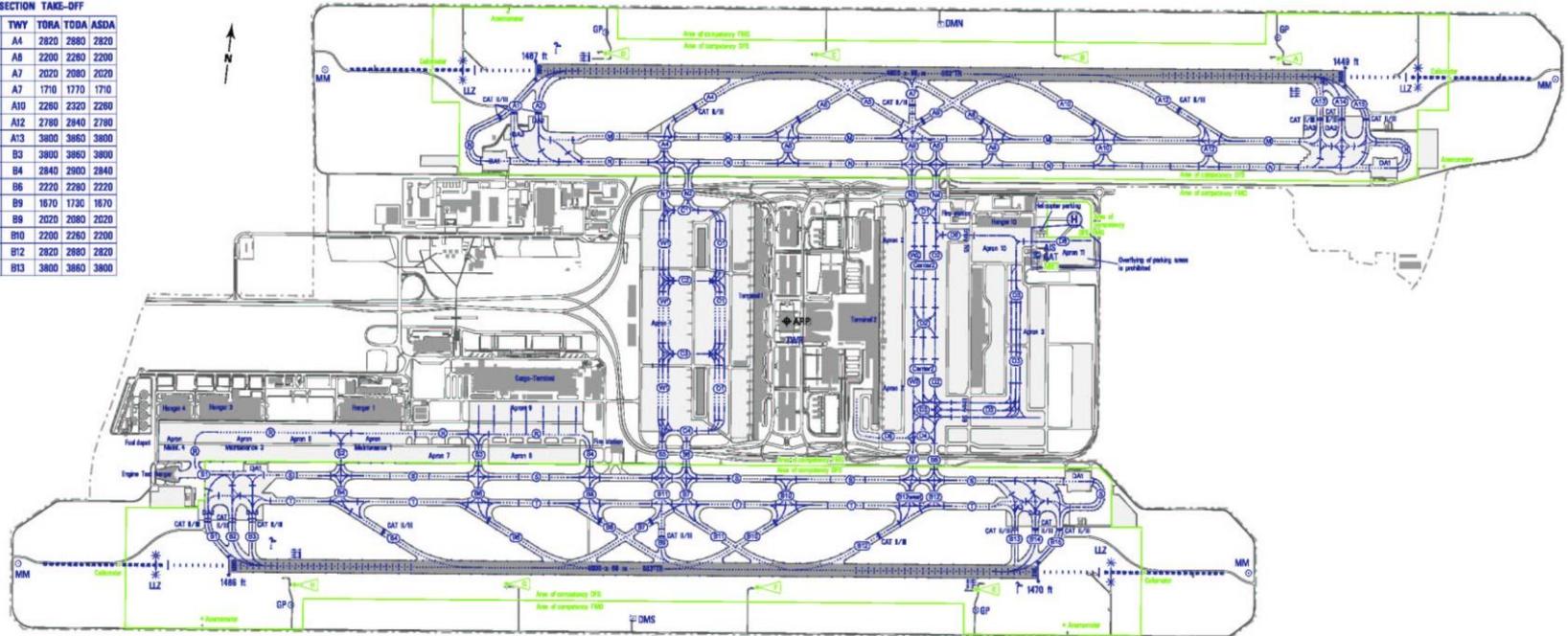
ARP 1470 ft
N 48° 21' 13.52"
E 011° 47' 08.91"

AERODROME
ELEVATION
1487 ft

MÜNCHEN

INTERSECTION TAKE-OFF

RWY	TWY	TORA	TODA	ASDA	
04L	A4	2820	2880	2820	
	A8	2200	2280	2200	
	A7	2020	2080	2020	
26R	A7	1710	1770	1710	
	A10	2280	2320	2280	
	A12	2780	2840	2780	
A13	3800	3860	3800		
	08R	B3	3800	3860	3800
		B4	2840	2900	2840
B6		2220	2280	2220	
B9	1670	1730	1670		
	28L	B9	2020	2080	2020
		B10	2200	2260	2200
B12		2820	2880	2820	
B13	3800	3860	3800		



1:15000

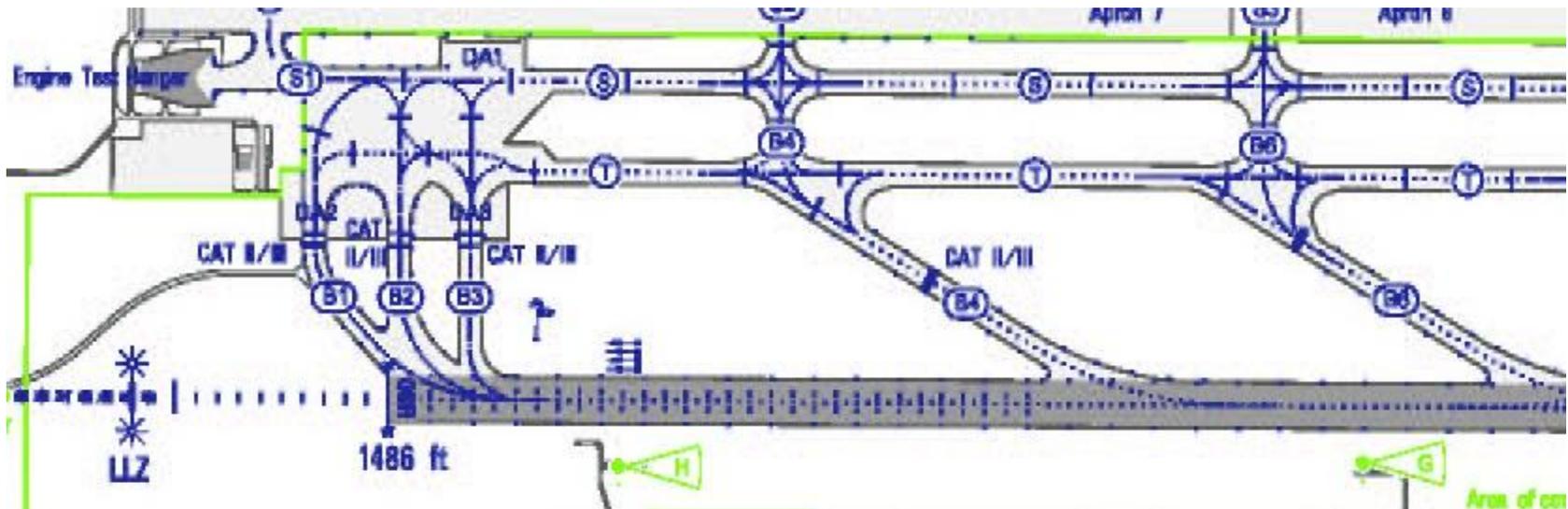
Continuation: Aprons 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

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AMDT 9

Munich Runway 08R

- Modern airport independent parallel operations
- > 350.000 movements / year (>90/h)
- Tower equipped with A-SMGCS
- Including runway incursion monitoring and alerting device



Traffic Situation on 3rd of May 2004

- Night time, excellent visual conditions
- Boeing B737-300 established ILS RWY08R on short final,
- ATR42-500, CAT-I holding point taxiway B4
- A321, departing on runway 08R in front of the approaching B737-300



A-SMGCS Pictures

AT45 holding at CAT I holdingpoint having received conditional clearance for line-up, 18 seconds left to closest proximity

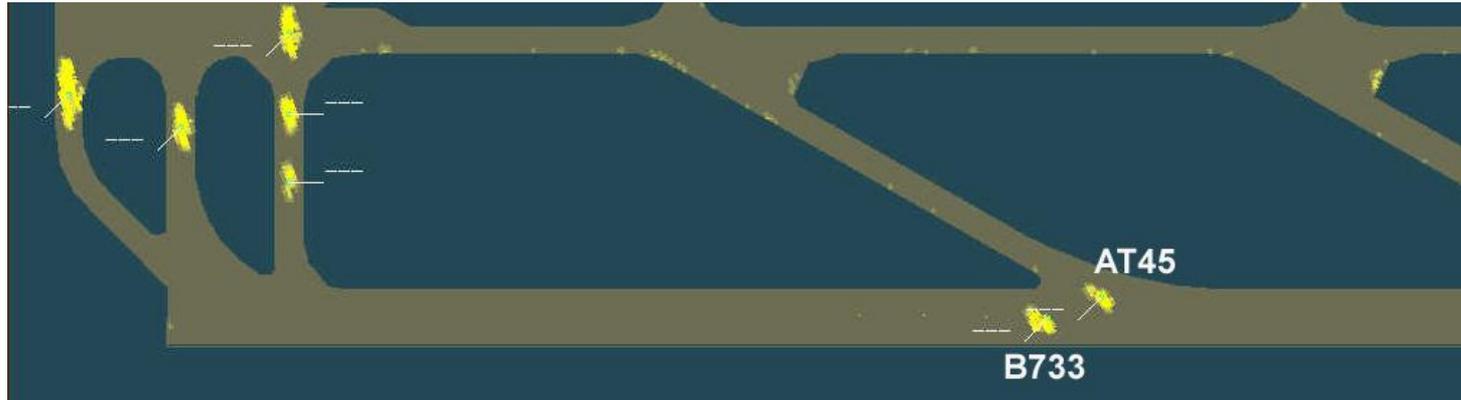


AT45 commencing taxi for line-up, whilst B733 is on landing flare, 5 s left



A-SMGCS-Pictures of the Severe Incident

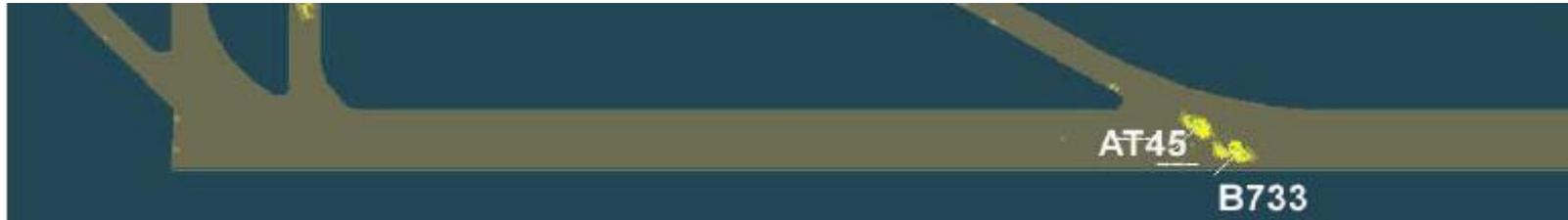
Crew of the AT45 mistook the departing A321 as the landing B733.



Both aircraft passed each other at a distance of less than 10 meters at a speed of approximately 110 knots.



A-SMGCS Alerting Function



- Runway Incursion and Monitoring device was installed
- All functions had been deactivated because of:
 - Inaccurate display of targets in the past
 - Ghost targets
 - Unacceptable number of nuisance alerts
 - Lack of controllers trust and confidence in the system

Audible and Visible Alerts generated by the A-SMGCS



- 2 alerts were generated within a second but not visible or audible
- 1 alert between the departing A321 and the taxiing AT45
- 1 alert between the approaching B733 and the AT45
- Because of other traffic the controller did not monitor the ASMR

Conclusions and Findings (Short Summary)

- The alerting function was switched off
- All attempts to calibrate the system failed
- Procedures for the use of A-SMGCS in aerodrome control were missing
- If the alerting device would have been available, 18 sec. would have been left for a controllers reaction

Reduction of Runway Incursions (General Recommendations)

- Strict adherence to the recommendations published in ICAO DOC9870 and EAPPRI 2.0
- Establishment of Local Runway Safety Teams
- Implementation of systems that meet the specific aerodrome need by supporting aerodrome control procedures
- Operational evaluation prior to live operations
- Continuous observation and assessment of performance through safety management and investigation processes

Thank You !