

AUDIT REPORT

MILANO-LINATE AERODROME AFTER COLLISION BETWEEN SK 686 SE-DMA AND D-IEVX 8 OCTOBER 2001



PREPARED BY
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REPORT FROM AUDIT OF MILANO-LINATE AERODROME AFTER COLLISION BETWEEN SK 686 (SE-DMA) AND D-IEVX

The Audit was performed at two separate occasions, 2001-11-28 and 2002-03-14. The ANSV and the accredited representatives 2002-06-06 held a third preparation meeting pending the official reporting. The main purpose of this Audit has been to establish the operational status of the Aerodrome in relation to design and operational requirements in the aftermath of the collision between SK 686 (SE-DMA) and D-IEVX and the ensuing crash into the baggage handling building at Milano-Linate. Inspections of the Manoeuvring Area and Ramp Area were performed including facilities and installations.

The report comprises three parts:

- Fact finding
- Analysis
- Assessment

The Fact finding part displays compliance or non-compliance covering relevant audit areas. The Fact finding result is a basis for analysis and assessment of the design and operational status of the Aerodrome.

The Audit is based on ICAO Annex 14 requirements concerning the design, layout and construction of the Aerodrome. The operational system of the Aerodrome i.e. Aerodrome Manual matters was included. It was decided to perform the Audit against requirements for reference Code 4 E.

The Fact finding part has been communicated to ENAC representatives and there was no objection to the findings.

The Audit was performed against Standards and Recommended practices given in the ICAO Annex 14 and this does not take into account differences filed to ICAO.

The Risk assessment of the Non-compliance's is based on the experience and competence of the Auditor. The following basis for classification of Non-compliance's is used for every area audited where observed Hazards can cause accidents, which are:

- Catastrophic - Aircraft destroyed and multiple deaths
- Hazardous - Major Aircraft damage and loss of life
- Major - Serious Aircraft incident and Major injury
- Minor - Minor Aircraft incident and Minor injury

Conclusive Evaluation:

The Aerodrome has been audited against state of the art requirements for Safety Management Systems. The status of the Aerodrome management and operations need to be adjusted and consequently raised to contemporary holistic Safety Management System levels to enable a proactive safety environment. The Aerodrome organisation with its complex management situation need to be scrutinized and possibly revised in order to be able to satisfy national and international commitments.

The Physical Characteristics of the runway system has been found to be in correlation with the requirements except for a few items that do not constitute immediate flight safety risks. However, the deficiencies regarding signage is not acceptable to the safe operation of aircraft and thus the Operational Status of the Aerodrome has been found to be poor with regard to the number and severity of many of the non-compliances in comparison to the requirements in Annex 14.

Compared to international standards and even for domestic standards Milano-Linate Airport has to decide whether it should or should not be kept as an international aerodrome, General Aviation included, if corrective action is not taken in respect of the deficiencies based on the fact of the number and severity of the non-compliances. The international aviation community expects the deficiencies to be corrected as laid down in ICAO Annex 14.

It must be said to the advantage of the Aerodrome although the non-compliances constitute a fairly small part of requirements given in Annex 14, is functioning with all its systems including the navigational aids. One of the risks that have been addressed in this audit is the position of the main apron, which under certain conditions with an "engine out" situation and an expected course deviation of more than 15 degrees will have an extremely remote probability of causing a catastrophe though unacceptable according to the Swedish Aviation Safety Authority Risk Assessment Matrix.

FACT FINDING**1. General**

This Audit has been performed on request from the Swedish Accident Investigation Board to establish the status of the Aerodrome mainly with regard to the requirements in the ICAO Annex 14 and contemporary Safety Management System requirements.

1.1 Owner and Operator

The Aerodrome is owned and operated by SEA and Managed by ENAC.

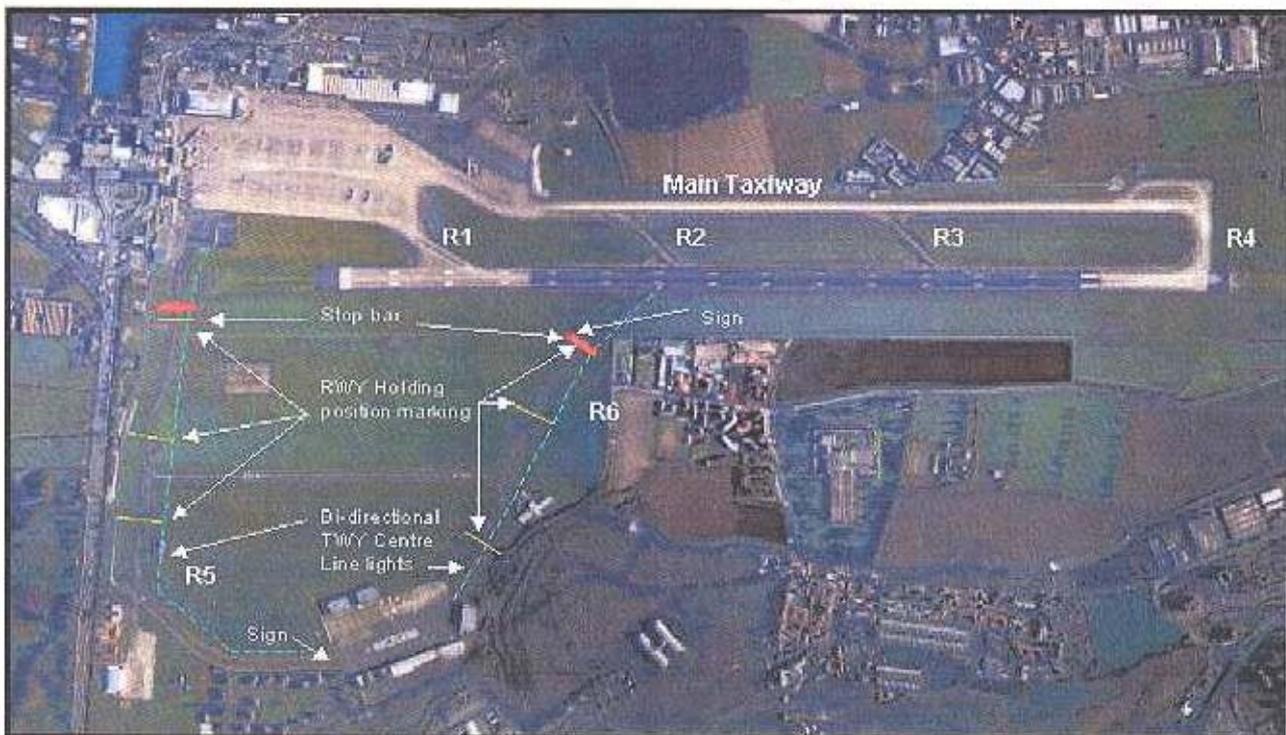
2. PHYSICAL CHARACTERISTICS AND SPECIFIC AUDIT OBJECTS

2.1 Aerodrome Data

The Data Base displaying facts of Physical Characteristics, facilities and equipment relevant to the assigned Aerodrome reference code can be found in Annex 14 Aerodrome Basic Data, attachment 1.

2.2 Actual situation

The Aerodrome is offering a Category III b Aerodrome with reference to the ICAO reference Code 4 E with B747 as critical aircraft. The situation on October 8th is described below with Taxiway Lighting in green, Signs and Holding position markings in yellow and Stop Bars in red. The description below only relates to the actual taxi clearance given to D-IEVX.



3. MANAGEMENT AND OPERATIONS SYSTEM

The Management and Operations Systems as it was during the accident have been discussed with representatives from all concerned parties below.

This Management and Operations Systems Audit has been performed against the following envisaged Safety Objective and Safety Management policy Statements as accepted by the Group of Aerodrome Safety Regulators under JAA and in line with ICAO Annex 14 SMS Standards and Recommendations to become effective in conjunction with the ICAO Manual on Certification of Aerodromes.

Safety objective

An Aerodrome organisation with its facilities, equipment and systems shall be designed and operated so that for any hazard the combination of the probability of occurrence and the seriousness of the consequences of the hazard occurring must not result in a level of risk that is unacceptable.

Safety Management Policy Statements

Safety management systems shall include the following:

- a) A statement that the highest priority shall be attached to safety in relation to all business activities.*
- b) A business objective for safety that shall minimise the Aerodrome's contribution to Aviation accident risk to as low as reasonably practicable.*
- c) A commitment by the organisation to adopt an explicit, pro-active approach to safety management.*
- d) Statements of safety-related responsibilities throughout the organisation.*
- e) Compliance with all appropriate safety standards.*
- f) That the safety assurance processes used by its external suppliers comply with the Aerodrome's safety management standards and requirements.*

The representatives of ENAV and SEA in general describe the Management and Operations situation as follows:

ENAC is the responsible party for management and operations of Milano-Linate Aerodrome. ENAC (Ente Nazionale per L'Aviazione Civile) the National Civil Aviation Authority is the regulating authority of the Italian Civil Aviation, under the control of the Ministry of Transportation and is represented at Linate by the Airport Area Management (Direzione de Circostrizione Aeroportuale, DCA) and its Traffic Control Department (Ufficio Controllo Traffico, UCT).

SEA has a concession to perform maintenance and Ground Handling matters at the Aerodrome. SEA is a regular limited company on a government concession for the ground handling services and for the complete management of the airport, including maintenance work and modifications of the manoeuvring areas on order from and under the control of ENAC, and if necessary in coordination with ENAV. There is a subcontractor to SEA namely ATA which is also an airport management company and has an air terminal at its disposal to supply ground handling services to aircrafts of the so-called General Aviation (executive, taxi, tourism, etc.) which uses the "West" apron reserved for them.

ENAV has, as a provider and regulator of Air Traffic Control matters through an agreement at ministerial level, a position outside the jurisdiction of the Aerodrome Director, ENAV spa (Ltd.), former Ente Nazionale di Assistenza al

Volo is a private supplier of Air Traffic Control Service, operating via agreements on ministerial level, and therefore also subject to supervision of the Ministry of Transport, but not under the jurisdiction of the Airport Director, and is represented by the local Central Flight Assistance (Centro Assistenza al Volo, CAV) in order to provide, for instance, aviation information and metrological service to the organization and for the execution of the general air traffic.

This triumvirate constitutes a complex operations situation where SEA performs working assignments regarding aerodrome maintenance ordered by ENAC. All changes have to be coordinated with ENAV as an "outside agency" with a certain regulating power. Inspections within the Aerodrome boundaries are performed by both ENAC and ENAV. No contractual agreement exists between the three main parties to ensure a proactive safety environment. No local policy or safety statement was presented during these meetings.

ENAC has the authority to perform internal audits and inspections at the Aerodrome. Evidence was given that such inspections or audits were seldom performed. When the situation requires ENAC is issuing amendments to the AIP. As a Director of the Aerodrome ENAC issues directives for change at the Aerodrome through its mandate to set the standard according to what has been decided internally and with regard to obligations in ratified international standards and recommendations pertaining to the ICAO Annexes.

As mentioned in the analysis below, a similar accident with non-catastrophic consequences as the recent collision happened in 1991 without, as it has been told, any remedial action but minor maintenance in order to satisfy the standards in ICAO Annex 14. It is safe to conclude that considerations and actions needed did not correspond to the obligations to international aerodrome standards.

There is an Airport Security Committee (Comitato Aeroportuale per la Sicurezza (CASO) that convenes on Ad Hoc basis and deals with aerodrome matters. No scheduled periodic meetings have been planned. Pro-active safety work does not exist and if safety is discussed it is revealed that it will only be reactive.

Interviews with internal aerodrome representatives from SEA, ENAV and ENAC reveal that what is considered to be a well functioning operations situation in the eyes of central governing bodies does not necessarily concur with the opinion of the operational staff. Although a service log system is in place within some of the organisations, staff in the organisations hesitates to report incidents or accidents involving their own persons because of risking sanctions by the judicial system.

Both ENAV and SEA disclose that there is no Safety Management System or quality system per se in operation. This is corroborated by the fact that no Aerodrome Manual is in place.

It is generally assumed that the aerodrome community is not yet mature enough for the present day quality culture.

In the context of contemporary quality system implementation where establishing of systems for Safety Directives and Policies, organisation of required resources and responsibilities, monitoring safety standards, reporting of deviations from a given standard and corrective measures is a requirement that does not exist at Milano-Linate.

4. ANALYSIS AND ASSESSMENT

4.1 List of Non-compliances

1. Aerodrome Operations Manual and Safety management System

2. Aerodrome Data

- VOR AD checkpoint/frequency
- PCN/ ACL

3. Physical characteristics

- TWY, Strength adapted to ACN
- Surface even and with good friction
- Strength of RWYs, adapted to critical ACN

4. Visual aids for navigation

- Wind direction indicators, installed
- Landing direction indicator, installed
- Signal area
- VOR Aerodrome check-point marking (Location and characteristics)

5. Lights

- Light intensity and control, available and functioning
- RWY Guard lights (Location and characteristics)

6. Signs

- Mandatory instructions signs (Location and characteristics)
- Information signs (Location and characteristics)
- Direction signs (Location and characteristics)
- Location signs (Location and characteristics)
- VOR check point sign (Location and characteristics)

7. Equipment and installations

- Security lighting
- Airport design (security)
- Detection of vehicles and A/C (Surface Movement Radar)

4.2 Analysis and severity of risk of the non-compliances

Non-compliance, Aerodrome Operations Manual and Safety Management System Analysis

The Management and operations situation is complex and cumbersome for all parties included the given facts that no performance agreements exists, no Aerodrome manual has been established and no Safety management system including Quality System Requirements has been incorporated and put into operation.

ENAV is a share holding company with powers to operate through an agreement on ministerial level which corresponds badly to a holistic managing and operating situation where one could assume that it would serve safety best if operations were run under one umbrella, namely the Aerodrome Director. The different entities, ENAV

and SEA could then through performance agreements be tied to the operation of the Aerodrome.

With reference to the recently issued State Letter and ensuing amendment on changes to the ICAO Annex 14 including a requirement for Safety Management System implementation at Aerodromes and the ICAO Manual on Certification of Aerodromes one could expect that this amendment could show the way to safer operations of Aerodromes.

The reason for not having a proper reporting system can be blamed on the consequences of the punitive environment that exists in relation to national law. It can be said that a no blame culture for individual mistakes, set aside intentional deeds, in an operational situation encourages occurrence reporting and corrective action for maintaining safe operations.

Assessment

The frequency for safety problems leading to very serious or catastrophic accidents with regard to the absence of a proper management and operations system is assessed to be from frequent to probable according to the risk matrix used in JAR 25.1309.

Non-compliance, Aerodrome data, VOR AD checkpoint/frequency

Analysis

The data missing in the publications to Air Operators can contribute to accidents and incidents. The risks they pose are not immediately affecting Flight Safety but for planning purposes they are needed.

Assessment

The probability is assessed to be remote and can cause Minor Aircraft incident and Minor injury

Non-compliance, PCN/ ACL not published, TWY Bearing Strength not adapted to ACN, Surfaces not even and with good friction, Strength of RWYs, adapted to critical ACN

Analysis

The paved areas at the Aerodrome have been assessed according to Single Wheel Load bearing strength. This method has been replaced by Pavement Classification Numbers relating to various types of pavement and Aircraft Classification Numbers to have a better correlation between types of aircraft and the bearing strength of the pavement. Flight Safety problems will only arise if the pavement deliberately is overloaded and maintenance is overlooked. The result of such mismanagement will in the end result in uneven indented surfaces that could result in standing water and ensuing water planing and consequent hazardous directional problems for aircraft should it happen at the wrong place at the runway system.

Further consequences will be cracked and broken top layers with loose particles that can cause FOD-problems to aircraft. The fact that this isn't published can indicate that care to follow up this requirement and not adapt to existing requirements has not been addressed. Visible deterioration has been observed during this audit.

Assessment

The frequency for aircraft damage and safety problems is assumed to be remote and the severity is classified as to cause minor Aircraft incidents to major - Serious Aircraft incident and Major injury

Non-compliance, Visual aids for navigation; Wind direction indicators not installed, Landing direction indicator not installed, Signal area not established, VOR Aerodrome check-point marking (Location and characteristics) not marked.

Analysis

The requirement for wind indicators is related to whether or not radio communication is provided at an Aerodrome. Wind direction indicators serve their purpose best for operators under VFR. The requirement for Landing direction indicator and Signal area are there for the same reason as the wind direction indicator and should be regarded for the same purpose.

The VOR Aerodrome checkpoint must be established for aircraft, which have no other possibility to check their equipment.

Assessment

The lack of wind direction indicators, landing direction indicator or has no effect on flight safety if there is a radio communication requirement at the Aerodrome.

It is however assessed that the probability for endangering safety is remote with the absence of VOR Aerodrome checkpoint can may cause minor Aircraft incidents and Minor injury.

Non-compliance, Lights, Light intensity and control, not fully available and functioning, RWY Guard lights (Location and characteristics)

Analysis

The Aerodrome with the capacity to offer services under Category III b conditions has a strict requirement that it shall be equipped accordingly. It was noted during the audit that the taxiway centre line lights are not sectionalised, as they should with regard to ATC clearances and sections that could be needed to different limits depending on use of runways and necessary Runway and Intermediate holding positions.

Runway Guard Lights (RGL) which under certain conditions shall be installed on every taxiway connected to the runway are the last resort to remind the crew in aircraft when entering an active runway that they must have a clearance to continue.

The following installations and measures are requirements for prevention of runway incursions:

1. RGL
2. TWY Lights
3. Stop Bars
4. RWY Holding Position Markings
5. Surface Movement Radar
6. Air Traffic Controllers

Assessment

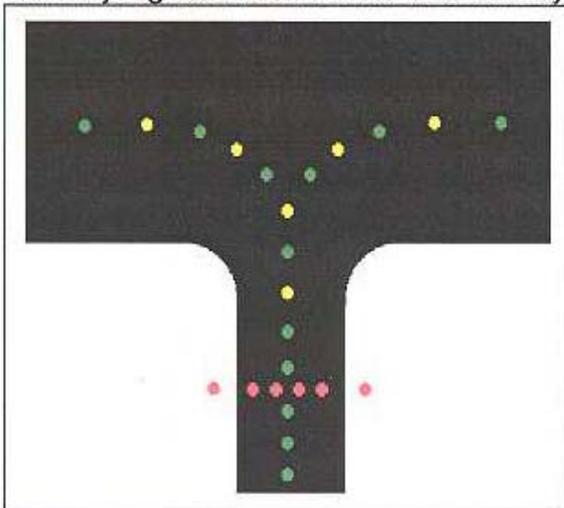
The absence of RGL and the inability to control and sectionalise TWY Lights are two of six factors that are necessary ingredients to achieve safe runways operations. The

Another important issue is that taxiway centre line lights shall be installed on the runway continuing onto the taxiway and serve as lead-in lights from the runway and lead-out lights when entering a runway.

These lights shall also be colour coded in alternate green and yellow to either show ILS critical area or the lower edge of the inner transitional surface. This is relative to how the usage of the taxiway is decided.

The conclusion is that all taxiways to be used under Low Visibility Conditions and taxiways connected to runways used under such conditions must have signs, markings and lights installed.

Taxiway Lights in connection with runways.



Non-compliance, missing Signs; Mandatory instructions signs (Location and characteristics), Information signs (Location and characteristics), Direction signs (Location and characteristics), Location signs (Location and characteristics), VOR check point sign (Location and characteristics)

Analysis

For the record it is worth mentioning that during the audit, information was given that the same type of event occurred in 1991 with minor or no actions taken. An investigation has reportedly been made and rests with representatives of the Magistrate. One important issue that has to be addressed is the fact, that the Runway Holding Positions S1-5 was not known to ATC.

As can be seen from the photographs below signage was not satisfying the standards in ICAO Annex 14.

When it comes to the matter naming the runway and taxiway system in combination with signage and markings it is advised in the ICAO Aerodrome design manuals on how to reach a practical solution. In this respect it is recommended to start with a defined point in the runway system with clockwise designation of aprons and taxiways avoiding the use of main apron and taxiway, east and west and so forth and instead use combinations of letters and numbers as stated in the ICAO Annex 14.

RWY Holding position S 4



R6 seen from the GA Apron decision point



R6 RWY Holding Position



R 5 Location Sign

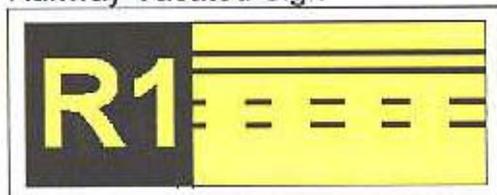


The Aerodrome has to decide on which part of the runway system shall be used for Aircraft movements or not. As a consequence of that decision the runway system shall have signs and markings installed according to the standards in the ICAO Annex 14.

In general and very briefly, every intersection, whether or not connected to a runway, shall be provided with a direction sign. Every taxiway shall have a location sign. The frequency of signs shall be decided with the safe conduct of aircraft in mind. Every taxiway leading to a runway shall have a mandatory instruction sign indicating the need for Air traffic Clearance. A "No Entry" sign shall indicate prohibited use of a taxiway.

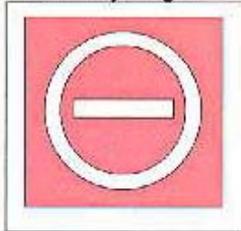
To enhance the effect of the taxiway lighting system in combination with signs it is advisable to use the Runway Vacated sign to indicate to a pilot leaving a runway the perimeter of the ILS critical area or the lower edge of the inner transitional surface whichever is farther from the runway centre line.

Runway Vacated Sign



When the Aerodrome has decided on which taxiways that shall not be used by aircraft the sign below is referred to.

No Entry Sign



The existing signage situation at Milano-Linate Aerodrome starting with the General Aviation Apron needs to be remedied with direction signs visible from the parking stands and location signs at apron exit points showing R5 and R6 if this is going to be the future designation of the in- and outgoing taxiways. It is also advisable to install extra location signs between intersections with regard to low visibility operations when the meteorological visibility can be as low as 50-70 meters.

Location sign



Direction sign



Since Milano-Linate Aerodrome has two runways but only one to be used under Category III conditions the signage and designation of the runway system must be such that confusion to pilots is avoided with the use of proper signs and designations.

The use of 01L, 01R and 18L and 18R is self-explanatory but even the non-instrument runway must have direction and mandatory instruction sign installed. An example is given below how it should be at the extreme taxiway connections to a runway and other connections.

Runway end signs



Other taxiway connections to a runway



An information sign shall be provided where there is an operational need to identify by a sign a specific location or routing (direction or destination) information. Such a position might be the present "Runway extension " position at the present R5 taxiway. Such a sign shall be a location sign.

A destination sign shall be provided to indicate the direction to a specific location on the aerodrome, such as general aviation apron or commercial aviation apron.

If the desire or need is to reinforce the possibility for a pilot to observe limits of Air Traffic Clearances and positions on the manoeuvring area and aprons one shall install signs on both sides of taxiways.

Assessment

There is a clear difference in how the both sides of the Aerodrome has been treated with regard to visual guidance measures and the provisions given for ATC to have the best possibility for the safe conduct of operations. It is necessary to mention that both sides of the Aerodrome have to have the same standard if operations shall continue under low visibility conditions. When, as reported at the time of the event, Runway Visual Range (RVR) was around 200 m, which in reality means that this value is measured with high intensity runway lighting and a light output that is considerably higher than what can be at other position at the aerodrome. The meteorological visibility will then be around half that value or lower. This is no easy environment to conduct taxiing in and keep track on ones position either on the GA Apron or on the taxiways without the required signage.

Non-compliance, Equipment and installations, Security lighting, Airport design (security), Detection of vehicles and A/C (Surface Movement Radar) missing.

Analysis

The fact that the Aerodrome has not taken action regarding the design of the Aerodrome from a security viewpoint does not immediately affect flight safety. Further discussions in this matter are left to another forum.

Surface Movement Radar to be used under Low Visibility Operations is only one means of compliance for the safe ATC Operation. Other sensors can accomplish the same result. It is however worth mentioning that these types of sensor equipment are at present state only used for surveillance purposes. It should though be pointed out that Milano-Linate ATC would have had a better chance of detecting aircraft during prevailing conditions during the time when this accident occurred. Air Traffic Control can be exercised in a less efficient manner with other methods for separation between aircraft with Safety kept at an acceptable level although with a possible effect on regularity.

Assessment

The Risk contribution because of the absence of Surface Movement Radar has to be assessed in the parallel investigation of the performance of the ATC.

Non-compliance outside the scope of ICAO Annex 14, Main Apron position with regard to collision risks with parked aircraft.

Analysis

The position of the Milano-Linate Main Apron has been addressed due to a possible crash into parked aircraft and the terminal buildings. The ICAO Annex 14 is not specific on this issue but it is obvious when assessing the compilations of empirical data from aircraft crash points not to draw the conclusion that such issues need considerable attention.

Although collisions are rare it is a fact that it happened as reported at Milano-Linate aerodrome at least twice. The result of this latest accident is known.

Availability of international empirical data i.e. occurrences reported to aviation safety authorities has in this case been limited to occurrences reported to the Swedish authority during the period 1997-2001 which roughly corresponds to 3% of the total international traffic.

The occurrences studied refer to Transport Category Aircraft comprising jet- and turbo prop driven such.

An analysis of the probability for engine-out situations during Take-Off shows that the probability of occurrence is $1.6 \cdot 10^{-5}$ for engine failure with loss of power per movement.

It can be assumed that less than one out of ten occurrences will lead to a significant deviation from track and either end up on the apron or in the terminal buildings. The Airworthiness Certification standard in this case is that aircraft must keep within a 15-degree deviation from track. Such a track will in the worst-case scenario lead to either collision with other aircraft on the apron or with the terminal buildings.

Assessment

This results in a total probability of less than $1.6 \cdot 10^{-6}$ for a catastrophic consequence with regard to the location of the Milano-Linate main apron. Translated into qualitative terms this will have a probability that is extremely remote though unacceptable. It is assumed that an in-depth analysis of the global arena can vary up or down within the bracket of 10^{-5} to 10^{-7} per movement of aircraft.

Göran Svensson, Aerodrome Safety Inspector

Attachment 1

AERODROME BASIC DATA, ANNEX 14

Aerodrome Basic data are referred to Reference Code 4 E
RWY 18L-36R referred to as the Main Runway. The parallel Non-
Instrument RWY 18R-36L is not included in this context.
(N/A=not applicable, Yes=compliant with SARPs)

**Requirement
fulfilled****1. Aerodrome Data**

1. Aerodrome reference point, established, deg-min-sec	Yes
2. Aerodrome and runway elevations,	Yes
3. Aerodrome reference temperature, determined	Yes
4. Aerodrome dimensions and related information, published	Yes
5. <i>Runway - true bearing</i>	Yes
6. <i>Strip - RESA, SWY, length</i>	Yes
7. <i>CWY - length</i>	Yes
8. <i>TWY- designation, width, surface type</i>	Yes
9. <i>Apron - surface type, A/C stands</i>	Yes
10. <i>Manoeuvring Area, established</i>	Yes
11. <i>Visual aids - approach</i>	Yes
12. <i>Marking of RWYs, TWYs, Aprons</i>	Yes
13. <i>Signs, stopbars, docking systems</i>	Yes
14. <i>VOR AD checkpoint/frequency</i>	No
15. <i>Standard taxi routes, designation/location</i>	Yes
16. <i>ILS/MLS, position</i>	Yes
17. <i>THR, co-ordinates, deg-min-sec</i>	Yes
18. <i>A/C stands, deg-min-sec</i>	Yes
19. <i>Obstacles in approach and take-off area</i>	Yes
20. <i>PCN</i>	No
21. <i>ACL</i>	No
22. <i>Declared distances, TORA, TODA, ASDA, LDA</i>	Yes
23. <i>Condition of movement area and related facilities</i>	
24. <i>Construction or maintenance work</i>	Yes
25. <i>Rough or broken surfaces on RWY, TWY or Aprons</i>	Yes
26. <i>Snow, slush or ice on RWY, TWY or Aprons</i>	Yes
27. <i>Standing water on RWY, TWY or Aprons</i>	Yes
28. <i>Snow banks or drifts adjacent to RWY, TWY or Aprons</i>	N/A
29. <i>Anti- or De-icing fluids on RWY, TWY or Aprons</i>	Yes
30. <i>Temporary hazards</i>	Yes
31. <i>Failure or irregular operation of visual aids</i>	Yes
32. <i>Failure of normal or secondary power supply</i>	Yes
33. <i>Wet friction values, determined</i>	Yes
34. <i>Disabled A/C removal services, at hand</i>	Yes
35. <i>Rescue and fire-fighting services, level of protection</i>	Yes BVIII
36. <i>Visual approach slope indicator systems, published</i>	Yes
37. <i>Co-ordination between AIS and AD, published</i>	Yes

2. Physical characteristics

1. <i>RWY orientation, 95%</i>	Yes
2. <i>Cross wind, >1500m/20kt, >1200m/13kt, < 1200m/10kt</i>	Yes
3. <i>Location of THR, normal</i>	Yes
4. <i>RWY length, adequate to traffic</i>	Yes

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5. Secondary RWY, available		Yes
6. SWY or CWY, available		Yes
7. RWY, width, Normal (Code 2, 30m actual is45m)		Yes
8. Parallel RWY, available		Yes
9. Parallel RWY, Minimum parallel distance adapted to traffic		Yes
10.Slopes on RWY		
11.Longitudinal slopes, total (3-4-1%,1-2-%)		Yes
12.Slope portion ally (3-1,5%, 4-1,25% and last ¼ slope 0,8%)		Yes
13.Consecutive slope changes (3-4 1,5%, 1-2 2%)		Yes
14.Vertical radius (4-30000m, 3-15000m, 1-2 7500m)		Yes
15.Sight distance (CDE-3m, B-2m, A-1, 5m)		Yes
16.Distance between slope changes (4-30000m, 3-15000m, 1-2 5000m)		Yes
17.Transverse slopes (CDE-1, 5%, A-B 2%)		Yes
18.Strength of RWYs, adapted to critical ACN		No
19.RWY shoulders (DE 60m)		Yes
20.Slopes on RWY shoulders (2,5%)		Yes
21.RWY strips, instrument RWYs		Yes
22.Strip length (234-60m, 30m non-instrument)		Yes
23.Strip width (3-4-300m,1-2-150m)		Yes
24.Non-Instrument RWY strips (3-4 150m, 2-80m, 1-30m)		Yes
25.Objects (120m,)		Yes
26.Strip grading and strengthening (34-75m, 12-80m)		Yes
27.Longitudinal slopes (4-1,5%, 3-1,75%, 12-2,%)		Yes
28.Transverse slopes (34-2,5%, 12-3%)		Yes
29.RESA (90-240m, slope down 5%, transverse +-5%)		Yes
30.CWY (width 150m, slope +1,25%, ditches 1/2 span)		Yes
31.SWY (>0,8%+slope, change in vertical radius 10000m, strength)		Yes
32.Radio altimeter operating area (300m, slope change 2%/30m)		Yes
33.TWYs		
34.Edge clearance (A-1, 5m,B-2, 25m, C-3-4, 5m/18m A/C length)		Yes
35.TWY width A-7, 5m, B-10, 5m, C-15-18m, D-18-23m/wheelsp 9m, E-23m)		Yes
36.TWY curves and fillets		Yes
37.TWY separation distances		N/A
38.Longitudinal slopes (CDE-1, 5%, AB-3%)		Yes
39.Longitudinal slope changes (CDE-3000m, AB-2500m)		Yes
40.Sight distance (CDE-3m/300m)		Yes
41.Transverse slopes (CDE-1, 5%)		Yes
42.Strength adapted to ACN		No
43.Surface even and with good friction		No
44.Rapid exit TWYs (Turn radius 34-550m/93kmh)		Yes
45.Fillets and intersection angles (25-40°)		Yes
46.TWY shoulders (E-44m, D-38m, C-25m)		Yes
47.TWY strips (table 3.1)		Yes
48.TWY strip grading (E-22m, D-19m, BC-12, 5m)		Yes
49.TWY strip slopes (CDE-2, 5%)		Yes
50.Holding bays, TWY holding positions (Table 3.2)		Yes
51.Aprons		
52.Slope (1%)		Yes
53.Clearance distance (DE-7, 5m, C-4, 5m, AB-3m)		Yes
54.Isolated A/C parking position		Yes

3. Obstacle restriction and removal

1. Obstacle limitation surfaces (Table 4.1)	Yes
2. <i>Conical surface, free</i>	Yes
3. <i>Horizontal surface, free</i>	Yes
4. <i>Approach surface, free</i>	Yes
5. <i>Transitional surface, free</i>	Yes
6. <i>Inner transitional surface, free</i>	Yes
7. <i>Balked landing surface, free</i>	Yes
8. <i>Take-off climb surface, free</i>	Yes

4. Visual aids for navigation

1. Wind direction indicators, installed	No
2. Landing direction indicator, installed	No
3. Signal area	No
4. Markings (applied)	
5. <i>RWYs (Loc. and charact. of THR, RWY #, TDZ, Aim. Pt, CL, Edge)</i>	Yes
6. <i>TWYs (Location and characteristics of CL, holding pos. Cat I-III)</i>	Yes
7. <i>Aprons (Loc. and charact. of lead-in and out turn and stand markings)</i>	Yes
8. <i>Apron safety lines</i>	Yes
9. <i>TWY intersection marking (transv. broken single line)</i>	N/A
10. <i>VOR Aerodrome check-point marking (Location and characteristics)</i>	No
11. <i>Road holding position markings (Traffic Act)</i>	Yes
12. <i>Information marking on pavement (If not possible to install signs)</i>	Yes

4.1 Lights

1. Danger and confusion to A/C, eliminated	Yes
2. Confusion to mariners	N/A
3. Frangibility on light fixtures and structures, applied	Yes
4. Strength of surface mounted lights, applied	Yes
5. Light intensity and control, available and functioning	No
6. Emergency lighting	N/A
7. Aeronautical beacons (AD/ID, location and characteristics)	N/A
8. Approach lighting systems	
9. <i>Simple approach (Location and characteristics)</i>	N/A
10. <i>Precision approach Cat I-III (Location and characteristics)</i>	Yes
11. <i>PAPI (Location and characteristics)</i>	Yes
12. <i>Circling guidance lights (Location and characteristics)</i>	N/A
13. <i>RWY lead-in lights (Location and characteristics)</i>	N/A
14. <i>RWY TRID (Location and characteristics)</i>	N/A
15. <i>RWY Edge lights (Location and characteristics)</i>	Yes
16. <i>RWY THR and wing bar lights (Location and characteristics)</i>	Yes
17. <i>RWY End lights (Location and characteristics)</i>	Yes
18. <i>RWY CL lights (Location and characteristics)</i>	Yes
19. <i>RWY TDZ lights (Location and characteristics)</i>	Yes
20. <i>SWY lights (Location and characteristics)</i>	N/A
21. <i>TWY CL lights (Location and characteristics)</i>	Yes
22. <i>TWY CL lights on Rapid exit TWYs (Location and characteristics)</i>	Yes
23. <i>TWY CL lights on other exit TWYs (Location and characteristics)</i>	Yes
24. <i>TWY Edge lights (Location and characteristics)</i>	N/A

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25. Stop bars (Location and characteristics)		Yes
26. TWY intersection lights (Location and characteristics)		N/A
27. RWY Guard lights (Location and characteristics)		No
28. Apron Floodlighting (Location and characteristics)		Yes
29. Visual docking guidance system (Location and characteristics)		Yes
30. A/C stand manoeuvring lights (Location and characteristics)		Yes
31. Road holding position lights (Location and characteristics)		Yes
4.2 Signs		
1. Frangibility, applied		Yes
2. Mandatory instructions signs (Location and characteristics)		No
3. Information signs (Location and characteristics)		No
4. Direction signs (Location and characteristics)		No
5. Location signs (Location and characteristics)		No
6. VOR check point sign (Location and characteristics)		No
7. AD identification sign (Location and characteristics)		N/A
8. A/C stand identification signs (Location and characteristics)		Yes
9. Road holding position sign identification sign (Location and characteristics)		Yes
4.3 Visual aids for denoting obstacles		
1. <i>Marking and lighting</i>		Yes
4.4 Visual aids for denoting restricted use areas		
1. Closed RWYs (Location and characteristics)		N/A
2. Non-load bearing surfaces (Location and characteristics)		N/A
3. Pre-THR area (Location and characteristics)		Yes
4. Unserviceable areas		N/A
5. Unserviceability lights, markers, cones, and marker boards		Yes
5. Equipment and installations		
1. Secondary power supply (Sign, AD, Obst, Met, Sec, Flood lights)		Yes
2. Secondary power supply (Max switch over time)		Yes
3. Electrical systems (monitoring and not inadequate or misleading info)		Yes
4. Fencing (animals and unauthorised persons)		Yes
5. Security lighting		No
6. Airport design (security)		No
7. AD vehicle operations		Yes
8. SMGCS (A/C, vehicles, signs, lights and markings, RWY Guard Lights, stop bar/TWY CL illumination and suppression)		Yes
9. Detection of vehicles and A/C (Surface Movement Radar)		No
6. Emergency and other services		
1. A/D emergency planning		Yes
2. Emergency Ops centre and command post		Yes
3. Communication systems		Yes
4. A/D emergency exercise		Yes
6.1 Rescue and fire fighting		
1. Level of protection (<700 m/3 busiest months, 99/2, 2000/1- cat below)		Yes

2. A/D category adapted to traffic	Yes
3. Extinguishing agents, enough (foam and complementary, capacity/discharge rate)	Yes
4. Rescue equipment	Yes
5. Response time	Yes
6. Emergency access roads	Yes
7. Rescue vehicles, numbers	Yes
8. Fire stations	Yes
9. Disabled A/C removal	Yes
7. AD maintenance programme	Yes
1. Pavements	Yes
2. Facilities (Visual aids, fencing, drainage systems and buildings)	Yes
3. Friction characteristics measurements (Wet RWY)	Yes
4. FOD programme	Yes
5. Winter season friction characteristics maintenance and measurements	Yes
6. Visual aids maintenance	Yes
7. Bird Hazard reduction	Yes
8. Apron management service	N/A
9. Ground servicing of A/C (Fuel fire, emergency evacuation exits)	Yes

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