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UNITING AVIATION



Case Study & Key Considerations

ATM Safety Assessment in Change Management

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ATM Safety Assessment in Change Management Webinar

4 November 2020 (Day 2)

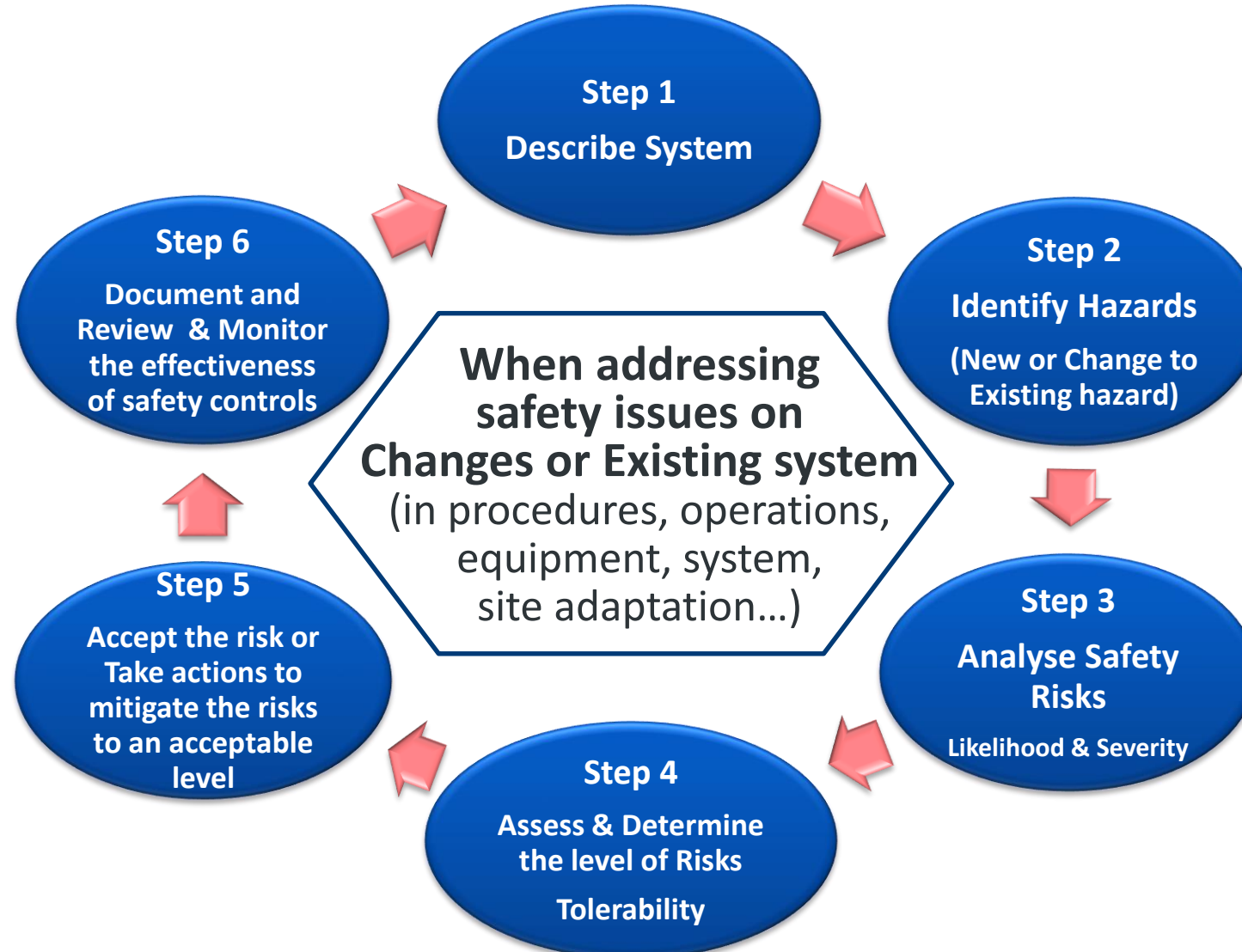
Contents

- **Case Study**
 - Airport taxiway expansion
- **Exercise**
- **Kew Considerations when conducting safety assessment in ATM**

Objective

- **Enhance the understanding how to conduct ATM safety assessment through exercises on case study and lessons learned from them**
 - Airport taxiway expansion

SAFETY ASSESSMENT PROCESS



Case Overview

Jeju international airport Layout

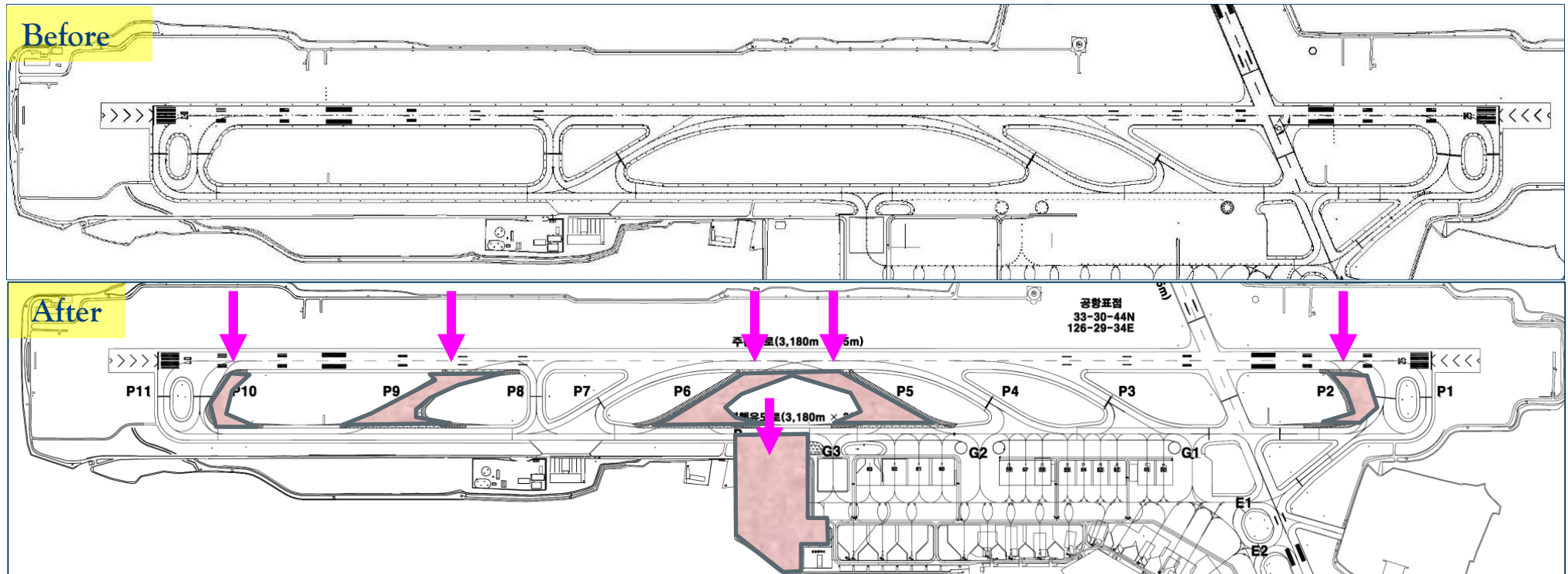


Case Overview: Airside infrastructure expansion

❖ Overview

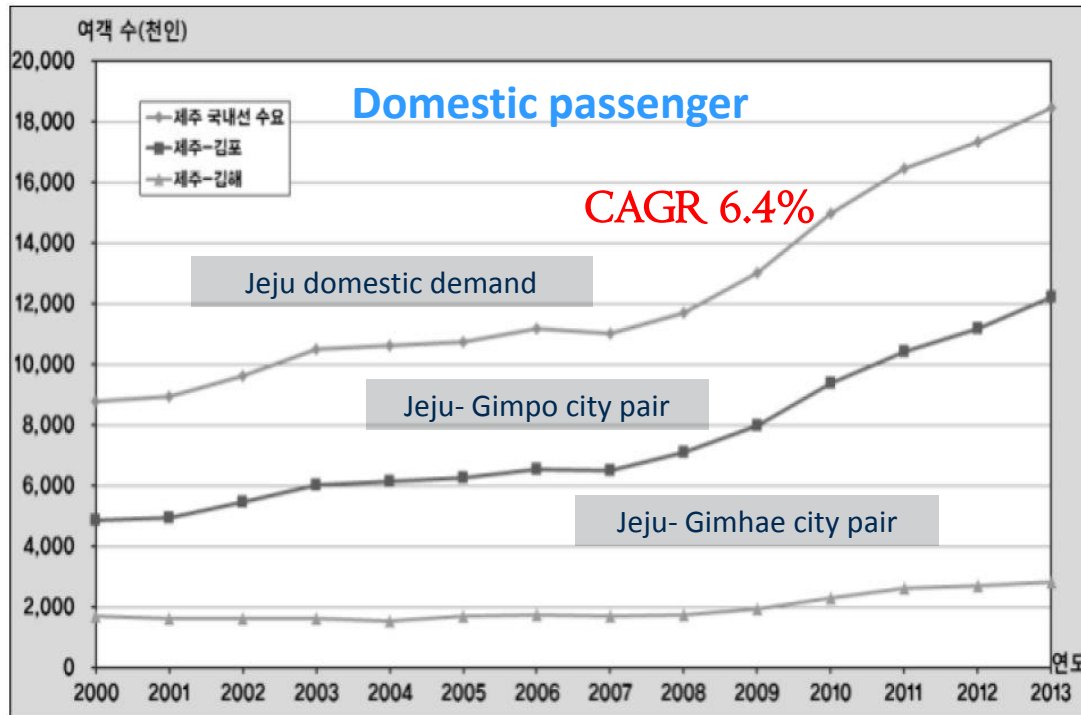
- Goal: Runway capacity enhancement for 2020 (target: 10% increase)
- Period: 2015. 8 ~ 2017. 12 (31 months)
- Expense: 50 million USD
- Major task: **3 rapid exit taxiways**, 2 holding bays, 7 aircraft stands
- Operation date: 1 April 2018

❖ Layout

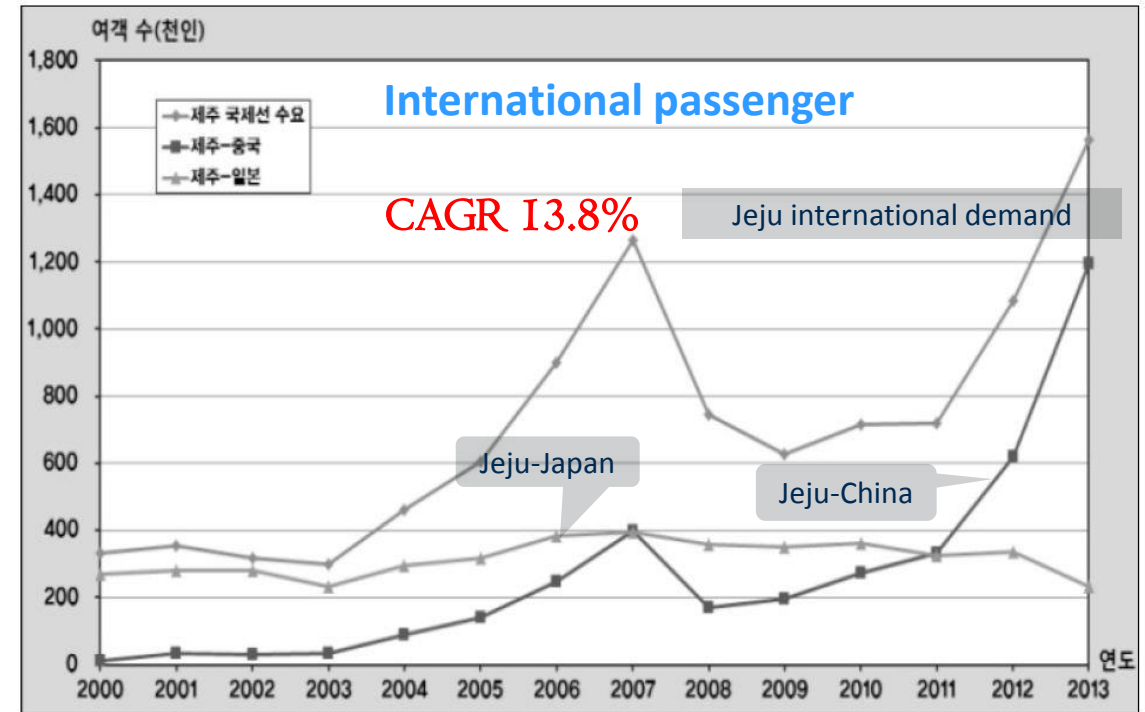


Rapid growth of demand

Domestic Pax record (2000 – 2013)

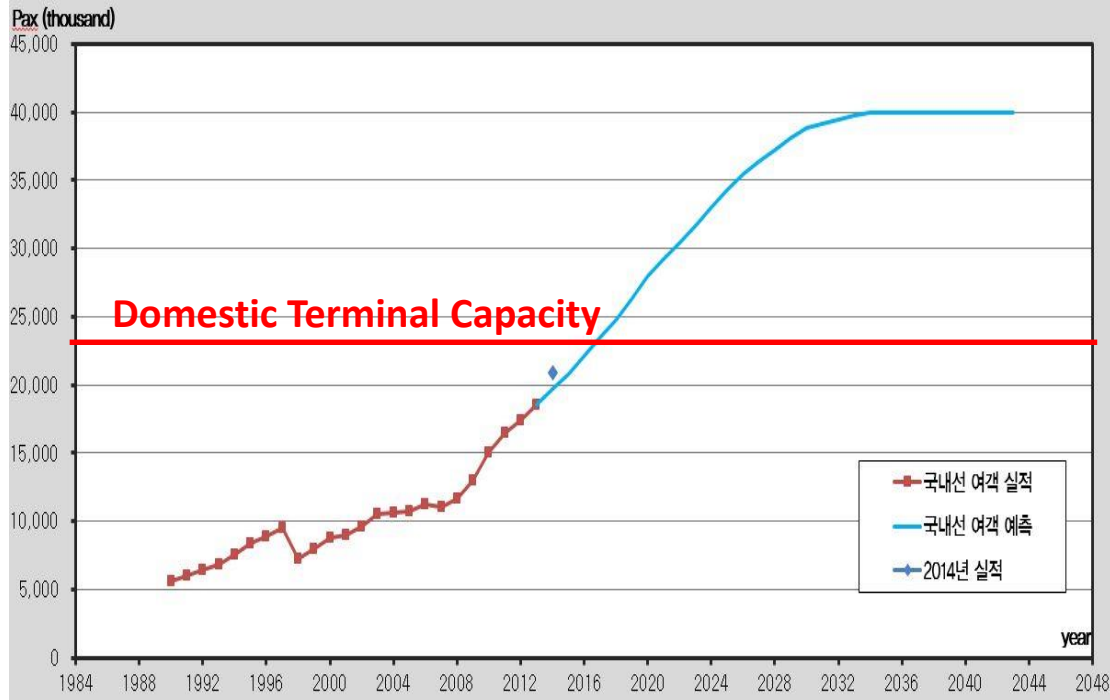


International Pax record (2000 – 2013)

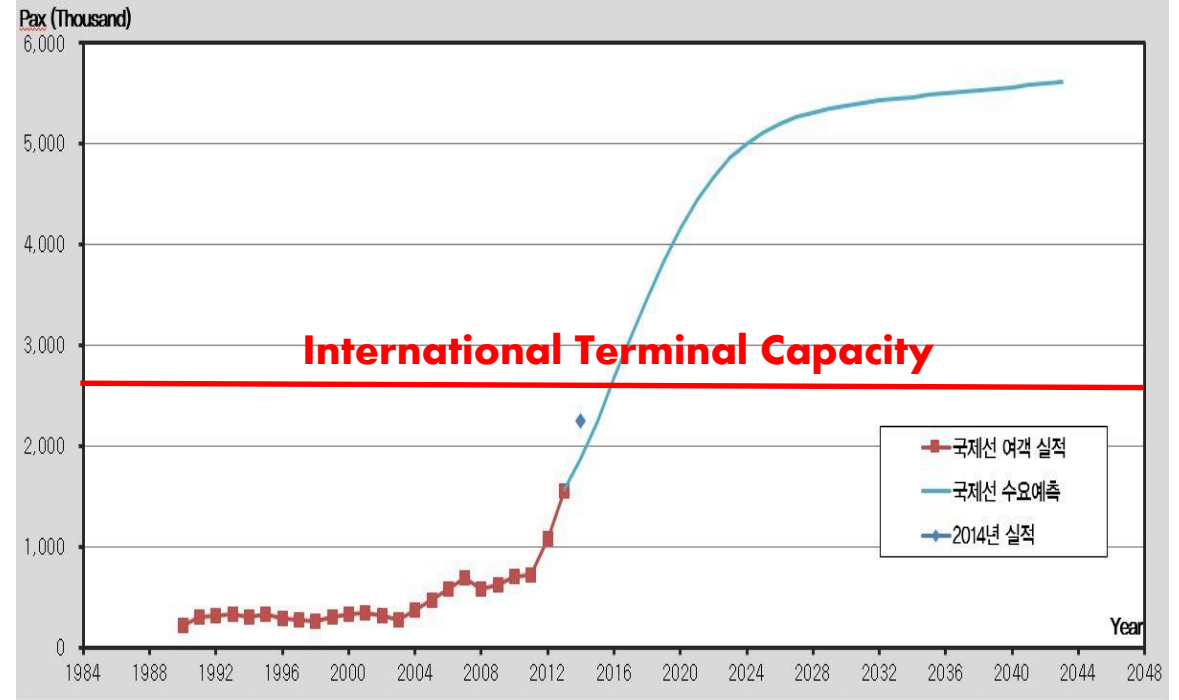


PAX Demand Forecast

Jeju air traffic demand research (2014)



Domestic Pax prediction

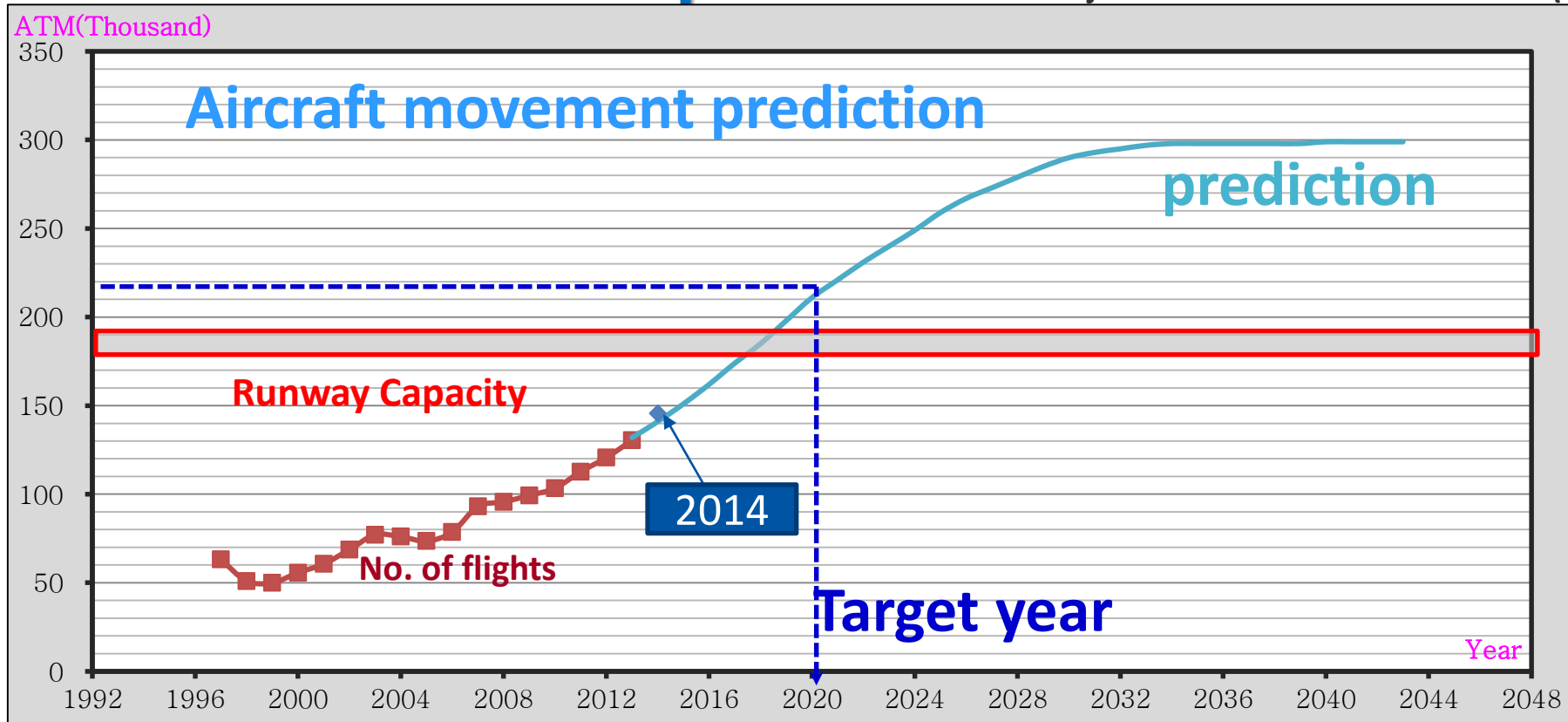


International Pax prediction

	2020	2025	2030	2035	2040	2045
Domestic Pax (thousand)	27,946	34,281	38,860	40,000	40,000	40,000
International Pax (thousand)	5,114	5,381	5,485	5,565	5,565	5,600

ATM prediction

Jeju air traffic demand research (2014)



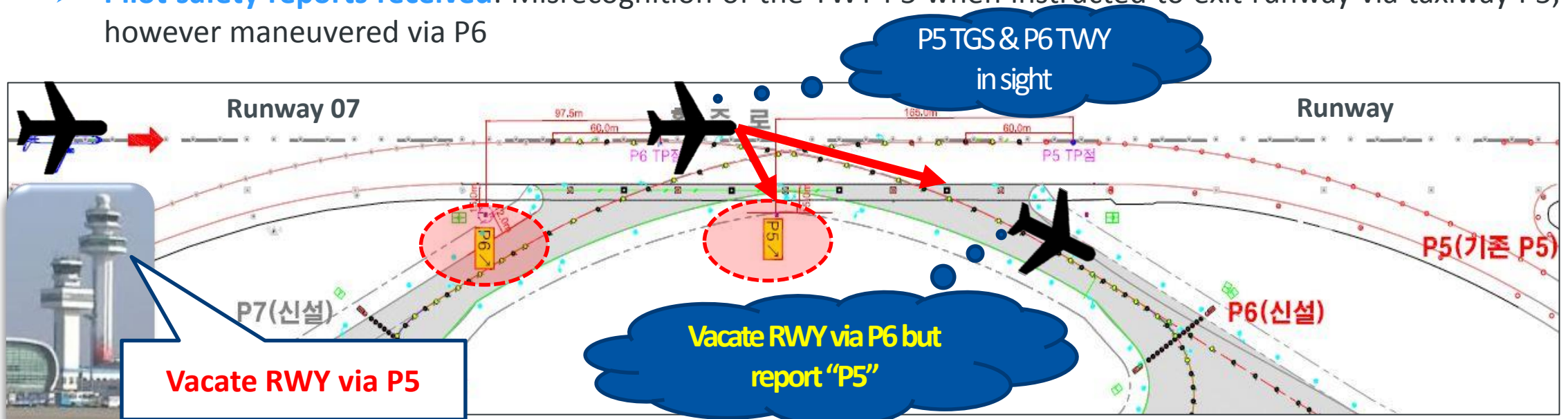
	2020	2025	2030	2035	2040	2045
ATM	211,000	259,000	290,000	298,000	299,000	299,000

TGS location of new RETs

RET: Runway Exit Taxiway
TGS: Taxiway Guidance Sign

❖ Hazards identified (April 2018): The location of TGS

- **P6, P7 Taxiway Guidance Sign (TGS) Location:** left side of the P6 and P7 as per the regulations
 - *Annex 14 vol. 1 5.4.3.17:* prior to the runway exit point in line with a position **at least 60m prior to the point of tangency**
 - **Note!** : There were some discussion on this matter among ATC personnel and operational frontline in the initial phase of plan (suggestion was on the pavement of TWY P6 and P7 to avoid misrecognition)
- **Pilot safety reports received:** Misrecognition of the TWY P5 when instructed to exit runway via taxiway P5, however maneuvered via P6

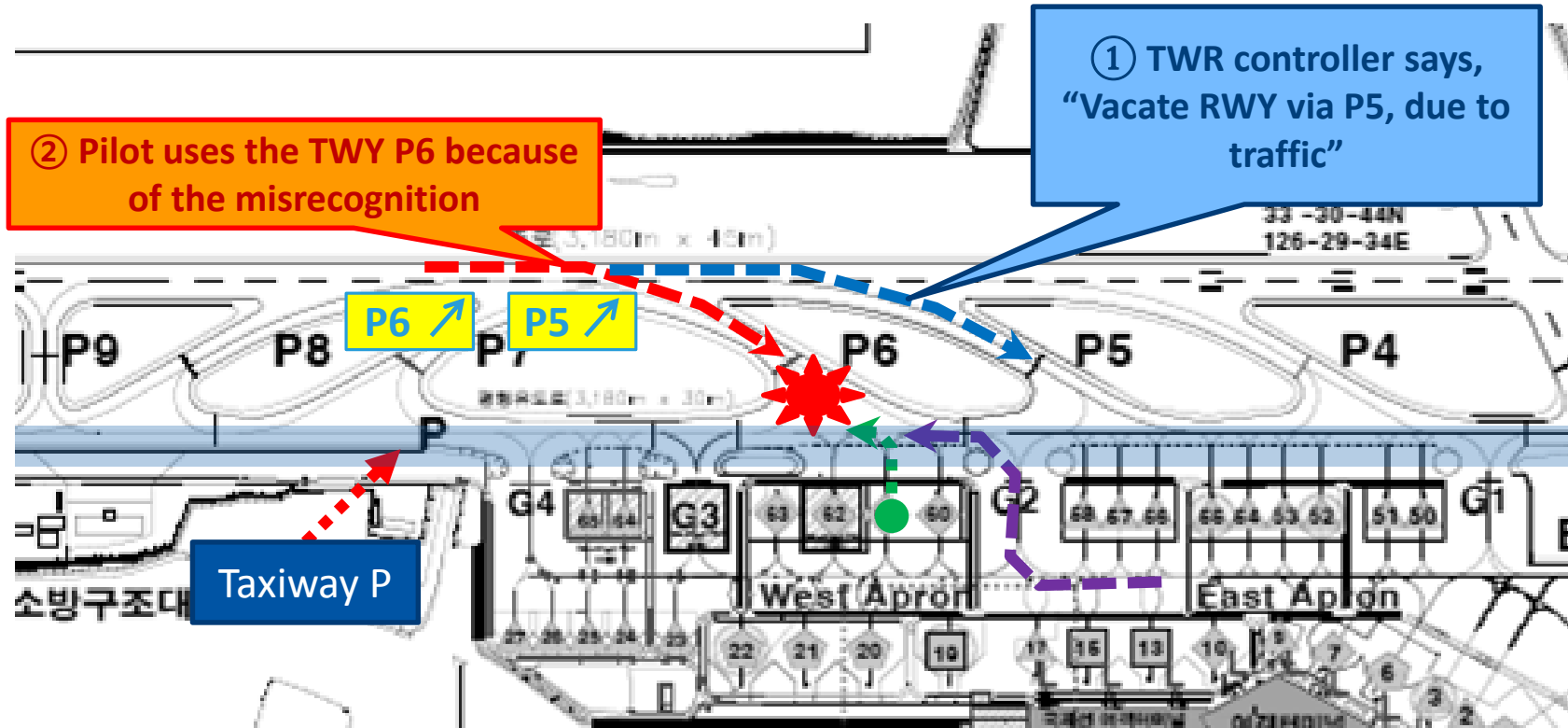


TGS location of new RETs

RET: Runway Exit Taxiway
TGS: Taxiway Guidance Sign

❖ Safety Risk Analysis (May 2018)

- Evaluation of the potential accident scenarios
 - **Scenario 1 (Consequence 1):** Collision with an aircraft which is taxiing on TWY P for departure

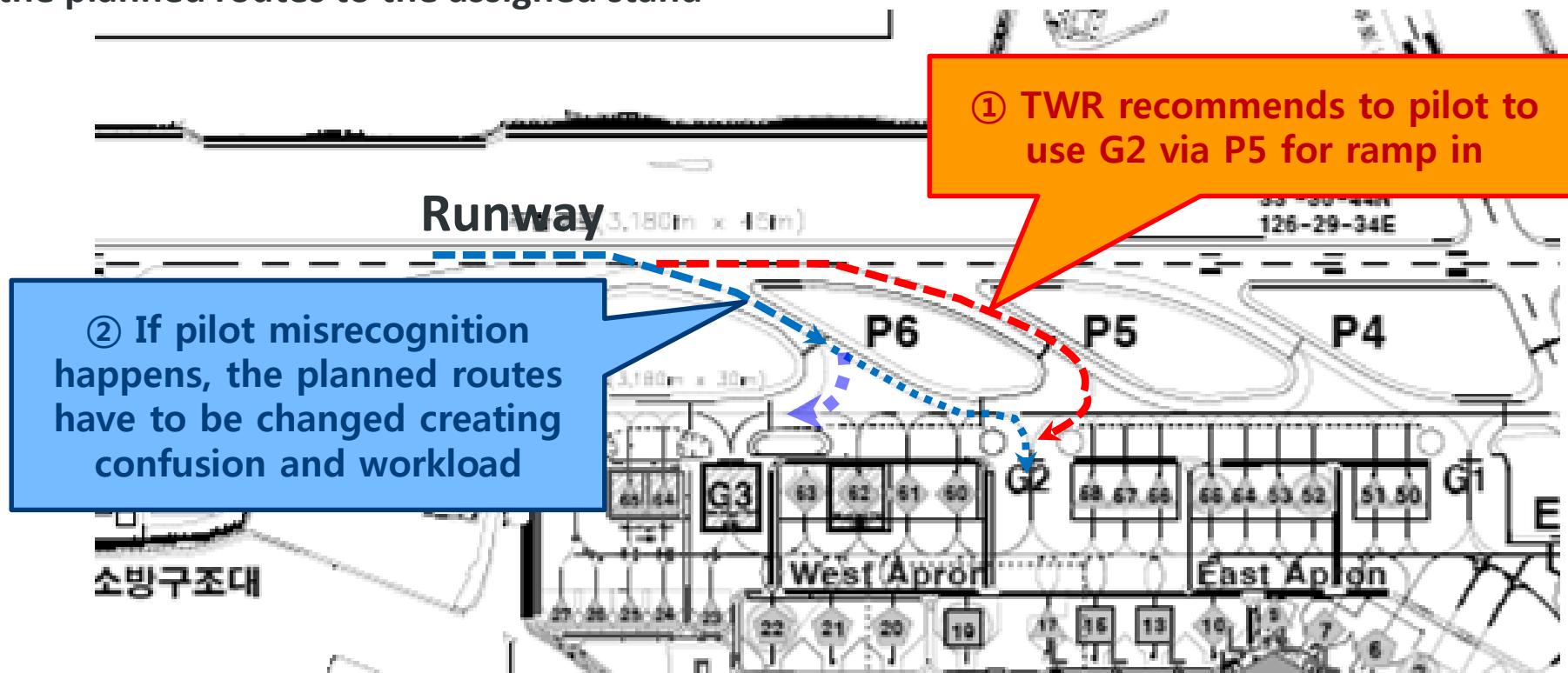


TGS location of new RETs

RET: Runway Exit Taxiway
TGS: Taxiway Guidance Sign

❖ Safety Risk Analysis (May 2018)

- Evaluation of the potential accident scenarios
 - **Scenario 2 (Consequence 2):** Pax injuries due to aircraft handling mistakes induced by confusion about the planned routes to the assigned stand



Safety Risk Analysis

- ❖ **Analysing safety risks of the potential consequences using safety data collection (May 2018)**
 - **Selection of past accident cases from accident database to classify the severity and probability**
 - **Used databases:** NTSB Aviation Accident Database, ICAO Accident Statistics
 - **Period of Data:** 2008 ~ 2017 (for 10 yrs.)
 - **Searching method:** Selecting the accident reports which is similar to each scenario using filter and analyzing severity and probability
 - **Results:** 25 accidents found for scenario 1, 0 accidents found for scenario 2

Results of Safety Risk Analysis

❖ Classification of the Severity and the Probability

Probability

Scenario	NTSB	ICAO	Criteria	Probability
Consequence 1	11	14	Likely to occur within a year	Remote (3)
Consequence 2	0	0	Unlikely to occur within a 10 years	Extremely Improbable (1)

Severity

Scenario	Section	Criteria	Severity
Consequence 1	Person	Injury requiring less than 4 weeks for cure	Negligible (1)
	Property	Loss of 100million ~ 1 billion Won	Major(3)
	Airport ops.	Nothing	Negligible (1)
Consequence 2	Person	Injury requiring less than 4 weeks for cure	Negligible (1)
	Property	Loss of less than 10million	Negligible (1)
	Airport ops.	Nothing	Negligible (1)

Safety Risk Probability Table

❖ Classification of the Probability

Code	Probability	Criteria
5	Frequent	Likely to occur within a week
4	Occasional	Likely to occur within a month
3	Remote	Likely to occur within a year
2	Improbable	Likely to occur within 10 years
1	Extremely Improbable	Unlikely to occur within a 10 years

Safety Risk Severity Table

❖ Classification of the Probability

Code	Severity	Criteria	
5	Catastrophic	Person	Occurrence of death (over 10 people)
		Property	Loss of 10 billion Won or more
		Airport ops.	Airport Closure
4	Hazardous	Person	Occurrence of death (1~9 people)
		Property	Loss of 1 ~ 10 billion Won
		Airport ops.	Runway closure(over 24h), Taxiway, Ramp Closure (over 72h)
3	Major	Person	Serious injury
		Property	Loss of 100million ~ 1 billion Won
		Airport ops.	Runway closure(under 24h), Taxiway, Ramp Closure (under 72h)
2	Minor	Person	Injury requiring over 4 weeks for cure
		Property	Loss of 10million ~ 100 million Won
		Airport ops.	Flight delay(over 3h) or cancelation
1	Negligible	Person	Injury requiring less than 4 weeks for cure
		Property	Loss of less than 10million
		Airport ops.	Nothing

Results of Safety Risk Analysis

❖ Tolerability of the safety risks: Magnitude of risks of potential consequence of each hazard

- **Scenario 1 (Consequence 1):**
Collision with an aircraft which is taxiing on TWY P for departure
 - **High (9)**
- **Scenario 2 (Consequence 2):** Pax injuries due to aircraft handling mistakes induced by confusion of planned route to the designated stand
 - **Low (1)**

Safety Risk Index		Severity				
		Catastrophic 5	Hazardous 4	Major 3	Minor 2	Negligible 1
Probability	Frequent 5	Very high (25)	Very high (20)	High (15)	High (10)	Middle (5)
	Occasional 4	Very high (20)	Very high (16)	High (12)	High (9)	Middle (4)
	Remote 3	High (15)	High (12)	High (9)	Middle (6)	Low (3)
	Improbable 2	High (10)	Middle (8)	Middle (6)	Middle (4)	Low (2)
	Extremely Improbable 1	Middle (5)	Middle (4)	Low (3)	Low (2)	Low (1)

Scenario 1

Scenario 2

Safety Risk Mitigation Decision-making

❖ 1st Runway Safety Committee for Decision Making (June 2018)

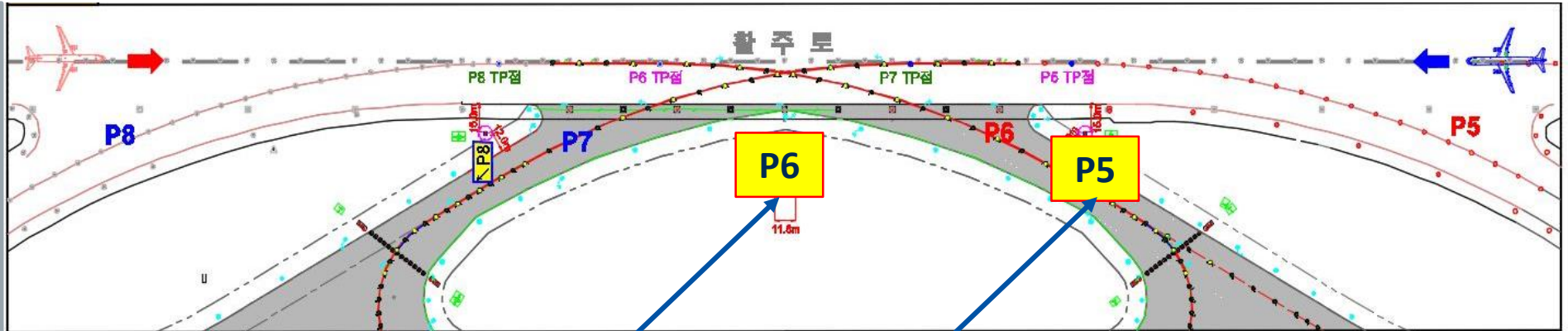
- Purpose: To review the risk assessment result and to plan the risk mitigation
- Chairperson: Accountable top management (the heads of JROA and KAC)
- Participating members: KAC, Airlines, Ground Handlers, ATC (JROA, MOLIT), 4 Experts from outside
- **Outcome (mitigation plans):**
 - **ATC:** keep doing the risk mitigation to reduce the risk of Hazard 1 (scenario 1)
 1. To announce **“if able after landing, vacate RWY via P4”** to pilot **via ATIS** when RWY 07 in use
 2. To **make several alternative departure taxiing routes** to prevent collision
 - **KAC:** relocate the TGW and set up the TWY information markings at the entrance of P6
 - After completion of relocation by KAC, ATC should stop the risk mitigation measure and **monitor the effectiveness of safety control**
 - All committee members agreed with the risk magnitude and the results of assessment
 - **The chair of the committee signed off the mitigation plan after monitoring**

Safety Risk Mitigation

❖ TGS relocated (12 June 2018)

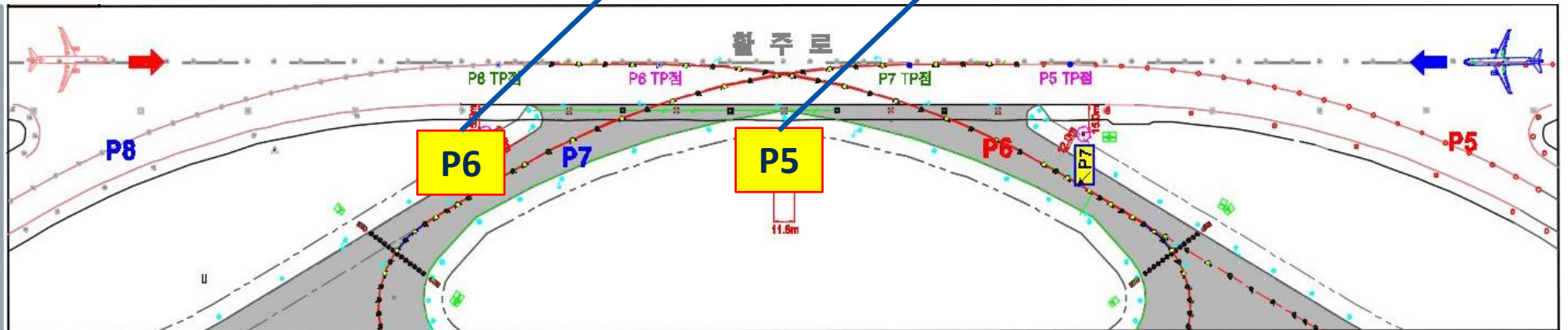
Relocated

It does not satisfy the requirements, but ensures more safety by reducing the misrecognition



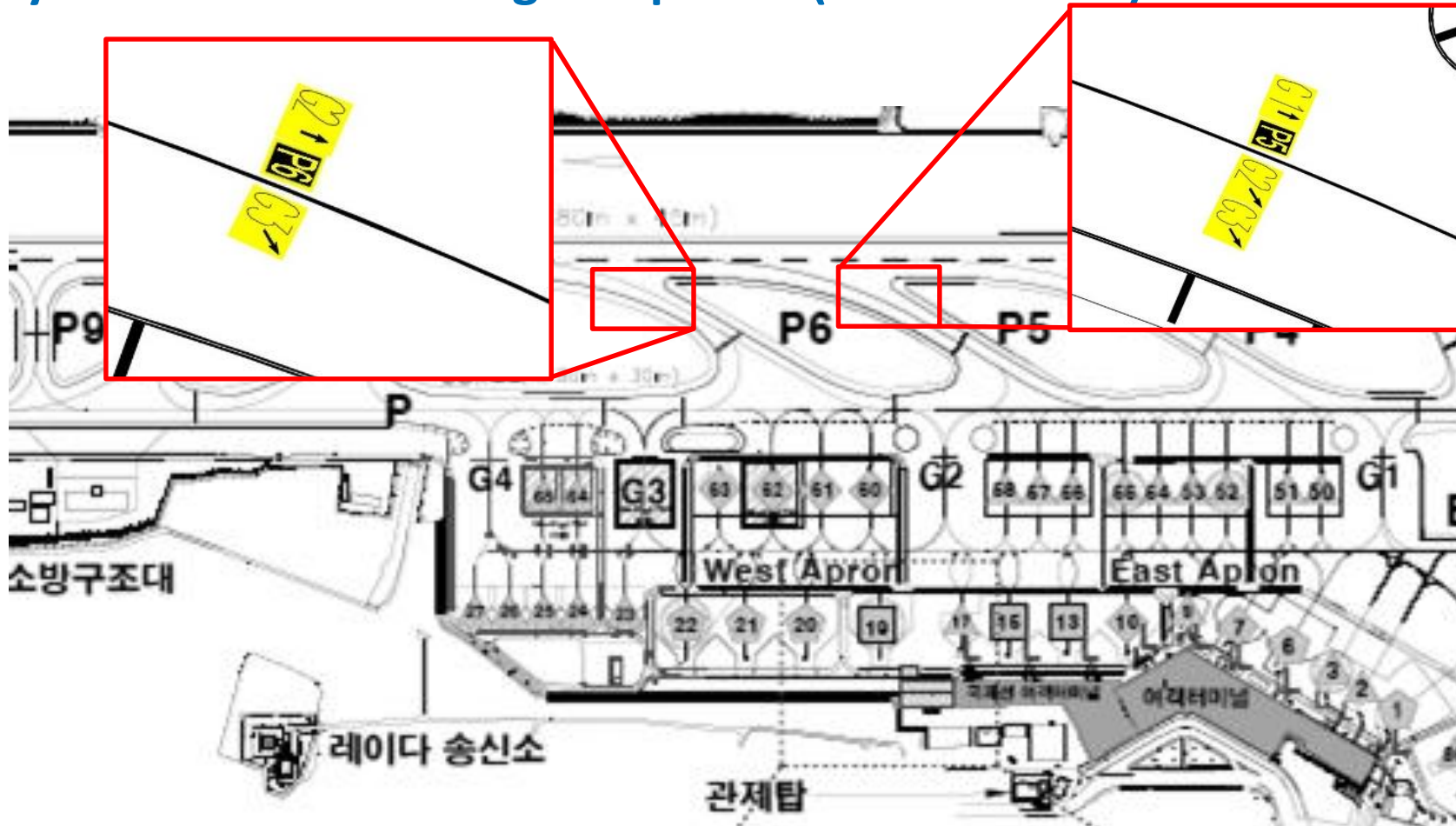
Before

It satisfies requirements in accordance with the national and ICAO Guidance (at least 60m prior to tangency point), but it created safety issues



Safety Risk Mitigation

❖ Taxiway information marking completed (11 June 2018)



Monitor and Review

❖ Monitoring

- Period: From July to August 2018
- Who: ATC (Jeju Tower)
- How: Watching arrival aircraft if misrecognition occurs or not
- Result: No misrecognition occurred after risk mitigation of KAC (relocation)

❖ 2nd Runway Safety Committee Review

- Purpose: To review the results of monitoring and risk assessment
- Chairperson: Accountable top management (the head of JROA and KAC)
- Participating members: KAC, Airlines, Ground Handlers, ATC (JROA, MOLIT), 4 Experts from outside
- Outcome:
 - All committee member agreed with the reduced level of risk related to consequence 1 (scenario 1)

Lessons learned from this case

- ❖ **In a certain circumstance, following the regulated safety recommendations could not be the best way.**
 - Runway exit sign shall be located prior to the runway exit point in line with a position at least 60m of the point of tangency for code number 4 runway. (ANNEX 14 vol. 1 5.4.3.17)
- ❖ **From the initial phase of planning and design of the project (change), detailed consideration and communication are important.**
 - There were some concerns about misrecognition among frontline personnel
 - Consequently, Usage of the new TWY was delayed for 3 months.
- ❖ **Decision making of accountable top management should be made in an informed and timely manner.**
 - It will save time and money ensuring the effectiveness of the whole process.



KEY CONSIDERATIONS

(FOR EFFECTIVE ATM SAFETY ASSESSMENT IN CHANGE MANAGEMENT)



There is no perfect human being nor technology

- ❖ Every system is inherently **vulnerable** from safety perspective
- ❖ Safety vulnerabilities in a system are **described** in terms of
 - hazards
 - consequences
 - safety risks
- ❖ Effective safety risk management seeks to **maximize the benefits of accepting a safety risk** (a reduction in time and cost) while **minimizing the safety risk itself**
- ❖ A Whole of system approach is needed
 - Aviation environment is ever changing and getting more complex and inter-related across stakeholders
- ❖ The right people involvement will maximize the practicability of safety risk assessment and mitigation

ATM Safety Assessment is ever important

- ❖ **Safety is critical when planning implementation of air navigation operational improvement**
 - To determine if these improvements (**changes**) can be implemented in a safe manner.
 - Any operational improvement to enhance the performance of the air navigational system, should be built based on a safety risk assessment.
 - Based on the results of a safety risk assessment, mitigation strategies may be implemented to ensure that an **acceptable level of safety performance (ALoSP) is maintained** with any air navigation operational improvement.
- ❖ **A safety risk assessment provides information to identify hazards that may arise from, for example:**
 - Any planned modifications in airspace usage;
 - The introduction of new technologies or procedures; or
 - As a result of the decommissioning of older navigational aids.
- ❖ **Safety assessment results will play an important role for the basis of the Safety Database**

One can't fit all

❖ Every organization has its own needs and context of operation by its SMS maturity

- Review the SRM tools used and **customize** periodically to ensure they are **suitable for “your operating environment”**
- **Be commensurate with your organization’s size and complexity** of services

❖ Prioritize the safety risks control

- Assess & control the highest safety risk
- Allocate resources to the highest safety risks
- Effectively maintain or improve safety
- Achieve the stated and agreed safety objectives and SPTs
- Satisfy the requirements of the State’s regulations with regards to control of safety risks

Reasonably Practicable



Associated Cost:

- Money
- Time
- Effort
- Environment

Balancing the Cost-effectiveness, Time, difficulty of taking action to reduce or eliminate the risk



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THANK YOU

Definitions (Doc9856) :

- **ATM system.** The ATM system is a system that provides air traffic management through the collaborative integration of humans, information, technology, facilities and services, supported by air, ground and/or space-based communications, navigation and surveillance
- **State safety programme (SSP).** An integrated set of regulations and activities aimed at improving safety.
- **Safety management system (SMS).** A systematic approach to managing safety, including the necessary organizational structures, accountability, responsibilities, policies and procedures.
- **SMM.** Safety Management Manual (Doc9859)
- **Safety.** The state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level.
- **Acceptable level of safety performance (ALoSP).** The level of safety performance agreed by State authorities to be achieved for the civil aviation system in a State, as defined in its State safety programme, expressed in terms of safety performance targets and safety performance indicators
- **Change management.** A formal process to manage changes within an organization in a systematic manner, so that changes which may impact identified hazards and risk mitigation strategies are accounted for, before the implementation of such changes Significant/major/minor change
- **Hazard.** A condition or an object with the potential to cause or contribute to an aircraft incident or accident. Safety risk
- **Safety risk.** The predicted probability and severity of the consequences or outcomes of a hazard.
- **Safety risk probability.** the likelihood or probability that a safety consequence or outcome will occur.
- **Safety risk Severity.** the extent of harm that might reasonably occur as a consequence or outcome of the identified hazard.

Definitions (Doc9856):

- **Risk mitigation.** The process of incorporating defences, preventive controls or recovery measures to lower the severity and/or likelihood of a hazard's projected consequence. SSP
- **Safety oversight.** A function performed by a State to ensure that individuals and organizations performing an aviation activity comply with safety-related national laws and regulations.
- **Safety performance.** A State's or service provider's safety achievement as defined by its safety performance targets and safety performance indicators.
- **Safety performance indicator.** A data-based parameter used for monitoring and assessing safety performance.
- **Safety performance target.** The State or service provider's planned or intended target for a safety performance indicator over a given period that aligns with the safety objectives.