ICAO Workshop on Oversight of IFPs for CAAs

(Nadi, Fiji, 29-30 October 2024)

- IFP Oversight Regulatory Framework of Republic of Korea -

Ministry of Land, Infrastructure and Transport

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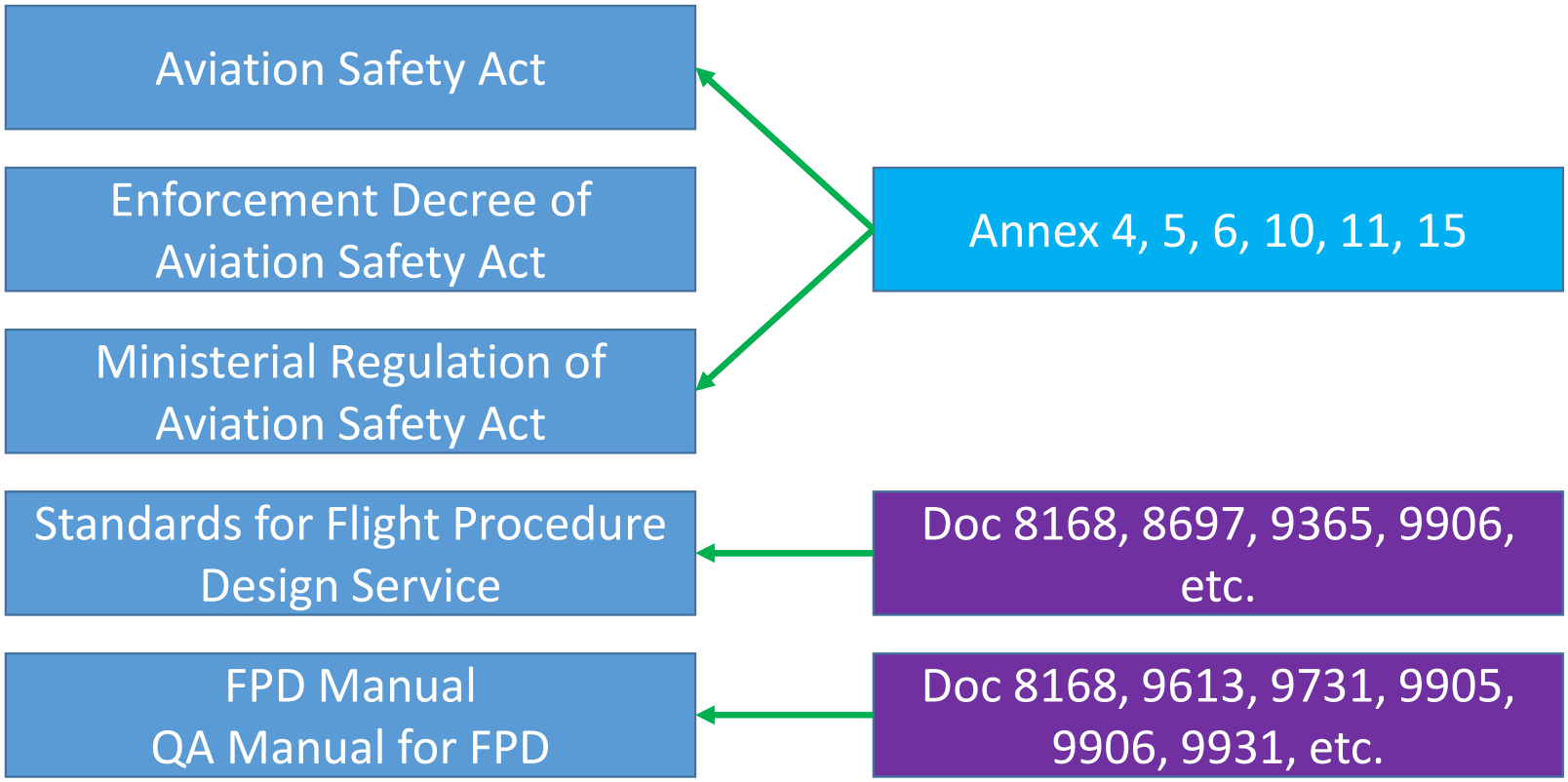
❖ Regulatory framework for flight procedure design



❖ Regulations on IFP Development

➢ Article 78 of Aviation Safety Act

- The ASA empowers the Minister of MOLIT to develop and publish IFPs
- The Air Traffic Service Certificate holders may develop and publish IFPs except ATS routes and their developed procedures need to be approved by the Minister of MOLIT
- The Minister of MOLIT shall promulgate the detailed regulation, standards and manuals for IFP design criteria, publication procedures of IFPs, IFP approval procedures

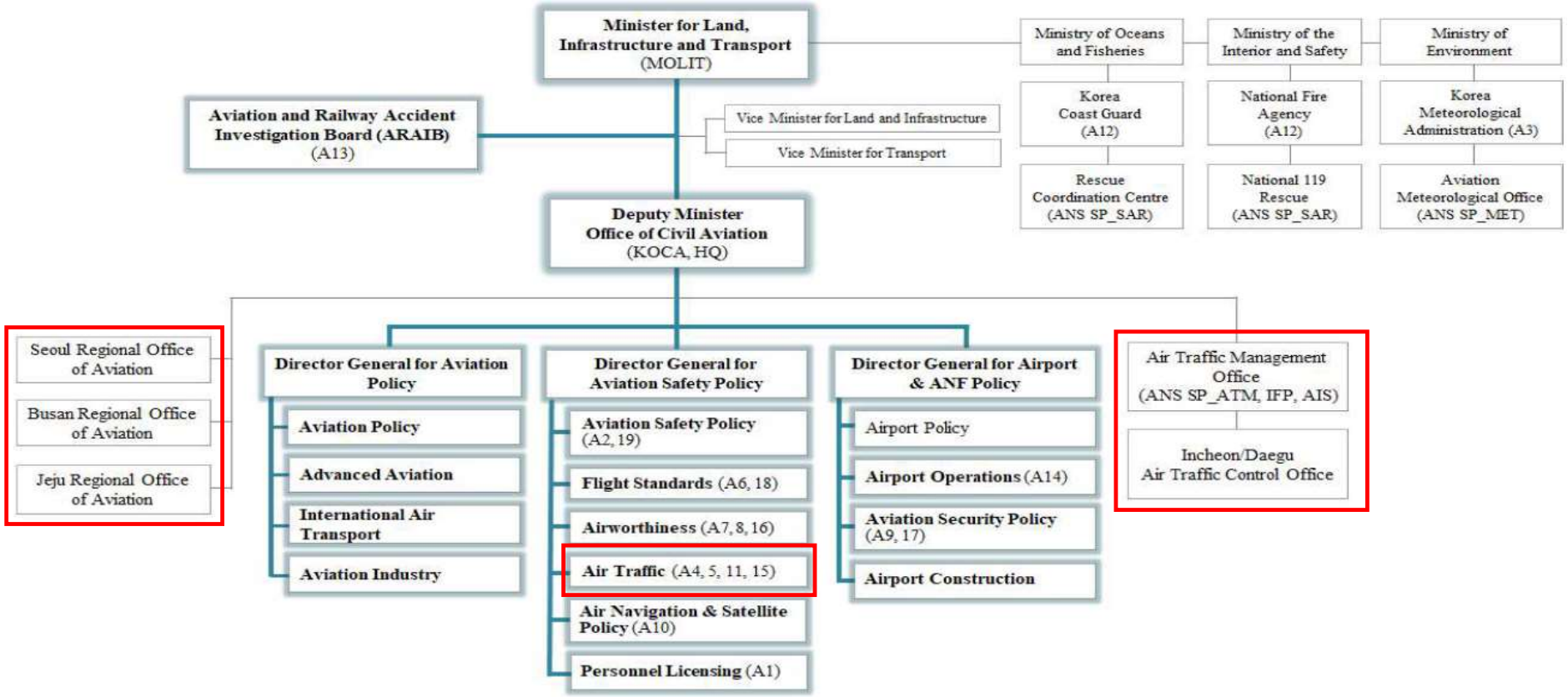
➢ Article 26 of Enforcement Decree of Aviation Safety Act

- The responsibility for IFP development and publication is delegated to Regional Aviation Offices and Air Traffic Management Office
- The Minister of MOLIT also entrusts the responsibility of IFP development and publication to the Minister of Defense and ATS Certification holders within their area of responsibilities.

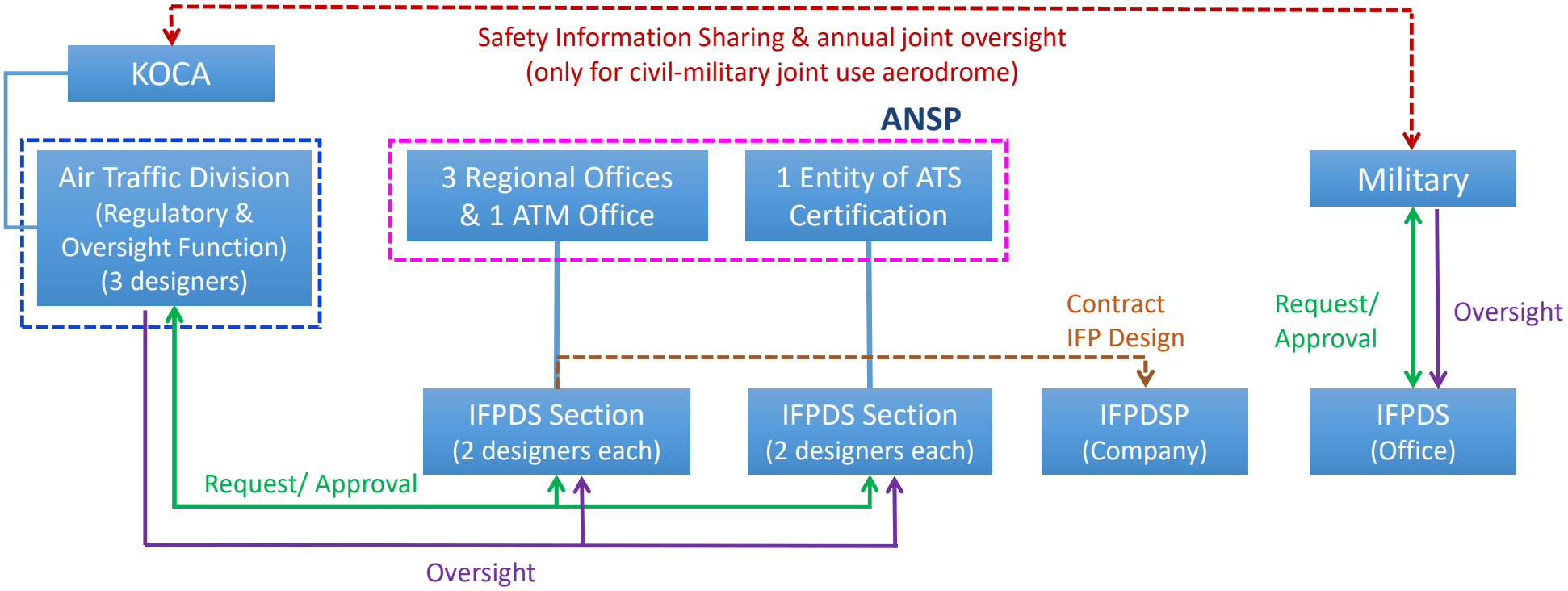
❖ Regulations on IFP Development

- **Article 221 bis of Ministerial Regulation of Aviation Safety Act**
  - **Provides general IFP development and publication criteria**
  - **Requires the Minister of MOLIT to approve IFPs of ATS Certificate holders**
  - **Requires the Minister of MOLIT to publish detailed criteria on IFP design, IFP publication, IFP approval procedures, etc.**
- **Standards for IFP Design Services**
  - **Contains detailed criteria on IFP design process, qualification and training requirements for IFP designers, use of IFP automation programme, approval of non-standard IFPs, management of IFP design packages, etc.**
- **Flight Procedure Design Manual**
  - **Contains IFP design criteria referenced from ICAO Pans-OPS Volume II (Doc 8168), RNP AR Procedure Design Manual (Doc 9905), etc.**

❖ Structure of Korea Office of Civil Aviation

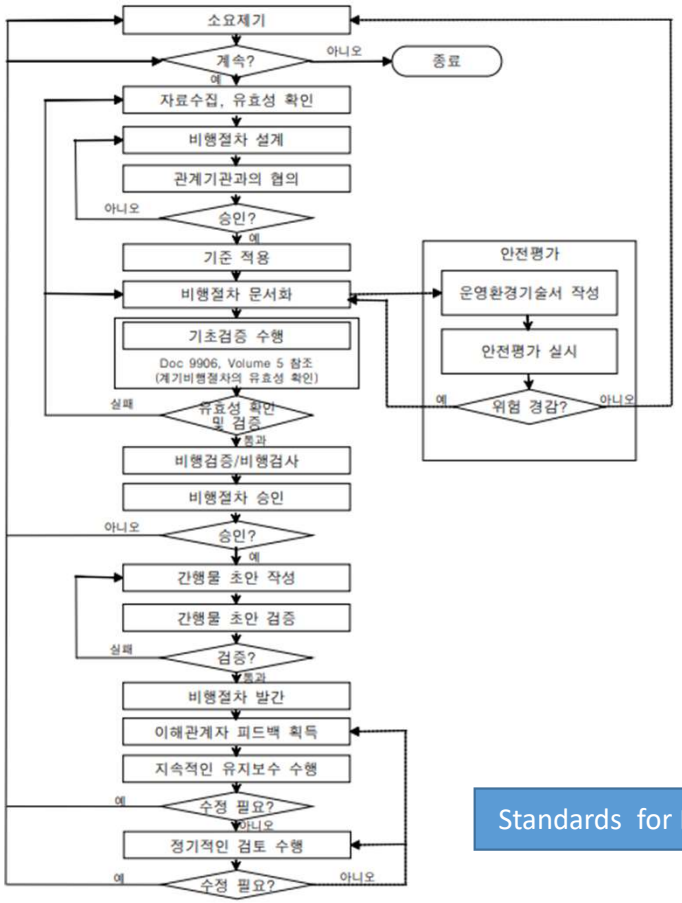


❖ IFP Organizations and Resources

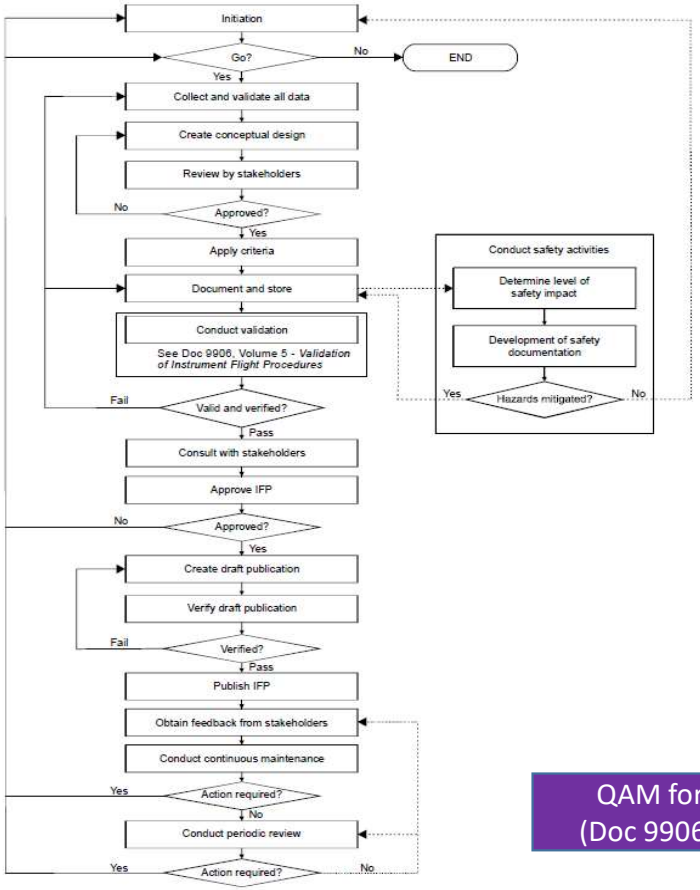


Ministry of Land, Infrastructure and Transport

❖ IFP Development Process



Standards for FPDS



QAM for FPD
(Doc 9906 Vol I)

❖ IFP Development Process (Standard for FPDS)

➢ Validation

- After completion of FPD documentation and safety activities
- Comprised of Ground Validation and Flight Validation
- Detailed procedures are in the QA Manual for FPD
- Allows to skip the flight validation when the accuracy and completeness of all obstacle and navigation data considered in the procedure design and flight validation are verified during ground validation.

➢ Ground Validation

- Specifies qualification (knowledge and experience) of a validator who is not involved in the FPD process
- Items to be verified during the ground validation, i.e. errors in criteria application and documentation, evaluation of flight validation elements (obstacles, fix tolerances, etc.)
- Asks the designer to rectify all errors and determines whether to conduct flight validation or not.

❖ IFP Development Process (Standards for FPDS)

➢ Flight Validation

- Specifies items to be verified during the flight validation, i.e. obstacle clearance, navigation data accuracy, appropriateness of all required infrastructures, flyability, etc.
- Briefing to flight validation pilots on the special features and unique applications
- participation in the flight validation process by the designers to assist evaluation and obtain direct information related to the procedure design
- Minimum requirements for flight validation pilots, etc.

➢ Flight Inspection

- Conducted by Flight Inspection Office for all new or amended flight procedures
- Conducted after validation process
- May be conducted together with flight validation
- List of documents to be provided for Flight Inspection Office at least one week before
- Details are in the Flight Inspection Guidance for NAVAIDs

❖ IFP Development Process (Standards for FPDS)

➢ Result of Flight Validation/Flight Inspection

GNSS(RNAV, RNP, GBAS, SBAS 등) 비행검사 결과서

1.장소(Location) : 제주국제공항	2.검사일자(Inspection date) : 2024.6.10.
3.검사종류(Inspection Type) : 특별검사	4.검사 항공기(A/C NO) : FC-79(PRAETOR 600)
5.결과(Result) : 합격	

6.Confirm Procedure

SEGMENTS	ACCURACY		SEGMENTS	STATUS	
	SAT	UNSAT		SAT	UNSAT
Route			Route		
STAR			STAR		
SIAP	X		SIAP	X	
DP/SID			DP/SID		

7.Precedure Evaluation

Human Factors	SAT	Communications	SAT
Lighting Systems	-	Procedure Flyability	SAT
Obstacle Verification	SAT	Interference	SAT

8.Flight Inspection Result

Route / Procedure Name	Way-point Position / Leg / Lengths / Tracks	비 고
RNP Y RWY 07(AR)	SAT	

9. 다음 검사 기준일(Next Due Date) :

10.비고(Remarks)
1) 제주지방항공청 항공관제과-1498(2024.6.29.) 관련 비행검사 결과임.

조종사(Pilot) 비행검사관(Flight Inspector)

민영재 백병기 강성남KangSN 이홍섭

전방향표지시설 등(VOR, VOR/DME, VORTAC, TACAN) 비행검사 결과서

1.시설(Station) : 제주 VOR/DME	2.식별(ID) : YDM	3.검사일자(Inspection Date) : 2024.6.10.
4.검사종류(Inspection Type) : 정기검사		5.검사 항공기(A/C) : FC-79(PRAETOR 600)
6.시설주(Owner) : 국토교통부		
7.결 과(Result) : 합격		
8.검사장비(Facility Inspected) : VOR/DME		

9.방위각(Radial Data)

Service Destination	VOR	VOR	VOR		
Radial Use		APCH	APCH		
Azimuth	Orbit	067	067		
Transmitter(s)	1/2	2	1		
MSL Altitude	100	80	80		
Distance From	10.0	14.0	14.0		
Distance To		1.0	1.0		
Roughness And Scalloping	비교참조	0.2/2.2	0.8/18.7		
Bends	비교참조	+0.2/18.0	+0.2/1.8		
Polarization					
Alignment Error	비교참조	+0.8	+0.2		
Modulations	S	S	S		
Transmitter Difference	S	S	S		
Signal Strength	비교참조	-85dBm	-87dBm		
Interference	S	S	S		

10.장비상태(General) 11.모니터(Monitors) ※ Commissioning Inspected: 2011.10.27.

Standby Power		Monitor Date Inspected 2018.9.28.		TX	Align	Alarm+	Alarm-
Voice		VOR	Reference :				
Identification	Satisfaction		Check Point :				
DME Accuracy	Satisfaction	DME	Reference :				
DME Coverage			Check Point :				

12.다음 검사 기준일 (Next Due Date) : 2026.4.16.

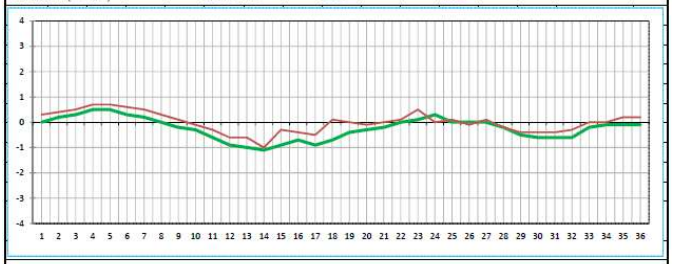
13.비고(Remarks)
1) Orbital alignment plot 참조.

조종사(Pilot) 비행검사관(Flight Inspector)

민영재 백병기 강성남KangSN 이홍섭

VOR, VOR/DME, VORTAC, TACAN, ORBIT PLOT

1. 항행시설명(Station) : 제주 VOR/DME	2. 검사일자(Date of Inspection) : 2024.6.10.
3. 검사장비(Facility Inspected) : VOR/DME	4. 궤도반경/고도(Orbit Rdious/ALT) : 10NM/10,000FT
5. AZIMUTH(+ OR -) PLOTTING	TX 1 TX 2



6. CHECK POINT LOCATION :	AFIS
7. TACAN DISTANCE LOCK ON :	-
8. TACAN AZIMUTH LOCK ON :	-
9. AREA OF INTERFERENCE :	S

10. ROUGHNESS (DO NOT PLOT IF LESS THAN ±1.0 DEGREE)

11. SCALLOPING (DO NOT PLOT IF LESS THAN ±1.0 DEGREE)

12. VOR COVERAGE SIGNAL STRENGTH : - 58 dBm

13. ORBITAL ERROR SPREAD

NO	EQUIPMENT	MINIMUM	MAXIMUM	SPREAD	MEAN
1	VOR	-1.1	0.5	1.6	-0.2
2	VOR	-1.0	0.7	1.7	0.0

❖ IFP Approval (Standards for FPDS)

- After the completion of IFP Development, IFPDSP shall ask approval of IFPs to the Director of ATM Division, KOCA at least 2 weeks before publication.
  - Exception: minor changes not requiring the amendment of current IFPs, change of waypoint/fix name, addition/amendment/deletion of waypoint/fix not affecting current IFPs, amendment of IFP description, course change less than 1°, etc.
- Documents required for IFP approval
  - Application form
  - Designation documents for IFP designers who participated in the IFP design
  - List of participants in the IFP design and records of coordination with stakeholders
  - Summary of IFP design
  - Documentation for IFP design, validations, flight inspection, safety assessment
  - Final report for IFP Design

➢ Review result of IFP approval application documents

□ **설계과정** (비행절차업무기준 별표1)

구분	검토내용	적합여부
자료수집 및 유효성 확인 (비행절차업무 기준 제7조, 제8조, 제9조)	○ 장애물자료, 항행안전시설 및 공항시설 측량자료, 설계계산서, 자기편차 값 등 설계기초자료 확보 확인 ○ ILS 장비(내용연수) 개량 및 신관제동 신축사업 등의 영향으로 착륙 시정 변경 예상(300m →1,500m) - SBAS 절차 신설로 최대 600m 착륙 시정 계선 효과가 있어 항공기 운영자 등 요구사항은 반영하였음 ○ 국토지리정보원 발행('18)한 1:25,000 수치지도를 활용하였으며 수치지도에서 추출된 장애물은 수치지도의 축척에 따른 수평·수직 오차가 적절히 가산됨.	적합
비행절차설계 (비행절차업무 기준 제19조, 비행절차설계요령 제Ⅰ부 제4절 제3장, 제4장, 제5장, 비행절차설계요령 제Ⅱ부 제1절 제1장 1.6.1항)	○ (**표준계기도착절차**) 한국형 위성항법시스템(KASS)을 이용한 신규 SBAS 접근절차로써 절차 수립을 위한 기초자료 정확성 확인 - 장애물/항행안전시설 자료 등 기초자료 및 적용된 티미널 비행절차 설계기준의 정확성 등 확인 - 보호구역의 작도를 위한 관련 계산 및 도면 정확성 확인 ○ (**항공정보의 표기법 등**) 항공정보간행물 차트 등 확인 -「항공정보 및 항공지도 등에 관한 업무기준」에 따른 항공정보의 수록 및 정확성 확인	적합
관계기관 협의 (비행절차업무 기준 제18조)	○ 계기비행절차 신설을 위한 유관기관 의견 조회 실시 ('24.4월.) : 부산항공청, 한국공항공사 등 ○ 항공교통본부('24.4월) - 항공지도 도식기준 사전검수 결과 등 반영 ○ KASS 비행절차 도입관련 ICAO 고유 채널번호 획득 - 채널번호(52013), 채널 ID 등 획득('24. 5월) ○ 제주공항 취항 항공사 의견 조회 완료('24.4월) - 대한항공, 아시아나항공, 진에어, 제주항공, 에어부산, 티웨이 항공, 에어서울, 에어로케이, 이스타항공 등	적합
비행절차 문서화 (비행절차업무 기준 제20조)	○ 항공정보간행물 초안, 장애물 정보, 비행절차 계산서, 기초검증 결과 등 비행절차 문서화 확인	적합

구분	검토내용	적합여부
변화관리 (비행절차업무 기준 제19조의2)	○ 항공교통업무 안전관리시스템 운영지침 제34조에 따라 계기비행절차 변화관리 실시 확인('24.4월)	적합
비행검사(검증) (비행절차업무 기준 제23조, 제24조)	○ 항행안전시설 비행검사 업무지침에 따른 비행검사 RNP RWY 07(SBAS) "합격" 확인(검사일 '24.4.22.) - 장애물 회피기준 충족여부 : 특이사항 없음 - 항공정보간행물에 발간될 항행자료의 정확성 : 특이사항 없음 - 활주로표지, 등화시설, 통신 및 지원시설 등의 운영적절성 : 특이사항 없음 - 비행용이성(Flyability) : 특이사항 없음 - 항공지도, 기상최저치 등 그 밖의 운영상 요소 : 특이사항 없음	적합

□ **문서적절성**

구분	검토내용	적합여부
비행절차업무 담당자 지정내역 (비행절차업무 기준 제25조제2항제1호 및 제29조)	○ 비행절차업무담당자 지정내역서 확인 - 비행절차업무기준 제29조에 따른 자격요건 충족 확인 <자격 요건> 1. 항공교통관제사 또는 조종사 자격증명을 소지한 자 2. 초기교육훈련 및 직무교육훈련을 이수한 자	적합
비행절차 설계참여자 현황 및 관계기관 협의내역 (비행절차업무 기준 제25조제2항제2호)	○ 비행절차 설계참여자 현황 - 자격요건 충족 확인 ○ 관계기관 협의내역 확인 - 항행위성정책과 협의(SBAS 절차 ICAO 고유번호) - 부산지방항공청 협의 확인 - 항공교통본부 협의 확인 - 한국공항공사 협의 확인 - 대한항공, 아시아나, 제주항공 등 제주 취항 항공사 협의 확인	적합
비행절차 설계요약 (비행절차업무 기준 제25조제2항제3호)	○ 비행절차업무기준 별지3호 양식에 따라 작성 확인	적합

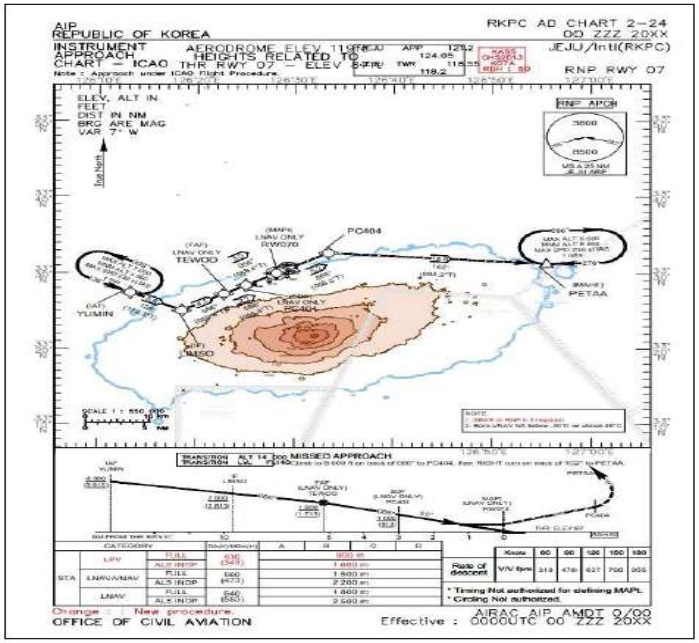
구분	검토내용	적합여부
항공정보 간행물 도면 (비행절차업무 기준 제20조)	○ 비행절차설계 계산서상 결심고도 및 기상최저치 등과 일치여부 확인, SBAS 절차 관련 설명사항 확인	적합
비행절차 설계 계산서 (비행절차업무 기준 제20조)	○ 항공정보간행물상 결심고도 및 기상최저치 등과 일치여부 확인	적합
기초검증 (비행절차업무 기준 제22조)	○ 기초검증 결과 최종접근경로 설계기준, 장애물 평가, 설계자료, 도면 및 AIP 고시(안)에 대해 정확하게 계산 및 작성되었음을 확인 * 교통안전공단 항공안전처-1316('24.4.17)	적합
비행검사 결과 (비행절차업무 기준 제25조제2항제5호)	○ 비행검사 결과 문서 확인(합격) * 비행점검센터-509('24.5.7)	적합
변화관리 실시결과 (비행절차업무 기준 제25조제2항제6호)	○ 변화관리 결과문서 확인 - 장소: 제주지방항공청 회의실 - 참석: 외부위원 등 10명(제항청, 항공교통본부, 항공사 기장) - 결과: 위해요소 발굴 없음. (RNP LNAV/VNAV 접근 절차 대비 착륙 최저치 하향에 따른 복행·체공 가능성 감소 예상 * 제주지방항공청-1218('24.5.1)	적합
비행절차설계 결과보고서 (비행절차업무 기준 제25조제2항제7호)	○ 비행절차업무기준 별지5호 양식에 따라 작성 확인	적합

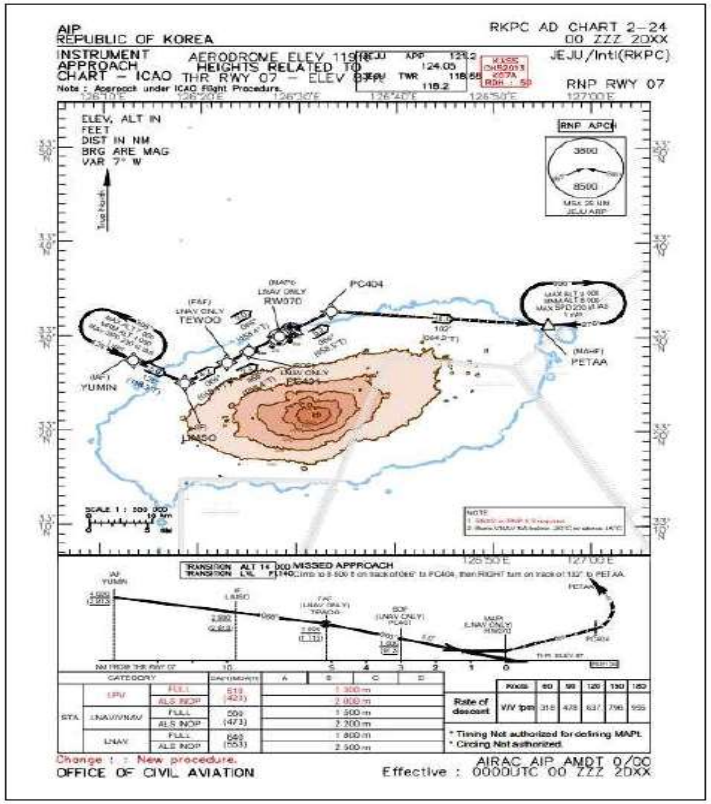
➢ Review result of IFP approval application documents (cont')

□ 제주국제공항 계기비행절차 신청목록(총 2식)

순번	구분	항법	활주로/출-도착	계기절차 명칭
1	신설	RNP(LPV) :SBAS 기반 접근절차	07/도착	RNP 07(SBAS) : 430ft(DA)
2				RNP 07(SBAS) : 510ft(DA)

□ 제주국제공항 계기비행절차 AIP 고시도면 (총 2식)





❖ Duties of PANS-OPS Inspector

- ➢ Reflecting PANS-OPS and related documents to national rules and regulations
- ➢ Surveillance IPFD service providers on the implementation of IFPD rules and regulations
- ➢ Oversight of flight procedure design process and quality assurance of published IFPs
- ➢ Oversight of IFP designers' qualification and training
- ➢ Oversight of airspace operations and management (AOM)
- ➢ Other duties necessary to enhance quality of FPDS

❖ Qualification and experience requirements of PANS-OPS Inspectors

- ➢ At least 7 years of experience in FPD and AOM (max. 1 year)
- ➢ Air Traffic Controller or pilot license (min. CPL) holders, and
  - Completed ICAO PANS-OPS training course
  - Completed initial training (41H), field training (5 Days) and OJT course (60H)

❖ Training requirement for PANS-OPS Inspectors

- Comprised of initial training, OJT (including field training), recurrent training (12M) and specialized training, i.e. RNP AR training, QA training, etc.
- If an inspector fails to complete recurrent training, the privilege of the inspector is suspended until he/she finishes recurrent training or requalification training (16H)
- develop an annual training plan for ANS inspectors according to Regulation for Aviation Safety Personnel Training.

❖ Number of PANS-OPS Inspector

- Consider the number of facilities who have IFP design function, IFPs that each facility has, time that needed to review an IFP, working days per year, frequency of oversight, etc.
- Calculated 1.71 inspectors, which means 2 inspectors to oversee 5 IFP design offices.
- Currently, only one inspector is employed as PANS-OPS inspector

❖ Supporting tools and documents for ANS inspectors

➢ Regulation for ANS Safety Oversight

- Contains duties of inspector, tasks of each oversight process, qualifications and training requirements of inspectors, calculation of inspector numbers, etc.

➢ ANS Oversight Inspector's Manual

- Contains ethics, roles and responsibilities, site oversight coordination procedures, checklist, administrative actions and penalties, detailed inspection procedure etc.

➢ Supporting resources including budget, a car, office and equipment, documents, etc.

❖ Oversight process

➢ Specified in the Regulation for ANS Safety Oversight

➢ Includes planning, oversight notification, conducting oversight, findings and remedial action requests, review of CAPs and follow-up actions, record keeping, etc.

IV. Challenges on IFP development and oversight

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❖ Difficulty to maintain experienced IFP designers and inspectors

- ➢ Two designers for each IFPDO and frequent move to other position
- ➢ One PANS-OPS inspector, but currently one is selected and under training

❖ Difficulty for KOCA designers to maintain IFP Design skills

- ➢ IFPDO contracts procedure design works to private IFP design company
- ➢ IFPDO conducts safety assessment and steps from flight validation of the IFP Design process, therefore few chances to design procedures by themselves
- ➢ No way to oversee contractors as they don't hold any IFPD certificate from the KOCA even though they have trained designers and follow the standards and manual for FPDS of KOCA
  - KOCA hasn't introduced IFP certification procedures for a private IFP design company
- ➢ Senior designers of KOCA retires early to move a private company and junior designers don't want to work as an IFP designer long because of difficulty in doing FPD works

❖ IFPs for civil-military joint use aerodromes

- Civil airlines fly to 8 civil-military joint use aerodromes managed by military authority
- Military authorities apply to US TERPs criteria in their airports considering joint exercises with US forces
- Dilemma to use two design criteria within one State even though the military aircraft is not subject to the ICAO criteria, PANS-OPS according to the Article 3 of Chicago Convention
  - So it is natural for military authority to apply their own IFP design criteria to their airports
  - Do we have to design IFPs for civil aircraft to the military airports intending to fly to?
  - There are no known accidents/incidents directly related to IFPs so far.

Questions?

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Thank you

감사합니다

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