Purchase Order

Applying Helmet Mounted Display(HMD) to KF-16 Upgraded Aircraft(KF-16U)

1. Applicable Scope

This Purchase Order shall be applied to 'Applying HMD to KF-16U'.

2. Applicable Data and Documents

2.1 General

The following documents shall be applied with this Purchase Order within the regulated scope, and the latest version shall be applied unless otherwise specified.

2.2 Standards and Specifications

KDS 8455-0002	Ministry of National Defense(MND) Seal
KS A ISO/IEC GUIDE 41	Recommendations for Packaging
KS T 1002	Transport Package Sizes by Modular Coordination
KS T 1039	Polypropylene Band
KS T 1061	Corrugated Fiberboard Shipping Containers

2.3 Regulations and Guidelines

방위사업 관리규정(방위사업청)
Regulations on Defense Acquisition Program Management (DAPA)
표준화 업무규정(방위사업청)
Regulations on Standardization Operational (DAPA)
국방 표준 바코드 운용지침서
Guidelines to Management of National-Defense Standard Bar Code (MND)
현존전력 성능 극대화 사업 업무지침(방위사업청)
Guidelines to Maximizing Performance of Existing Forces (DAPA)
현존전력 성능 극대화 사업 업무규정(국방기술품질원)
Regulations on Maximizing Performance of Existing Forces (DTaQ)
군용항공기 표준감항인증기준(방위사업청)
Airworthiness Certification Standards for Military Aircraft(DAPA)
군용항공기 비행안전성 인증에 관한 업무규정(방위사업청)
Regulations on the Airworthiness Certification of Military Aircraft (DAPA)
군용항공기 비행안전성 인증 업무규정(국방기술품질원)
Regulations on the Airworthiness Certification of Military Aircraft (DTaQ)

2.4 Order of Precedence

If this Purchase Order is not consistent with or different from other documents, the Purchase Order prevails. Unless any special exemption is granted, the Purchase Order cannot take precedence over related regulations or guidelines. In addition, The Korean version of Purchase Order shall prevail over the English version.

3. Specification and Performance Requirements

The names of each item do not refer to specific manufactures or models, and all components must be of equal or higher specifications and performance than those indicated in the specifications and performance requirements.

3.1 Specification

3.1.1 The base system components installed on the KF-16U in relation to HMD are as shown in Table 1.

Table 1 KF-16U HMD-related base system components

Components	Function
Aircraft Interface Unit(ACIU)	- Interface communication and control between KF-16U aircraft and HMD - Power supply to HMD Components, support data loading, initiate the system startup
Tracker Reference Unit(TRU)	- Main optical tracking reference in the cockpit and support both the day and night sensors - Measures the position and direction of the pilot's head using an optical sensor and transmits the data to ACIU
Helmet-Vehicle Interface	Connecting the KF-16U aircraft and HMD to provide power(12.5 VDC) and communication.
KF-16U Interface	The interface applied to the KF-16U aircraft. Refer to Figure 1.

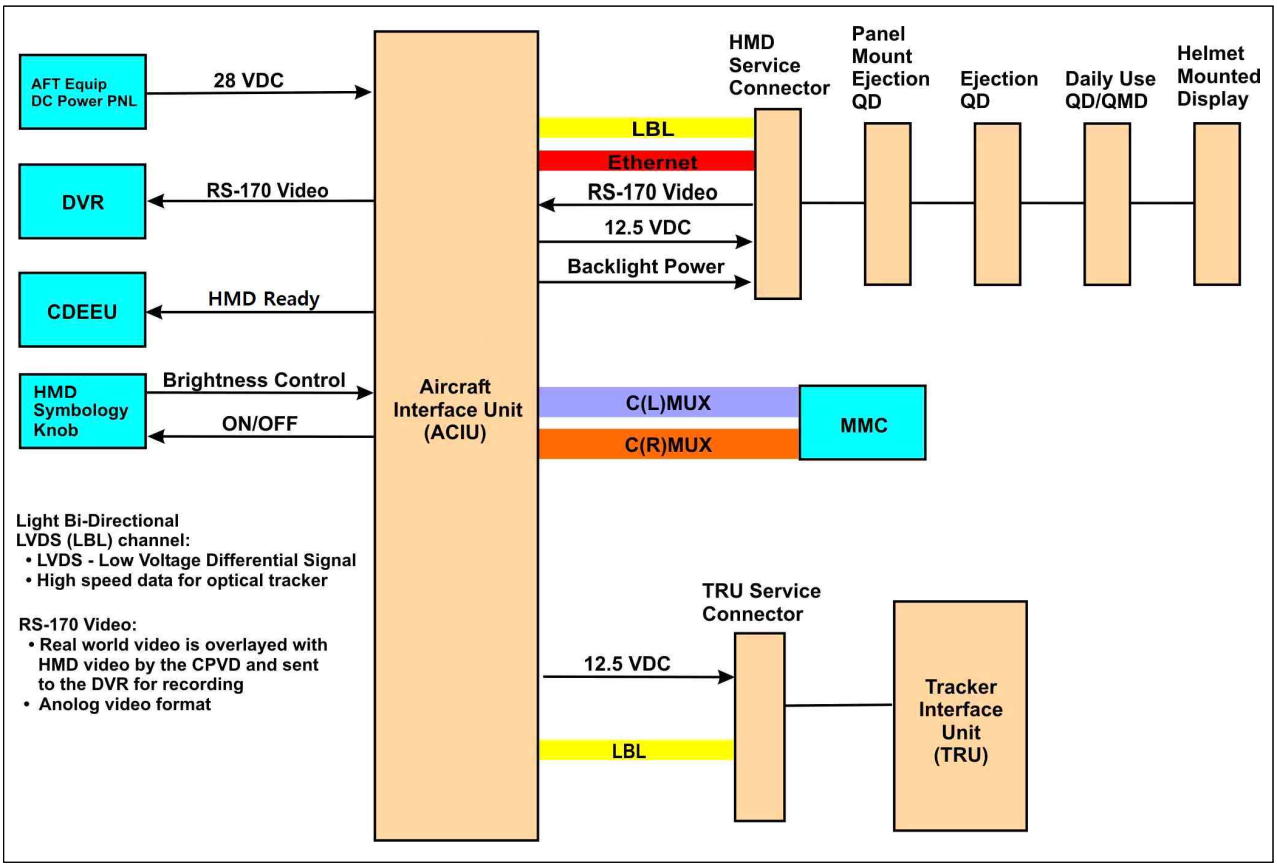

Figure 1 HMD Functional Block Diagram

3.1.2 The specified requirements for the items are shown in Table 2 below.

Table 2 Specification of HMD

* HMD: Helmet Mounted Display

Category	Description	
Configuration	Fighter Pilot Helmet	
Aircraft	KF-16 Upgraded Aircraft(KF-16U)	
Target Processing in Air-to-Air Engagement	Within Visual Range(WVR)	The targets acquired utilizing HMD must be interfaced with aircraft sensors to enable the operation of air-to-air weapons(such as AIM-9X)
	Beyond Visual Range(BVR)	Displaying target information obtained through aircraft sensors in the pilot's Field of View(FOV)
Target Processing in Air-to-Ground Engagement	Without Target Detection	HMD shall uses information(Updating target coordinates, precise engagement) transmitted by ground mission personnel and other aircraft
	With Target Detection	Updating target information through HMD when a position error occurs between displayed target and actual target.
Visual Data Processing	In-Flight	Air routes and specific targets stored on mission computer can be displayed through HMD
	Post-Flight (for debriefing)	Recording the pilot's FOV and flight information using helmet mounted camera (Video Format : RS 170 Composite Video, FOV : 19° or higher)
Image Source Resolution		VGA(800 pixel × 600 pixel) or SXGA(1,280 pixel × 1,024 pixel)
Active Area		600 pixel × 600 pixel or higher during the day and night
Refresh Rate		60Hz to 100Hz
FOV(Field-of-View)		19° or higher
Displayed Information		Flight Data, Information on Sensors, Weapons & Threats and Location of Flight Team Operated by Link-16

3.2 Performance Requirements

Table 2 HMD Components Improvements

Category	Description
HMD Components	Helmet Assembly
	Day Information Display Device
	Visor
	Night Information Display Device
	Step-In Visor
	Cable Mounted Device
	Personal Fitting Line
	Zeta Liner
Logistics Support Equipment	HMD-related Aircraft Maintenance Equipment
	HMD O'Level Maintenance Equipment
	Pilot Personal Fitting Equipment
Organization Level Maintenance Training	O'Level Maintenance Training Personal Fitting Product Training
	Pilot HMD Familiarization

3.2.1 HMD Components

When connected to the upgraded ROKAF KF-16U, the HMD components must implement all functions required in this purchase through the base system already installed, and a total of 42 HMDs is required.

3.2.1.1 Helmet Assembly

3.2.1.1.1 The Helmet Assembly shall be capable of mounting and operating HMD components and Oxygen Mask Assembly(MBU-20/P), and shall function properly during flight and emergency ejection as a pilot helmet for the KF-16 performance upgrade aircraft(KF-16U) based on Gentex HGU-55/P.

3.2.1.1.2 The Helmet Assembly shall be available in at least three sizes(Medium, Large, X-Large) to accommodate the user(pilot), and shall be capable of being fitting with a custom liner (if necessary) and a Zeta Liner to prevent the inability to identify visual information due to shaking during use.

3.2.1.2 Day Information Display Device

3.2.1.2.1 The Day Information Display Device can display flight parameters, sensors, weapons, threat information, Link-16 operation flight formation position information, etc. in the pilot's field of view during daytime flight.

3.2.1.2.2 The Day Information Display Device shall have a resolution of 600 pixels × 600 pixels or higher and a Field of View(FOV) of 19° or more based on the center of the field of view. The displayed information shall be adjustable so that it can be clearly recognized.

3.2.1.3 Visor

3.2.1.3.1 Visor shall be mounted on HMD Component and shall operate during day flight. And Visor shall provide anti-glare, flight information visualization and pilot face protection during ejection and emergency situations.

3.2.1.3.2 Visor shall be mounted on HMD Component, and there are two color options to mount : Tinted, Clear.

3.2.1.4 Night Information Display Device

3.2.1.4.1 The Night Information Display Device can display flight parameters, sensors, weapons, threat information, Link-16 operation flight formation position information, etc. in the pilot's field of view during nighttime flight.

3.2.1.4.2 The Night Information Display Device shall have a resolution of 600 pixels × 600 pixels or higher and a Field of View(FOV) of 19° or more based on the center of the field of view, and shall be capable of mounting standard ANVIS 9 NVG(modified if necessary).

3.2.1.5 Step-In Visor

3.2.1.5.1 Step-In Visor is a type of visor used when a Night Information Display Device is mounted on a helmet assembly for night flying. It must be mounted and operated on the helmet assembly without interfering with other components.

3.2.1.5.2 Step-In Visor shall provide two or more sizes and provide a pilot face protection during the ejection and emergency situations.

3.2.1.6 Cable Mounted Device

3.2.1.6.1 Cable Mounted Device secures the cable for communication between the Day/Night Information Display Device and the KF-16 performance improvement aircraft(KF-16U) to the Torso Harness.

3.2.1.6.2 Cable Mounted Device shall be mounted on PCU-15 Torso Harness, and shall fasten the Torso Harness and Day/Night Information Display Device Cable during ejection.

3.2.1.7 Personal Fitting Liner

3.2.1.7.1 If necessary, a Personal Fitting Liner should be installed inside the helmet assembly to protect the pilot's head from impact, prevent helmet shaking due to gravitational acceleration, and prevent the display information from moving out of the pilot's FOV.

3.2.1.7.2 If Personal Fitting liners are required, the contractor shall manufacture them based on information scanned from the heads of pilots in the ROKAF, and shall provide the methods and equipment for scanning the pilot's heads.

3.2.1.8 Zeta Liner

3.2.1.8.1 Zeta Liner shall be mounted inside Helmet Assembly and shall provide a comfortable fit and anti-shake function for the pilot. And Helmet Assembly shall not have any abnormalities during operation.

3.2.1.8.2 Zeta Liner shall be available in various sizes depending on the size of the Helmet, the thickness and length of the Zeta Liner.

3.2.2 Logistics Support Equipment

3.2.2.1 HMD-related Aircraft Maintenance Equipment

3.2.2.1.1 HMD-related Aircraft Maintenance Equipment is used to check the compatibility of the aircraft HUD(Head-Up Display) with HMD operation and to check for any abnormalities in the display of HMD information within the aircraft seat.

3.2.2.1.2 HMD-related Aircraft Maintenance Equipment shall be determined based on the specific list of necessary equipment and methods for aircraft inspection, in accordance with operational HMD.

3.2.2.1.3 If the operational HMD determination requires such equipment, 4 devices are required for checking the compatibility of the aircraft HUD and 8 devices are required for checking for any abnormalities in the display of HMD information within the aircraft seat.

3.2.2.2 HMD O'Level Maintenance Equipment

3.2.2.2.1 HMD O'Level Maintenance Equipment is equipment that provides HMD component maintenance capabilities and, when necessary, the ability to modify HMD components.

3.2.2.2.2 HMD O'Level Maintenance Equipment shall display information for inspecting HMD components, perform self-checks to determine whether there are any abnormalities, and be capable of adjusting HMD.

3.2.2.2.3 HMD O'Level Maintenance Equipment is determined based on the HMD components that need to be inspected and the methods used to inspect them.

3.2.2.2.4 If the operational HMD determination requires such equipment, 8 HMD component inspection equipment and 4 HMD component modification equipment are required.

3.2.2.3 Pilot Personal Fitting Equipment

3.2.2.3.1 When a custom liner is required, the contractor shall provide measuring equipment and fitting software that can scan the pilot's head to produce a custom liner.

3.2.2.3.2 Customized liners should be manufactured based on information obtained through measuring equipment and fitting programs.

3.2.2.3.3 If a customized liner is required based on the operational HMD decision, one measuring device to scan the pilot's head and one laptop with the fitting program is required.

3.2.3 Organization level Maintenance and Training

This section shall comply with 3.3.1 Training of Technical Personnel and User (Pilot) in 3.3 Integrated Product Support

3.3 Integrated Product Support

3.3.1 Training of Technical Personnel and User (Pilot)

3.3.1.1 Training for technical Personnel shall be conducted alongside user (pilot) training. And Training shall be planned to ensure that the required level of technical proficiency is achieved.

3.3.1.2 Training shall be conducted by the vendor prior to the initial delivery, and the HMD components and Maintenance Equipment necessary for training shall be provided in consultation with relevant agencies.

3.3.1.3 Theoretical and practical training shall be provided for operation, maintenance, and logistics. And detailed training plans must be coordinated with relevant agencies. Training shall be conducted in Republic of Korea.

3.3.2 Technical manuals and Documentation.

3.3.2.1 Types and Quantities of technical manuals and documentation are specified in Table 4.

Table 4 Types and Quantities of technical manual and documentation

No.	Item Description	Quantity
1	User and Maintenance manuals (Hard copy)	42 copies
2	User and Maintenance manuals PDF file (CD)	42 EA
3	Organizational level maintenance manuals (Hard copy)	10 copies
4	Organizational level maintenance manuals PDF file (CD)	10 EA
5	Intermediate level maintenance manuals (Hard copy)	10 copies
6	Intermediate level maintenance manuals PDF file (CD)	10 EA

3.3.2.2 Technical Manual shall be delivered simultaneously with the equipment in hard copy and as a digital file(PDF format).

3.3.2.3 Updates of Technical manuals and Documentation(Hard copy and Digital file) shall be continued and provided until the decommission.

3.3.2.4 The technical manual should include instructions on the configuration of the delivered equipment, usage methods, and precautions(safety guidelines). If necessary, technical manuals providing calibration procedures and special inspection procedures should be provided.

3.3.2.5 NATO Codification shall be conducted directly by the contractor, and the results shall be submitted.

3.3.2.6 The contractor shall submit technical materials and certification documents for Airworthiness certificate and Acceptance test upon request.

4. Delivery and Installation

4.1 The contractor shall submit a quality certification materials in accordance with the schedules of terms and conditions to Quality Certification Authority and undergo Quality Certification Authority inspection(or Acceptance test)

4.2 Delivery and Installation schedules shall be coordinated with relevant agencies and shall NOT interfere with contract schedules.

4.3 Products shall comply with specifications. In exceptional cases, The contractor shall coordinate with relevant agencies.

4.4 The contractor shall comply with relevant party's instructions during installation and shall NOT impose any restrictions on aircraft operation due to installation.

4.5 If necessary, The contractor may request consultation from relevant agencies concerning install location, visiting schedule and other related issues.

4.6 The delivery locations are Seosan, Chungju and Gunsan Airbase, subject to change at the request by relevant agencies.

4.7 Initial delivery of all contract items shall commence no later than 15 months after contract signing, and delivery shall be completed no later than 21 months after contract signing. And, the first set of prototype(including ground equipment) shall be delivered in advance so that the Performance Verification Test can be completed before the first delivery.

4.8 The contractor shall deliver commodity in accordance with the DAP terms of INCOTERMS 2020.

5. Inspection, Testing and Quality certificate

5.1 Inspection and Testing Obligation

5.1.1 Unless otherwise specified in contract, Inspections and Testing are the contractor's obligation. The contractor shall provide evidence, via inspections, tests or certification, that the specifications, Performance and Quality are in compliance with this purchase order.

5.1.2 In the event of discontinuation or supply constraints, the contractor may substitute the part(unit) with one of equivalent or superior specifications, performance and quality. The contractor shall fulfill an obligation for substantiating the equivalence or superiority of the substitute product.

5.1.3 Quality certificates shall, in principle, be issued by a public certification authority. In cases where this is not feasible, self-issued certificates by the manufacturer may be used.

5.1.4 The Contractor is responsible for all costs associated with inspection and testing, including materials, labor, and equipment, except in personnel or material support by military.

5.2 Inspection and Testing

5.2.1 Inspection and Testing shall be carried out through mutual consultation.

5.2.2 Performance Verification Test(Acceptance Test)

5.2.2.1 Performance Verification Test(Acceptance Test) is performed prior to the start of delivery utilizing pre-production products.

5.2.2.2 Performance Verification Test consists of Technical Test followed by System Compatibility Test. Technical Test is functional and performance test for components or fully assembled unit. System Compatibility Test is compatibility test applied to aircraft. The details shall comply with the relevant party's regulations.

5.2.2.3 The Contractor shall submit a plan for Performance Verification Test including Acceptance test threshold, procedure and methods. The plan shall be confirmed by relevant agencies and may be composed of Technical Test plan and System Compatibility Test plan.

5.2.2.4 The Contractor shall submit a result of Technical Test in accordance with the plan.

5.2.2.5 Relevant agencies may participate technical tests. The Contractor shall provide technical personnel support for System Compatibility Test upon request.

5.2.2.6 System Compatibility Test for prototype may be replaced with Acceptance Test subject to the decision of relevant agencies.

5.2.2.7 For the acceptance test, the Contractor shall submit to DTaQ an acceptance test plan(draft) that includes details such as test standards, procedures, and methods. DTaQ will then finalize the acceptance test plan after a review process involving relevant agencies.

5.2.2.8 The Contractor shall acquire Airworthiness certificate in accordance with Regulations on Standard Airworthiness Certification Criteria for Military Aircraft by DTaQ.

5.3 Quality Certificate

5.3.1 The Contractor shall submit the quality assurance plan for this project to the quality assurance organization and the project management agency after signing the contract.

5.3.2 The warranty period shall be three(3) years.

5.3.3 Quality Assurance Grade shall be set to rating G(Installation/Integration Test Assurance)

5.3.4 If specification and quality of equipment deviate from contract, The contractor shall, at its own expense, replace it with one of equivalent or superior specifications within warranty.

5.3.5 Beyond the expiration of warranty, the contractor shall provide information regarding spare parts for operation and maintenance.

5.3.6 If relevant agencies request Government Quality Assurance of manufacturing country's Government, the contractor shall accept the request as contract terms and condition.

6. Packaging and Labeling

6.1 Packaging shall be minimized and must NOT cause damage to the product in accordance with International package standard. Alternatively, it may comply with KS A ISO/IEC GUIDE 41.

6.2 Unit, Inner, Outer packaging shall follow standard commercial packaging practices.

6.3 Packaging shall ensure protection from corrosion and damage during delivery, storage and preservation.

6.4 The label shall include the following details, and be attached to the outer packaging.

- Nomenclature
- Model
- Part number(P/N)
- National Stock Number(NSN)
- Serial number(S/N)
- Date of manufacture (DD/MM/YYYY)
- Date of delivery (DD/MM/YYYY)
- Manufacturer
- Photo of appearance
- Etc.

6.5 Packaging and Labeling shall remain intact throughout delivery, storage and preservation.

7. Security and Safety

7.1 The contractor shall NOT disclose and use any confidential and general information related to the contract for any other purposes. Any violation of this provision shall subject the contractor to applicable penalties and liabilities.

7.2 The contractor shall ensure that all personnel accessing the delivery site obtain security clearance.

7.3 The contractor shall remain liable for any disclosure of confidential information by its employee or subcontractor, regardless of intention may be.

7.4 All security procedures for access to the delivery site shall be subject to the end user's instruction and such activities shall NOT interfere with the delivery site.

7.5 In the event of conducting a Performance Verification Test, the contractor must identify potential safety hazards that may arise during the execution of this contract, establish and implement safety management measures accordingly, and submit progress reports to the project management agency upon request.

8. Others

8.1 All documents submitted for the contract shall be written in both Korean and English.

8.2 To ensure smooth execution of the contract, PMR or current issues review are held periodically.

8.3 The contractor shall consult with the end user and the project management agency about supervision, inspection, modification and related matters in advance.

8.4 Any additional, ambiguous or supplementary matters not specified in this purchase order shall be coordinated with the end user and the project management agency.

8.5 Upon request by the end user, The contractor shall provide contract-related documents.

8.6 After signing the Contract, the Contractor shall submit the Process Plan for this project to the end user and the project management agency.

8.7 If the Contractor uses any intellectual property rights (including, but not limited to, patents, copyrights, utility models, and trademarks) of a third party in performing this Contract, the Contractor shall be solely liable for any claims resulting from such use.