2018. 05. 07.

KOREA Fire Research and Development with a Living Lab. in the 4th Industrial Revolution

소방청
National Fire Agency 119

Bang, Jang Won
Head of Korea National Fire Research Institute

Contents

1-1. Present and Future of KNFRI

KOREA Nat'l Fire Service Academy(KNFSA)

KOREA Nat'l Fire Research Institute

GongJu Branch

①	대응기술연구동
②	사고원인분석동

Asan

①	화재안전기준센터
②	미래정책연구동
③	화학안전연구센터
④	소방활동안전 연구센터

1-1. KNFRI (In & Out)

KNFRI

in

- Korea Fire R&D planning, managing & appraising
- Fire Fighter Safety Research
- Fire Fighter Fatality Analysis
- Fire Investigation & Research
- Hazardous Material Analysis and Appraisal
- Training Course for Drone and Fire investigation)
- Fire Debris Analysis
- Drone Research
- Fire Fighter Health Research

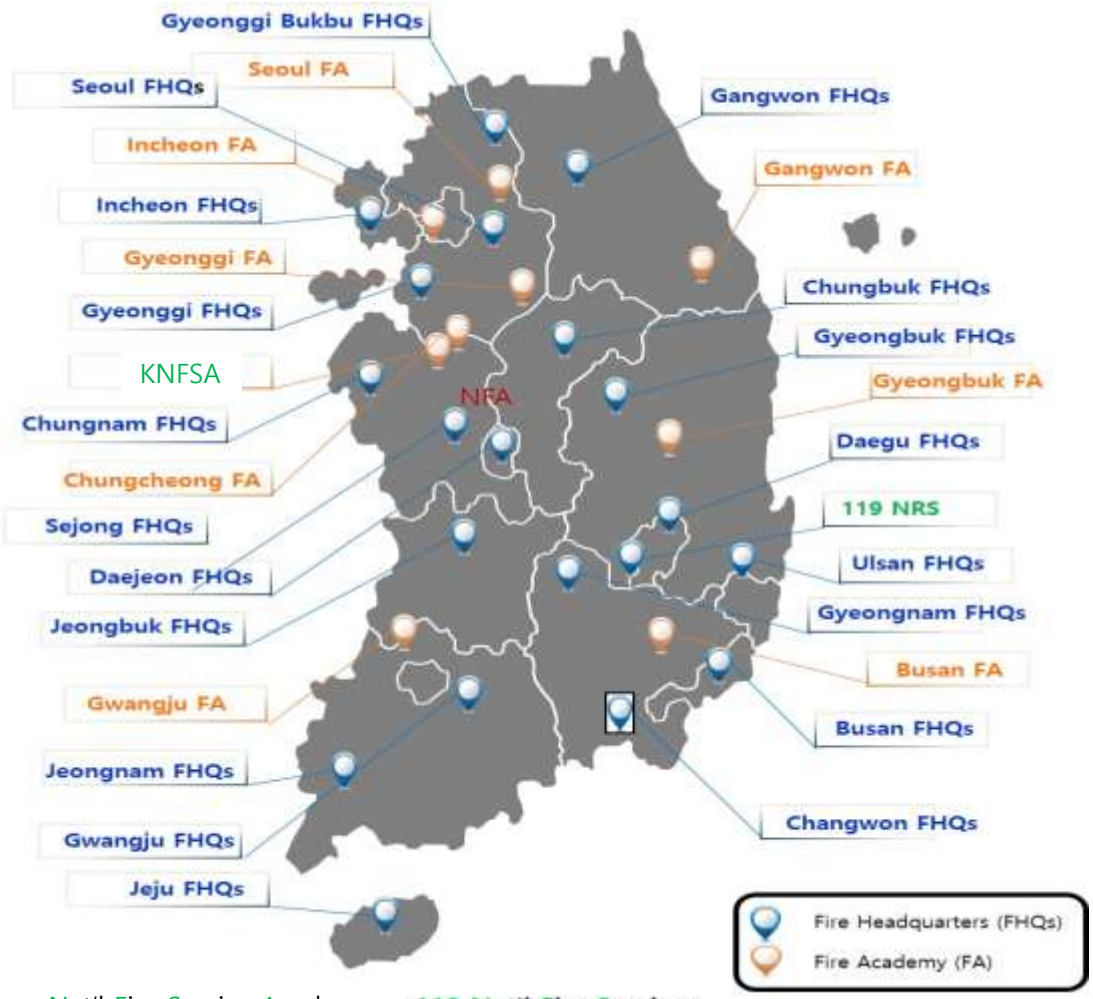
out

[2018]

- 13 Billion USD
- 21 projects about
  - Fire Fighter Resilience
  - Smart Emergency Medical Service
  - Fire Safety for Higher Stories Building, Tunnel, Underground Space
  - Drone, Helmet ……..

1-2. Fire Services in Korea

Working 24/7 for a Safe and Happy Korea



Korea Nat'l Fire Service Academy 119 Nat'l Fire Services

As of 2017

<Fire Organizations>

⇒ NFA, NRS, KNFSA
FHQs(18)
Fire Academy(8)

<Fire Personnel>

⇒ Professionals 48,092
(National 635 / Local 47,457)

⇒ Volunteers 94,515
(W 37,797 / M 56,718)

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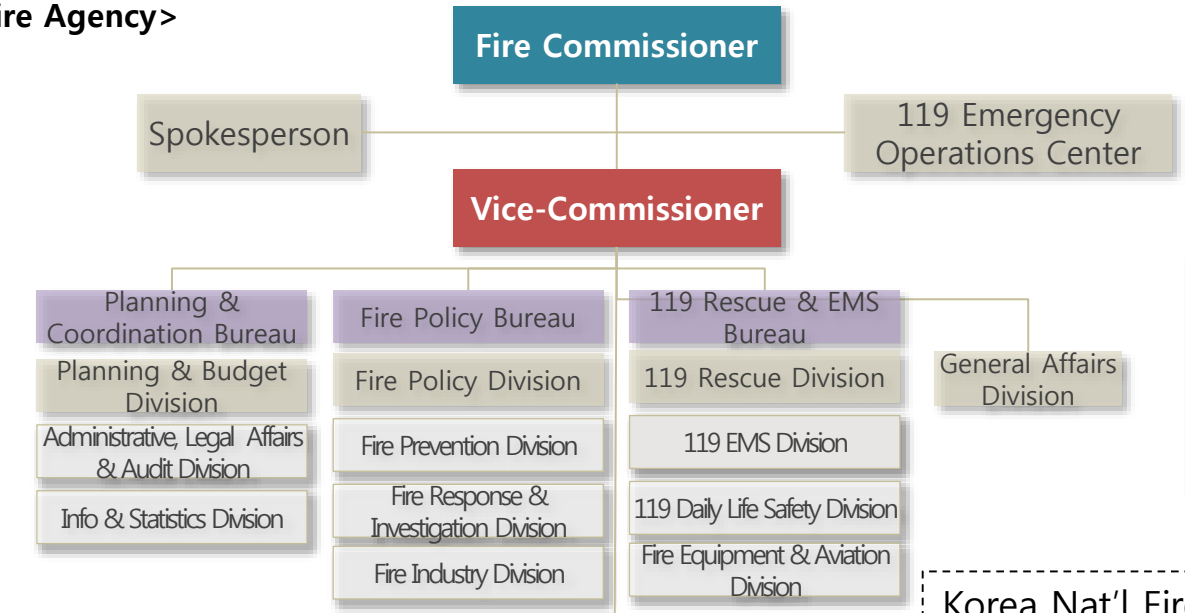
1-3. Organization

<National Fire Agency>



I am here ^^

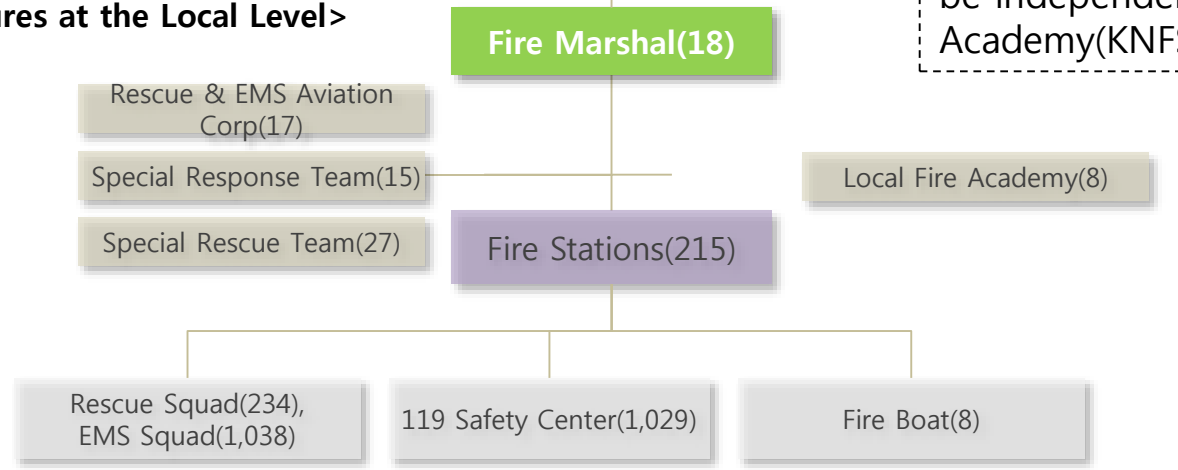
119 NRS

KNFSA

KNFRI

Korea Nat'l Fire Research Institute(KNFRI) will be independent from Korea Nat'l Fire Service Academy(KNFSA) at the end of this year

<Fire Structures at the Local Level>



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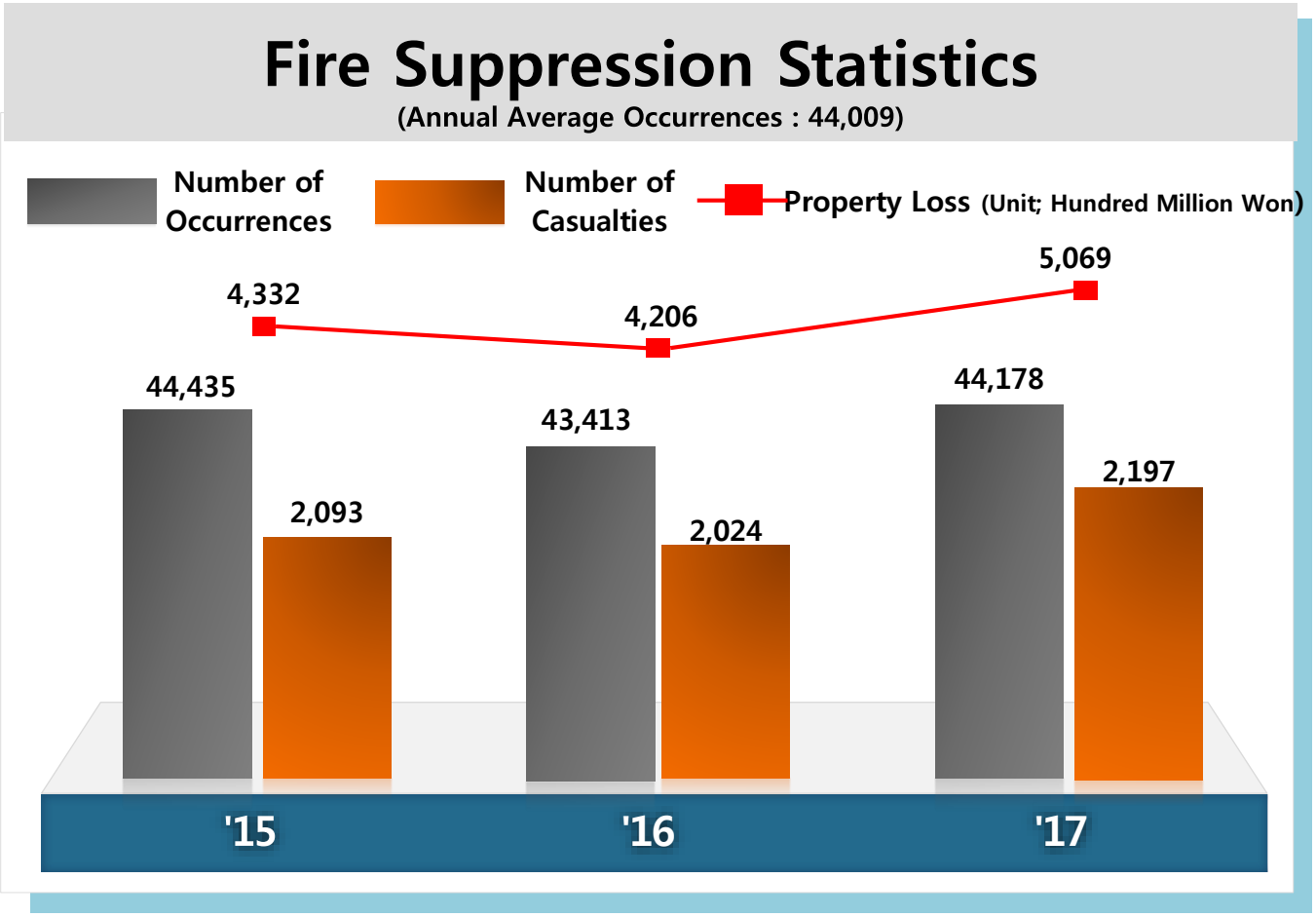
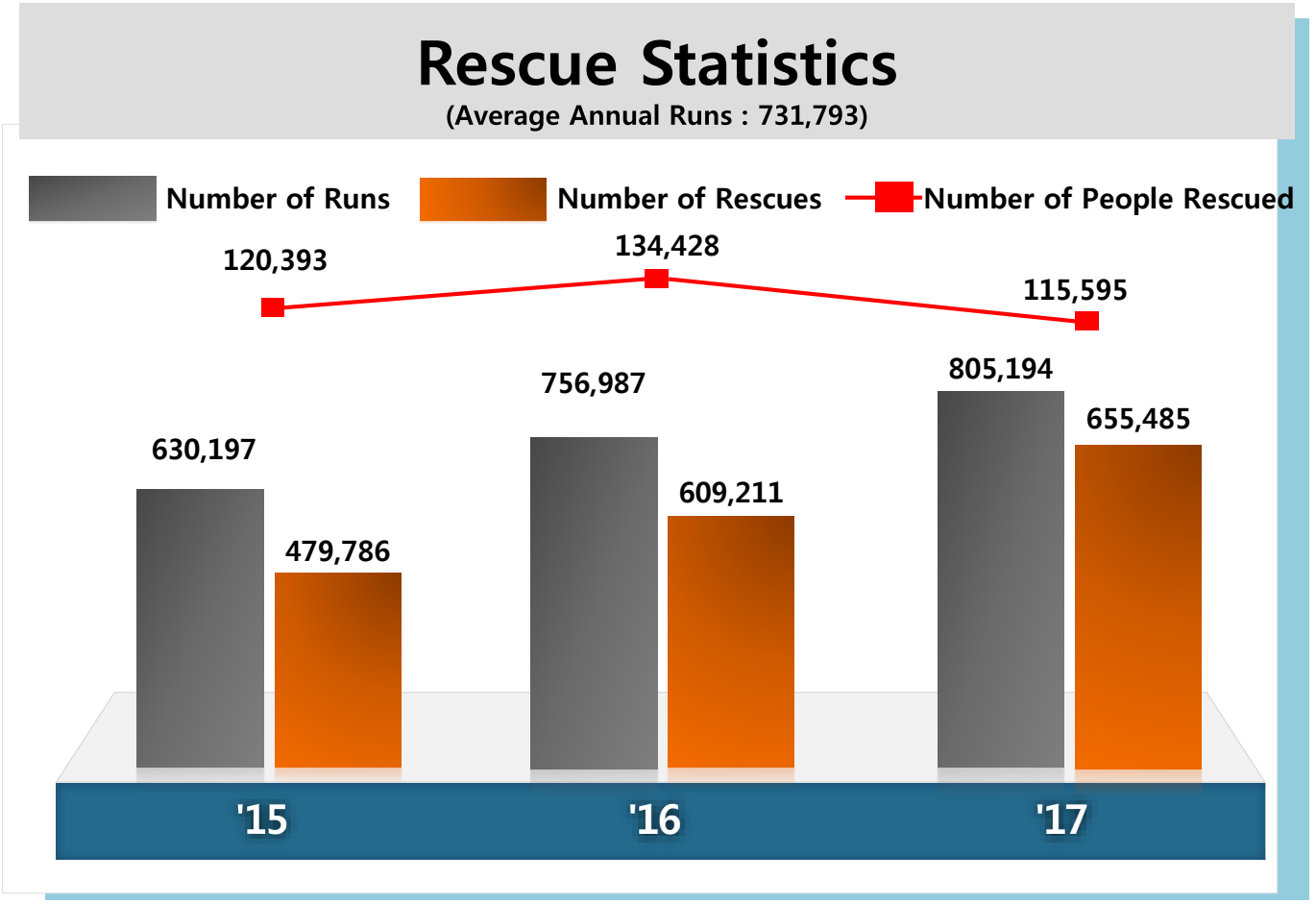
1-4. Statistics

Daily Average 121 Cases, Casualties 5.8 Persons, Property Loss 1.2 Million $



1-5. Statistics(continued)

83 Runs Every Hour, 13.2 Persons Rescued



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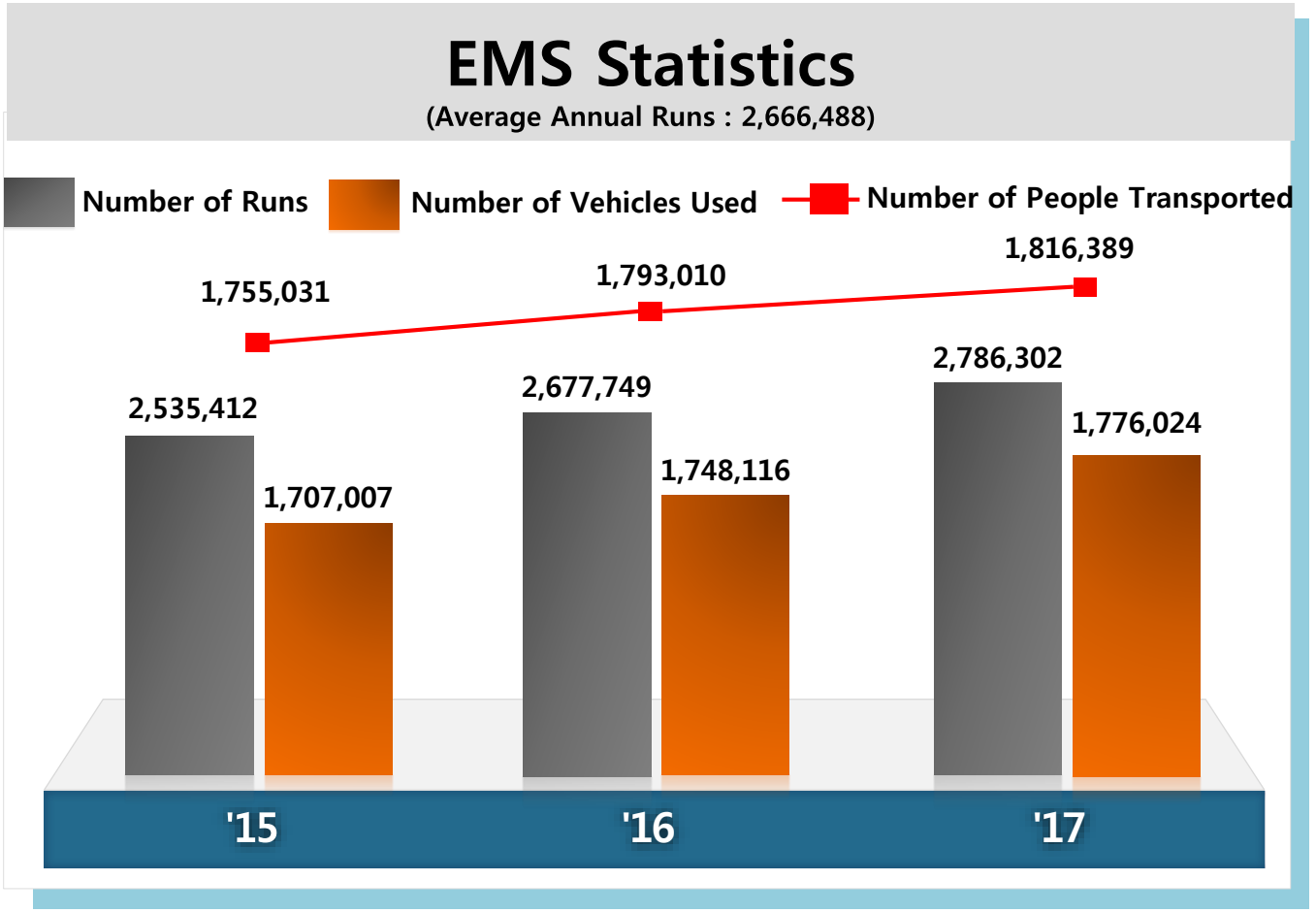
1-6. Statistics(continued)

One Out of Every 29 People Uses the 119 Ambulance



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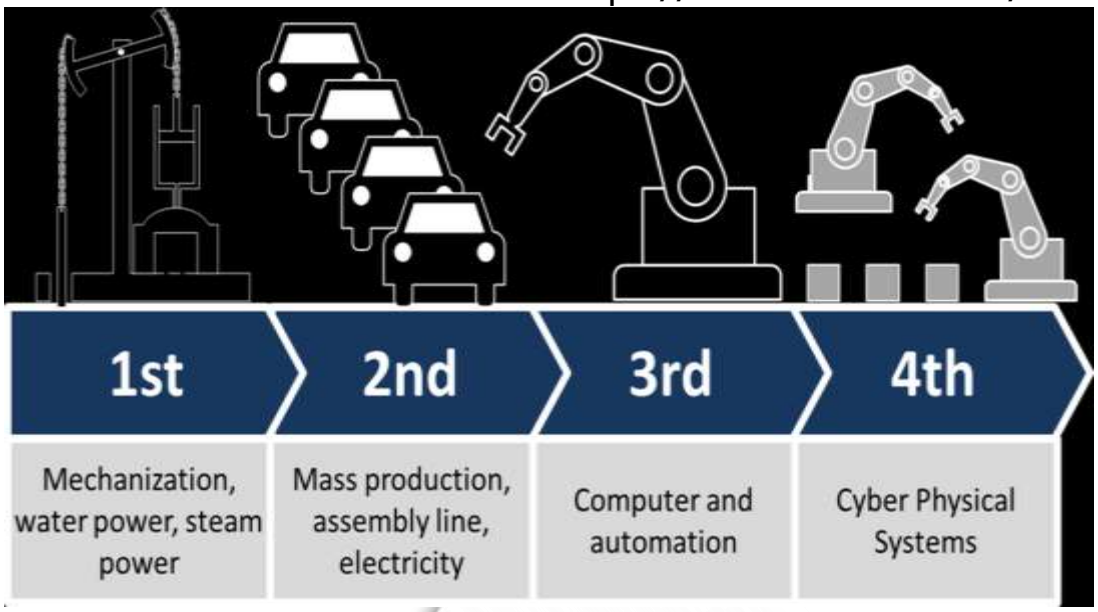
2-1. Fire Technology and 4th industrial Revolution

The Fourth Industrial Revolution

https://www.forbes.com/



Emerging technology breakthroughs in fields such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing.

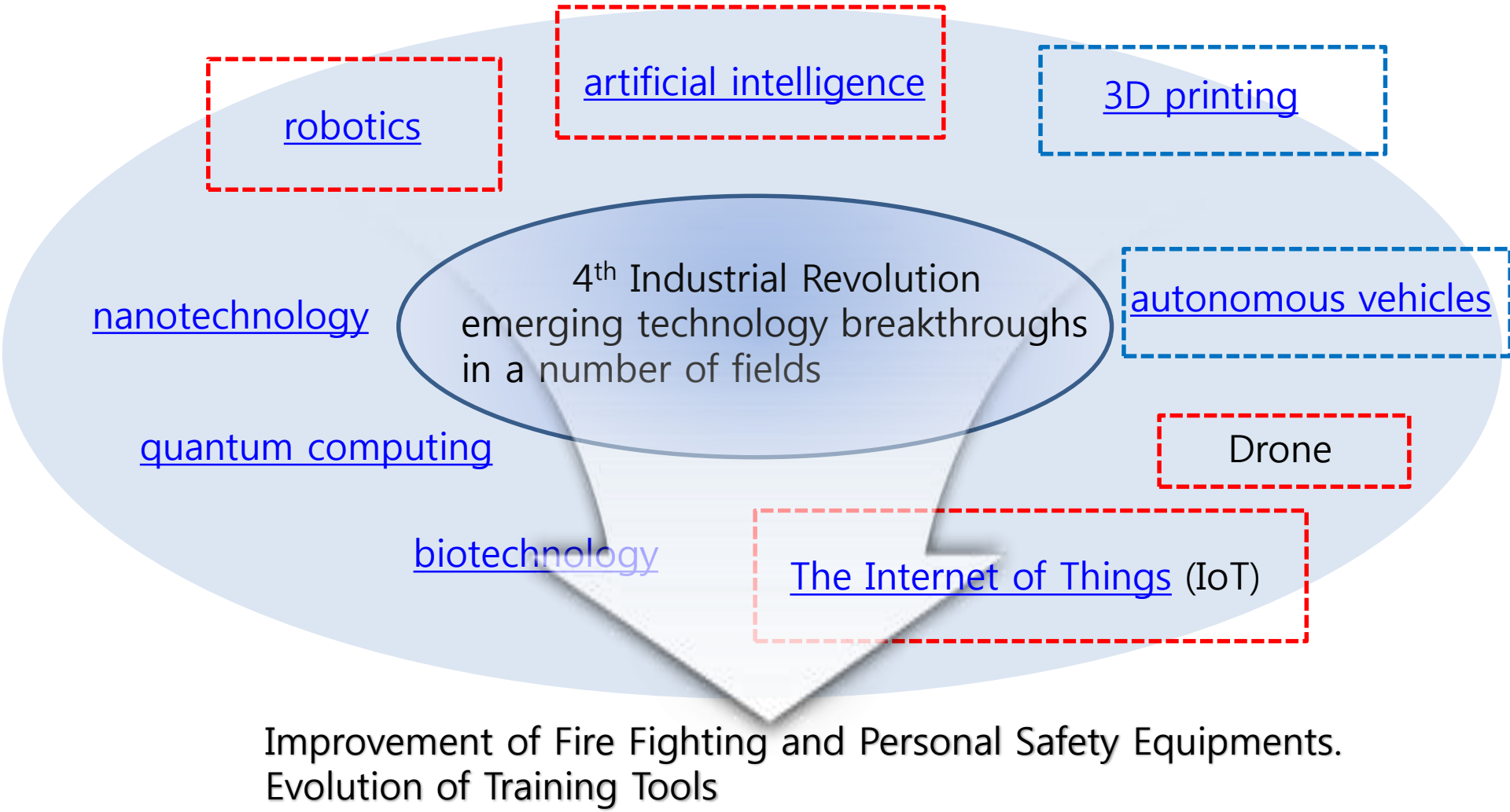
"We are now in the early stages of the Fourth Industrial Revolution."

Fire Fighters in duties can use products of 4th industrial Revolution??

Klaus Schwab is Founder and Executive Chairman of the World Economic Forum.

2-1. Fire Technology and 4th industrial Revolution

Related Research Field with Fire, Rescue, Emergency Medical Services.



Improvement of Fire Fighting and Personal Safety Equipments.
Evolution of Training Tools

→ Advanced Fighting Power of Disaster Response by 4th Industrial Revolution Technologies

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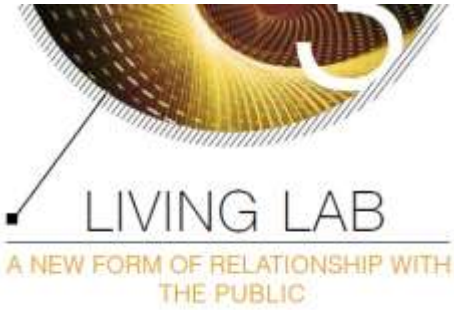
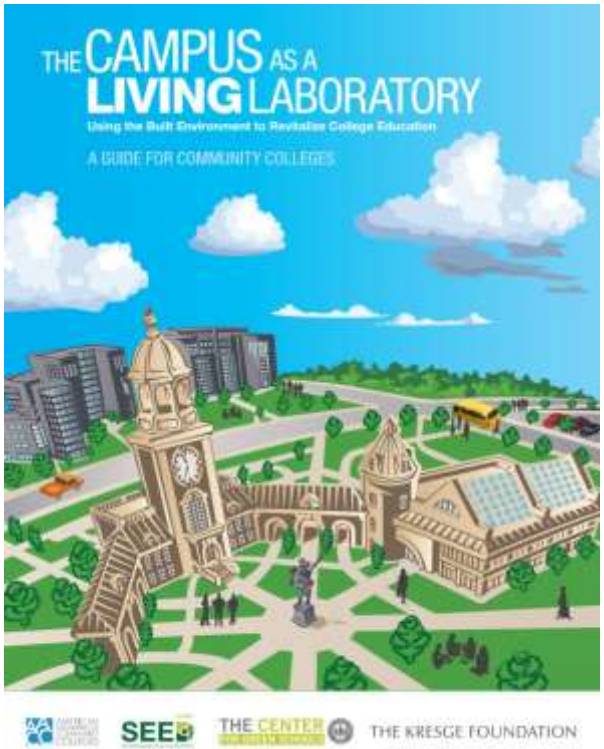
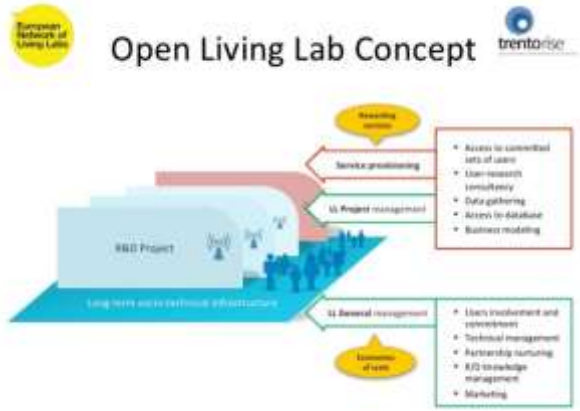
2-2. Living lab

A **living lab** is a research concept.
Researches using a Living Lab are all over the world!







2-2. Our Living lab

A **living lab** is a research concept.

The concept is based on a systematic user co-creation approach integrating research and innovation processes.

- Supplier(Researcher) Driven → Consumer(Firefighter) Driven

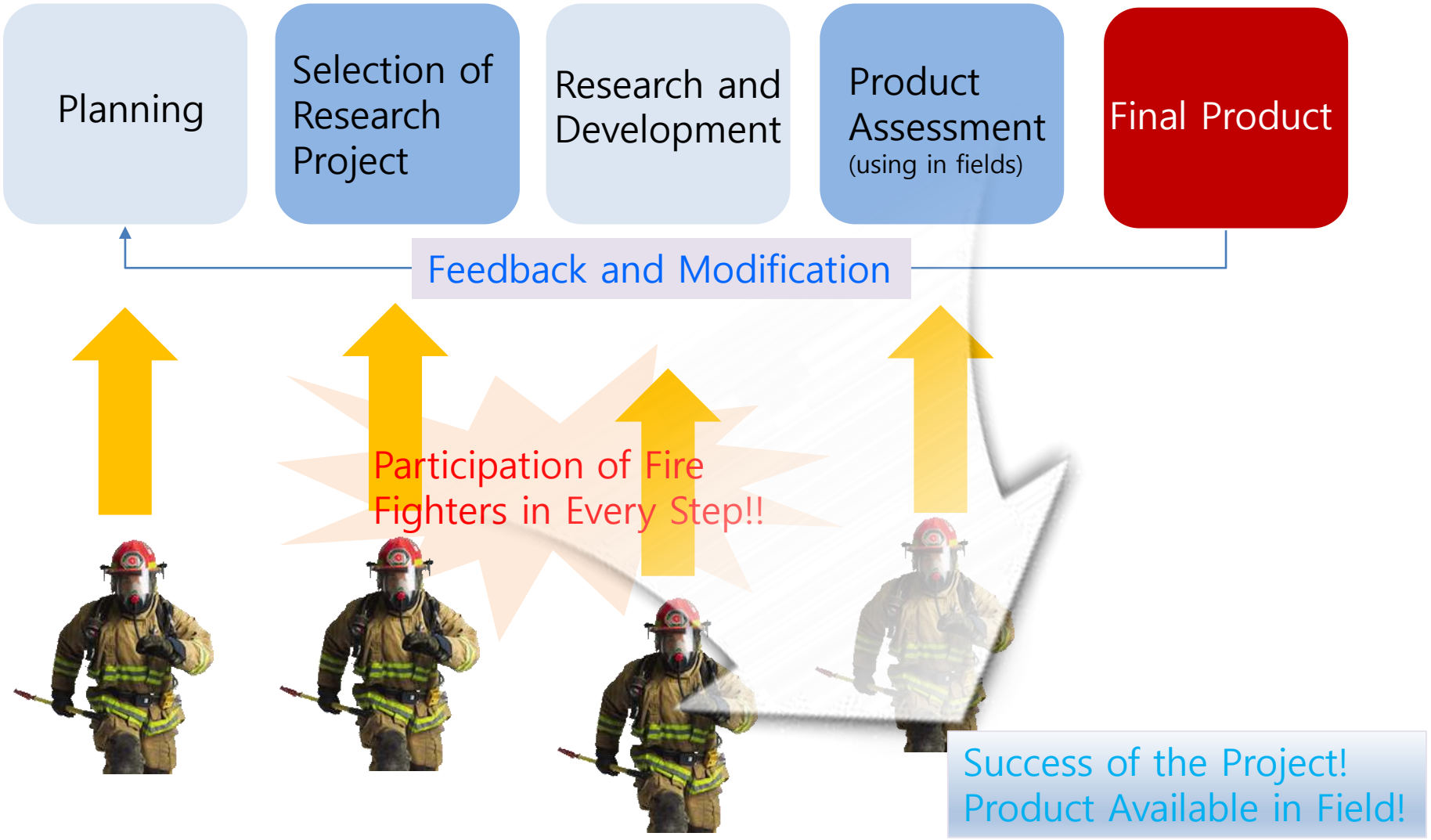
+

Research Together with Researcher and Firefighter!

One Team of KNFRI

2-2. Our Living lab

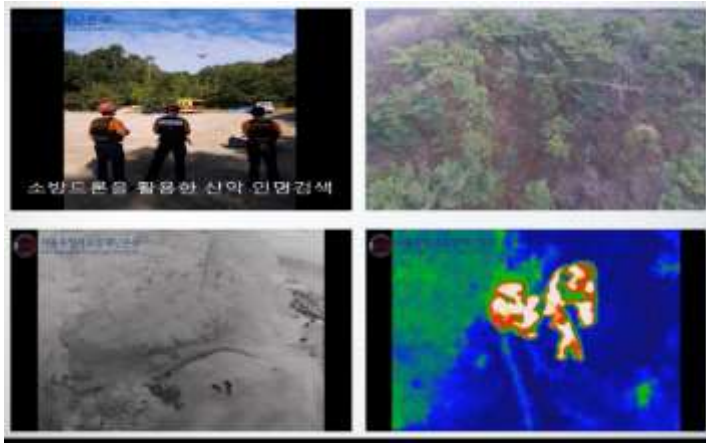
Process of Research and Development



3-1. Drone for Fire Fighting(Seoul FHQs)

Example of Drone Application in Fire Fields

- Seoul FHQs(2015. 7 ~ 2018. 3)
- Total 575
  - Fire 123
  - Rescue 26
  - Training, Investigation, etc : 425



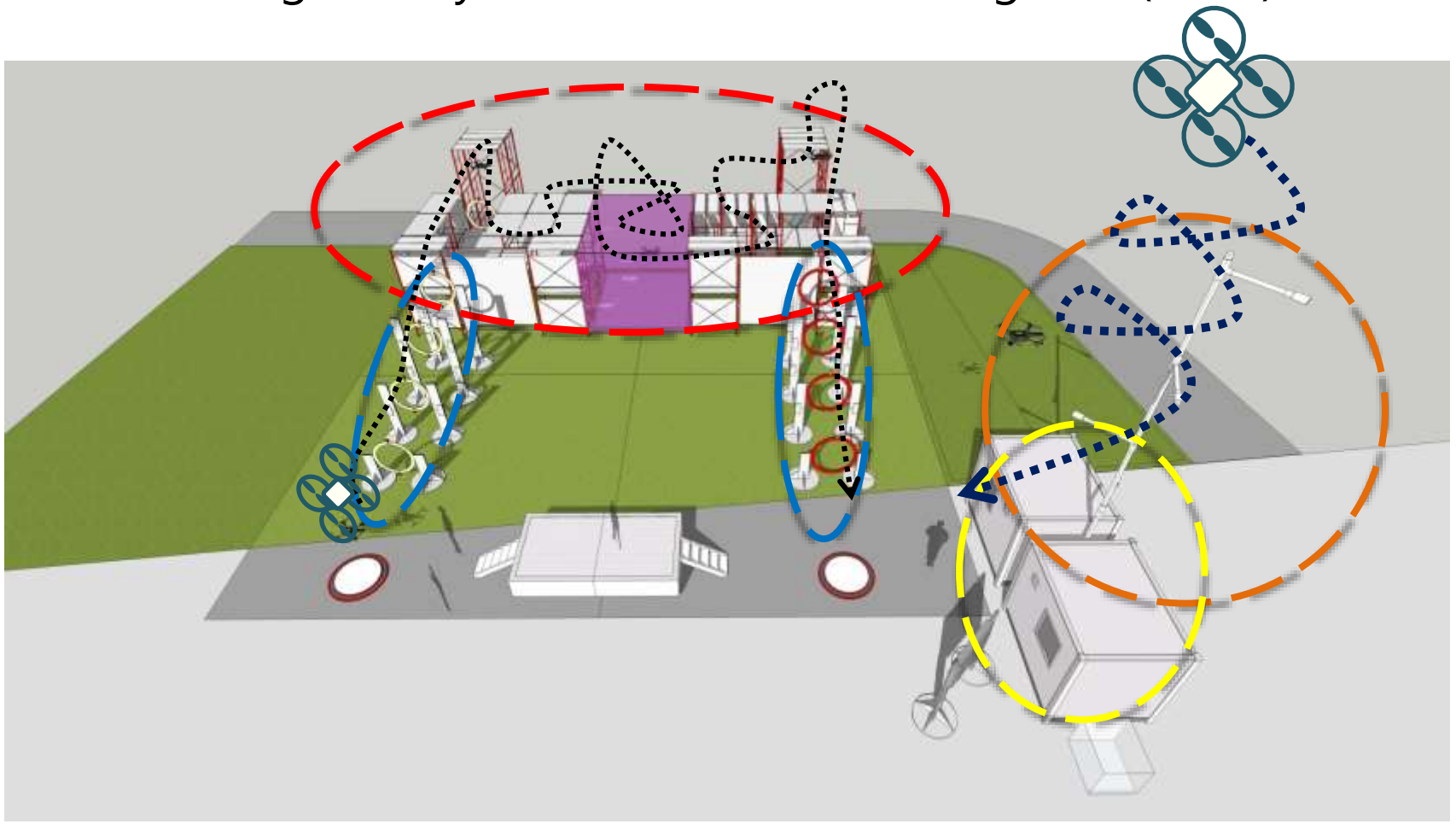
3-1. Drone for Fire Fighting(Seoul FHQs)

- Title : The Drones Guarding the Sky of Seoul

Drone Inspection of Wildfire, Building fire, River, etc.
Searching Victims, lost people, wild animals(like a wild pig), and Origin of Fire in Wildland, Building, House, and Collapsed Building, etc. by using thermal image Camera

3-1. Drone for Fire Fighting

Drone Training Facility for Search and Investigation(2017)



Thermal image measurement

Point of Interest Training

Indoor training

Tilted Climbing and Descending

3-1. Drone for Fire Fighting

Fire Fighter Training Facility for Search and Investigation(2017)

Climbing

Descending

- Drone Training Facility for Search and investigation(2017,KNFSA)

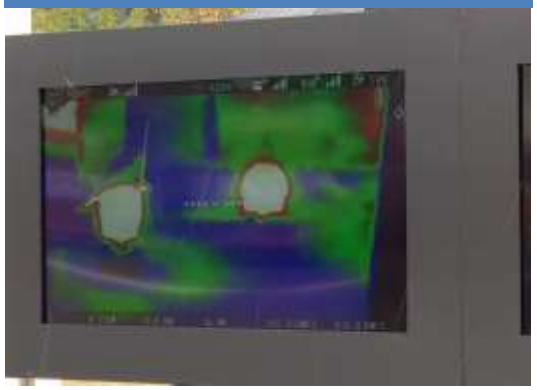
3-1. Drone for Fire Fighting

Fire Fighter Training Facility for Search and Investigation(2017)

Searching for Victims

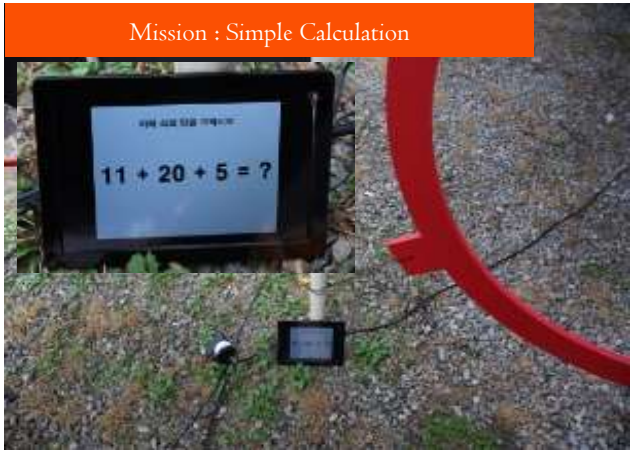
Searching in Somke

Thermo Image Measurement



Point of Interest in Smoke

Mission : Simple Calculation



3-1. Drone for Fire Fighting(problems)

Fire Field :
- Heat, Fire, Smoke, Water, Complexity, Communication Error, etc.

Very difficult Condition to fly a Drone

Flying Duration : Low Battery Capacity, Short time operation
Weakness to Cold Weather : Below 15 ℃ lower the battery capacity, easy to discharge
Weakness to Hot Smoke : Operational Error and Damage of a Drone
Avoiding obstacles : High Building, Electric wire, unexpected obstacle
No water resistance(waterproof) : rainy, snowy
Communication Error : Indoor radio interference
GPS Error
Crash, Collision
·
·
·

Lots of Missions to do

3-1. Drone for Fire Fighting(Tests)

Crash due to Malfunction

Crash between Drones

Explosion in Flammable gas

Flying through a Tunnel

Behavior in a Flame

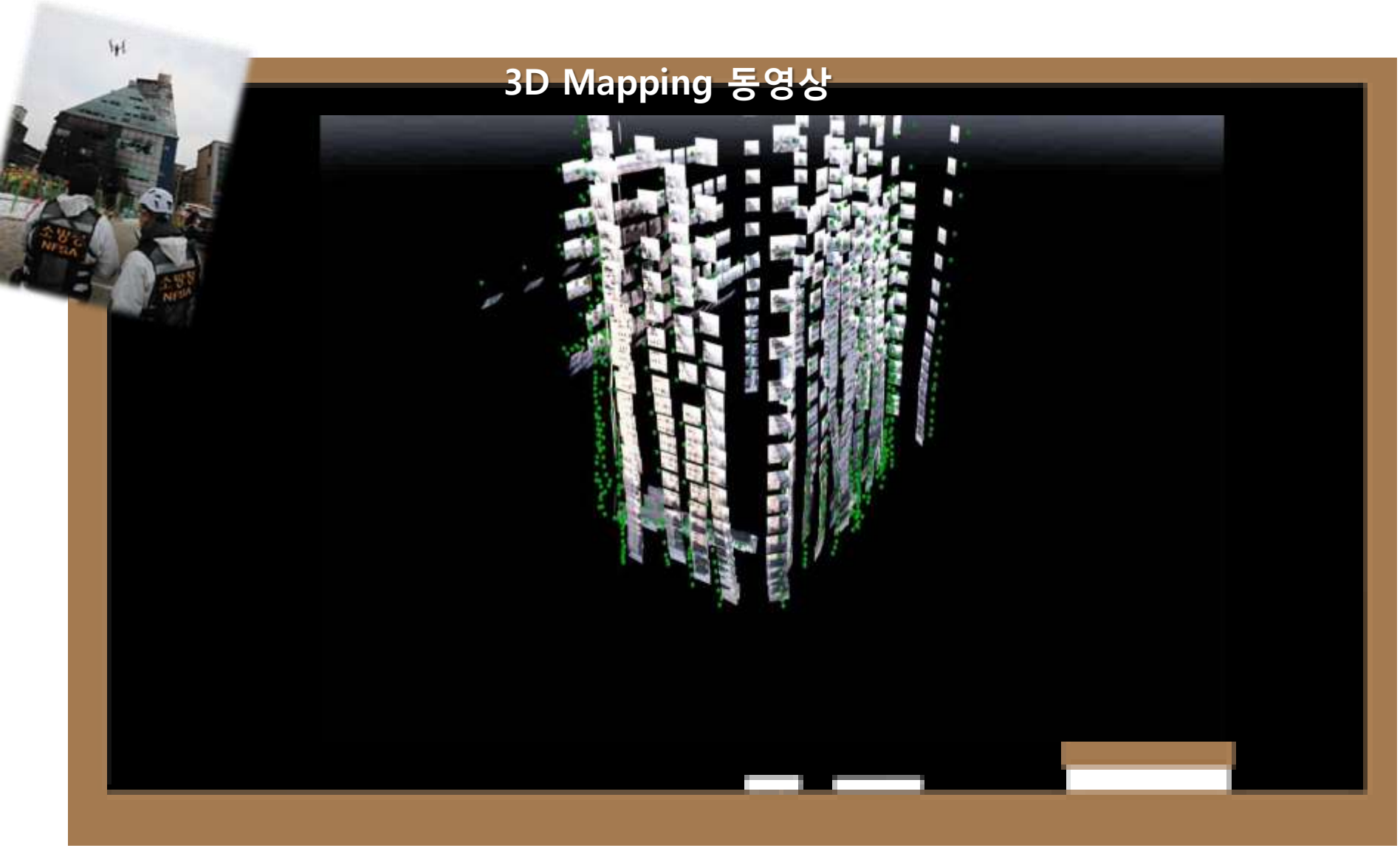
Flying in a Smoke

3-1. Drone for Fire Fighting(Tests)

Drone with Throwing Type Fire Extinguisher

3-1. Drone for Fire Fighting(3D Mapping)

Video Clip Showing 3D Mapping Using Drones



3-2. Introduction of Korea Fire R&D(helicopter simulator)

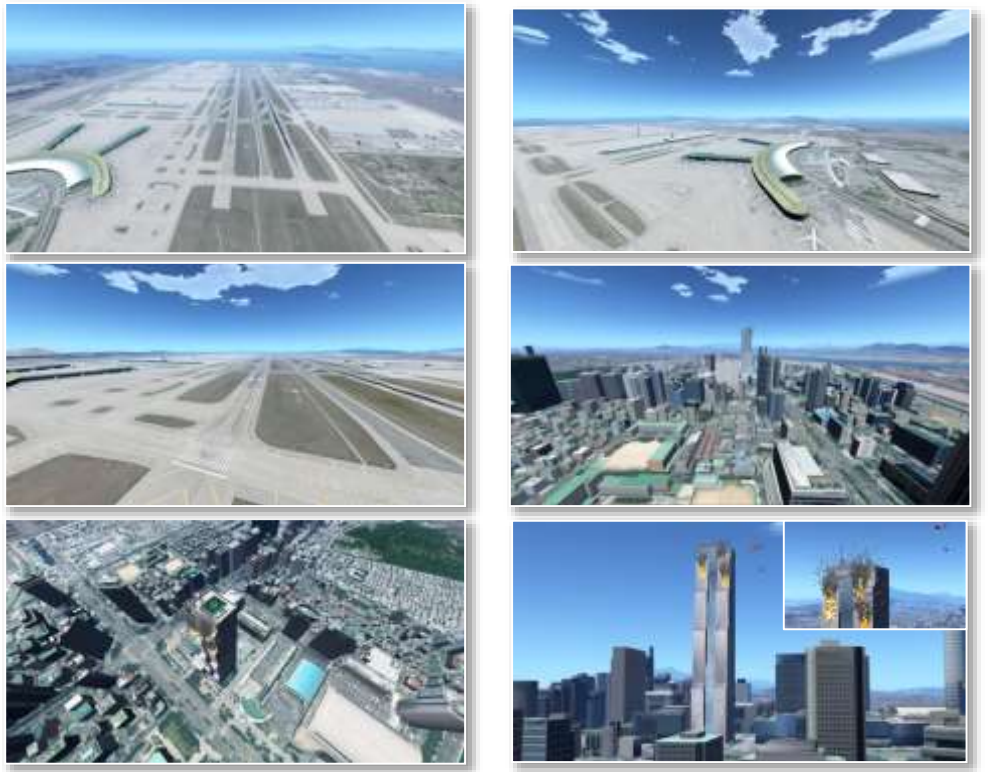
2015.06 ~ 2018.06 (3 years)

3.6 billion USD

Instrument Panel & Switch

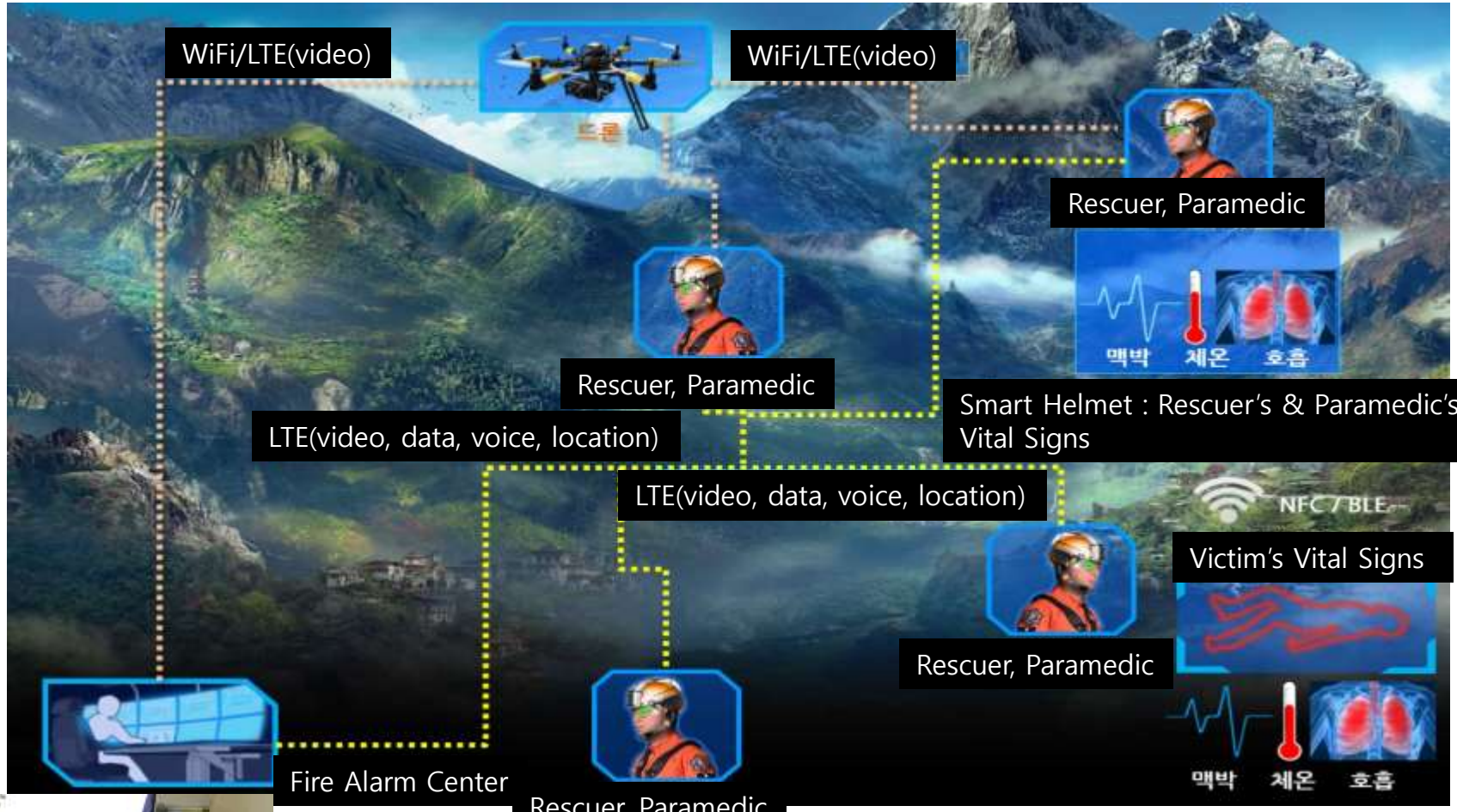
Flight Instrument Software

3D video



3-3. Introduction of Korea Fire R&D(Smart Helmet)

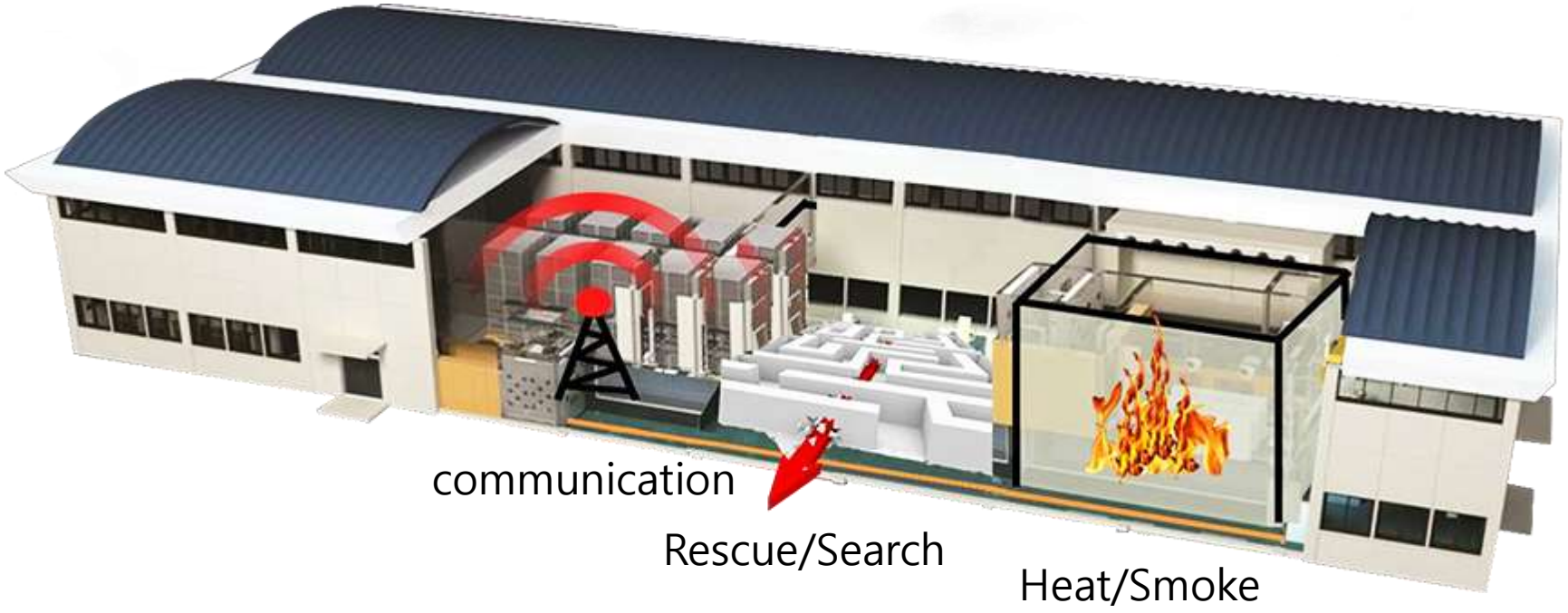
2015.12 ~ 2018.12 (3 years, 1.2 billion USD)



Vital Signs : Pulse, Temperature, Respiratory rate

3-4. Introduction of Korea Fire R&D(Equipment Testing Facility)

Testing Fire fighting, Rescue, Search Equipment and Robots



Performance Test Facility Development

- changeable, movable facilities

3 Rooms-communication Test

Rescue/Search Equipment

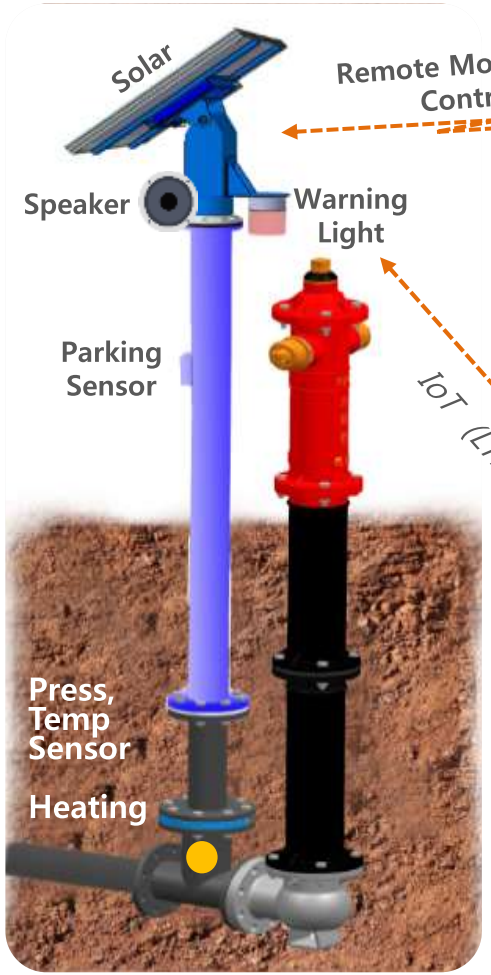
Performance in Heat/Smoke

Performance Evaluation

- Performance index of Test Condition(Copying Real Fire Field)
- Selection of Test Items and preparation of Test method

3-5. Introduction of Korea Fire R&D(Kyungbuk FHQs, Smart Hydrant)

Smart Hydrant

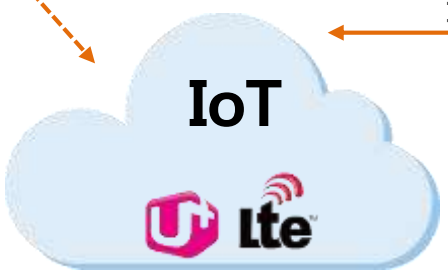


Remote Monitoring Control

IoT (LTE) Communication

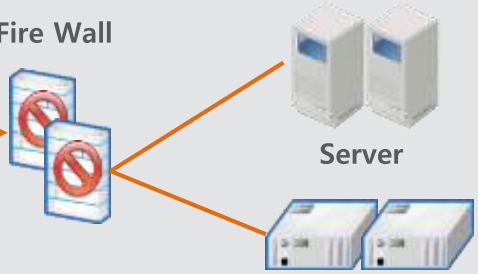
IoT Network

Monitor/Control GUI



Internet

Fire Alarm Center



4. Introduction of Fire R&D of KNFRI(2018 New Project)

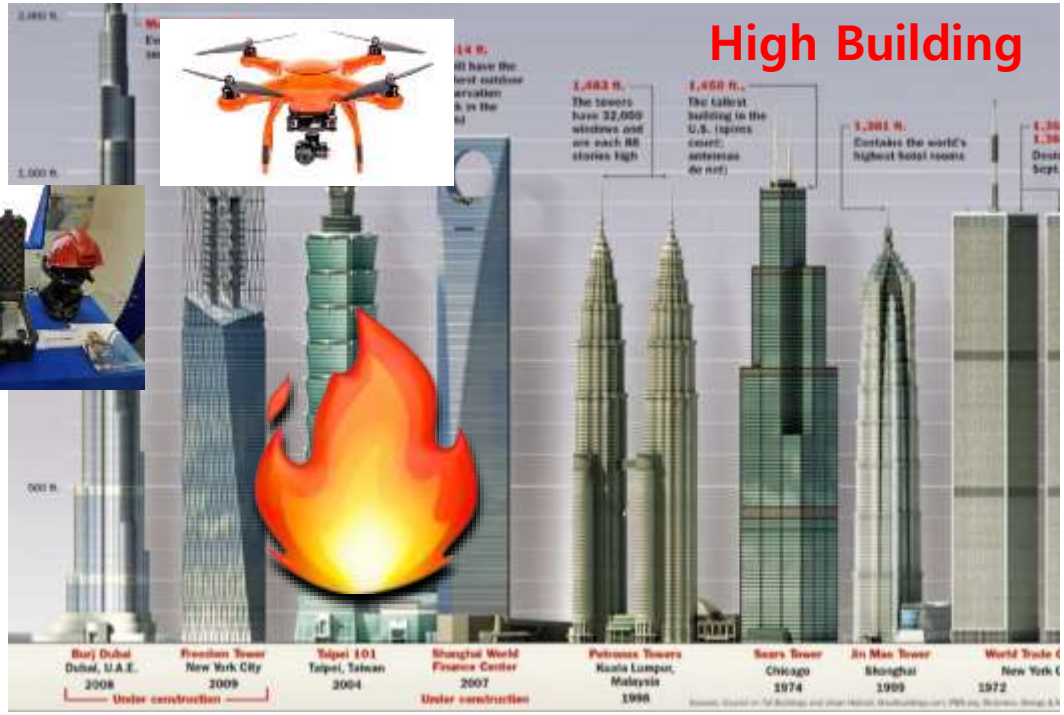
- Content Development of Simulation Training for Fire Fighting
  (3 years, 1 Billion USD) Scenario, Training Software

- Fire Fighter Training Device and Platform using Augmented Reality
  (2 years, 0.85 Billion USD)
  Augmented reality (AR) adds digital elements to a live view often by using the camera.
  (Examples of augmented reality experiences include the game Pokemon Go.)

- Fire Alarm System Using IoT(3 years, 1 Billion USD)

5. Conclusion

Disaster



4th Industry

+

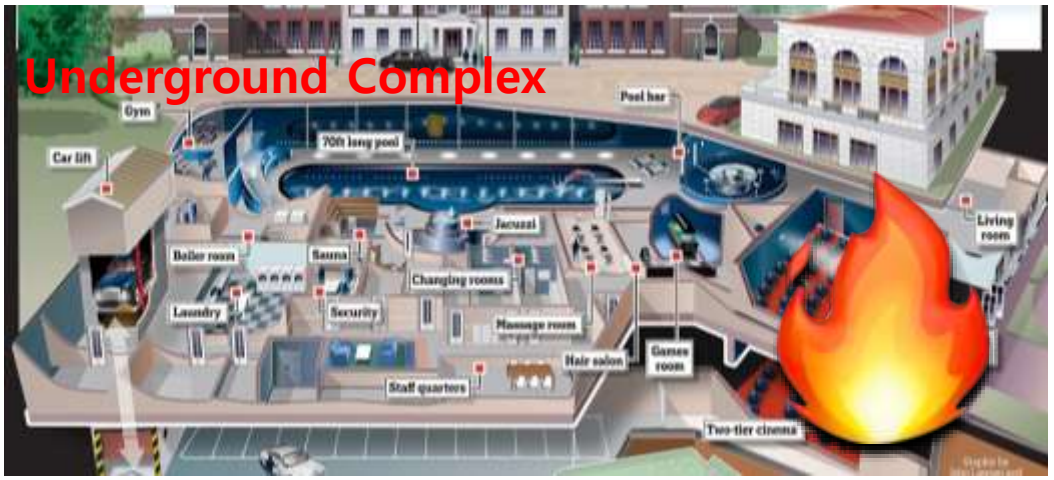
Living Lab

+

Fire Fighter

+

Researcher



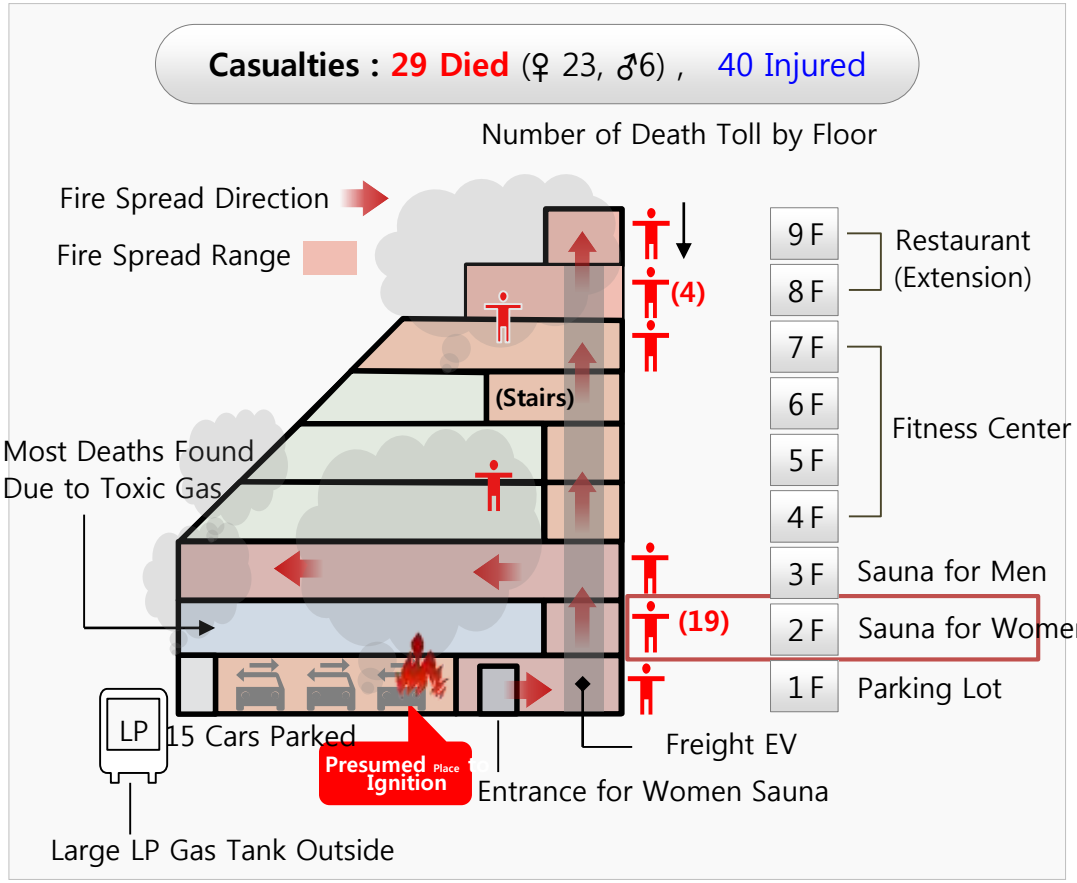
Safe Korea, Happy World!

We wish Firefighter and People in Korea will be Safe in the Future with Korea Fire R&D

A Summary of the Jecheon Fire

The Jecheon Fire

- **Date :** 21. 12. 2017
- **Place :** Jecheon City
- **Place of Ignition:** 1st Fl. in the Parking Lot



✓ **(Cause)** Overheating Lights on the Ceiling on the 1st Fl. That were Used for Thawing Ice

✓ **(Damages)** Casualties : 29 Died, 40 Injured, Property Loss : $ 2M

소방청

3-1. Drone for Fire Fighting(Cooperation, 뺄 것 후보)

Cooperation Projects for Drones

2017.06.01.~2020.05.31(3 years)

43 billion USD

Ministry of Science and ICT

Goal

Heat, wind, waterproofed Drone

Drone management System

산업통상자원부

MINISTRY OF TRADE, INDUSTRY & ENERGY

Goal

Common Platform developments

For 3 users(fire, police, coast Guard)

Involved in R&D and User

Fire Agency

Goal : Fire drone(Hazardous material detection)

Police Agency

Goal : high crime areas, tracking suspect, measurement of traffic volume, software development

Coast Guard Agency

Goal : drone for marine rescue, software

2-2. Our Living lab

- 4 phase of emergency management(by FEMA)

mitigation | preparedness | response | recovery

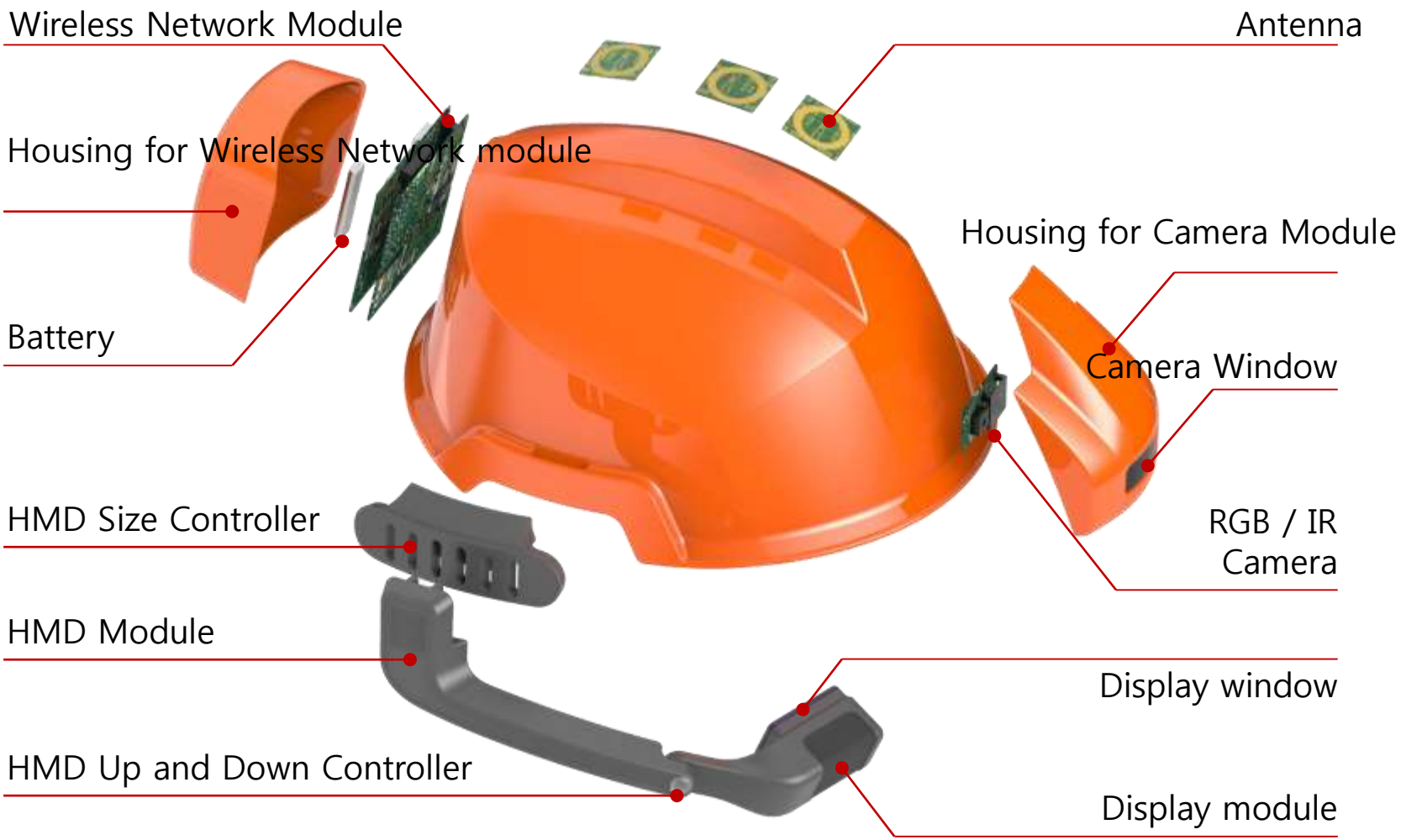
Very difficult mission, Short span of time

Conducting emergency operations to save lives and property by taking action to reduce the hazard to acceptable levels

Sherpa : Fire Fighter

Mountaineer : Researcher

3-3. Introduction of Korea Fire R&D(Smart Helmet)



*HMD: Head Mounted Display

정량적 목표 (기술 개발 항목)

개발항목	평가 항목 (주요성능 Spec)	단위	개발 목표치			
			1차년도	2차년도	3차년도	
센싱 및 위치	요구조자 생체신호 모니터링	요구조자수 (동시접속)	1(NFC)	-	7(블루투스)	TTA
	위치기반 탐색중복 회피	resolution/sec	-	10/20	10/10	
	현장대원 모니터링용 생체센서	종류	3	3	3	
	위치정밀도	m	10	10	10	
통신용 모듈	무선통신(거리) (Local Area)	m	-	20(Wi-Fi)	50(LTE|PS-LT)	TTA
	무선통신(속도) (Local Area)	Mbps	-	5(Wi-Fi)	20(LTE |PS-LT)	
디스플레이	해상도 / 시야각	도	HD(1280 x 720)			충남테크노파크 디스플레이센터
			30	35	35	
스마트 소방헬멧 (헬멧 하우징)	내관통성(3M 자유 낙하)	mm	-	9.3	9.0	KFI 인증시험
	충격흡수성(최고전달충격력)	N	-	4,450	4,400	
	내전압시험	mA	-	4	3	
	내수성시험(무게증가율)	%	-	1.5%이하	1%이하	
	난연성시험(탄화길이)	mm	-	24	23	
	방염성능시험(잔염 및 잔진)	초	-	4	3	
	턱걸이 끈 강도 시험(신장길이)	mm	-	35	30	
	턱끈풀림시험(일정하중에서 풀림)	N	-	510~1000	520~1000	
	측면변형시험	mm	-	45	40	
	이탈시험	kg	-	8	10	