

2021 Aircrew Systems Master Plan Roadmaps



Personnel Protection & Performance Sustainment

Aircrew Systems Capability Evolution Roadmaps 2021

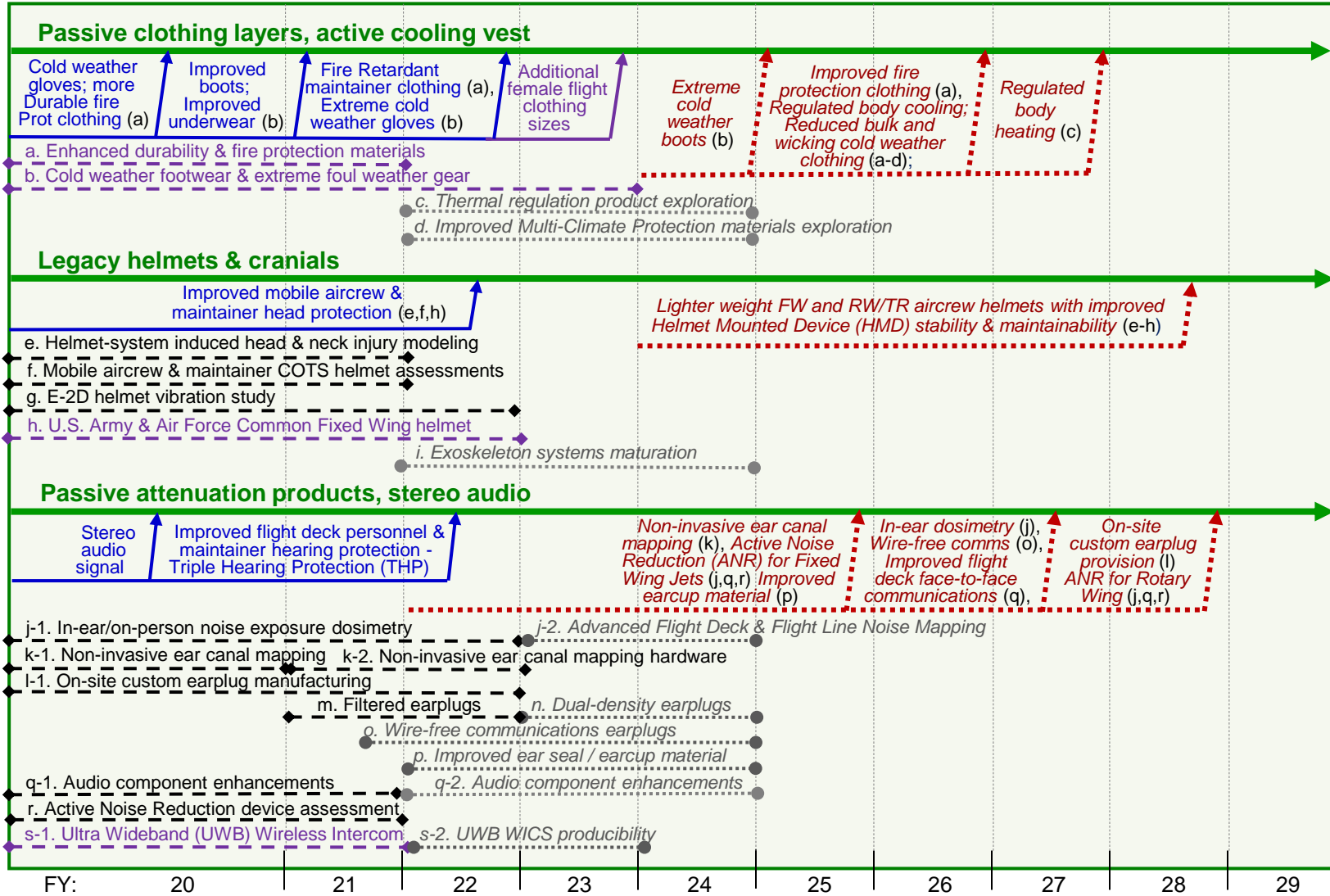
Optimum Human System Performance, Protection & Persistence

Capability Elements

Exposure Protection

Head, Neck and Back Protection

Hearing Protection & Speech Intelligibility



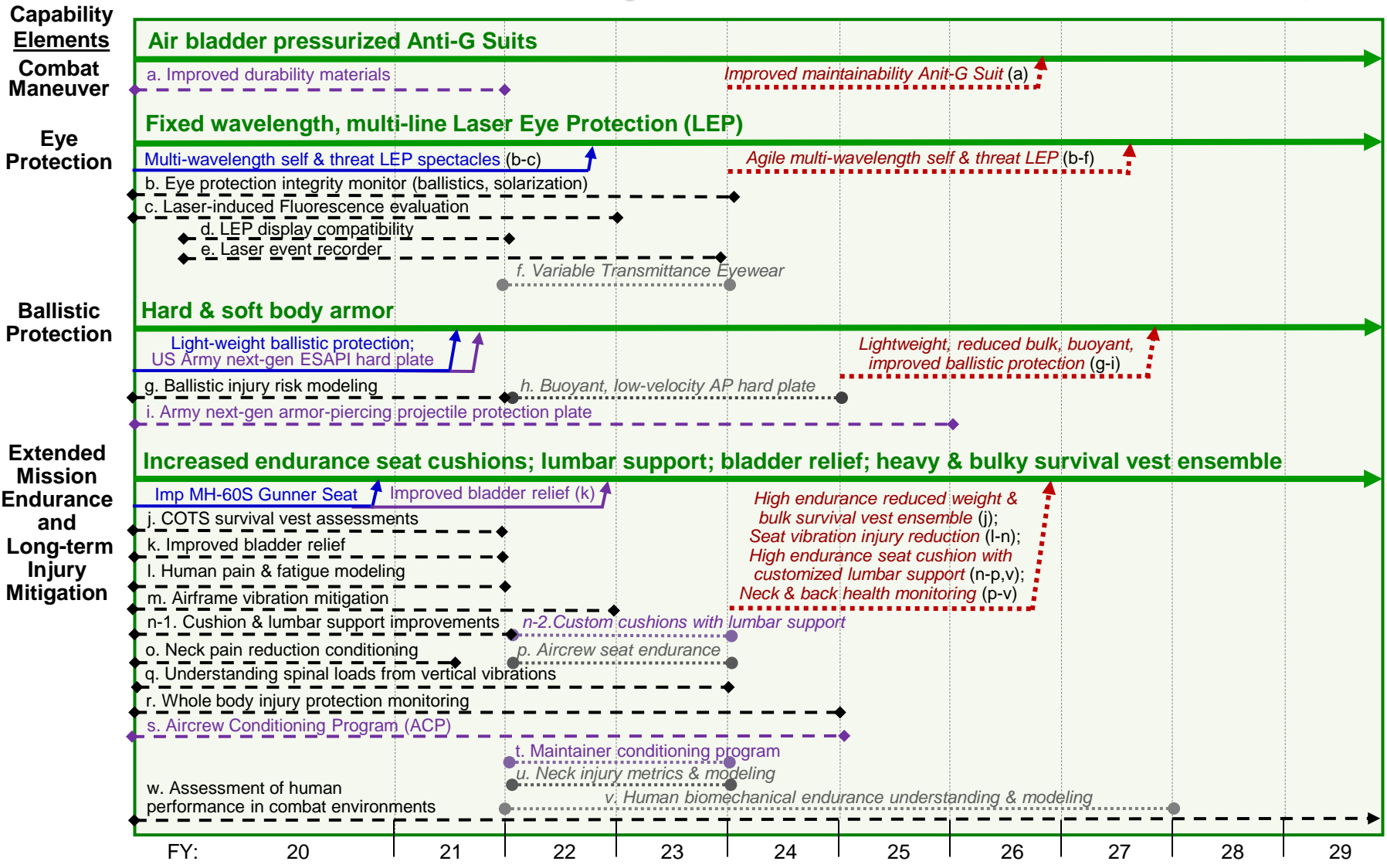
Capability Baseline →	Advanced Research & Technology Maturation	◆ - ◆ Funded	● - ● Unfunded	▲ Funded Capability Enhancement	▲ Unfunded Recommended Capability Development	▲ Joint or other Service
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Combat Operations Survivability & Perseverance

Aircrew Systems Capability Evolution Roadmaps 2021

Persistent and Survivable Dynamic Combat Operations



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Physiological Episode Protection (1 of 2)

Aircrew Systems
Capability Evolution
Roadmaps 2021

Capability
Elements
Understanding
Physiological
Effects

Limited quantitative awareness of cognitive and performance impacts of hypoxia

- a. Assessment of effectiveness of Ketones in mitigating hypoxia
- b. Assessment of brain hemodynamic response to respiratory challenges
- c. Assessment of influence of fatigue, caffeine & dehydration on susceptibility to contaminant effects
- d. Assessment of effects of hypoxia on Spatial Disorientation
- e. Analysis of F-35 cockpit configuration influence on respiration, pulmonary function & static Atelectasis
- f. Assessment of lower back disorder influence on motion sickness & cognition
- g. Exploration of Atelectasis under high oxygen concentration, g-loading & prolonged static positions
- h. Exploration of nitrous oxide effects
- i. Assessment of effects of contaminants in breathing air
- j. Analysis of fluctuating oxygen concentration levels on cognition and performance
- k. Assessment of cabin pressure fluctuation effects
- l. Analysis of the effects of breathing resistance on physiology & performance
- m. Assessment of effects of mask valves on breathing performance
- n. Analysis of musculoskeletal disorders from long term tactical jet operations
- o. Analysis and development of in-mask sensors
- p. Advanced analysis of high oxygen concentrations with pressure variation

Continuous adjustments to oxygen generation, management & monitoring capabilities that improve physiological episode prediction & prevention (a-n)

Reduced Oxygen Breathing Devices (ROBDs) and Reduced Oxygen Breathing Environment (ROBE) chamber

Incorporation of improved effects understanding elements into ROBD & ROBE training

Improved ROBE training (a-s)

Improved ROBE training (a-s)

q. Normobaric Hypoxia Training Device enhancements

r. Hypoxia training improvements

s. Hypoxia-Ventilation Research Device development

FY: 20 21 22 23 24 25 26 27 28 29

Elimination of Physiological Episodes

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Joint or other Service



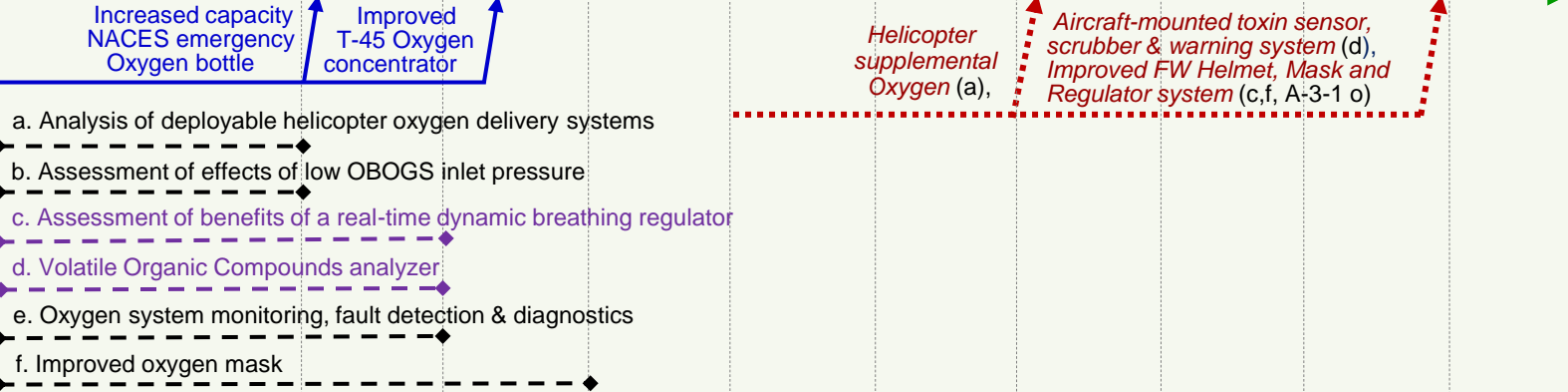
Physiological Episode Protection (2 of 2)

Aircrew Systems
Capability Evolution
Roadmaps 2021

Capability
Elements

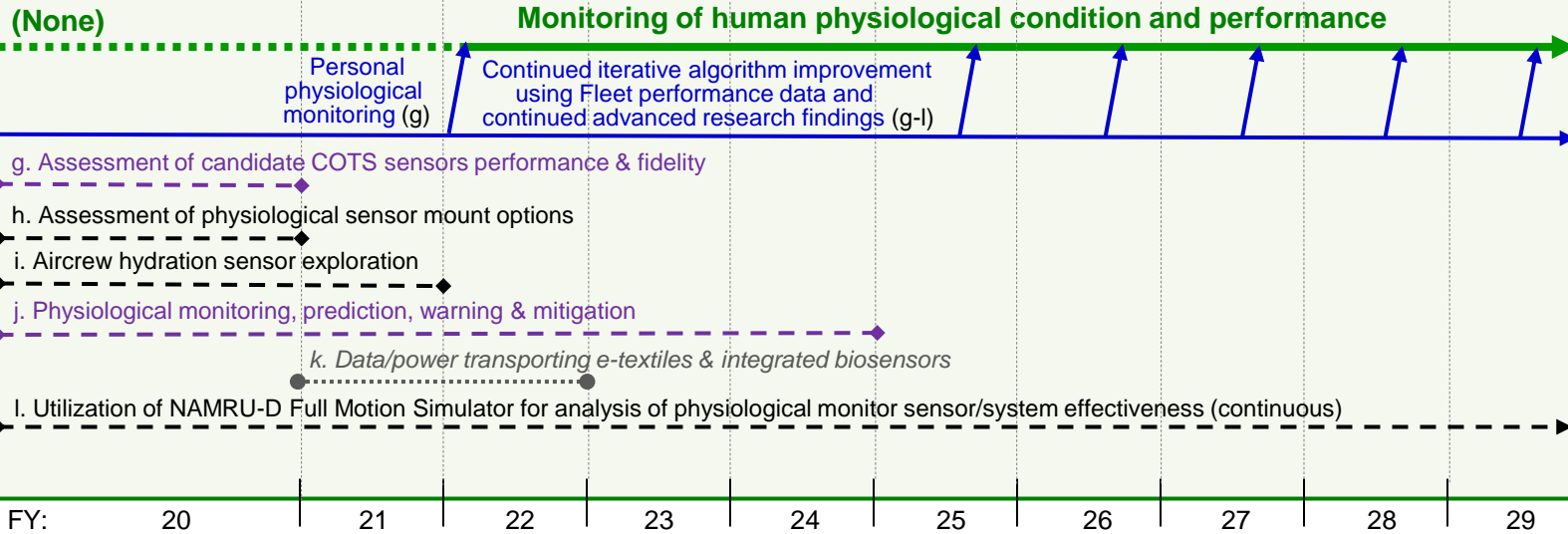
Oxygen
Delivery
System
Integrity

On-Board Oxygen Generation Systems (OBOGS), Portable RW Oxygen, Cockpit Pressure Monitoring



Elimination of Physiological Episodes

Physiological
Condition
Monitoring
and Warning



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Visual Situational Awareness

Aircrew Systems
Capability Evolution
Roadmaps 2021

Capability
Elements

Gen 3 Image Intensification (I²) technology Night Vision Devices (NVD); White Phosphor tube option

Improved Rotary Wing digital night vision - Enhanced Visual Acuity (EVA)
Increment 1: enhanced low-light sensitivity, reduced scintillation, reduced halo effect, lighter weight, improved fit, digital symbology overlay (a-h)

Enhanced digital Situational Awareness - EVA Inc. 2 (a-h)

Night Vision

a. Next Gen (ISIE-19) Near IR digital sensor (Army)

b. Effect of Motion on Digital Image Modulation Transfer

c. Solid-state multi-spectral extreme low light level sensor (Army)

d. Field of View effectiveness study

e. Motion Blur characterization

f. Examination of causal factors of ocular fatigue with White Phosphor NVGs

g. Quantitative Night Vision System image quality testing

h. Advanced micro-display technology development (Army)

Flight Parameter
Heads Up
Display

Day or night capable helmet mounted Helmet Mounted Display (HMD)

Army Degraded Visual Environment (DVE) capability improvement

Improved Rotary Wing digital night vision EVA (Enhanced Visual Acuity)
Increment 1: enhanced low-light sensitivity, reduced scintillation and halo effect, lighter weight, improved fit, digital symbology overlay (a-j)

Next Generation Fixed Wing Helmet, Enhanced digital Situational Awareness EVA Inc. 2 (a-j)

i. See-through display technology development

i. Display visor automatic tinting

Heads Up
Cueing and
Targeting

Day or night capable helmet mounted cueing

Next generation day/night tactical helmet: high resolution, all-weather, multi-spectral display with tactical data overlay - EVA Inc. 2 (a-j, l-n)

Spatial
Disorientation
Protection

Legacy recognition training

k. Training-based countermeasure improvements

l. HMD symbology effectiveness analysis

m. Visual illusion causal factor analysis

n. Cognitive workload causal factor analysis

Improved Spatial Disorientation protection - EVA (h-i)

Spatial Disorientation training improvements (k-o)

Spatial Disorientation symbology improvements - EVA Inc. 2 (a-j, l-o)

o. Utilization of NAMRU-D Disorientation Research Device (continuous)

FY: 20 21 22 23 24 25 26 27 28 29

Optimum Day/Night Operations Safety
& Maximum Tactical SA / Warfighting Effectiveness

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Chemical Biological Exposure Protection & Perseverance

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Capability Elements

Hazard Detection

Passive paper sensors

Skin Exposure Protection

Legacy protective clothing

Lighter weight, lower bulk, improved protection coveralls

Uniform Integrated Protection Ensemble (UIPE) products (gloves, booties, socks, etc.) + continuous improvement work, solution deliveries TBD

Respiratory Exposure Protection

Improved protection Chem Bio masks & filters (JSAM variants)

Improved respiration protection for Tactical Aircraft (JSAM TA)

Modified JSAM TA Hybrid for E-2C/D and V-22 variants

Biological hazard respiratory containment mask

Mission Preparation and Endurance

Non-compatible canteens & camelbacks

Chem Bio equipment compatible hydration & bladder relief system interfaces

Exposed Personnel, Equipment and Aircraft Care

Skin wipes; Soap & water aircraft decontamination, Joint Service Equipment Wipes (JSEW)

Sensitive Equipment Decontamination System (SEDS)

Full Aircrew Protection and Persistent, Effective Air Combat Operations in a Chem Bio Environment

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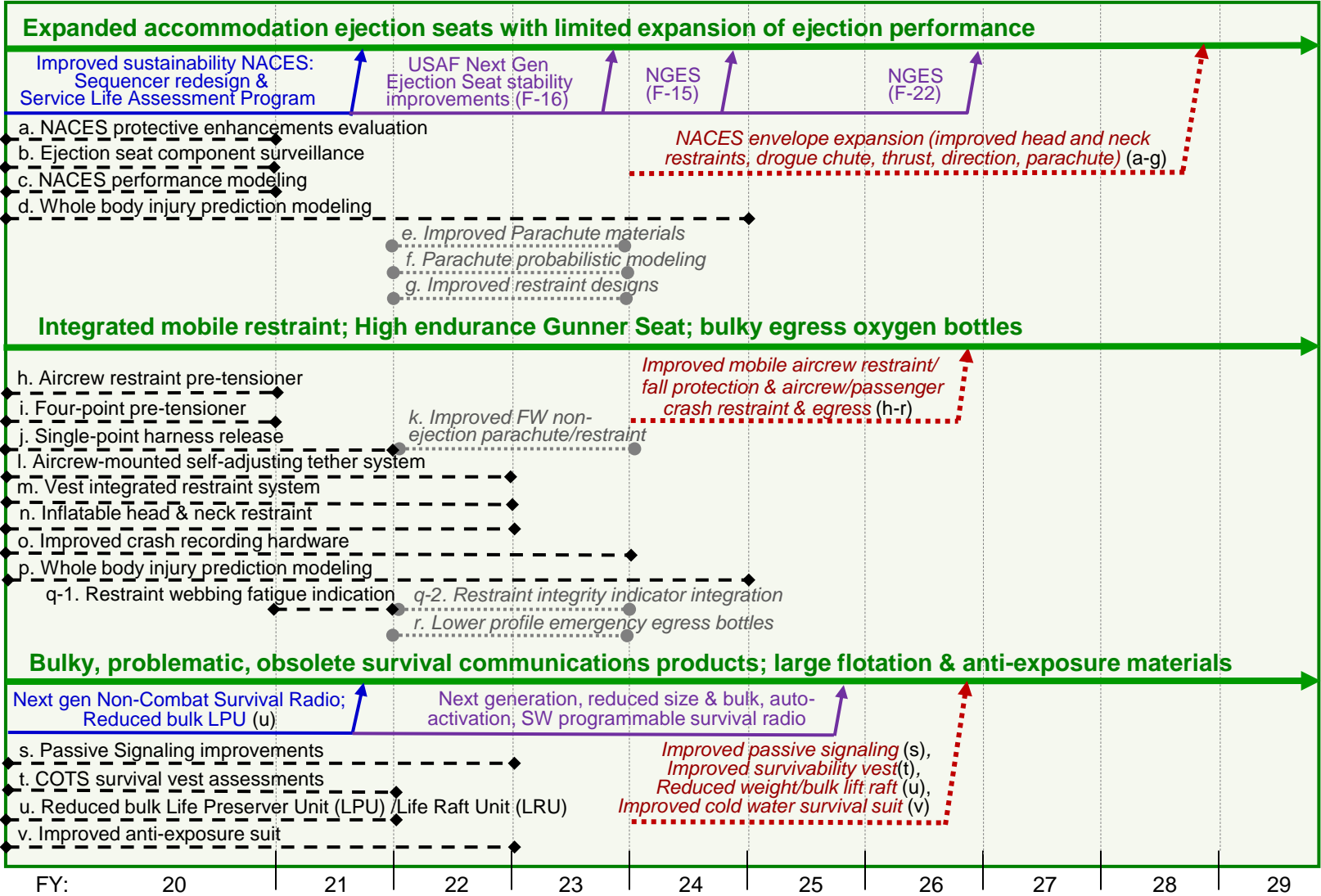
Joint or other Service



Ejection; Crash Survivability & Egress; Survival, Evasion & Recovery

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Capability
Elements
Ejection



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