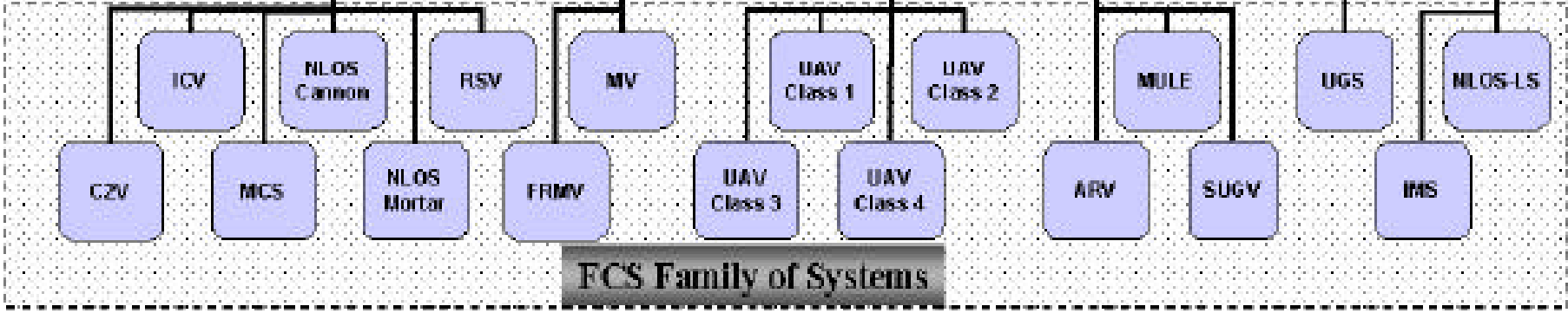# System of Systems Testing Lessons Learned from FCS
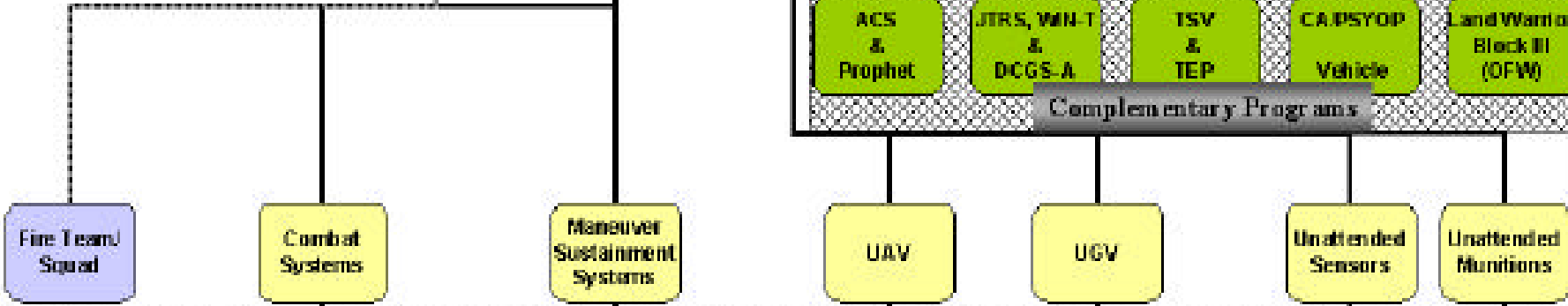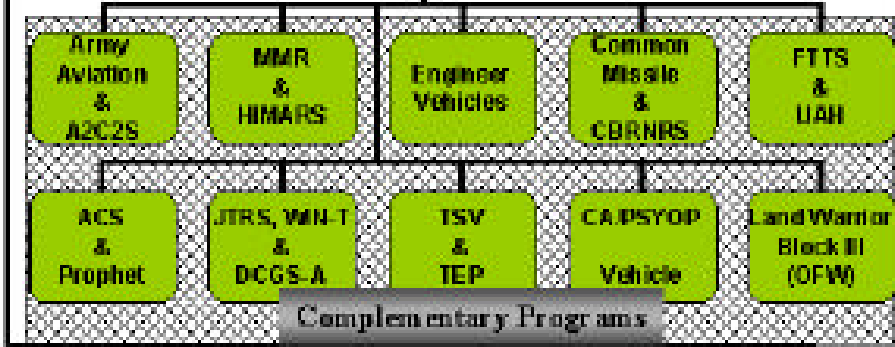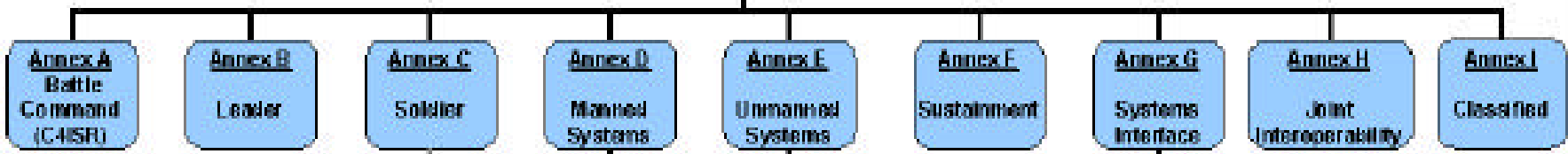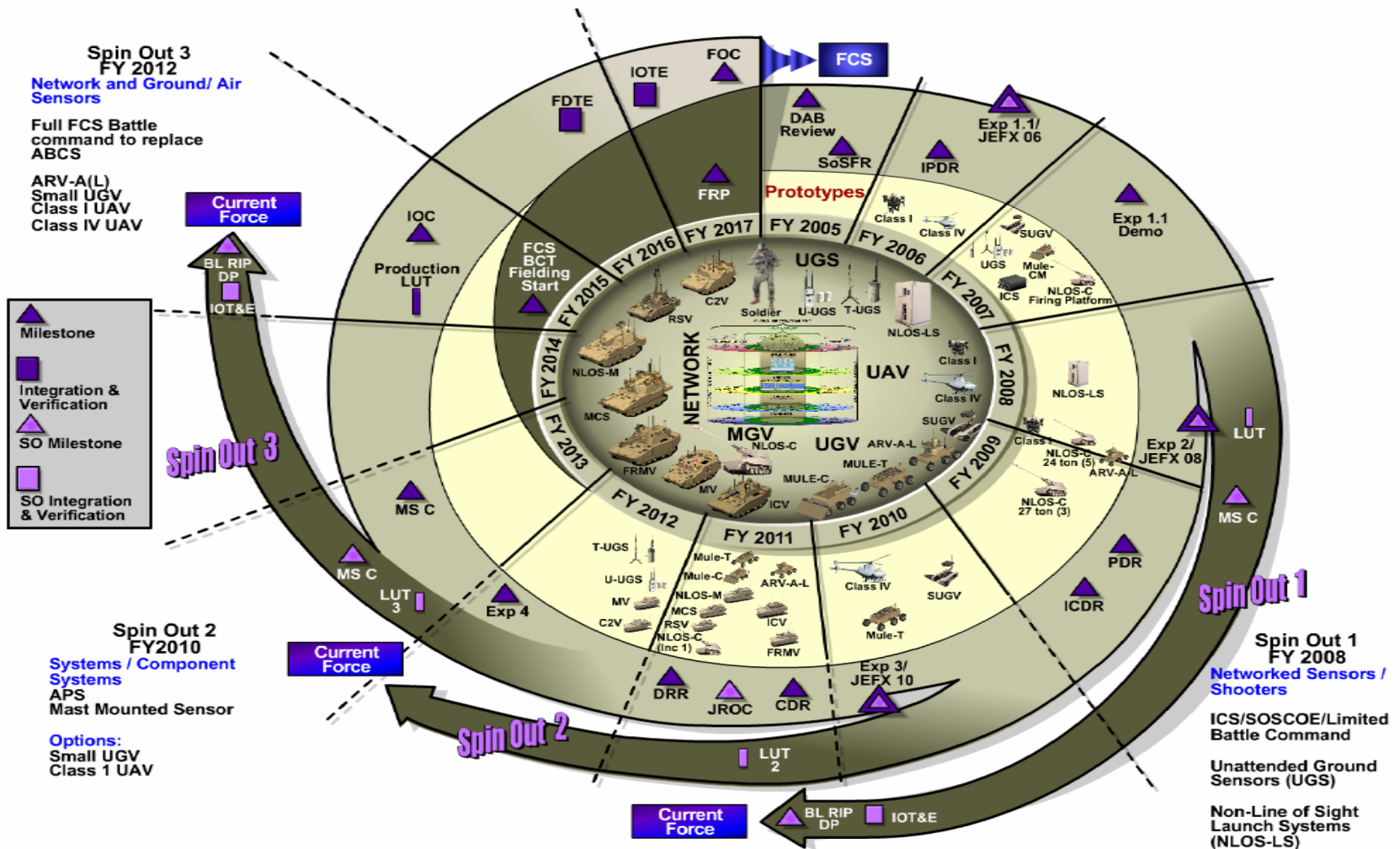
LTG (R) Joe Yakovac

President JVMLLC

System of System Definitions

(1)Virtual   Virtual SoS lack a central management authority and a centrally agreed upon purpose for the SoS. Large-scale behavior emerges—and may be desirable—but this type of SoS should rely upon relatively invisible mechanisms to maintain it.

(2)Collaborative   In collaborative SoS, the component systems interact more or less voluntarily to fulfill agreed upon central purposes. The Internet is a collaborative system. The Internet Engineering Task Force works out standards but has no power to enforce them. The central players collectively decide how to provide or deny service, thereby providing some means of enforcing and maintaining standards.

(3)Acknowledged   Acknowledged SoS have recognized objectives, a designated manager, and resources for the SoS; however, the constituent systems retain their independent ownership, objectives, funding, and development and sustainment approaches. Changes in the systems are based on collaboration between the SoS and the system.

(4)Directed   Directed SoS are those in which the integrated SoS is built and managed to fulfill specific purposes. It is centrally managed during long-term operation to continue to fulfill those purposes as well as any new ones the system owners might wish to address. The component systems maintain an ability to operate independently, but their normal operational mode is subordinated to the central managed purpose.

Base ORD
Family of Systems (FoS) Common Requirements

Annex A Battle Command (C4ISR)
Annex B Leader
Annex C Soldier
Annex D Manned Systems
Annex E Unmanned Systems
Annex F Sustainment
Annex G Systems Interface
Annex H Joint Interoperability
Annex I Classified

Army Aviation & A2C2S
MMR & HIMARS
Engineer Vehicles
Common Missile & CBRNRS
FTTS & UAH

ACS & Prophet
JTRS, WIN-T & DCGS-A
TSV & TEP
CA/PSYOP Vehicle
Land Warrior Block III (OFW)

Complementary Programs

Fire Team/ Squad
Combat Systems
Maneuver Sustainment Systems
UAV
UGV
Unattended Sensors
Unattended Munitions

ICV
NLOS Cannon
RSV
MV
UAV Class 1
UAV Class 2
MULE
UGS
NLOS-LS

CZV
MCS
NLOS Mortar
FRMV
UAV Class 3
UAV Class 4
ARV
SUGV
IMS

FCS Family of Systems

FCS System of Systems

FCS SOS Lessons Learned

- T@E is a team sport and a shared responsibility

- T@E planning starts a pre MS A and is a constant throughout the entire life cycle (entire community involvement from day one,2nd organization to form within FCS was the Combined Test Organization)

- Embrace but understand the limitations of Modeling and Simulations

FSC SOS Lessons Learned (Cont.)

- T@ E must be Doctrine, Organization, Training, and Leader focused along with Material

- Difficult to align programs especially those outside of the lead service

- System of Systems KPPs should evolve over time and should account for performance growth (similar to a system reliability growth)