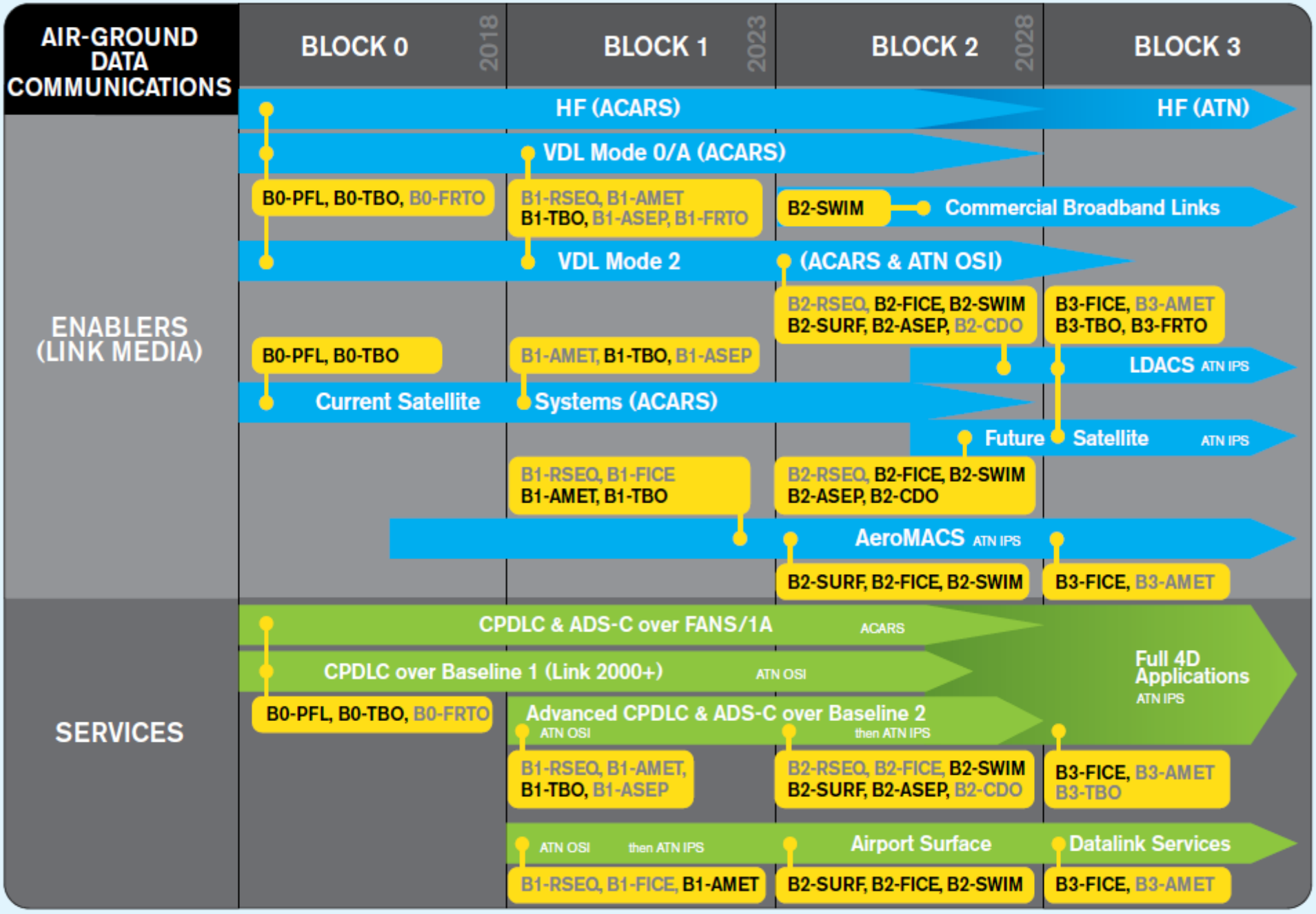
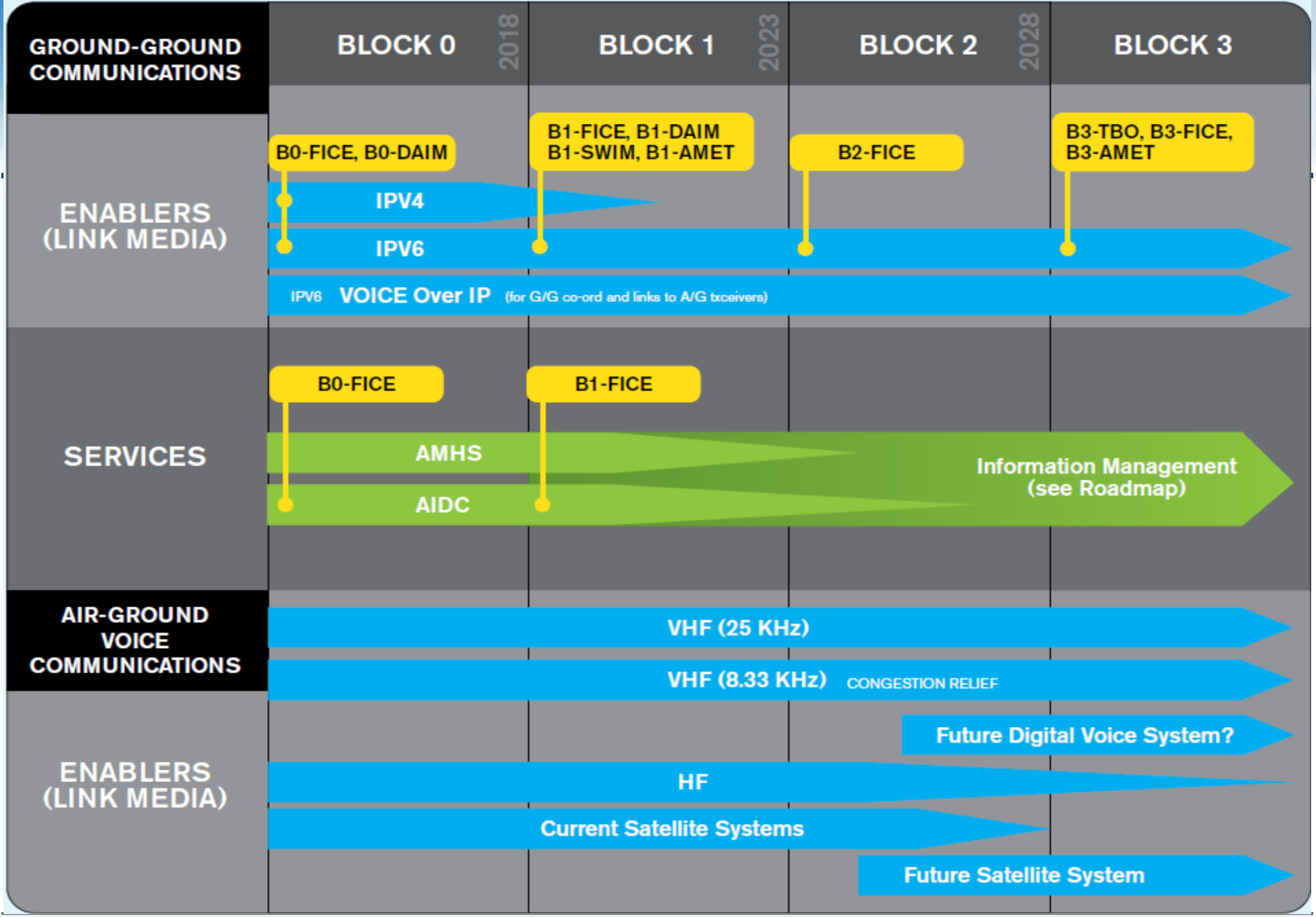
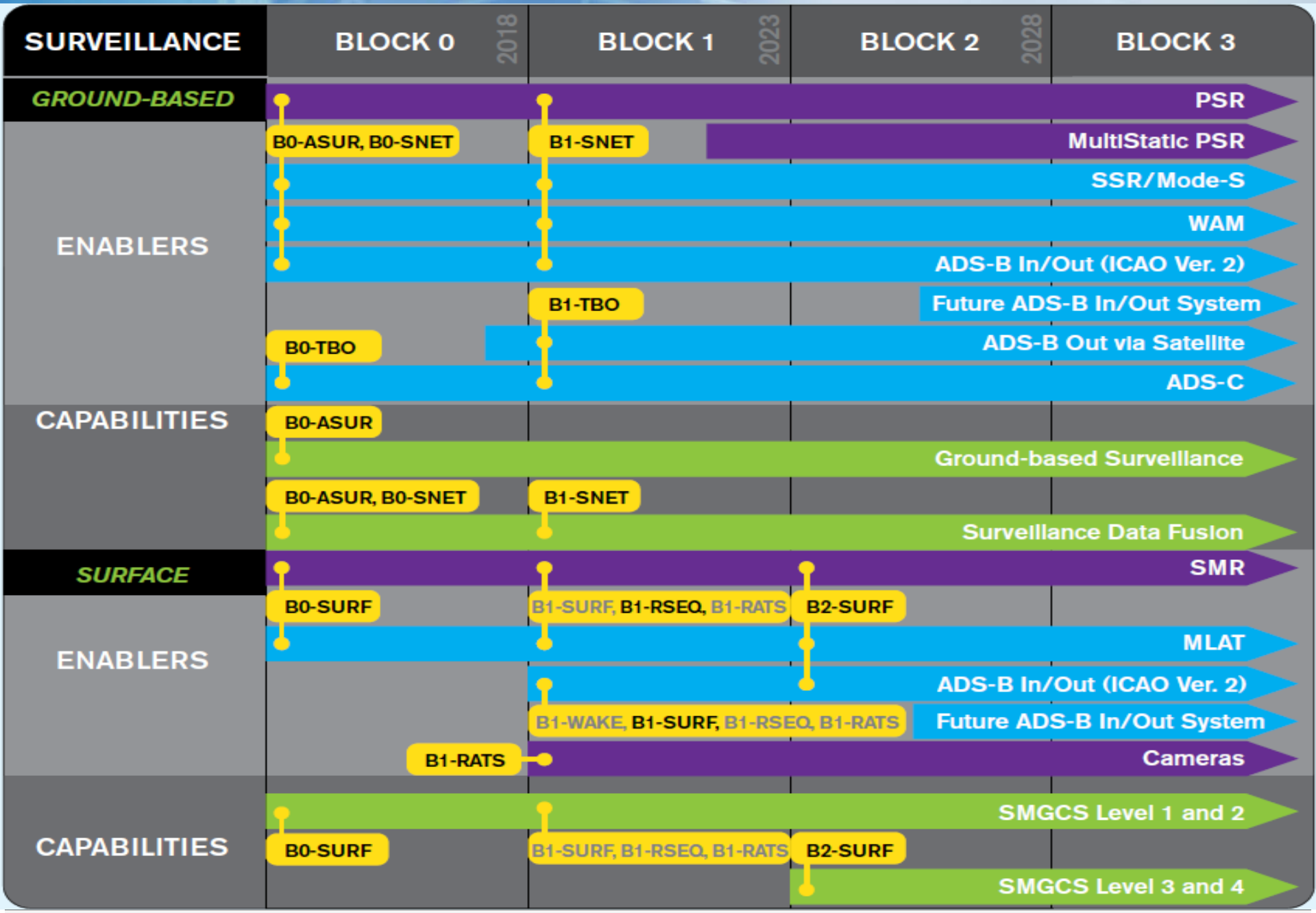
WKSP/ASBU/NAIROBI/2013-PPT/03

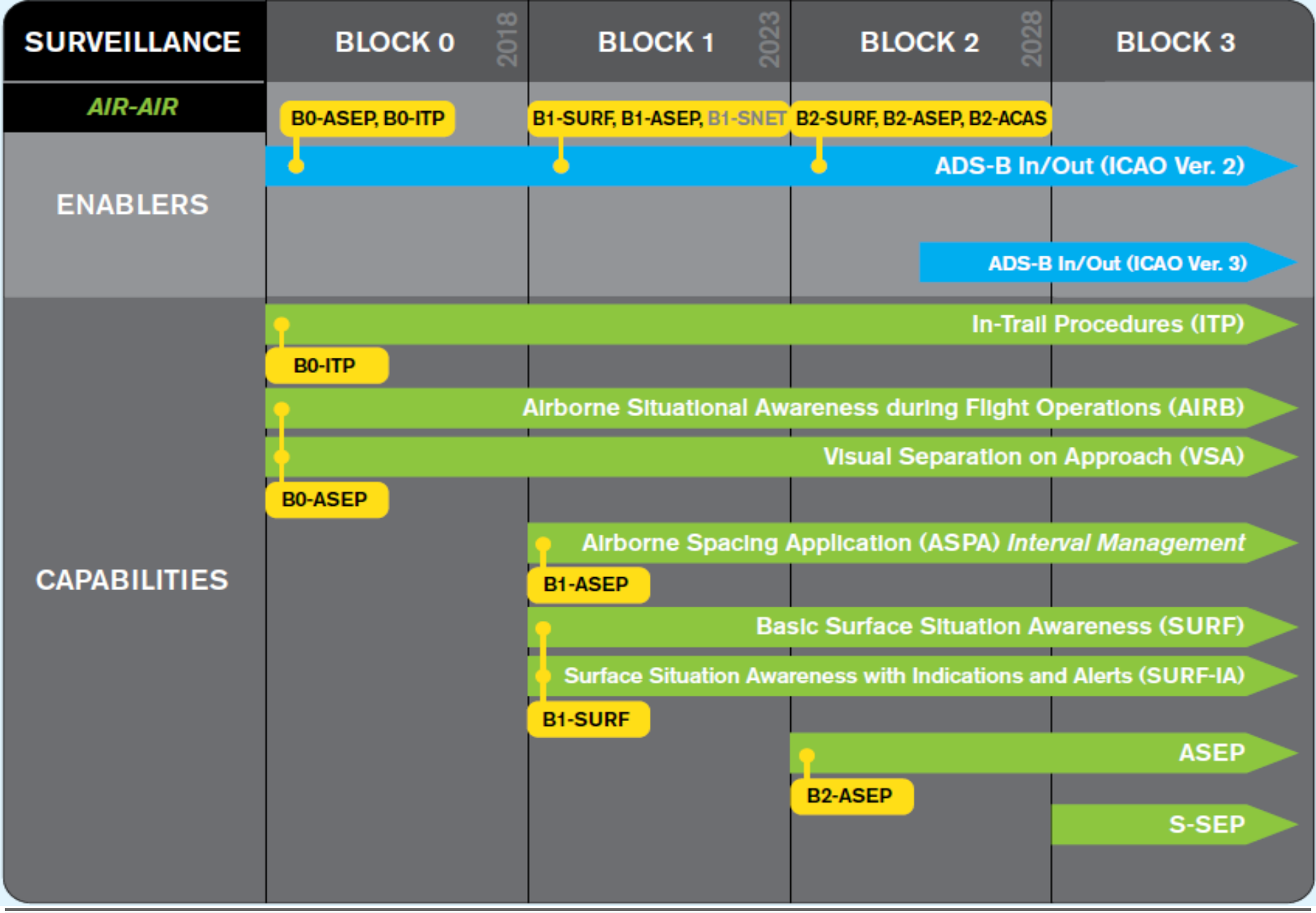
Technology Roadmaps

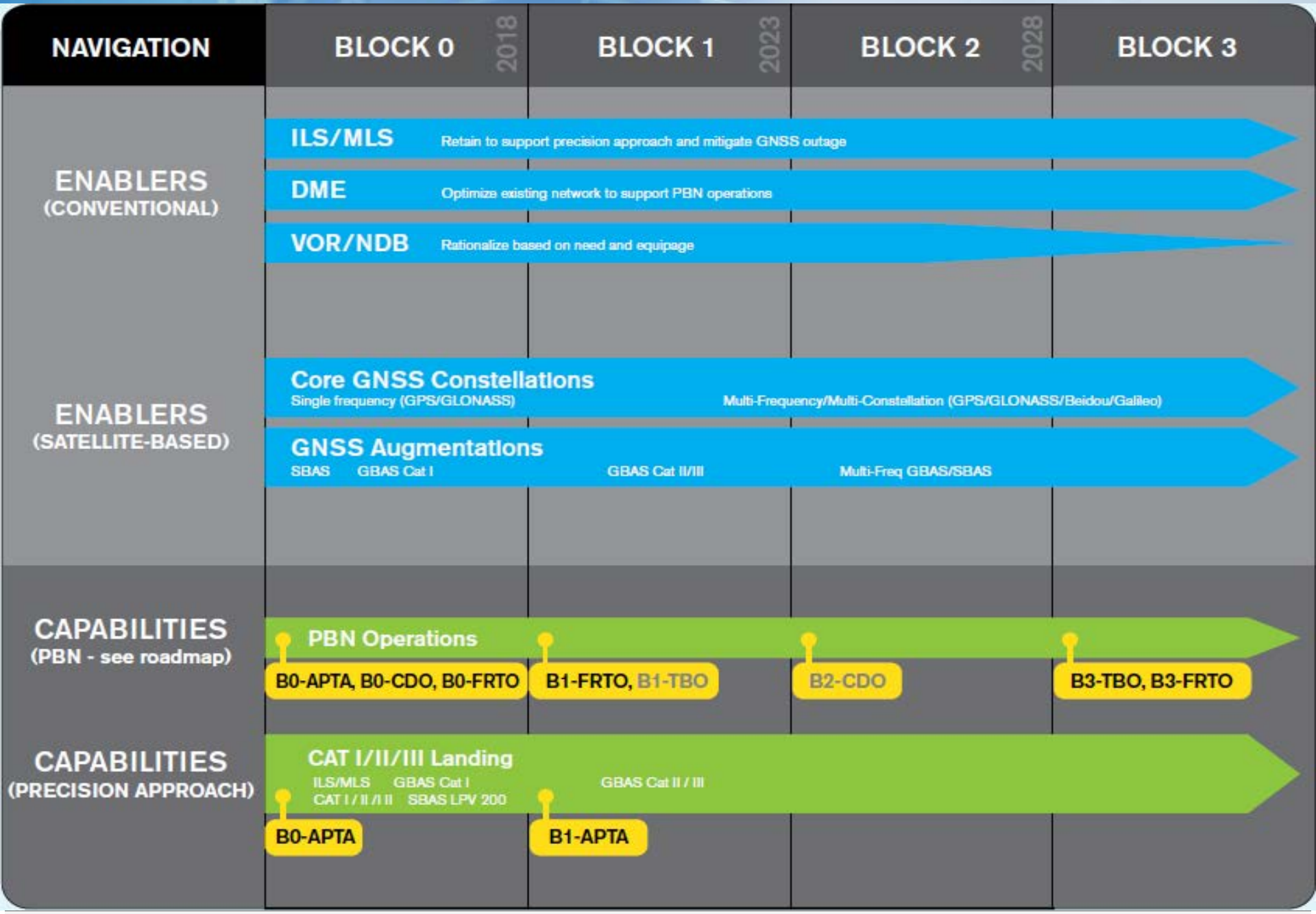
Air Navigation Bureau

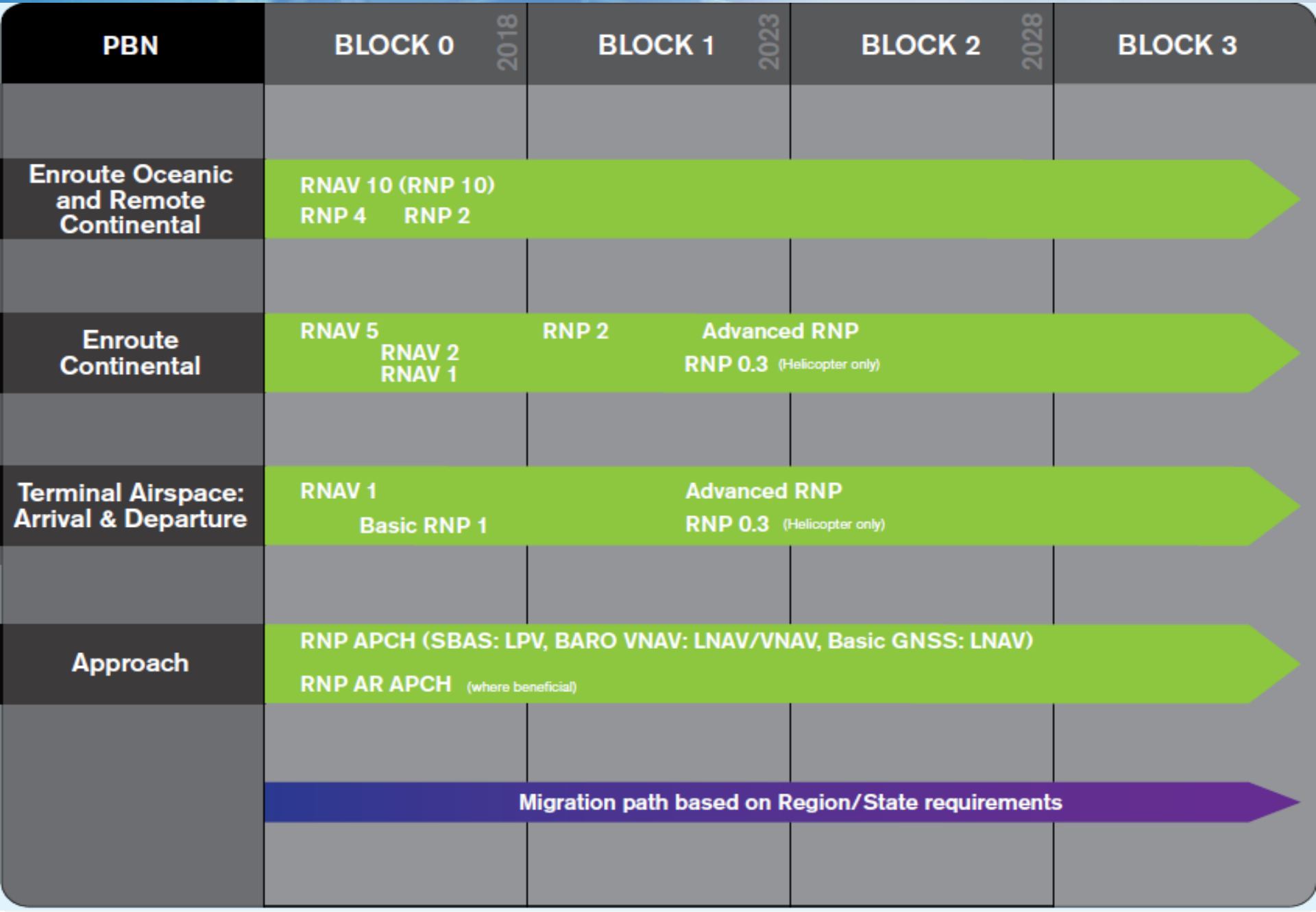

AIR-GROUND DATA COMMUNICATIONS
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
ENABLERS (LINK MEDIA)
HF (ACARS)
HF (ATN)
VDL Mode 0/A (ACARS)
B0-PFL, B0-TBO, B0-FRTO
B1-RSEQ, B1-AMET
B1-TBO, B1-ASEP, B1-FRTO
B2-SWIM
Commercial Broadband Links
VDL Mode 2
(ACARS & ATN OSI)
B2-RSEQ, B2-FICE, B2-SWIM
B2-SURF, B2-ASEP, B2-CDO
B3-FICE, B3-AMET
B3-TBO, B3-FRTO
B0-PFL, B0-TBO
B1-AMET, B1-TBO, B1-ASEP
LDACS ATN IPS
Current Satellite
Systems (ACARS)
Future Satellite ATN IPS
B1-RSEQ, B1-FICE
B1-AMET, B1-TBO
B2-RSEQ, B2-FICE, B2-SWIM
B2-ASEP, B2-CDO
AeroMACS ATN IPS
B2-SURF, B2-FICE, B2-SWIM
B3-FICE, B3-AMET
SERVICES
CPDLC & ADS-C over FANS/1A
ACARS
CPDLC over Baseline 1 (Link 2000+)
ATN OSI
Full 4D Applications
ATN IPS
B0-PFL, B0-TBO, B0-FRTO
Advanced CPDLC & ADS-C over Baseline 2
ATN OSI
then ATN IPS
B1-RSEQ, B1-AMET,
B1-TBO, B1-ASEP
B2-RSEQ, B2-FICE, B2-SWIM
B2-SURF, B2-ASEP, B2-CDO
B3-FICE, B3-AMET
B3-TBO
ATN OSI
then ATN IPS
Airport Surface
Datalink Services
B1-RSEQ, B1-FICE, B1-AMET
B2-SURF, B2-FICE, B2-SWIM
B3-FICE, B3-AMET

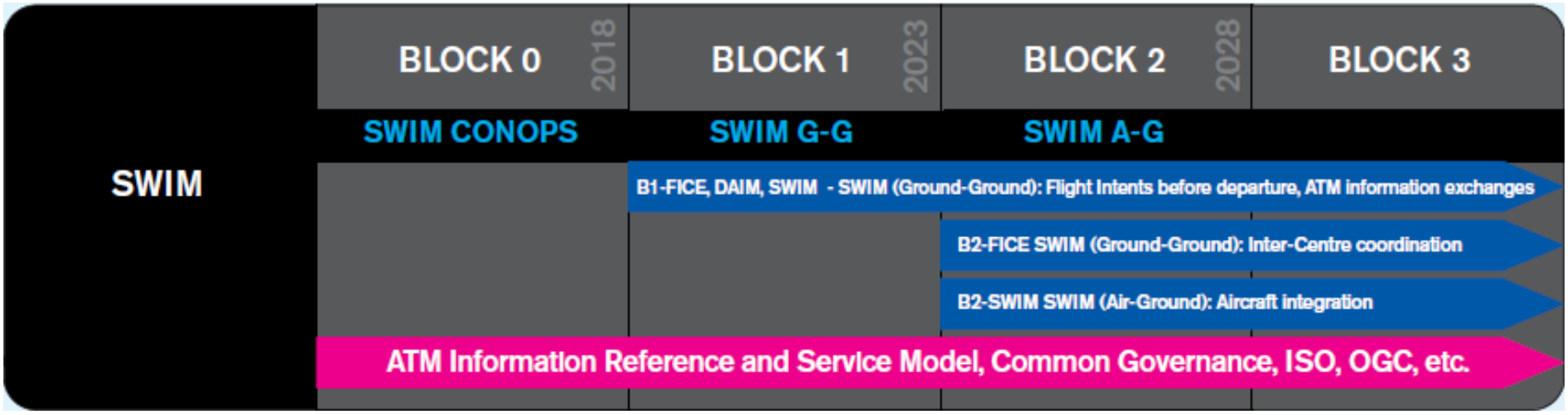

GROUND-GROUND COMMUNICATIONS
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
ENABLERS (LINK MEDIA)
B0-FICE, B0-DAIM
B1-FICE, B1-DAIM
B1-SWIM, B1-AMET
B2-FICE
B3-TBO, B3-FICE,
B3-AMET
IPV4
IPV6
IPV6 VOICE Over IP (for G/G co-ord and links to A/G txceivers)
SERVICES
B0-FICE
B1-FICE
AMHS
AIDC
Information Management
(see Roadmap)
AIR-GROUND VOICE COMMUNICATIONS
VHF (25 KHz)
VHF (8.33 KHz) CONGESTION RELIEF
Future Digital Voice System?
ENABLERS (LINK MEDIA)
HF
Current Satellite Systems
Future Satellite System

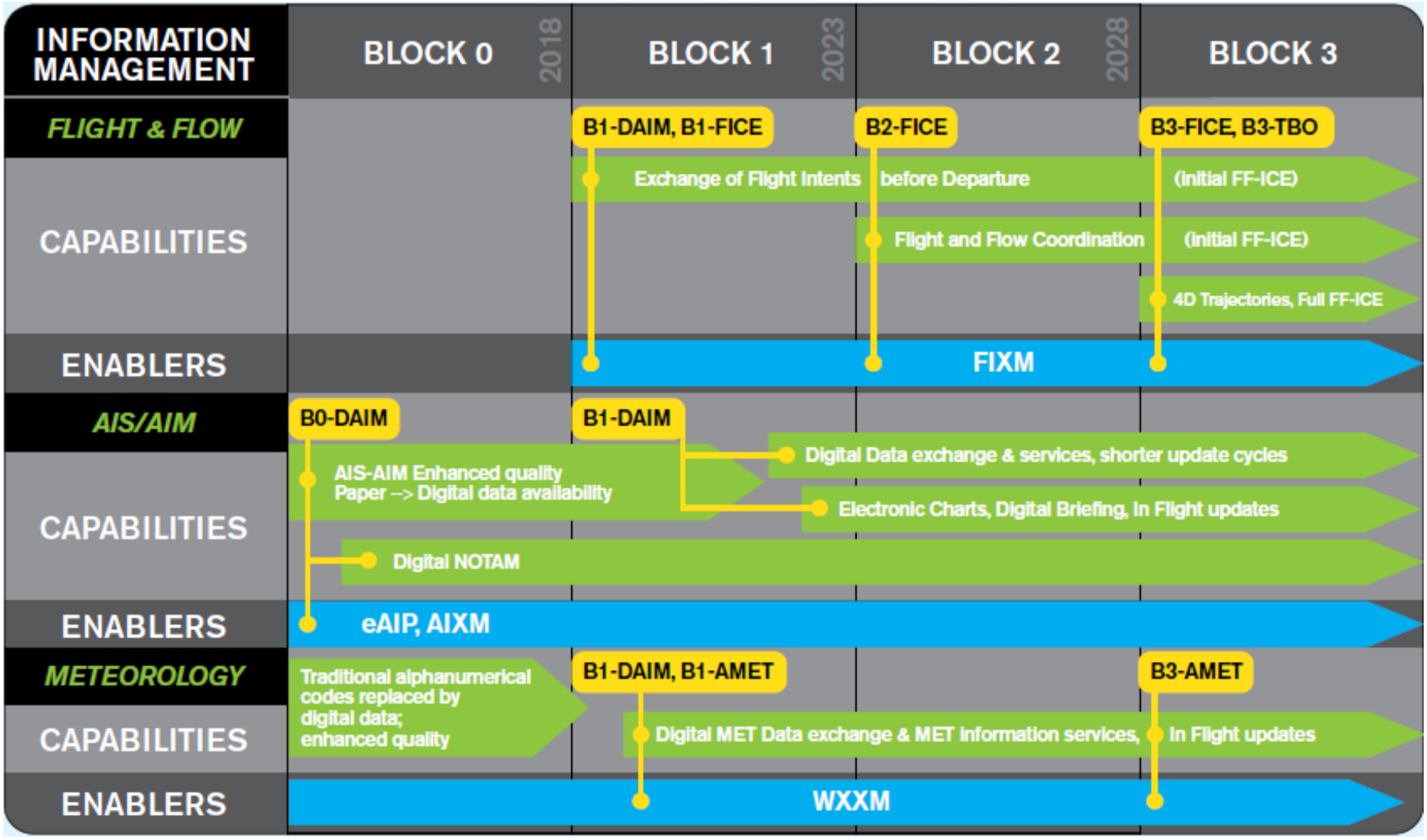

SURVEILLANCE
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
GROUND-BASED
ENABLERS
CAPABILITIES
SURFACE
ENABLERS
CAPABILITIES
PSR
MultiStatic PSR
SSR/Mode-S
WAM
ADS-B In/Out (ICAO Ver. 2)
Future ADS-B In/Out System
ADS-B Out via Satellite
ADS-C
Ground-based Surveillance
Surveillance Data Fusion
SMR
MLAT
ADS-B In/Out (ICAO Ver. 2)
Future ADS-B In/Out System
Cameras
SMGCS Level 1 and 2
SMGCS Level 3 and 4
B0-ASUR, B0-SNET
B1-SNET
B1-TBO
B0-TBO
B0-ASUR
B0-ASUR, B0-SNET
B1-SNET
B0-SURF
B1-SURF, B1-RSEQ, B1-RATS
B2-SURF
B1-WAKE, B1-SURF, B1-RSEQ, B1-RATS
B1-RATS
B0-SURF
B1-SURF, B1-RSEQ, B1-RATS
B2-SURF

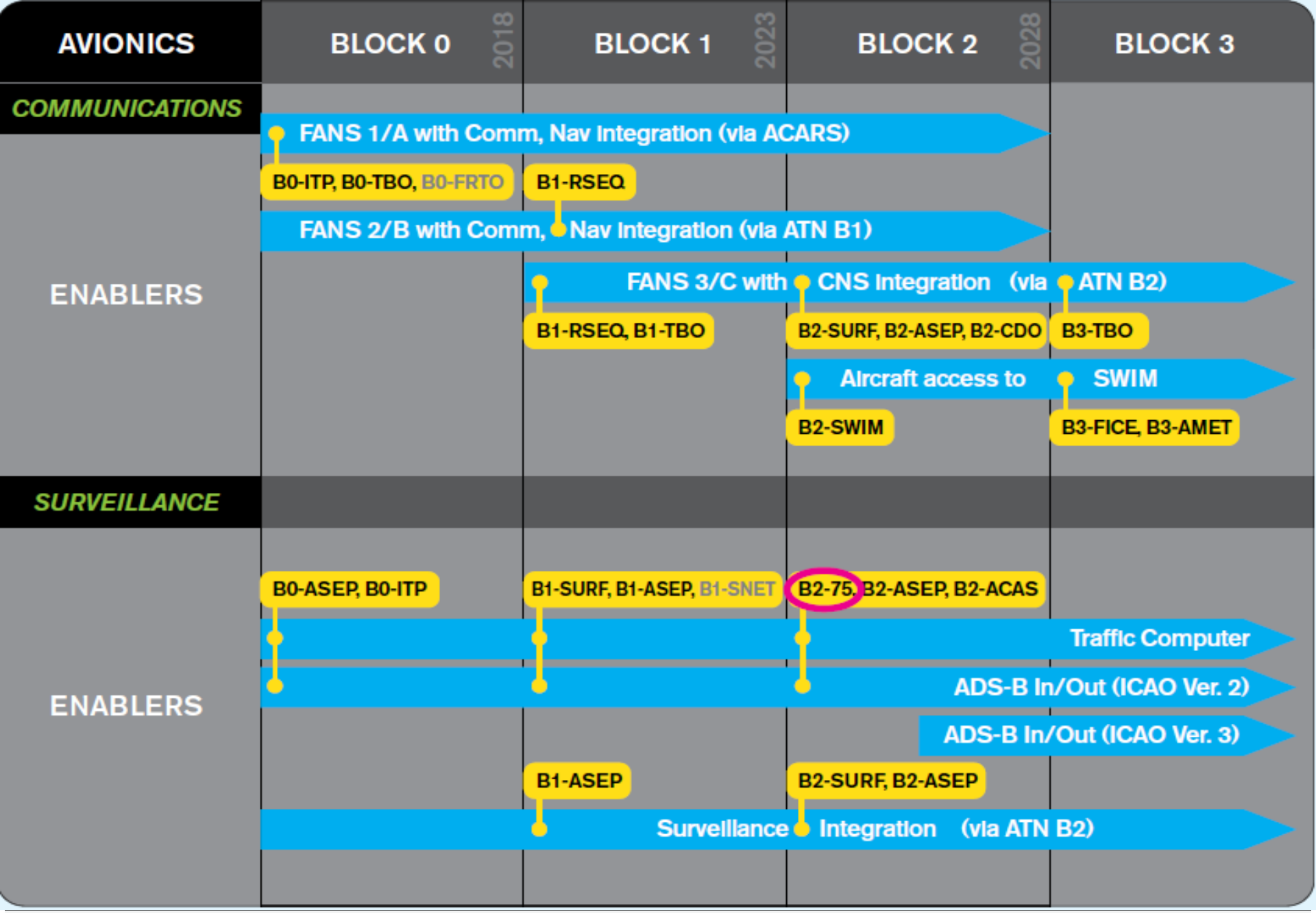

SURVEILLANCE
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
AIR-AIR
B0-ASEP, B0-ITP
B1-SURF, B1-ASEP, B1-SNET
B2-SURF, B2-ASEP, B2-ACAS
ENABLERS
ADS-B In/Out (ICAO Ver. 2)
ADS-B In/Out (ICAO Ver. 3)
CAPABILITIES
In-Trail Procedures (ITP)
B0-ITP
Airborne Situational Awareness during Flight Operations (AIRB)
Visual Separation on Approach (VSA)
B0-ASEP
Airborne Spacing Application (ASPA) Interval Management
B1-ASEP
Basic Surface Situation Awareness (SURF)
Surface Situation Awareness with Indications and Alerts (SURF-IA)
B1-SURF
ASEP
B2-ASEP
S-SEP

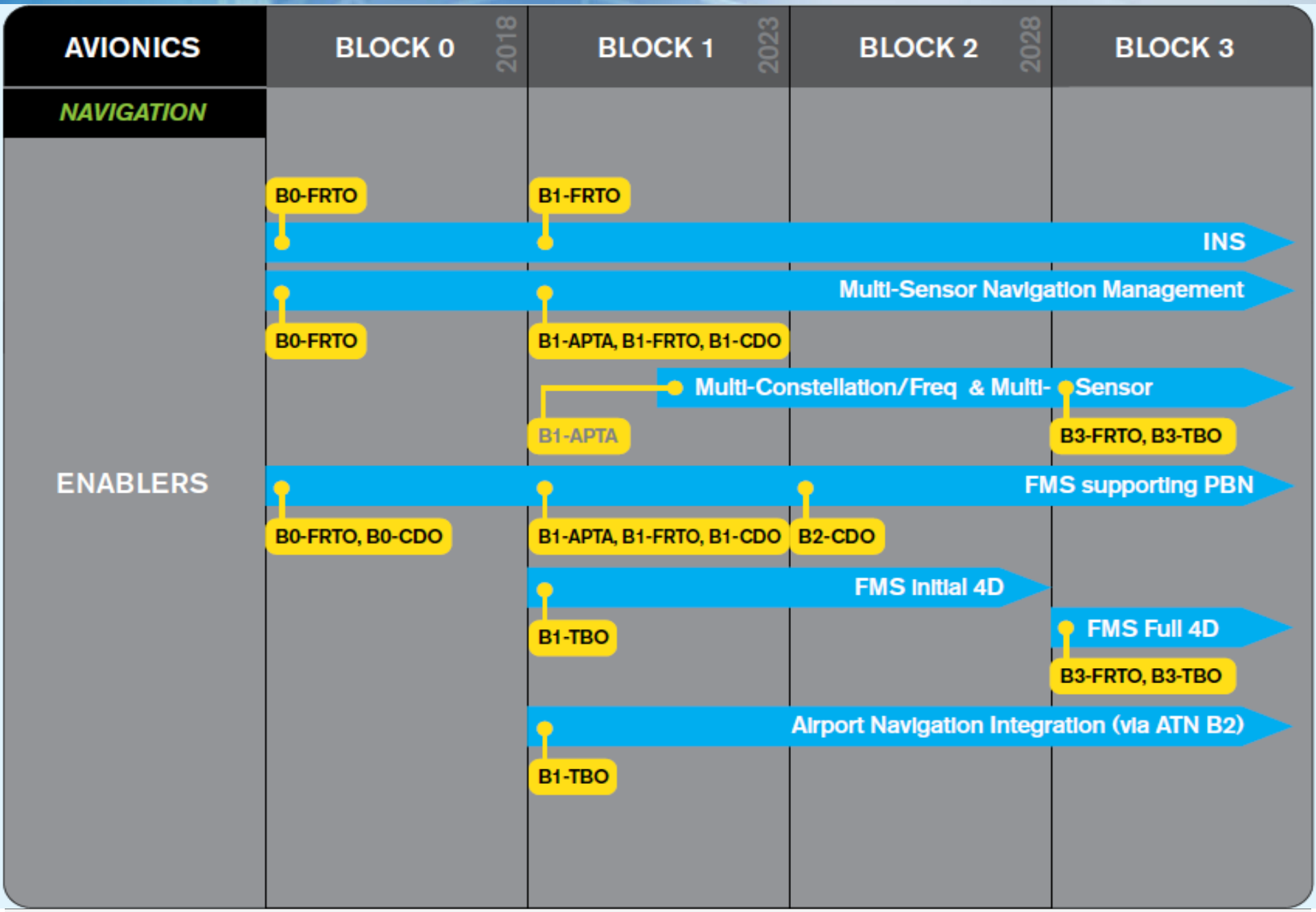

NAVIGATION
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
ENABLERS
(CONVENTIONAL)
ILS/MLS
Retain to support precision approach and mitigate GNSS outage
DME
Optimize existing network to support PBN operations
VOR/NDB
Rationalize based on need and equipage
ENABLERS
(SATELLITE-BASED)
Core GNSS Constellations
Single frequency (GPS/GLONASS)
Multi-Frequency/Multi-Constellation (GPS/GLONASS/Beidou/Galileo)
GNSS Augmentations
SBAS
GBAS Cat I
GBAS Cat II/III
Multi-Freq GBAS/SBAS
CAPABILITIES
(PBN - see roadmap)
PBN Operations
B0-APTA, B0-CDO, B0-FRTO
B1-FRTO, B1-TBO
B2-CDO
B3-TBO, B3-FRTO
CAPABILITIES
(PRECISION APPROACH)
CAT I/II/III Landing
ILS/MLS
GBAS Cat I
CAT I / II / III
SBAS LPV 200
GBAS Cat II / III
B0-APTA
B1-APTA

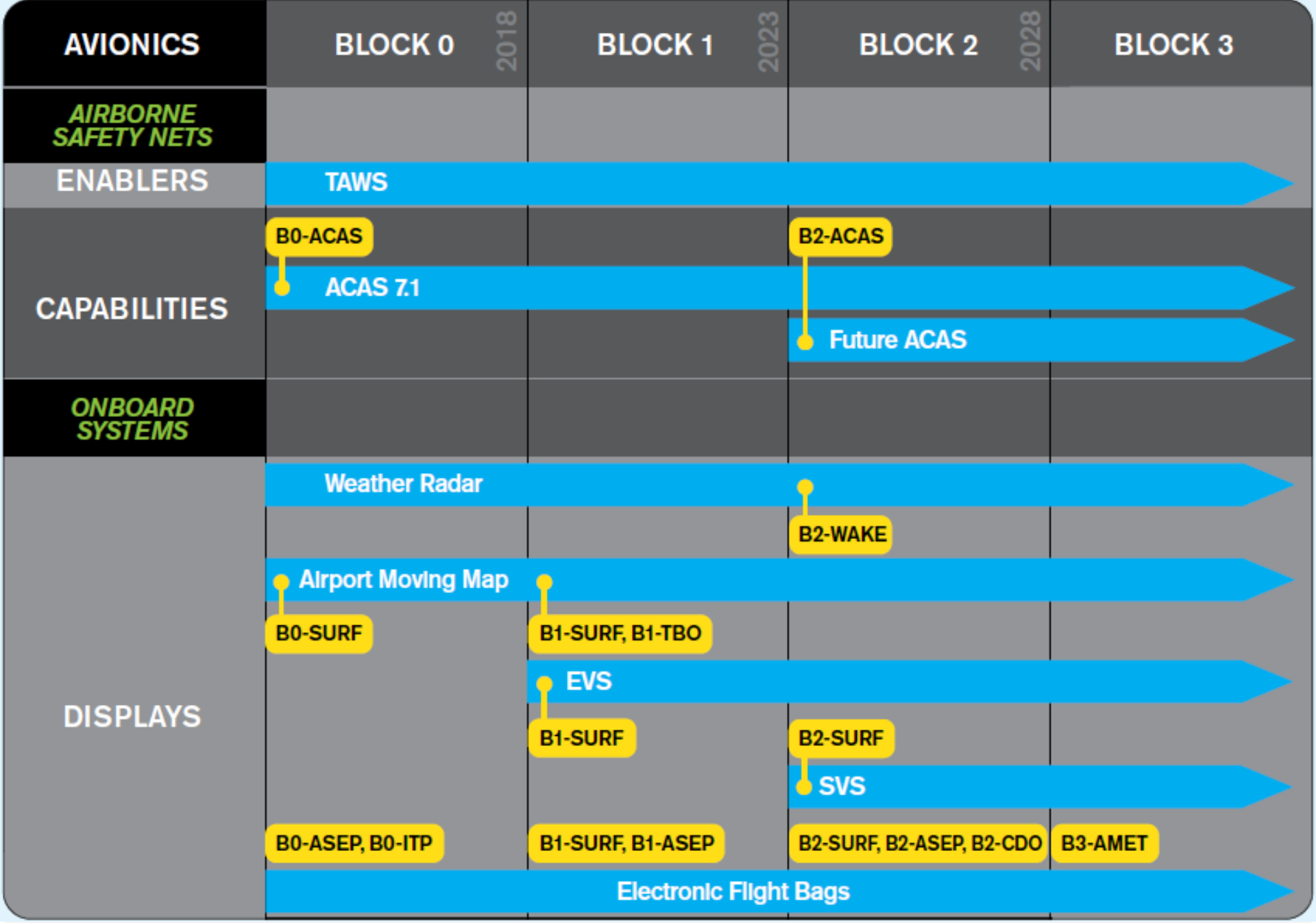

PBN
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
Enroute Oceanic and Remote Continental
RNAV 10 (RNP 10)
RNP 4
RNP 2
Enroute Continental
RNAV 5
RNAV 2
RNAV 1
RNP 2
Advanced RNP
RNP 0.3 (Helicopter only)
Terminal Airspace: Arrival & Departure
RNAV 1
Basic RNP 1
Advanced RNP
RNP 0.3 (Helicopter only)
Approach
RNP APCH (SBAS: LPV, BARO VNAV: LNAV/VNAV, Basic GNSS: LNAV)
RNP AR APCH (where beneficial)
Migration path based on Region/State requirements


SWIM
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
SWIM CONOPS
SWIM G-G
SWIM A-G
B1-FICE, DAIM, SWIM - SWIM (Ground-Ground): Flight Intents before departure, ATM information exchanges
B2-FICE SWIM (Ground-Ground): Inter-Centre coordination
B2-SWIM SWIM (Air-Ground): Aircraft integration
ATM Information Reference and Service Model, Common Governance, ISO, OGC, etc.


INFORMATION MANAGEMENT
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
FLIGHT & FLOW
CAPABILITIES
ENABLERS
AIS/AIM
CAPABILITIES
ENABLERS
METEOROLOGY
CAPABILITIES
ENABLERS
B1-DAIM, B1-FICE
B2-FICE
B3-FICE, B3-TBO
Exchange of Flight Intents before Departure
(initial FF-ICE)
Flight and Flow Coordination
(initial FF-ICE)
4D Trajectories, Full FF-ICE
FIXM
B0-DAIM
B1-DAIM
AIS-AIM Enhanced quality
Paper --> Digital data availability
Digital Data exchange & services, shorter update cycles
Electronic Charts, Digital Briefing, In Flight updates
Digital NOTAM
eAIP, AIXM
Traditional alphanumerical codes replaced by digital data; enhanced quality
B1-DAIM, B1-AMET
B3-AMET
Digital MET Data exchange & MET information services,
In Flight updates
WXXM


AVIONICS
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
COMMUNICATIONS
FANS 1/A with Comm, Nav Integration (via ACARS)
B0-ITP, B0-TBO, B0-FRTO
B1-RSEQ
FANS 2/B with Comm, Nav Integration (via ATN B1)
ENABLERS
FANS 3/C with CNS Integration (via ATN B2)
B1-RSEQ, B1-TBO
B2-SURF, B2-ASEP, B2-CDO
B3-TBO
Aircraft access to SWIM
B2-SWIM
B3-FICE, B3-AMET
SURVEILLANCE
B0-ASEP, B0-ITP
B1-SURF, B1-ASEP, B1-SNET
B2-75, B2-ASEP, B2-ACAS
Traffic Computer
ENABLERS
ADS-B In/Out (ICAO Ver. 2)
ADS-B In/Out (ICAO Ver. 3)
B1-ASEP
B2-SURF, B2-ASEP
Surveillance Integration (via ATN B2)


AVIONICS
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
NAVIGATION
ENABLERS
B0-FRTO
B1-FRTO
INS
Multi-Sensor Navigation Management
B0-FRTO
B1-APTA, B1-FRTO, B1-CDO
Multi-Constellation/Freq & Multi-Sensor
B1-APTA
B3-FRTO, B3-TBO
FMS supporting PBN
B0-FRTO, B0-CDO
B1-APTA, B1-FRTO, B1-CDO
B2-CDO
FMS Initial 4D
B1-TBO
FMS Full 4D
B3-FRTO, B3-TBO
Airport Navigation Integration (via ATN B2)
B1-TBO


AVIONICS
BLOCK 0
2018
BLOCK 1
2023
BLOCK 2
2028
BLOCK 3
AIRBORNE SAFETY NETS
ENABLERS
TAWS
CAPABILITIES
B0-ACAS
ACAS 7.1
B2-ACAS
Future ACAS
ONBOARD SYSTEMS
DISPLAYS
Weather Radar
B2-WAKE
Airport Moving Map
B0-SURF
B1-SURF, B1-TBO
EVS
B1-SURF
B2-SURF
SVS
B0-ASEP, B0-ITP
B1-SURF, B1-ASEP
B2-SURF, B2-ASEP, B2-CDO
B3-AMET
Electronic Flight Bags

North American Central American and Caribbean (NACC) Office MexicoCity
South American (SAM) Office Lima
ICAO Headquarters Montreal
Western and Central African (WACAF) Office Dakar
European and North Atlantic (EUR/NAT) Office Paris
Middle East (MID) Office Cairo
Eastern and Southern African (ESAF) Office Nairobi
Asia and Pacific (APAC) Office Bangkok

Thank You