

**ALL INDIA RAIL SAFETY COUNCIL**

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# KAVACH: INDIGENOUS TRAIN PROTECTION

**INDIGENOUS TECHNOLOGY.  
INTELLIGENT PROTECTION.**

LINK LOCOMOTIVES, STATIONS, SIGNALS  
AND TRACK DATA • KAVACH ADDS AN  
AUTOMATIC SAFETY LAYER TO SUPPORT  
SAFE TRAIN OPERATION.



**CONNECT**



**MONITOR**



**WARN**



**PROTECT**



**VIKSIT BHARAT 2047**



**MAKE IN INDIA**



**NET ZERO 2070**



**DIGITAL INDIA**



**VISION ZERO**

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## WHY AUTOMATIC TRAIN PROTECTION

NEXT SIGNAL  
1200 m

### KAVACH BENEFITS

- PREVENTS SPAD
- AVOIDS OVERSPEED
- MINIMIZES HUMAN ERROR
- ENHANCES CAPACITY

KAVACH  
AUTOMATIC  
TRAIN PROTECTION  
SYSTEM

KAVACH

78  
km/h

SPEED PERMITTED: 80 km/h  
NEXT SIGNAL: 1200 m

SIGNAL  
ASPECT  
CLEAR

## WHEN HUMAN ATTENTION IS STRESSED, TECHNOLOGY MUST SUPPORT SAFETY.

SUPERVISE SIGNALS AND SPEED CONTINUOUSLY •  
PROVIDE TIMELY WARNINGS AND AUTOMATIC INTERVENTION WHEN REQUIRED.



OBSERVE



COMPARE



ALERT



INTERVENE



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# INDIGENOUS DEVELOPMENT OF KAVACH

**DESIGNED IN INDIA.  
BUILT FOR INDIAN RAILWAYS.**

DEVELOP, TEST AND MANUFACTURE SAFETY-CRITICAL  
TECHNOLOGY **LOCALLY** • NATIONAL CAPABILITY  
STRENGTHENS RELIABILITY AND **SELF-RELIANCE**.



**DESIGN**



**DEVELOP**



**TEST**



**DEPLOY**



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## RADIO COMMUNICATION INFRASTRUCTURE



## RELIABLE COMMUNICATION. CONTINUOUS PROTECTION.

CONNECT LOCOMOTIVES AND STATIONS THROUGH RESILIENT RADIO LINKS •  
TIMELY DATA EXCHANGE IS ESSENTIAL FOR SAFETY-CRITICAL DECISIONS.



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## SIGNALLING SYSTEM INTEGRATION

**INTEGRATE CAREFULLY. PROTECT CONSISTENTLY.**

INTERFACE KAVACH WITH EXISTING SIGNALS, INTERLOCKING AND TRACK SYSTEMS - VERIFIED DATA MUST MATCH REAL OPERATING CONDITIONS.



INTERFACE



VALIDATE



SYNCHRONISE



PROTECT



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# RFID LOCATION & TRACK IDENTITY

**PRECISE LOCATION SUPPORTS  
PRECISE PROTECTION.**

TRAIN ID: 12951

DIRECTION: UP

KM: 342/18

SECTION: A - B



RFID TAG  
SECTION A - B  
KM 342/18

KAVACH ONBOARD UNIT

LOCATION CONFIRMED ✓

KM: 342/18

SECTION: A - B

DIRECTION: UP

A  
B  
C



**TAG**



**READ**



**LOCATE**



**CONFIRM**



**READ TRACKSIDE RFID TAGS TO CONFIRM TRAIN POSITION  
AND DIRECTION • RELIABLE LOCATION DATA  
STRENGTHENS SAFE SUPERVISION.**



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## HOW KAVACH WORKS

**KNOW THE TRAIN.  
KNOW THE SIGNAL.  
CONTROL THE RISK.**

COMBINE LOCATION, SPEED, MOVEMENT  
AUTHORITY AND RADIO DATA • CONTINUOUS  
SUPERVISION ENABLES WARNINGS AND SAFE BRAKING.



LOCATE



COMMUNICATE



COMPUTE



ACT



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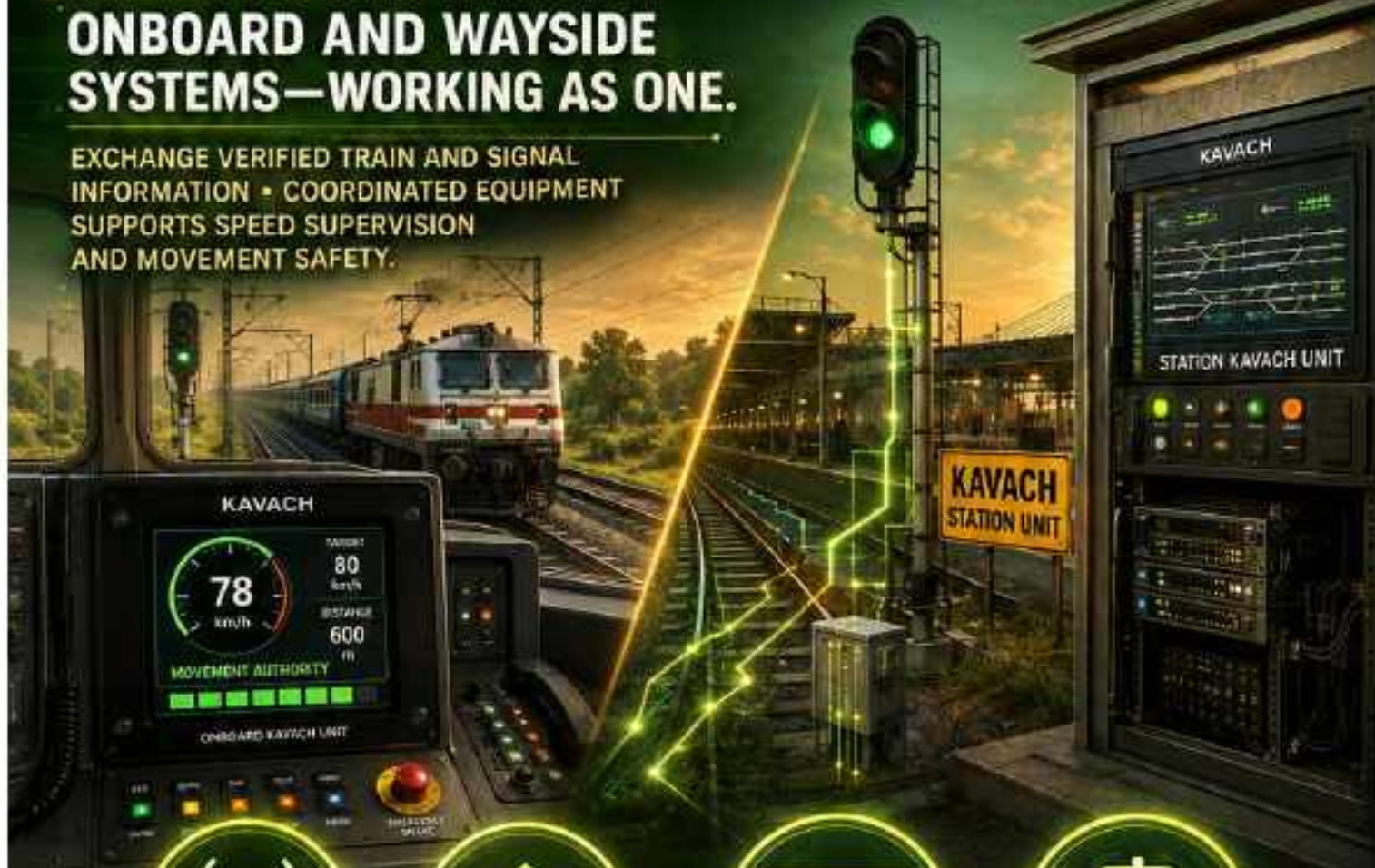
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# LOCO & STATION KAVACH

## ONBOARD AND WAYSIDE SYSTEMS—WORKING AS ONE.

EXCHANGE VERIFIED TRAIN AND SIGNAL  
INFORMATION • COORDINATED EQUIPMENT  
SUPPORTS SPEED SUPERVISION  
AND MOVEMENT SAFETY.



RECEIVE



VERIFY



DISPLAY



CONTROL



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## KAVACH

TRAIN PROTECTION SYSTEM

— SERIES 12 OF 12 —



## SPEED SUPERVISION & BRAKE INTERVENTION



### SAFE SPEED AT EVERY SIGNAL AND CURVE.

COMPARE ACTUAL SPEED WITH PERMITTED LIMITS • WARN THE DRIVER AND APPLY BRAKES AUTOMATICALLY IF SAFE ACTION IS NOT TAKEN



MEASURE



COMPARE



WARN



BRAKE



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# KAVACH 4.0 & FUTURE DEPLOYMENT



**UPGRADE SECURELY. DEPLOY RESPONSIBLY. SCALE SAFELY.**

STRENGTHEN FEATURES, CYBERSECURITY, INTEROPERABILITY AND NETWORK COVERAGE • FUTURE EXPANSION MUST PRESERVE VALIDATION AND SAFETY ASSURANCE.



**UPGRADE**



**SECURE**



**INTEGRATE**



**SCALE**



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## KAVACH

INDIGENOUS TRAIN PROTECTION SYSTEM



## TESTING, MAINTENANCE & TRAINING

**TEST COMPLETELY. MAINTAIN PRECISELY. TRAIN CONTINUOUSLY.**

VALIDATE EVERY INTERFACE, INSPECT EVERY ASSET AND PREPARE EVERY USER •  
SAFETY INTEGRITY DEPENDS ON LIFECYCLE DISCIPLINE.



TEST



CERTIFY



MAINTAIN



TRAIN



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KAVACH – INDIA'S INDIGENOUS  
AUTOMATIC TRAIN PROTECTION SYSTEM



# SIGNAL & LOW-VISIBILITY PROTECTION

KAVACH  
PROTECTION  
ENVELOPE



KAVACH STATUS  
**PERMISSIVE**  
SPEED RESTRICTION  
**30** km/h  
NEXT SIGNAL  
**GREEN – CLEAR**



## PROTECTION THAT DOES NOT DEPEND ON CLEAR WEATHER.

SUPPORT SIGNAL-PASSING PREVENTION AND SAFE OPERATION  
IN FOG, RAIN OR DUST • VERIFIED DIGITAL INFORMATION HELPS CREWS ACT CORRECTLY.



DETECT



INFORM



RESTRICT



STOP



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