

Dark Territory Supervision of Limits of Authority

Mt Isa Line, Queensland, Australia



Introduction

- World 1st System
- Enforces limits of authority and speed limits within 'dark territory'
- Integration of QR Direct Traffic Control (DTC) with WESTECT (ATP)
- Commenced operation July, 2004.





The Mt Isa Line – 1,000km from Townsville to Mt Isa



DTC System

- DTC is a computer assisted train order working system
- Train movements are governed by train movement authorities
- Train locations are updated by voice channel radio reporting
- DTC is an absolute block system.
- Train movements are to physical track locations marked by Block Limit Boards.

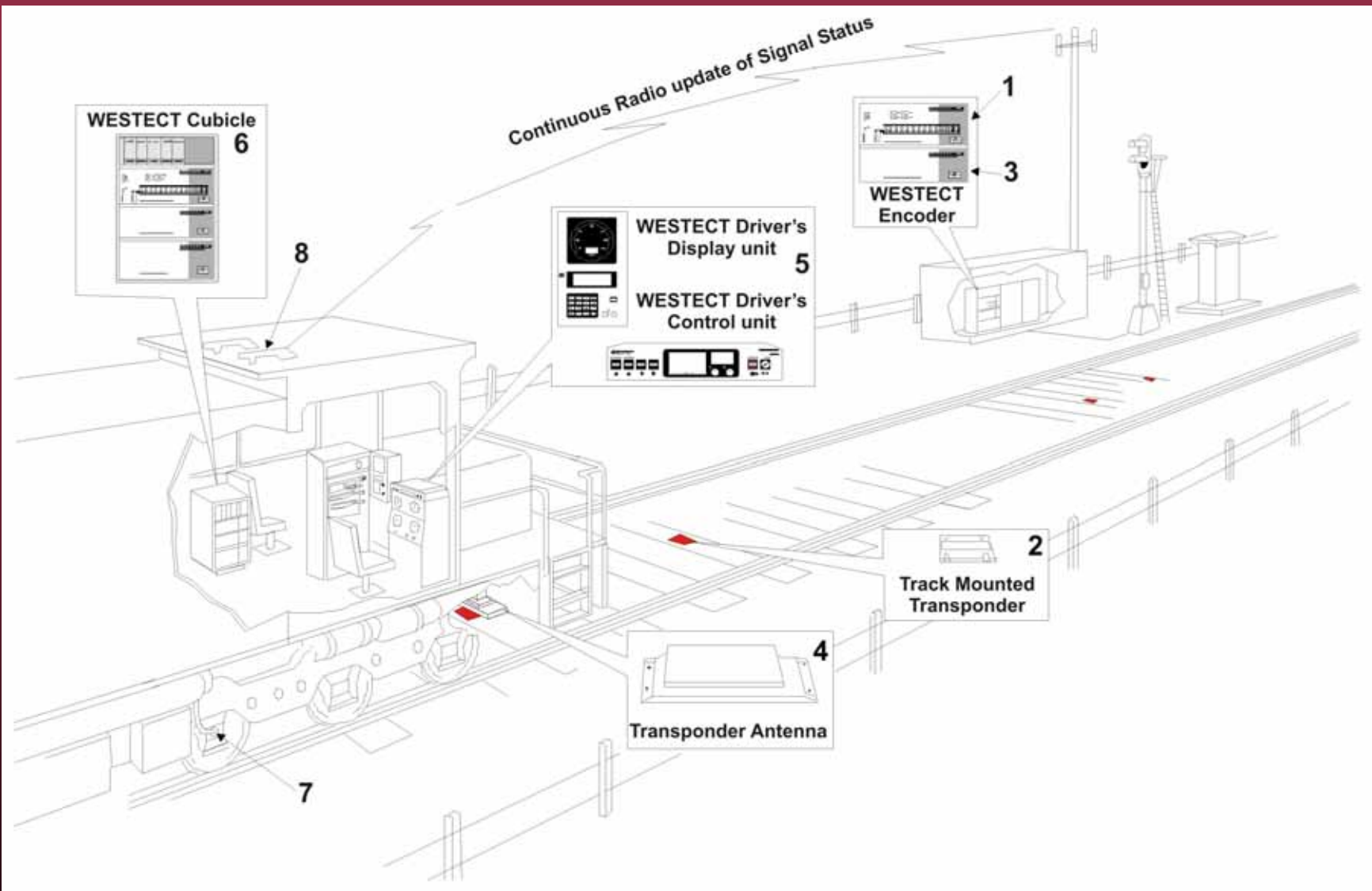


WESTECT ATP

Train Protection System

- Developed by Westinghouse Signals Australia for QR as an overlay for colour light signalling territory
- Three main components:
 - Wayside Encoder
 - Onboard System
 - Track Mounted Transponders

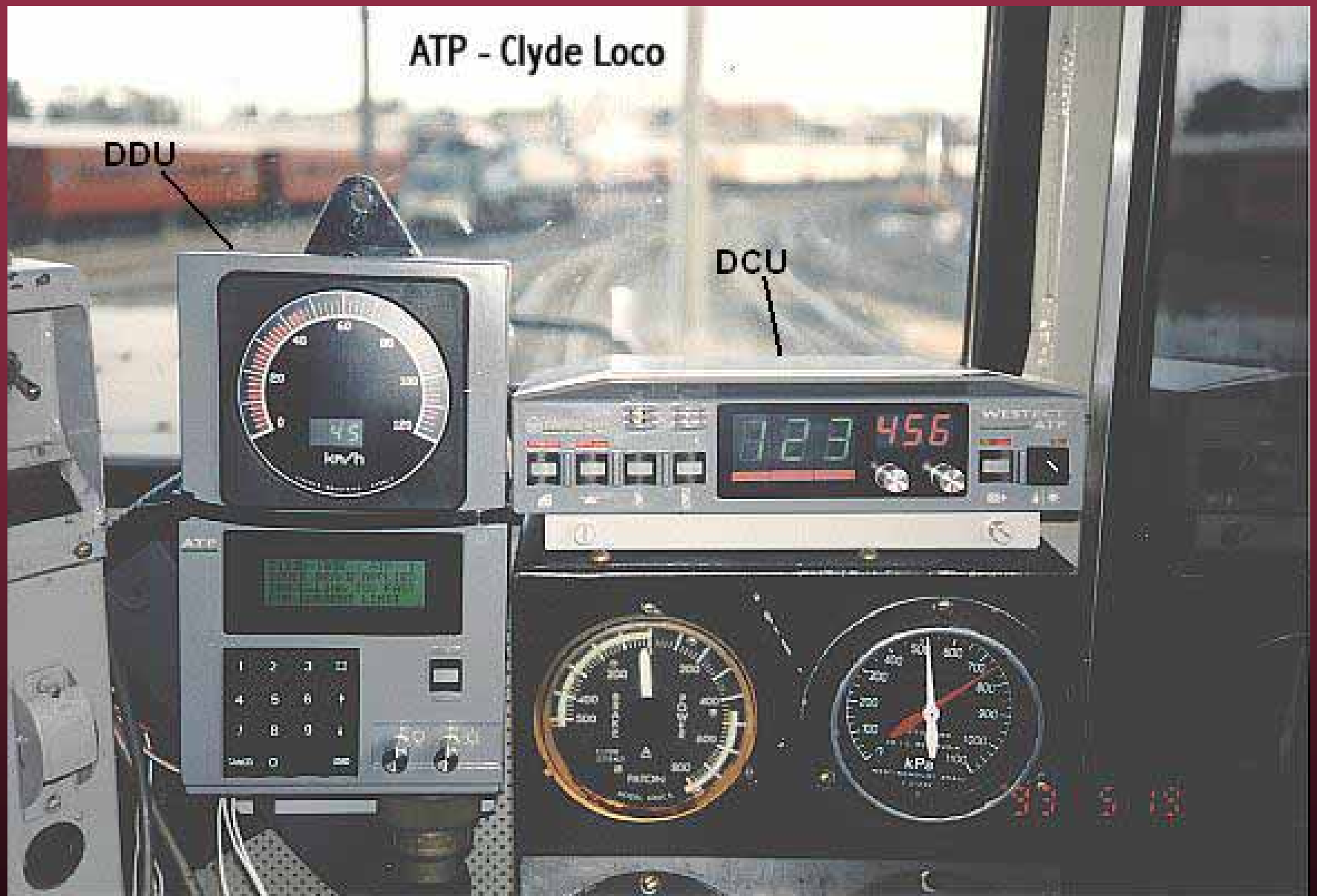




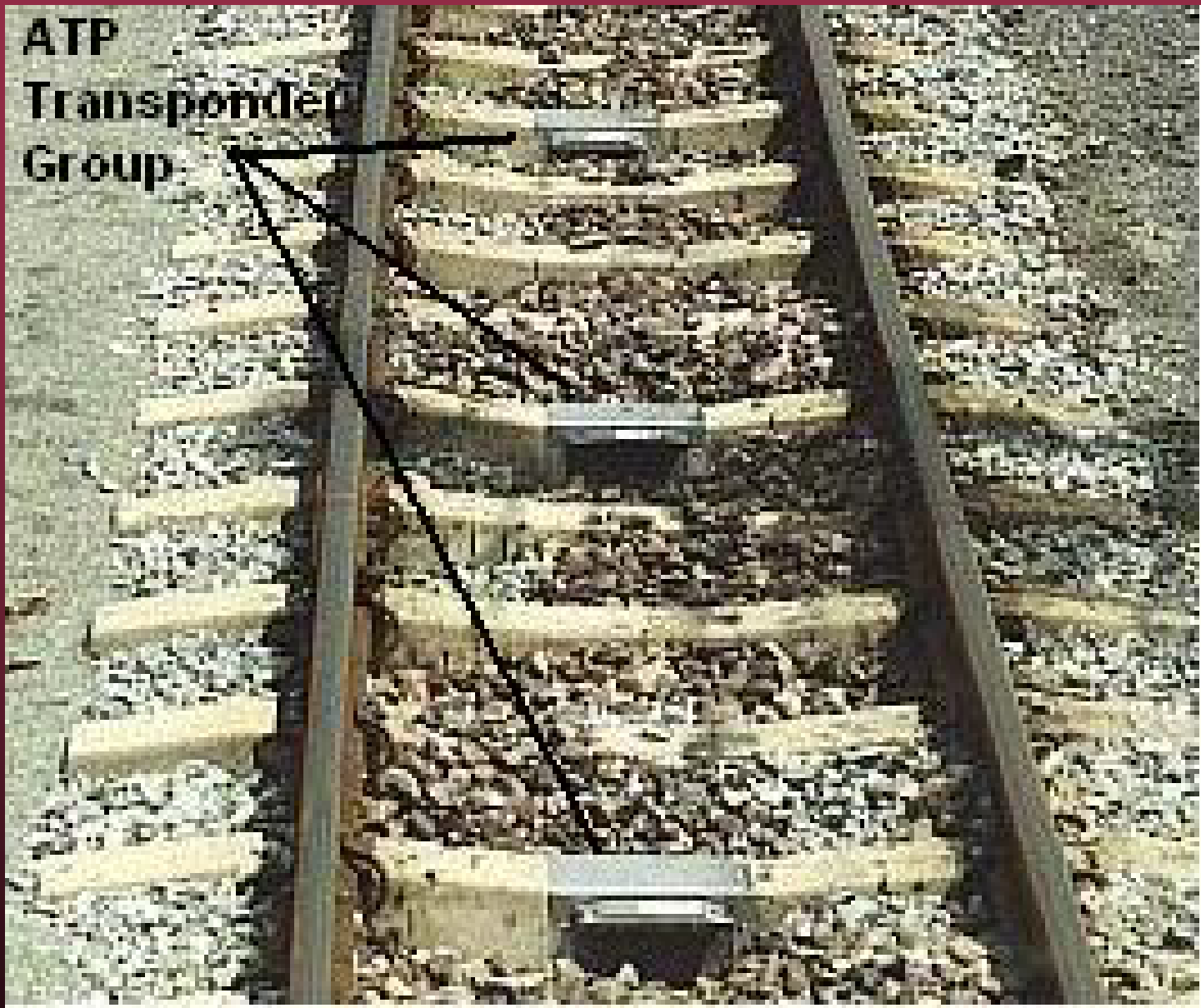
ATP - Clyde Loco

DDU

DCU



ATP
Transponder
Group



Application of ATP to Dark Territory

STAGE 1 (In operation from November 2000)

- Track mounted transponders provided 3Km approaching and in 55 station yards on the Mt Isa Line.
- The onboard system registers when ATP Territory is entered and then speed supervision commences.
- The driver is required to control the speed of the train to 25Km/h and acknowledge each Block Limit Board
- The onboard system exits ATP territory either when departing the yard on the fast road or holding train speed for 750m on the slow road



Application of ATP to Dark Territory (cont')

STAGE 2 (In operation from 1 July 2004)

- WESTECT ATP is provided with information about each train's limit of authority by the DTC driver workstation
- If the driver does not take action to control the train within the issued authority ATP will make a penalty brake application



Transitions in Safe Working on the Mt Isa Line

- Transition from Remote Controlled Signalling to DTC Territory
- Several yards have locally controlled colour light signals that are coordinated separately from the DTC authority issuing system
- Flynn requires supervision of both remotely controlled points and DTC authorities.



Train Carried Changes

112 locomotives are equipped with the ATP-DTC link. The changes included:

- Cabling between the ATP cubicle and the DTC driver's workstation
- Replacement of the ATP Radio Communications Modules to receive virtual encoder messages
- Revision of ATP software
- Revision of DTC software and track database



Trackside Changes

- QR developed a cost effective alternative for single isolated colour light signals for 6 locations.
- Flynn ATP Encoder and DTC authority provide route and speed information
- Several colour light signals under local control have been removed for through-DTC working.
- Temporary Speed Restrictions (TSR) can be supervised by TSR transponders



System Robustness

- DTC uses GPS to warn when transponders are missing. Train will stop if necessary
- If DTC fails, ATP reverts to the Block Limit Board Warning System (Stage 1)
- If ATP radios fail, ATP has features to allow restricted progress of trains.
- If the link signal is lost ATP to DTC, or DTC to ATP, fault reports are displayed and logged.



GPS DTC Warning

09-Nov-1999	QR DTC Version 1.07	11:12:30
Authority Exceeded	WN	58 - 59 kp
Current Authority		
Driver on Train WW01 - 0123 PROCEED to WOLDSTON WN 27 Then ENTER the WRONG (UP) Road STOP in the UP Road facing WN 25		
DANGER Authority Exceeded Press Enter		
Press R/REL to Release Blocks, or Enter a Command Code		

In the event that WESTECT ATP is unavailable, DTC provides audible and visual warnings to drivers



Outcomes Achieved

- The innovative ATP-DTC link system is the world's first commercially implemented dark territory limit of authority supervision system.
- The level of driver satisfaction with the system is high.



Outcomes Achieved

- The ATP-DTC link system as implemented is considered to be very cost effective when compared to other systems presently being developed.
- Safety of train operations on the Mt Isa line has been improved.

