

行政院及所屬各機關出國報告
(出國類別：其它)

出席臺日鐵路實務交流定期會議
(2ND TAIWAN-JAPAN RAILWAY PRACTICAL
INTERCHANGE AND COOPERATION PERIODICAL
MEETING)

服務機關：交通部高速鐵路工程局

職 稱：代理局長 組長 正工程司兼科長

姓 名：胡湘麟 楊正君 劉建宏 賴美孜

派赴國家：日本

出國期間：103 年 03 月 11 日～03 月 14 日止

報告日期：103 年 06 月 10 日

提 要 表

系統識別號：	C10300726					
計畫名稱：	參加「台日鐵路實務交流定期會議」					
報告名稱：	出席台日鐵路實務交流定期會議					
計畫主辦機關：	交通部高速鐵路工程局					
出國人員：	姓名	服務機關	服務單位	職稱	官職等	E-MAIL 信箱
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前往地區：	日本					
參訪機關：	日本公益財團法人交流協會、日本東海旅客鐵道株式會社技術開發部					
出國類別：	其他					
出國期間：	民國103年03月11日 至 民國103年03月14日					
報告日期：	民國103年05月30日					
關鍵詞：	高速鐵路					
報告書頁數：	20頁					
報告內容摘要：	第2屆臺日鐵路實務合作交流會議由日方主辦，於103年3月12日假公益財團法人交流協會召開，由日本國土交通省鐵道局羽尾審議官一郎與我交通部高速鐵路工程局胡代理局長湘麟共同主持，雙方就鐵路安全監理作業及海外拓展鐵路政策進行交流，並就目前辦理之鐵路業務進行經驗分享。					
電子全文檔：	C10300726_01.pdf					
出國報告審核表：	C10300726_A.pdf					
限閱與否：	否					
專責人員姓名：						
專責人員電話：						

摘 要

第 2 屆臺日鐵路實務合作交流會議由日方主辦，於 103 年 3 月 12 日假公益財團法人交流協會召開，由日本國土交通省鐵道局羽尾審議官一郎與我交通部高速鐵路工程局局胡代理局長湘麟共同主持，雙方就鐵路安全監理作業及海外拓展鐵路政策進行交流，並就目前辦理之鐵路業務進行經驗分享。

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壹、目的

爲促進臺灣及日本在高速鐵路業務之交流與合作，第 1 屆臺日鐵路實務合作交流會議由我方主辦，於 102 年 3 月 12 日召開共同討論雙方合作事宜，並達成初步共識。嗣後我方亞東關係協會及日方公益財團法人交流協會於 102 年 11 月 5 日簽署「加強鐵路業務交流及合作瞭解備忘錄」，臺日雙方將於每年輪流召開實務層級定期會議，俾加強雙方在鐵路運轉、安全與防災、海外拓展等方面之經驗交流與協助。

第 2 屆臺日鐵路實務合作交流會議由日方主辦，於 103 年 3 月 12 日假公益財團法人交流協會召開，由日本國土交通省鐵道局羽尾審議官一郎與我交通部高速鐵路工程局局胡代理局長湘麟共同主持，雙方就鐵路安全監理作業及海外拓展鐵路政策進行交流，並就目前辦理之鐵路業務進行經驗分享。

貳、行程

本次行程除出席日方舉辦之第 2 屆臺日鐵路實務合作交流會議外，為充實行程擴大出訪效果，另安排參訪日本 JR 位於東京車站之運轉指令所(行控中心)，以及 JR 東海旅客鐵道株式會社研究機構，另外拜會丸紅株式會社，行程自 103 年 3 月 11 日起至 3 月 14 日止，共計 4 日，行程表詳表 1。

表 1 行程表

日期	行程摘要	地點
3 月 11 日 (星期二)	去程(台北→東京)	-
3 月 12 日 (星期三)	1. 出席第 2 屆臺日鐵路實務合作交流會議 2. 參觀 JR 東海運轉指令所 3. 拜會丸紅株式會社	東京
3 月 13 日 (星期四)	參觀 JR 東海旅客鐵道株式會社研究機構	名古屋
3 月 14 日 (星期五)	返程(東京→台北)	-

參、過程

3-1 第 2 屆臺日鐵路實務合作交流會議

爲促進臺灣及日本在高速鐵路業務之交流與合作，第 1 屆臺日鐵路實務合作交流會議由我方主辦，於 102 年 3 月 12 日假本局召開，本局與日本國土交通省鐵道局共同討論雙方合作事宜，並達成初步共識。嗣後我方亞東關係協會及日方公益財團法人交流協會於 102 年 11 月 5 日簽署「加強鐵路業務交流及合作瞭解備忘錄」，臺日雙方將於每年輪流召開實務層級定期會議，俾加強雙方在鐵路運轉、安全與防災、海外拓展等方面之經驗交流與協助。

第 2 屆臺日鐵路實務合作交流會議由日方主辦，於 103 年 3 月 12 日上午 10 點假公益財團法人交流協會（日本東京六本木）召開，由日本國土交通省鐵道局羽尾審議官一郎與本局胡代理局長湘麟共同主持。我方與會單位除本局外，尚包括台灣高鐵公司；日方與會單位除國土交通省鐵道局外，尚包括交流協會及 JR 東海株式會社。臺日雙方就鐵路安全監理作業及海外拓展鐵路政策進行交流；此外，雙方並就目前辦理之鐵路業務進行經驗分享，包括本局說明目前規劃中之機場捷運站外 check-in 及行李托運準備情形；台灣高鐵公司報告南港車站機電系統辦理情形；日方 JR 東海株式會社則說明最新 700N 系列及其 ATC 系統。

本次會議我方對日方鐵路監理、事故調查機制、誤點賠償等獲益良多，胡代理局長並再次表達我國交通部對臺日鐵道合作的支持，希望雙方建立窗口持續合作；羽尾審議官表示臺灣高鐵系統安全績效良好，未來臺日合作拓展海外市場前景看好。會議於 13:30 圓滿結束。

本次會議議程如表 2，出席會議情形詳圖 3-1、圖 3-2，各單位提出之簡報資料詳如附件。出席人員如下：

我方—台北駐日經濟文化代表事務所：徐鼎昌副組長、何天賜秘書

交通部高速鐵路工程局：胡湘麟局長、楊正君組長、賴美孜科長、劉建宏科長

台灣高鐵公司：黃晴裕協理、史明嘉協理、王建淇專員

日方－交流協會：情野久美子部長、角田徑子副長

國土交通省鐵道局：羽尾一郎審議官、潮崎俊也課長、小林知宏室長、深田遵課長補佐、四元昌弘專門官、鈴木雅史係長

JR 東海：上野雅之副室長、加賀山慶一副室長、佐藤賢司担当課長

翻譯：矢野麻惟子小姐

表 2 第 2 屆臺日鐵路實務合作交流會議議程

Time	Content
10:00-10:20	開幕致詞 日方 ● 交流協會情野久美子部長 ● 國土交通省鐵道局羽尾一郎審議官 我方 ● 台北駐日經濟文化代表事務所徐鼎昌副組長 ● 本局胡湘麟代理局長
10:20-11:00	主題 1：鐵路安全監理 ● 日本鐵路安全監理(鐵道局國際課協力室小林知宏室長) ● 臺灣鐵路安全監理(高鐵局第一組楊正君組長) ● 討論
11:00-11:05	休息
11:05-11:35	主題 2：鐵路海外拓展政策 ● 日本新幹線系統海外拓展(鐵道局國際課協力室深田遵課長補佐) ● 臺灣鐵路海外拓展政策(高鐵局第一組楊正君組長) ● 討論
11:35-12:30	主題 3：其他 ● N700 系統及其 ATC(JR 東海技術企劃部上野雅之副室長) ● 機場捷運站外報到及行李託運規劃(高鐵局第六組劉建宏科長) ● 南港車站軌道及機電核心系統辦理情形(台灣高鐵公司王建淇) ● 討論
12:30-12:40	閉幕致詞 ● 國土交通省鐵道局羽尾一郎審議官 ● 本局胡湘麟代理局長
13:30-	餐敘



圖 1 第 2 屆臺日鐵路實務合作交流會議



圖 2 日本國土交通省鐵道局羽尾審議官與本局胡代理局長互贈紀念品

3-1-1 鐵路安全監理

本局就我國高鐵安全監理提出報告，報告分 2 部分，第 1 部分為我國安全監理系統，內容包括組織、法令及作為；第 2 部分為臺灣高鐵之安全分析；日方報告分 2 部分，第 2 部分說明日本鐵路安全政策，第 2 部分為政府扮演角色，包括鐵道局及行車調查委員會。以下謹就雙方報告及交流，整理臺日之鐵路監理機關、監理法令及行車事故調查機制，說明如下：

一、鐵路監理機關

日本國土交通省鐵道局為鐵路監理之中央專責機關，我國則尚無鐵路監理專責機關。

我國鐵路安全監理主管機關為交通部，高鐵局受交通部之命，於完成高鐵興建期之監理技術幕僚任務後，自 2007 年高鐵通車後接續辦理高鐵營運監理作業。另自 2011 年起，藉由本局人力及辦理高鐵營運監理累積之實務經驗，成立交通部鐵路營運監理小組，協助交通部辦理國內所有鐵路之監理，包括台鐵、阿里山森林鐵路及台糖鐵路。未來本局將配合政府組織改造，與鐵路改建工程局合併改制為鐵道局，鐵道局下設營運監理組，未來鐵道局將成為我國辦理鐵路監理之專責機關。

二、鐵路監理法令

我國監理法令依據為鐵路法及其子法，其規定涵蓋鐵路機構應遵循之有關設備、人員、規章及接受主管機關查核之相關規定。在安全監理作為則特別強調事故/事件通報、定期/臨時檢查及事故調查。

臺日雙方之鐵路法令架構概念及內涵大致相同，惟日本之鐵路規模大，鐵路機構多達 205 家，檢查係責由地方交通局執行，在檢查頻率乙節並未如我國執行年度一次定期檢查，鐵道局在 2012 年針對 50 家鐵路機構辦理 60 次定期檢查，另針對 3 家鐵路機構辦理臨時檢查，通常以體質及績效較差之鐵路機構為受檢對象。

我國目前執行檢查之鐵路機構僅限於高鐵、林鐵及糖鐵，台鐵尚以管理方式

爲之，目前正在立法院審議之鐵路法修正草案通過後，未來台鐵亦將納入交通部(或鐵道局)之檢查對象。

三、鐵路行車事故調查

在鐵路行車事故調查機制部分，日本於國土交通省下設一大眾運輸行車事故調查委員會，由鐵路、航空及海運三委員會組成，在有列車衝撞、出軌、失火、人員死傷及財損之事故發生時啓動。2013 年共啓動 16 次。

我國依鐵路法係由鐵路機構自行調查研究與鑑定責任，因此，台鐵之事故調查目前仍以台鐵局內部自行調查爲主，高鐵則除由台灣高鐵公司內部調查外，交通部並成立高鐵行車事故處理小組，遴聘國內具鐵路營運、土建、機電及法律等專業之 11 名產官學界專家擔任委員，辦理高鐵重大行車事故調查相關事宜。惟截至目前尚未啓動過。

另交通部之鐵路事故調查之法令授權，並已納入鐵路法修正草案中，未來我國行車調查之運作模式，究於交通部下設一獨立委員會，或由行政院飛航安全委員會改制爲運輸安全委員會，則應進一步評估法令調查權責之競合及行政機關組織業務分工，通盤檢討。日本之大眾運輸安全委員會之運作模式，值得參考。

3-1-2 鐵路海外拓展政策

根據 UNIFE(歐洲鐵路產業協會)評估，全球鐵路產業市場約有 1,360 億歐元，每年並以 2-2.5% 速度成長。基此，日方希望以其推動新幹線之確保安全概念(專用路權、獨立自動控制系統、人員嚴格訓練以消除事故風險)、新幹線系統自有技術(車輛製造研發、自動列車控制、行車控制系統)以及嚴謹的教育訓練(50 年無死傷事故之營運經驗)，搭配新幹線唯一輸出案例－臺灣高鐵－之良好營運績效，共同拓展海外市場。

本局表示與日方之合作，政府樂見其成並將予以支持。另外，我國在推動高鐵計畫上，無論在官方、鐵路機構、顧問公司及相關配合廠商累積相當的經驗，包括可行性研究、民間參與投資法規制定、各系統整合、各部門整合、土地開發、

財務計畫及售票系統...等。過去許多國家針對我國高鐵計畫表達欲汲取經驗並派員來訪，包括歐美、澳洲、印度、泰國、韓國(後續延伸計畫)、越南、馬來西亞、新加坡等國家之政府機構、國會議員/助理或學術單位，透過外交部、經濟部或主動逕洽本局安排拜會討論。我國推動經驗可供其他國家，特別是與我國相同必須引進他國高鐵系統技術的國家，作為推動高鐵建設的參考。

3-1-3 N700 系統

東海道新幹線自 1964 年開通迄今 50 年，保持無導致旅客死傷之行車事故之紀錄，列車平均延誤時間 0.5 分鐘，平均每日開行 323 列次、每列車 1,323 座位，每日運量 40.9 萬人次。最高營運速度將於 2015 年提昇為每小時 285 公里。

東海新幹線行駛列車由第 1 代 0 系列車及 1985 年 100 系，均為鋼製車體及傳統式轉向架，1992 年 300 系以後含 1999 年 700 系車輛則採輕量鋁製車體、改良轉向架、交流驅動馬達及再生煞車系統，不斷提昇列車在安全、速度、舒適。2007 年發展之 N700 系及 N700A 系，除了車輛性能舒適提昇外，ATC 採數位電子化為一大突破，該 N700 及 N700A 系列車即為小牧研究中心所研發，JR 東海及該中心均以該成果為傲。



圖 3 新幹線 N700A 系列車

N700 及 N700A 研發有 4 大概念－安全、可靠、舒適及環保。在確保安全部分，N700 系改良煞車碟安裝方式，降低車輪因煞車熱導效應，煞車力較 700 系提高 15%，N700A 再改良，煞車力又較 N700 系提昇 15%。另外，N700 系發展地震煞車系統，當地震發生時，ATC 自動偵測並啟動，其較正常煞車力更大，煞車距離較 700 系縮短 10%，N700A 之煞車距離更較 700 系縮短 20%。

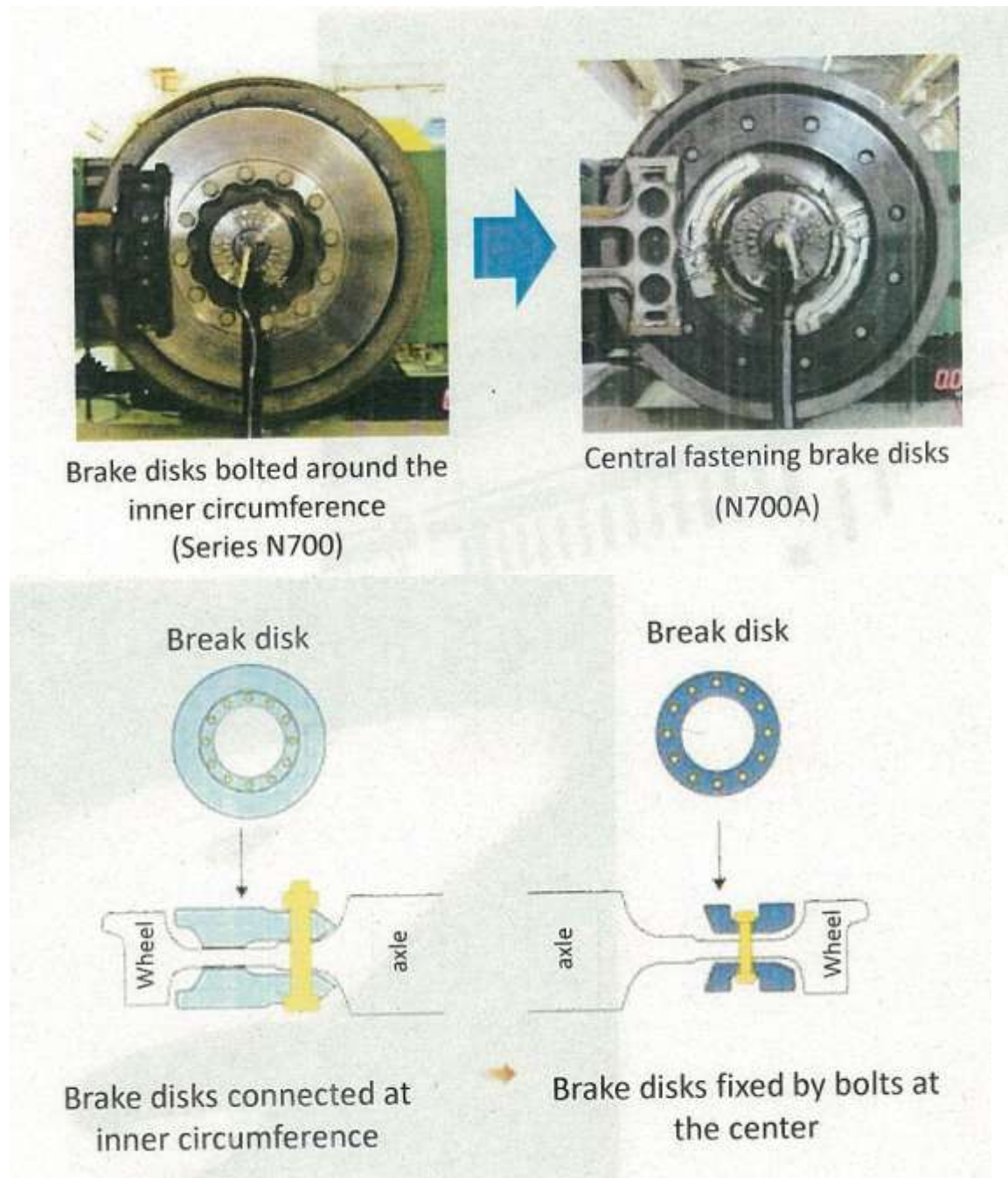


圖 4 N700A 煞車碟改良示意圖

在環保方面，N700/N700A 系改良其再生電力系統，當列車煞車時，馬達發電將傳回電車線供其他列車加速時使用，相較 700 系，其可節省 19%之能源消耗。

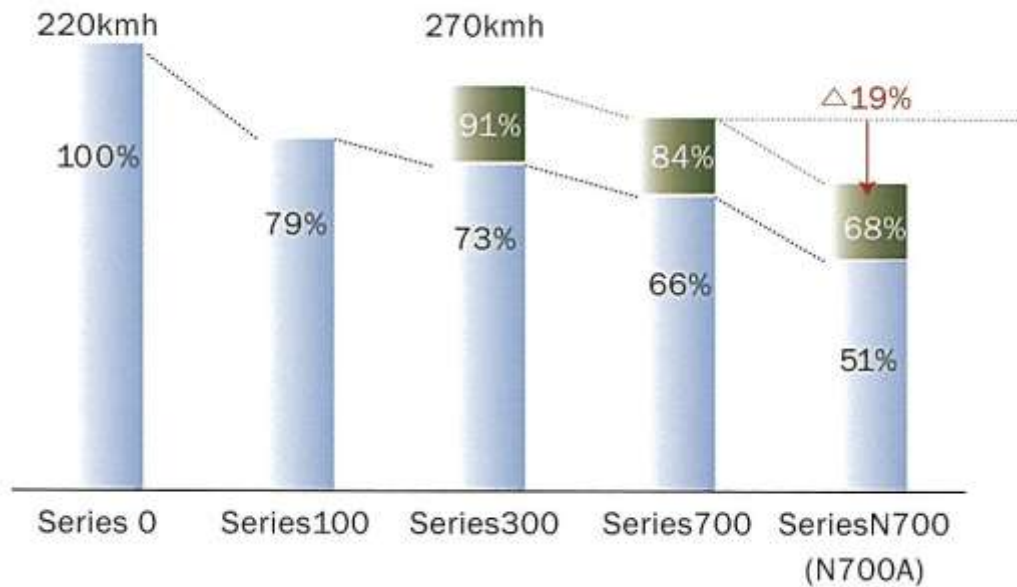


圖 5 N700A 能源消耗提昇比較圖

在可靠方面，運用最新的滑行控制系統，目標速度可由 ATC 依號誌、列車位置及軌道資訊自動計算後傳回，不再是固定數值，可有效進行趕點，降低列車延遲。

N700 系之 ATC 系統為數位化號誌系統，可有效防止列車碰撞及超速，其結合地面號誌設備及車載號誌設備，使列車運行更準確及有效率。諸如地面號誌可準備傳回前一列車之位置並自動計算煞車曲線，當速度大於煞車曲線之容許速度，則將自動減速煞車。

運用 ATC 數位化技術，分析近 7 年 130 列車超過 5.30 億筆資料，進行車輛設計及維修作業之研發改進作業，提昇 N700 列車最高速度達 300 公里，列車行駛時之空轉滑行比率大幅降低，為 100 系列車之 1/200，列車行駛效能顯著提昇。

N700A 在提供旅客舒適乘坐環境部分也有改良，例如商務艙加裝閱讀燈、改良車廂地板及車體內裝材質，降低噪音、智慧型空調系統依據車廂人數調整強度、提供電插座及無線網路、設置吸煙室、傾斜式車體降低顛簸及振動等，另外，車

廂並裝置有保全監視器及求救鈴。

目前東海道新幹線計有 700 系列車 40 輛、N700 系列車 80 輛、N700A 系列車 13 輛，未來將逐漸汰換。

3-2 JR 東海綜合技術研究機構(小牧研究中心)

JR 東海(東海旅客鐵道株式會社)轄管日本東海道新幹線及以東海地區 12 條在來線，總服務範圍面積雖僅佔日本 23.7%，惟服務範圍人口為日本人口的 60%、該範圍 GDP 則佔日本 64%。其每公里營運年收入高達 5,850 美元，為 JR 之最，2013 年底盈餘約 20 億美元。JR 東海收入 85% 以上來自東海道新幹線。

JR 東海自 1987 民營化成立公司後，持續針對確保安全可靠、提速、提昇服務及降低成本等，進行相關研究及開發工作。其除致力於運輸服務外，並自成立以來即積極更新老舊列車，目前東海道新幹線列車均為民營化後設計製造的，2008 年收購日本車輛製造，加強列車的開發、設計及製造。臺灣高速鐵路所使用的 700T 型列車是日本新幹線技術首次輸出國外，該型車即源自 JR 東海與 JR 西日本聯合開發的 700 型列車。JR 東海綜合技術部技術開發部並進一步在 2007 年完成開發 N700 系列，2013 年開發完成 N700A，該 N700 及 N700A 之開發均由小牧研究中心進行。除此之外，小牧研究中心之主要研發成果尚包括軌道出軌護欄、車輪阻出軌裝置、可動式月台門...等。

小牧研究中心係於 2002 年成立以整合 JR 東海之技術開發設備及作業。小牧研究中心之成立有三大目標，其一為：為鐵路工業確保行車安全及可靠運輸尋求解決之道；其二為：以中長期觀點追求新技術發展，其中以確保行車安全及可靠為首要任務。此外，該研究中心並專注於提昇東海道新幹線的服務以及降低成本之研發工作。

小牧研究中心為應用最先進設備的全方位研究中心，設於日本名古屋北部小牧東側的 Aichi 學術研發園區，佔地 73 公頃，廠房設備則約佔 20 公頃，包括研究大樓及 3 處實驗大樓、結構綜合測試線、電車線試驗裝置...等，主要設備包括車廂動態模擬器、架空線振動測試線、軌道及結構物動態模擬器、隧道風洞模擬器...等，分別說明如后：

- 車廂動態模擬器

模擬 700 型車廂內外環境，用以研究乘座舒適度。可模擬列車行駛時之 3 向傾斜及加速度，以及車內照明、空調、音響、車窗外車站、隧道、鐵橋及對向列車等情境。



- 低噪音風洞

為日本建立的第 1 座低噪音隧道風洞模擬器，可模擬相對風速達每小時 350 公里，其具有低噪音設備，在 300 公里風速測試下，背景噪音值僅達 78 分貝。



- 列車運行試驗裝置

模擬列車高速及隧道中運行時，車輪、連結器、輪軌接觸...等的實際狀況，並可模擬列車因地震產生縱向及橫向移動、振動之情形。



- 移動式載重試驗裝置

模擬列車高速運行時，其載重、因軌道不平整造成車輪上下振動等運動，對軌道產生之相互效應。



- 多軸式列車載重模擬裝置

以油壓千斤頂模擬東海道新幹線結構體經長期列車運行後產生之疲乏效應。



- 構造物三軸承重試驗裝置

可測試各種形狀土木結構物在承受持續的、不同方向的應力後之效應。

在設計高性能、低成本之土木結構，以及在研究安全、有效、低成本之地震後結構補強方法，有良好成果。



- 土木結構(高架橋路基)測試

廠區內以應用於實際土木結構之材料，興建一段標準型式之水泥橋梁及路基，用以觀察土木結構生命週期、測試災害預防措施以及新技術運用前之測試等。



- 架空線振動試驗裝置

總長 120 公尺，架空線電桿支架為可移動式，用以測試電車線及其構成元件之振動耐久性。



- 電車線試驗裝置

用以測試新開發之電車線之效能。本裝置有 600 公尺長，可模擬列車運行時之實際電車線之動態，用以開發低成本、高性能及易維修之電車線設備。



- 壓縮型鋼製防振支柱工法

設於橋柱中央之鋼造支架(剪力轉換器)在地震發生時，可吸收震動而變形。該支架並可控制墩柱變形、預防橋梁整個崩塌。

該剪力轉換器較油壓器易於維修，安裝亦較不受限於墩柱條件。

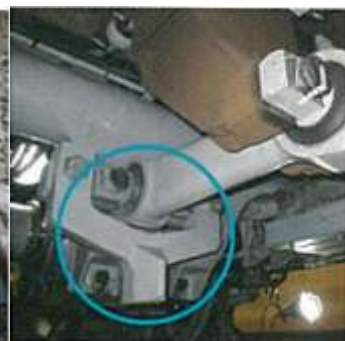


- 防出軌護軌、防出軌阻輪器

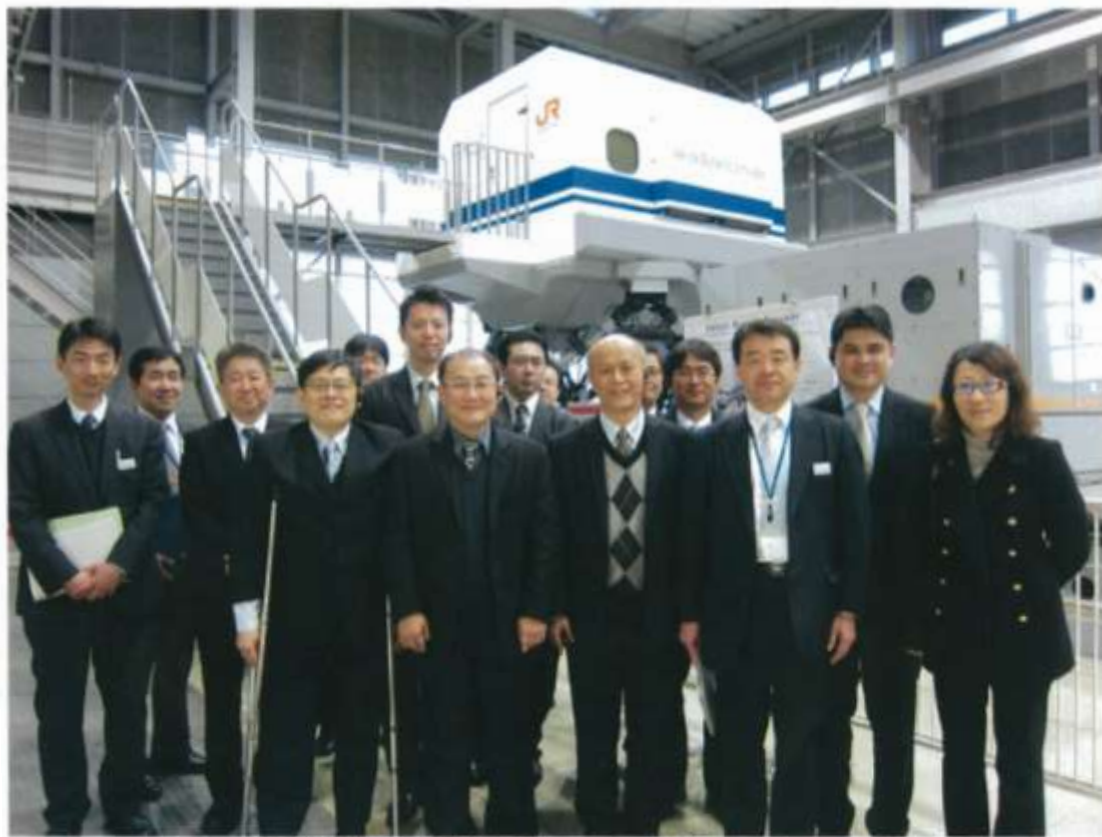
1995 阪神地震後，JR 東海即傾全力研究提昇東海道新幹線於地震發生時之安全對策，包括高架路段軌道抗震防護設備。2004 年新瀉地震後，發展新的防出軌設備，包括軌道上安裝防出軌護軌以及車輪上安裝防出軌器。



防出軌護軌



防出軌阻輪器



Technology Research and Development Department (KOMAKI)
Central Japan Railway Company 13th March, 2014

圖 6 參訪 JR 東海小牧研究中心



圖 7 胡代理局長致贈小牧研究中心紀念品

3-3 東京車站 JR 總合調度所

東海轄內東海道新幹線，由東京至新大阪全長 552.6 公里、17 個車站，連接東京、名古屋及大阪三大城市，均由東京總合調度所控制其行車、車輛及組員運用、設備、電力及號誌系統。東京 JR 總合調度所除了為 JR 東海之行控中心外，亦為 JR 西日本及 JR 九州聯合中央行車控制中心，集中設置於同一樓層同一空間辦公室，JR 東海派駐 41 名控制員、JR 西日本派駐 35 名及 JR 九州則派駐 9 名，共 85 名控制員監控各該管轄新幹線行車範圍。



圖 8 東京總合調度所

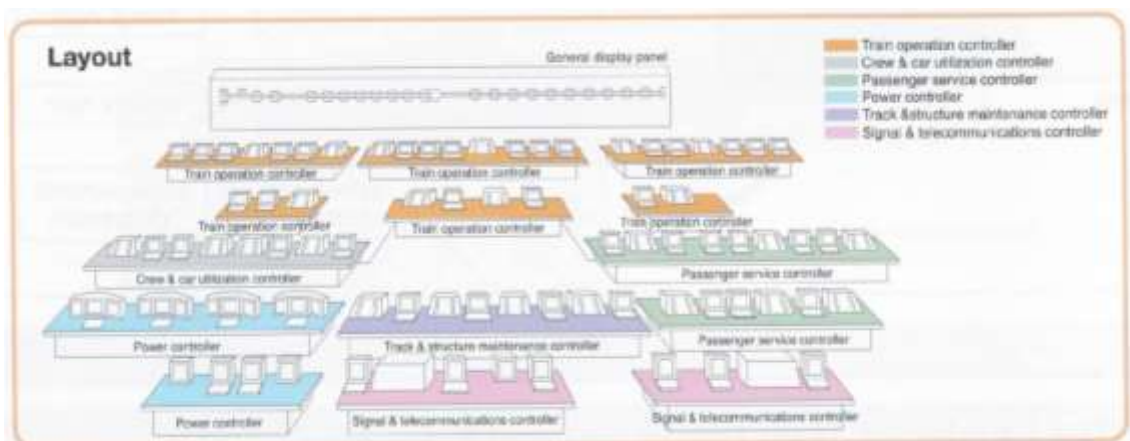


圖 9 東京總合調度所配置(JR 東海部分)

肆、心得與建議

4-1 心得

- 一、我國與日方於 102 年 11 月 5 日簽署「加強鐵路業務交流及合作瞭解備忘錄」，同意每年召開一次定期會議並由雙方輪流舉辦，本次赴日參加第二次會議，就臺日雙方鐵路合作定期交流之進行模式，有更進一步之共識。
- 二、本次會議臺日雙方就鐵路安全監理作業及海外拓展鐵路政策進行交流，雙方並就目前辦理之鐵路業務進行經驗分享。另外，我方對日方鐵路監理、事故調查機制、誤點賠償等獲益良多，並再次表達我國交通部對臺日鐵道合作的支持。日方則表示臺灣高鐵系統安全績效良好，未來臺日合作拓展海外市場前景看好。
- 三、日本東海旅客鐵道株式會社轄管日本東海道新幹線及以東海地區 12 條在來線，經營路線位於日本人口聚集主要地區、載客量最高。JR 東海持續進行相關研究及開發工作，並以確保鐵路行車安全及可靠、追求新技術發展、提昇東海道新幹線的服務以及降低成本為目標。
- 四、日本新幹線票價為運賃+料金，其中運賃為運送費用，料金則為額外服務費用，如訂位(座席料金及寢台料金等)、快速(急行、特急料金)、座艙等級(Green 料金)等。新幹線之遲延退費係採遲延超過 120 分鐘，退還旅客特急(急行)料金，不退運賃。其作法與現行台灣高鐵公司遲延超過 30 分鐘/60 分鐘，退還旅客票價一半/全額之概念不同。日本新幹線之作法，可做為我國各界要求高鐵中斷營運、遲延等情事之退票、退費標準之參考。

4-2 建議

- 一、臺灣高鐵為日本新幹線唯一系統輸出國，以臺灣高鐵之營運績效良好，與日本共同合作推展國際市場，前景看好，建議政府應予支持。
- 二、我國推動臺灣高鐵計畫係採「民間參與興建營運模式(BOT)」，亦為舉世矚目的民間參與重大交通建設案例，我國推動此一重大計畫所累積的經驗，已受到許多國家的關注與重視，同時成為他國推動高鐵或其他重大建設的參考範例，我們可以把握此一高鐵建設的成功經驗，適時輸出協助有興趣的國家推動相關建設，藉以提昇我國國際能見度並促進經貿外交。
- 三、臺日雙方已簽署「加強鐵路業務交流及合作瞭解備忘錄」，並已建立雙方輪流主辦召開會議之機制，建議藉此機制，再進一步建立聯繫窗口，以加強與日本新幹線營運、維修及設備技術交流，提昇臺灣高鐵服務水準、災害應變能力及設備維修技術。

附件

第 2 屆臺日鐵路實務合作交流會議簡報資料

1. Safety Supervision of Railway Systems in Japan – Railway Bureau, MLIT A1
2. Safety Supervision of Railway System in Taiwan – Bureau of High Speed Rail, MOTC A12
3. Worldwide expansion of SHINKANSEN system – Railway Bureau, MLIT..... A19
4. Policy on Railway Systems Expansion Overseas in Taiwan – Bureau of High Speed Rail, MOTC A23
5. Overview of Series N700 and ATC System – Central Japan Railway Company..... A26
6. In-Town Check-in, Baggage Handling and Emergency Preparation of TIAA MRT – Bureau of High Speed Rail, MOTC A34
7. Nangang Track work and Core System Nangang Extension Project – Taiwan High Speed Rail Corporation A42

1. Safety Supervision of Railway Systems in Japan – Railway Bureau, MLIT

Safety Supervision of Railway Systems in Japan

March 12th, 2014
Railway Bureau, MLIT



Ministry of Land, Infrastructure, Transport and Tourism



Ministry of Land, Infrastructure, Transport and Tourism

Topics

- 1. Outline of the Railway Safety Policy in Japan**
- 2. Role of the Government in Railway Safety**
 - Railway Bureau
 - Japan Transport Safety Board (JTSB)

2

1. Outline of the Railway Safety Policy in Japan
2. Role of the Government in Railway Safety
 - Railway Bureau
 - Japan Transport Safety Board (JTBSB)

3

Current Railway Network in Japan

Length of Railway Network
as of 2011

Type	km
JR (ex-JNR)	20,124
Major private	3,027
Subway	735
Regional	3,340
Total	27,226

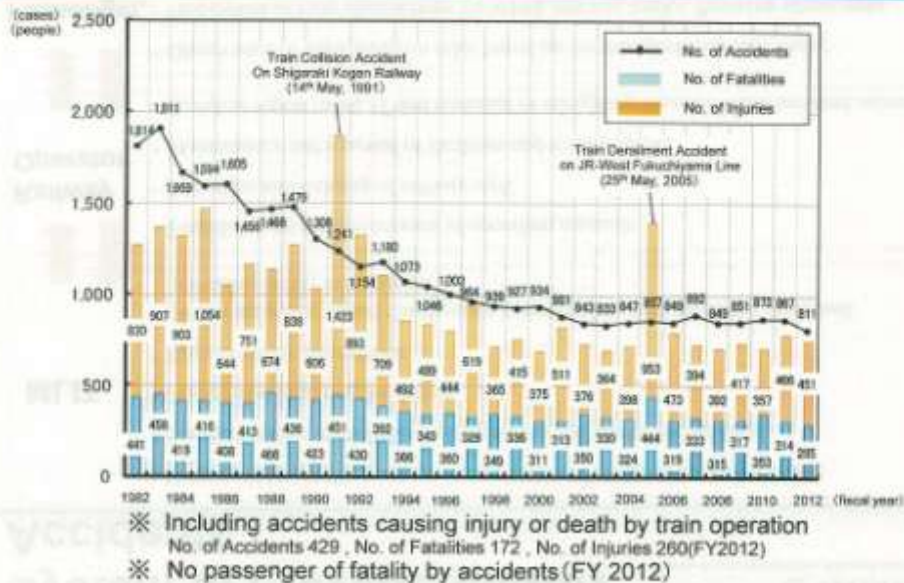
Number of Railway Operators
as of 2013

Type	Operators
JR (ex-JNR)	6
Private	176
Public	11
Freight	12
Total	205



4

Trend in Number of Accidents and Casualties in Japan



5

System to Prevent Railway Accidents

MLIT

- Entry permission of operators, authorization of construction enforcement
- Standardization of facilities, rolling stocks and operation handling
- Testing and licensing for drivers
- Regular safety inspections
- (When accidents occur) On-the-spot investigation, analysis of the cause and providing safety information

Railway Operator

- Establishment and observance of operation manuals
- Education and training of railway staff
- Maintenance and renewal of facilities and rolling stocks
- Accident report to MLIT and remedial or mitigating measure when accident occurs

Passenger, Public

- Observance of transportation rules based on the transportation provisions
- Prohibition of train obstructions including entering tracks, throwing stones onto tracks, and damage to signals
- Prohibition of actions that disturb order in cars and penalty for such behavior

6

Organizations for Ensuring Railway Safety in Japan

Railway Bureau, MLIT

Railway Department,
Local Transport Bureau

- Safety Inspection
- Safety Management Evaluation

Japan Transport Safety Board

(Organization in MLIT)

Railway Operators

Related Associations

Accident Investigation

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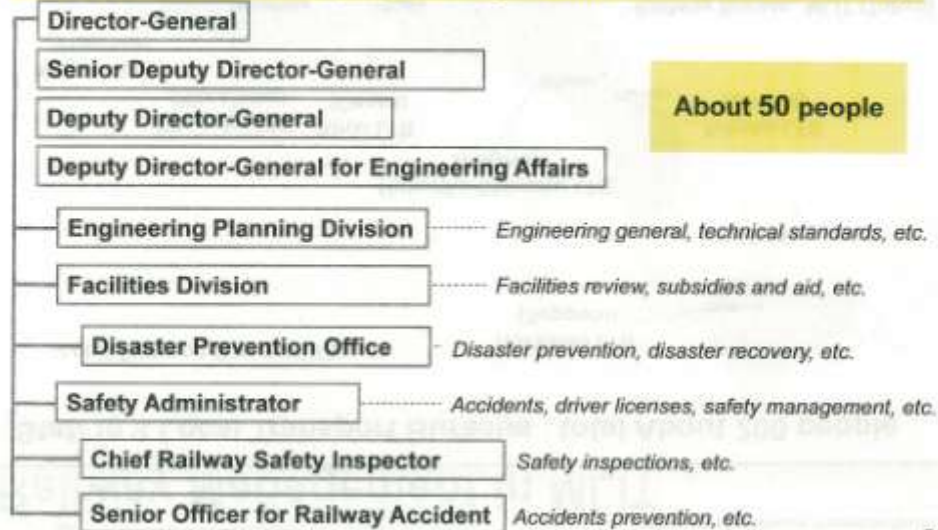
Topics

1. Outline of the Railway Safety Policy in Japan
2. Role of the Government in Railway Safety
 - Railway Bureau
 - Japan Transport Safety Board (JTSB)

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Organization Chart of Railway Bureau, MLIT

Railway Bureau, MLIT (Major Safety-related Divisions & Offices)



9

Organization and Staff for Railway Management in MLIT

Staff in 9 Local Transport Bureaus : total About 200 people



10

Kind of Inspection

1

Safety Inspection

- Safety, Facilities ,etc.
- Regular (Based on Inspection Plan)
- Special (As Necessary)

2

Operating Inspection

3

Accounting Inspection

11

Measure of safety Inspection



12

Point of On-Site Inspection

1. Situation of approach concerning securing safety of transportation
 2. Situation of observance to law concerning facilities, train and operation
 3. Execution condition of construction of facilities
 4. Processing situation of accident and disaster, and Execution condition of prevention countermeasure of accident and disaster
 5. Repair strategy and repair results concerning facilities and train
 6. Situation of clerk in charge's organization of an office to be engaged in business concerning security and situation of arrangement
 7. Qualification of clerk in charge engaged in business concerning security and situation of education, training and level of the skill
 8. Execution condition of matter that lies instruction etc. based on safety inspection
- ... etc.

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Implementation Status of Safety Inspection (FY2012)

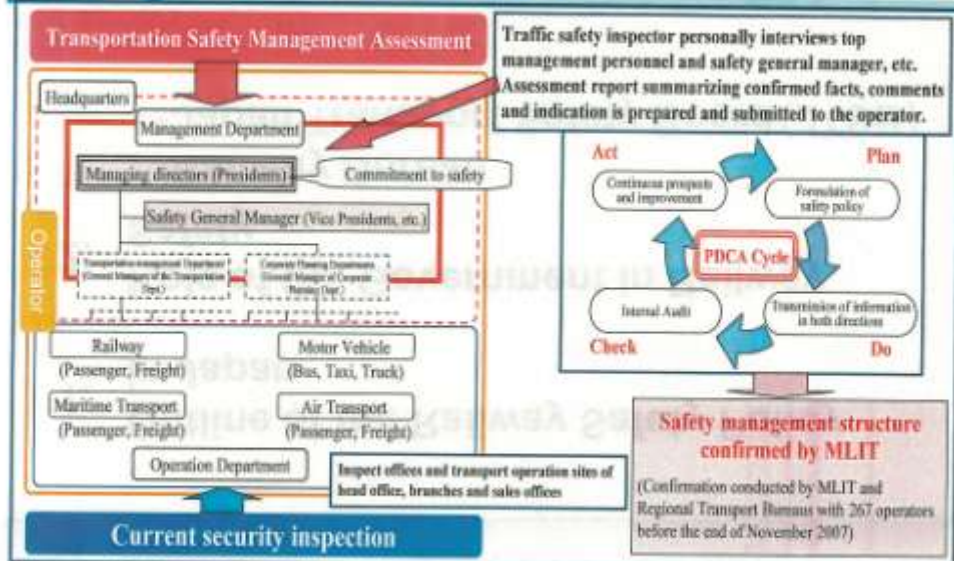


Outline of Administrative Direction

- Train operation without alcohol check
→ Formulation of assured check system etc.
- Constant overspeed
→ Readjustment of train schedule etc.

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Overview of Transport Safety Management Evaluation



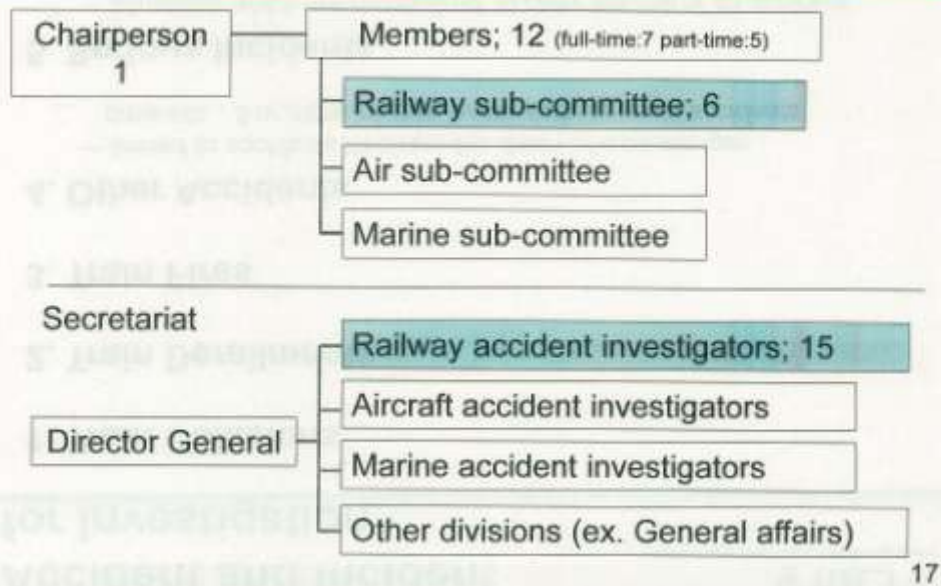
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Topics

1. Outline of the Railway Safety Policy in Japan
2. Role of the Government in Railway Safety
 - Railway Bureau
 - Japan Transport Safety Board (JTSB)

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Organization Chart of JTSCB



17

Accident and Incident for Investigation

1. Train Collisions

2. Train Derailments

3. Train Fires

4. Other Accidents

- limited to accidents involving the death of a passenger, crew etc. , 5 or more injuries, particularly unusual accidents

5. Serious Incidents

- situations which are recognized to carry the risk of an accident

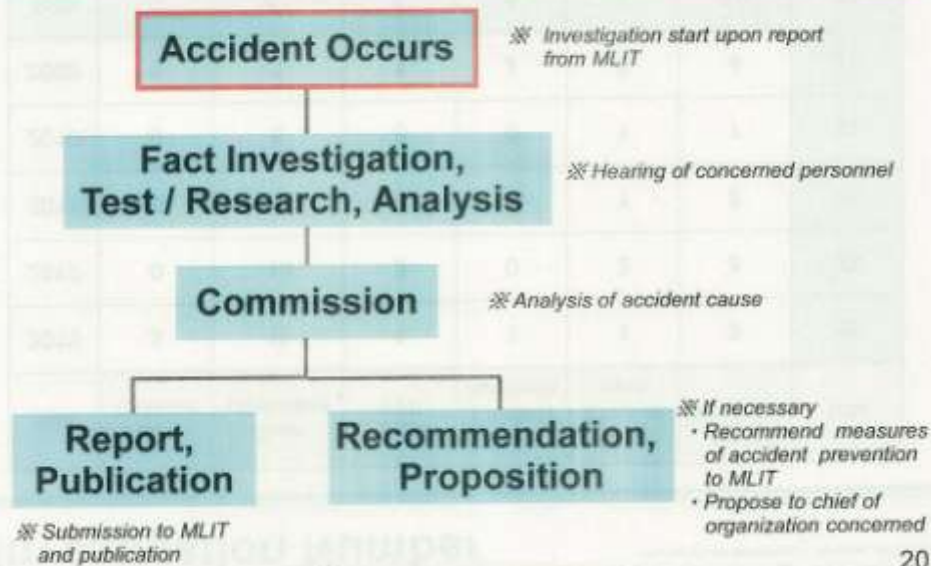
18

Investigation Number

Year	Train Collision	Train Derailment	Train Fire	Level Crossing Accidents	Human Death of Injury	Incidents	Total
2013	0	11	1	1	1	2	16
2012	0	13	2	0	2	5	22
2011	0	12	0	1	1	2	16
2010	0	6	0	0	1	7	14
2009	0	5	1	2	3	4	15
Total	0	47	4	4	8	20	83

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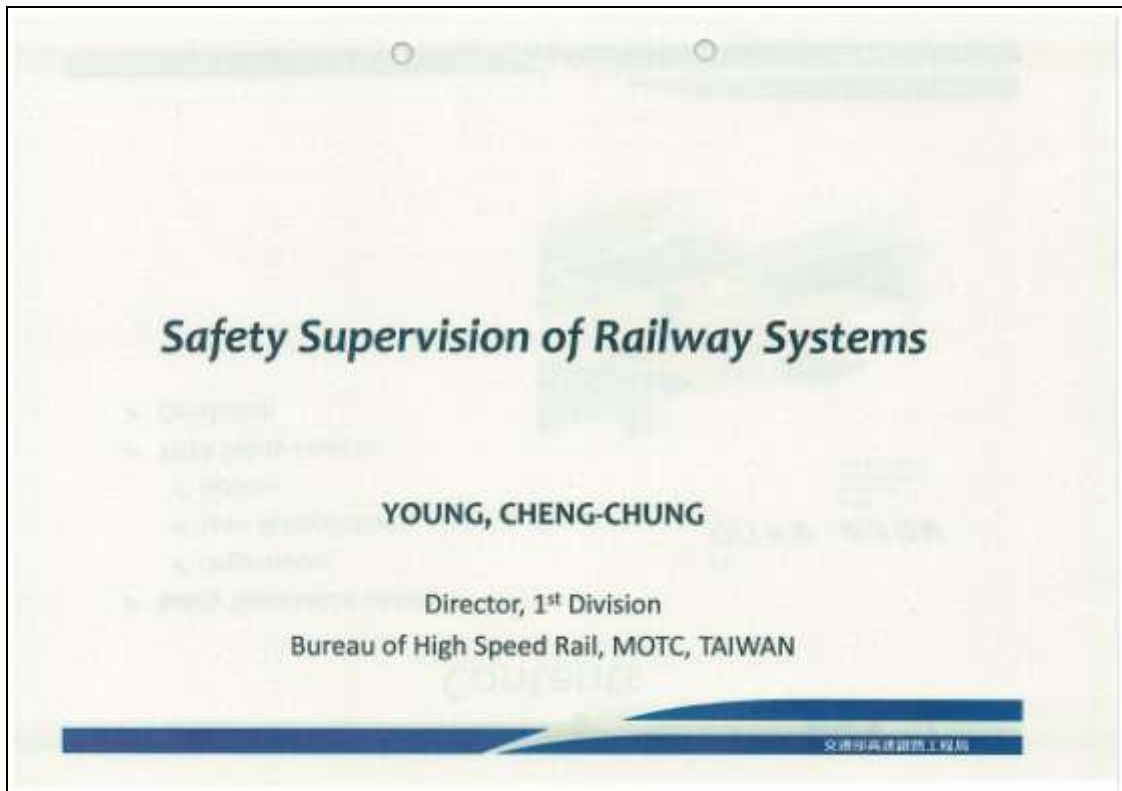
Flow of Investigation



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Thank you
for your kind attention

2. Safety Supervision of Railway System in Taiwan – Bureau of High Speed Rail, MOTC



Safety Supervision System

➤ Organization

- ✓ BOHSR supervises THSR since 2007.
- ✓ Railways Supervision Task Force, set up by BOHSR in 2011, represents MOTC to supervise all railway systems, including TRA (conventional railway), Alisan forest railway and Taisugar railway and THSR.
- ✓ In order to cooperate to the government reform, the Bureau of Railway will be established to be formally in charge of railway supervision in the future.

Authority Organization (draft)



Safety Supervision System

➤ Laws & Regulations



Safety Supervision System

➤ Actions



Safety Supervision System

➤ MOTC Accident Investigation

✓ Serious Accidents

- By HSR Accident Investigation Committee of MOTC, composed of experts of operations, E&M engineering, civil works and laws from government agencies & universities .
- Including train turnovers, collisions, human casualty ... etc.

✓ Other Accidents / Incidents

- Irregular inspections or review meetings by BOHSR,
- Major Cases: 700T derailments in earthquake, M/V derailments, Driver lost conscious on duty, Signaling / Power Supply failures, Bomb in HSR train, etc.

Safety Supervision System

➤ New Action: HSR Expertized Task Force (2014)

- ✓ Due to some operation-interrupted incidents occurred in 2013, the HSR Expertized Task Force was set up by MOTC.
- ✓ Purpose: Improve the safety, stability, reliability and emergency handling ability of HSR.
- ✓ Inspection period : 4 months or longer
- ✓ Teams : Signaling, Power Supply, Trainset & Operation Response
- ✓ Reviewing organization, manpower, rules & regulations, training and accident & incident history.

THSR Safety Analysis

ACCIDENT	Train Collision	Train Derailment	Train Fire	Accident against Road Traffic	Other Accidents w/ Casualty	Heavy Property Loss	TOTAL	Amount / 1M Train KM	Million Train KM
2007		1					1	0.13	7.93
2008		3					3	0.20	15.26
2009	1						1	0.07	14.99
2010		2					2	0.13	15.47
2011							0	0.00	15.96
2012					1		1	0.06	16.21
2013							0	0.00	16.03

INCIDENT	Causes inside company				Causes outside company			TOTAL	Amount / 1M Train KM	Million Train KM
	Staff	Rolling Stock	Railway Facilities	SUBTOTAL	Amount / 1M Train KM	Outside Railway	Natural Disaster			
2007		3	2	5	0.63	2	2	9	1.14	7.93
2008	2	2	3	7	0.46	1	2	10	0.66	15.26
2009			7	7	0.47	1	3	11	0.73	14.99
2010	1	2	6	9	0.58	2	2	13	0.84	15.47
2011		1	1	2	0.13			2	0.13	15.96
2012		3	1	4	0.25	2	4	10	0.62	16.21
2013			3	3	0.19	3	5	11	0.69	16.03

- In order to compare with SKS, above INCIDENT of THSR is calculated with standard of abnormal event which causes 30+ minute delay or cancellation.
- In Railway Law of Taiwan, INCIDENT means abnormal event which causes 5+ minute delay or cancellation.

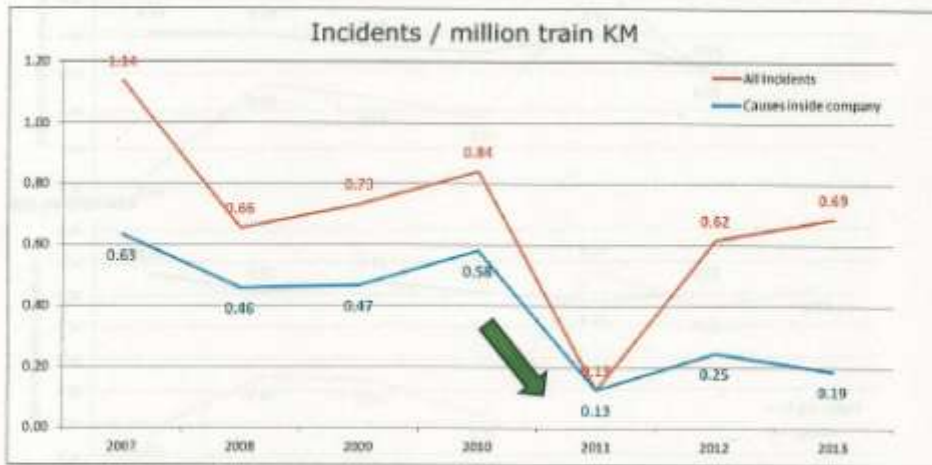
THSR Safety Analysis

ACCIDENT	Train Collision	Train Derailment	Train Fire	Accident against Road Traffic	Other Accidents w/ Casualty	Heavy Property Loss	TOTAL	Amount / 1M Train KM	Million Train KM
2007		1					1	0.07	14.99
2008		3					3	0.13	15.47
2009	1						1	0.00	15.96
2010		2					2	0.06	16.21
2011					1		1	0.00	16.03
2012							0		
2013							0		

INCIDENT	Causes inside company				Causes outside company			TOTAL	Amount / 1M Train KM	Million Train KM
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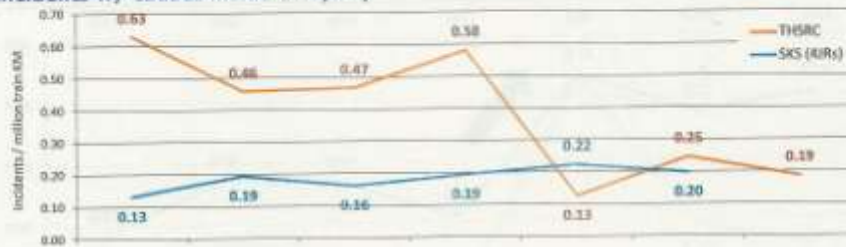
Trend of THSR Incidents



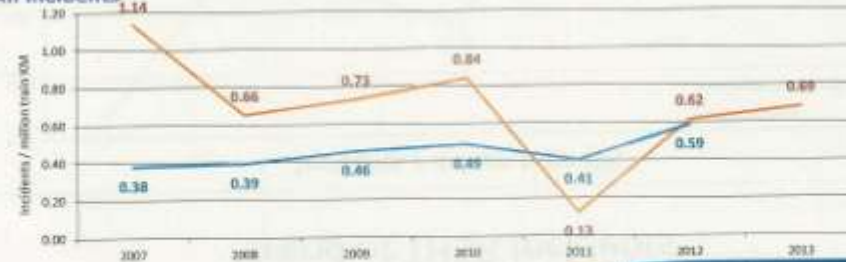
Incidents with inside-company causes declined substantially in recent years.

Comparison of THSR & SKS

Incidents w/ causes inside company



All incidents



Prospect

- Enhance System Safety & Reliability, key issues are the following:
 - ✓ Decrease turnout failures.
 - ✓ Avoid maintenance vehicle accidents.
 - ✓ Lessen interface obstacles between construction works of new station / extension line and revenue service line.
 - ✓ Properly apply new equipment without impacting normal functions of current systems. (e.g. new earthquake sensor installation)
 - ✓ Consider to gradually upgrade the current hardware and software of core system.
- Establish a contact window between BOHSR and Railway Bureau in order to arrange Japanese experts to Taiwan to assist in railway accident investigation.

Thank you for your attention

YOUNG, CHENG-CHUNG

3. Worldwide expansion of SHINKANSEN system – Railway Bureau, MLIT



3 key points of Shinkansen

To achieve the Shinkansen's major character of high safety and reliability levels overseas, followings are important.

1

Shinkansen's unique concept

2

Shinkansen as one system

3

Education and Training

2

(1) Shinkansen's unique concept

**Japan's High Speed Rail
"Shinkansen"**



[Concept]

- (1) Independent track for Shinkansen
- (2) Complete elimination of accident risks

-Dedicated track without level crossings
-Independent control system with ATC* and CTC for High Speed Rail
-Operation by well-educated personnel

**Fatality to date ZERO
for 49 years**

**High Speed Rail
of Europe**



[Concept]

- (1) Shared track between High Speed Rail and conventional rail
- (2) Minimizing damages in case of accidents

-Level crossings exist, which require rolling stocks to equip crash worthiness.
-Control system for High Speed Rail and conventional rail co-exist

3

(2) Shinkansen as one system

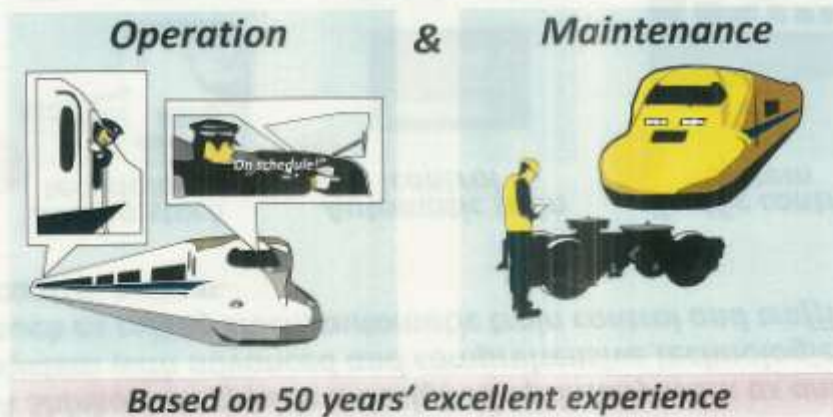
A Shinkansen system is designed optimally work as one system with advanced and comprehensive technologies such as rolling stock, automatic train control and traffic control system.



4

(3) Education & Training

A comprehensive education and training for operation and maintenance have been developed based on the half a century of experience.



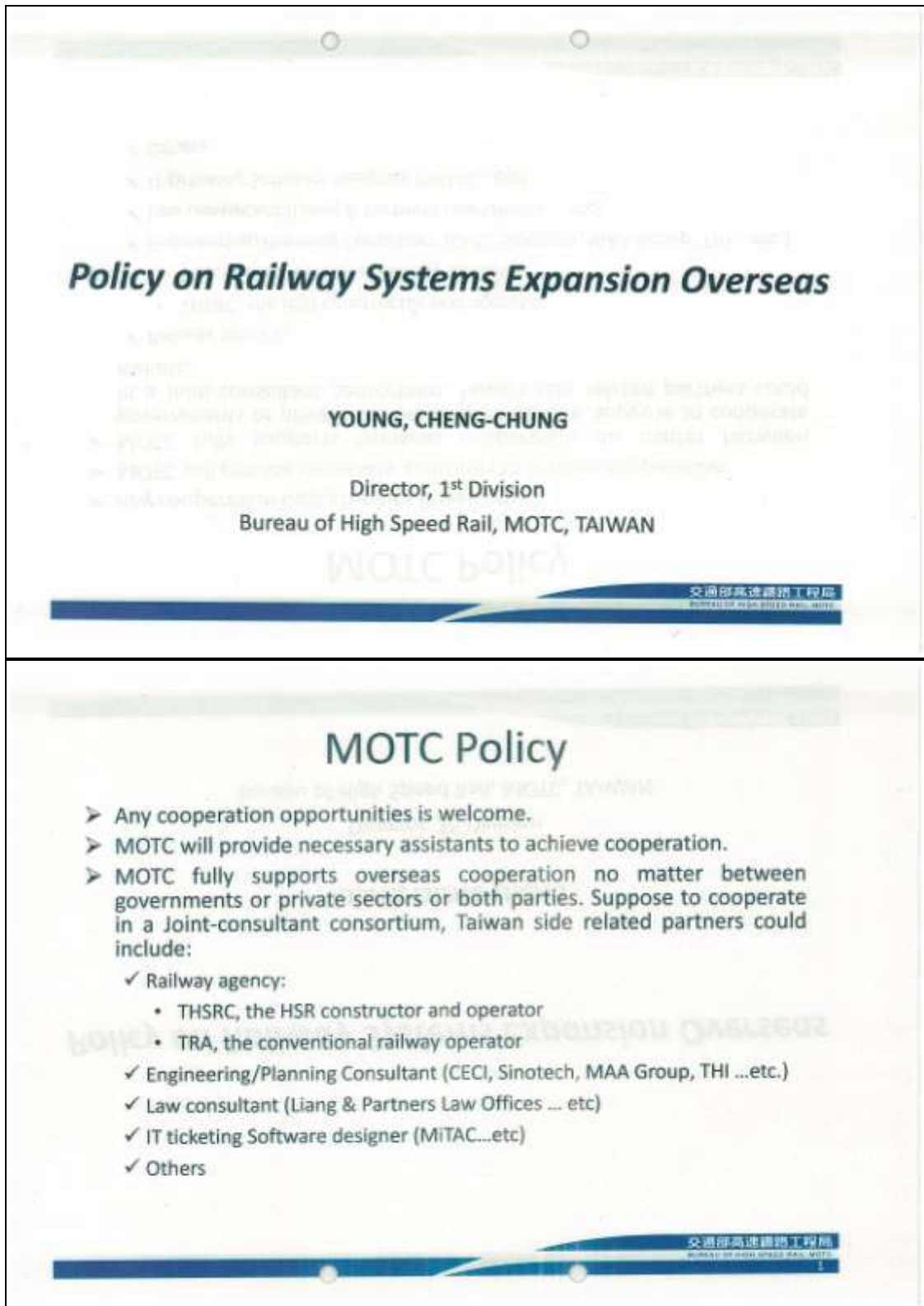
5

The Taiwan High Speed Rail is the only example which has experienced three major items listed below as well as the only example of Shinkansen's export.



A continuous safe and reliable operation of Taiwan HSR is beneficial for both Taiwan and Japan.

4. Policy on Railway Systems Expansion Overseas in Taiwan – Bureau of High Speed Rail, MOTC



Our HSR Acknowledges

- We are confidence with sharing acknowledges of:
 - ✓ Feasibility Study
 - ✓ BOT Legal Base Establish
 - ✓ Interface Integration between different parties
 - Sub-contractors of civil work, track work and E&M system [THSRC]
 - Government, Consultants, Concession, IV&V Agent and Bank Consortium
 - ✓ Land Development
 - Land acquisition
 - Land development Benefit Internalized into Project
 - ✓ Financing Plan and Implement
 - Government and Concessionaire share in Work, Cost and Risk
 - Loan Assistance
 - Refinancing Help
 - ✓ Ticketing software [THSRC]

交通部高速鐵路工程局

BUREAU OF HIGH-SPEED RAIL, MOTC

2

Overseas Cooperation Case

- Many organizations from Thailand, Vietnam, China, US, Europe, Australia... visited the BOHSR and THSRC for learning TW HSR promotion experience.
- Taiwan and Japan signed a "Memorandum of Cooperation in Railway Business" on 5th Nov. 2013.
- THSRC and 4 JR companies cooperate to found "International High Speed Rail Association" for promoting Shinkansen overseas market and the international HSR standard.
- Attendees from JR Kyushu Railway Company practiced THSRC on board duty (2013).
- CECI promotes "Russian Technical Visit to TW for the HSR" which will be held in April by EBRD and sponsored by our MOFA. THSRC and BOHSR will give lectures and help site visit (2014).
- CECI provided detail design service for Vietnam railway upgrading project (2009-2010). Later this year CECI will arrange Vietnam railway company to visit TW HSR.

交通部高速鐵路工程局

BUREAU OF HIGH-SPEED RAIL, MOTC

3

THANK YOU FOR YOUR ATTENTION

YOUNG, CHENG-CHUNG

更多資訊在 (more information)
<http://www.hsr.gov.tw>
<http://www.thsrc.com.tw>

交通部高速鐵路工程局
BUREAU OF HIGH-SPEED RAIL, M.O.T.

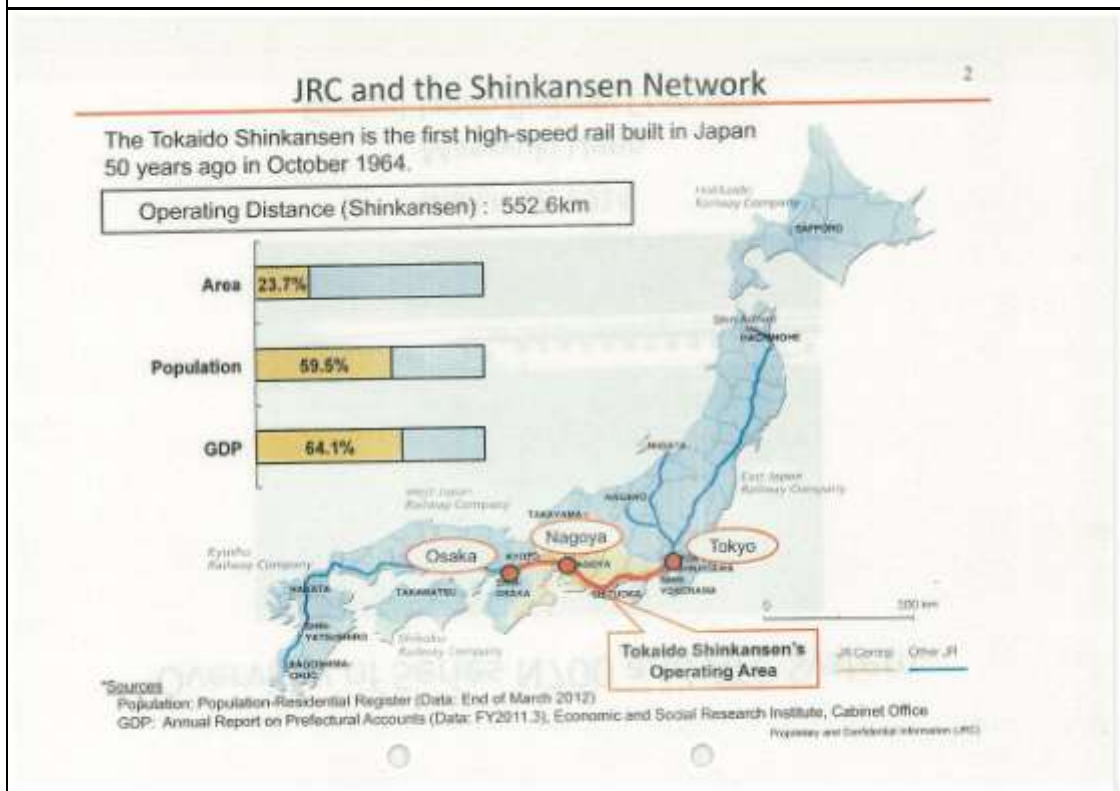
5. Overview of Series N700 and ATC System – Central Japan Railway Company

Overview of Series N700 and ATC System



March 12, 2014
Masayuki Ueno
Central Japan Railway Company

Proprietary and Confidential Information (PRC)



Key Features of the Tokaido Shinkansen

① Safety and Reliability

No passenger fatalities or injuries due to train accidents for 49 years
Annual average delay 0.5 minutes per operational train

② Mass Transportation

Ridership/day 409,000 people
(323 trains per day × 1,323 seats per train)

③ High Speed

2hr.25min. to cover 515km between Tokyo and Shin-Osaka
Maximum operation speed will be raised to 285km/h from 270km/h next spring

④ Environmental Adaptability

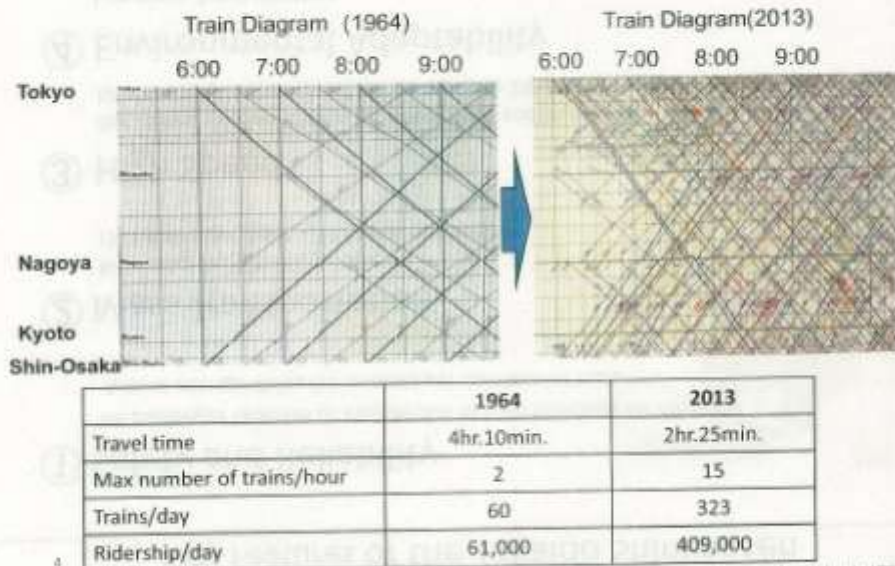
Low noise, Small vibration
Low energy consumption, Low CO₂ emissions

3

Proprietary and Confidential Information (JRC)

Mass Transportation

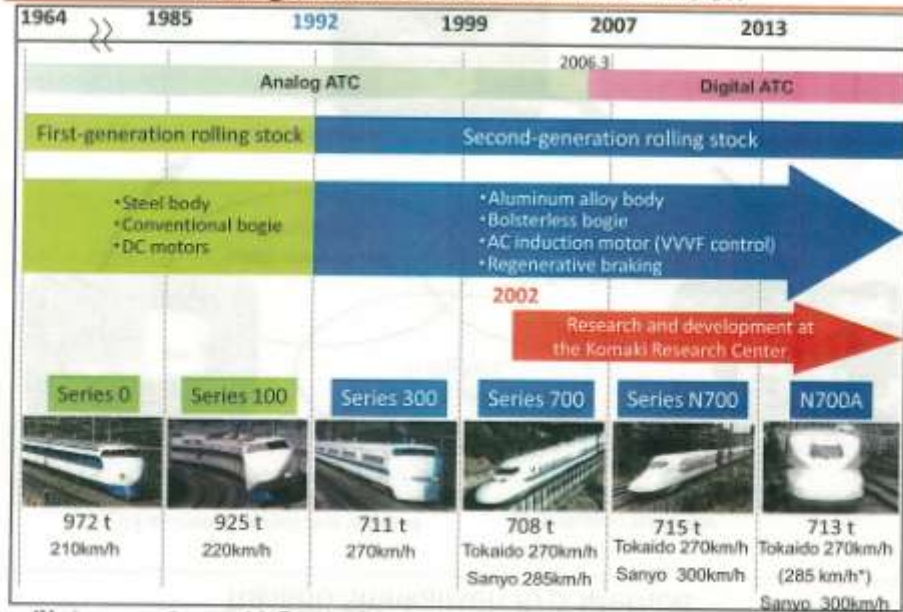
4



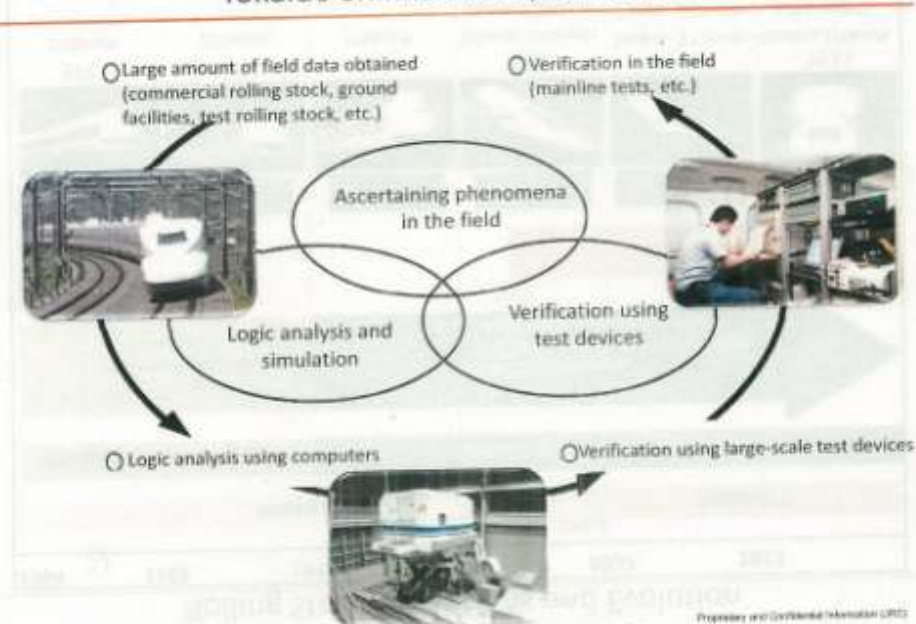
4

Proprietary and Confidential Information (JRC)

Rolling Stock Transitions and Evolution



Tokaido Shinkansen R/D Method



N700 Concept

7



Four characteristics of the Tokaido Shinkansen that have been carefully developed were even further refined on the N700A.

Unwavering safety

Central fastening brake disks
Earthquake brakes

Refined comfort

Seat moquette changes
Further improvements in quietness

Technology that supports reliability

Fixed speed running device
Logic vibration detection system
Backup brakes

High environmental performance

Miniature, lightweight blowerless CI
Reduction in energy consumption of cabin lighting
Employment of highly recyclable materials

Proprietary and Confidential Information (JRC)

Improving Brake Performance

8

- By changing the fastening position of brake disks to wheels, the amount of brake disk deformation caused by friction heat during braking was reduced.
- As a result stronger braking force was achieved (15% improvement over the Series N700).



Brake disks bolted around the inner circumference (Series N700)



Central fastening brake disks (N700A)



Brake disks connected at inner circumference



Brake disks fixed by bolts at the center

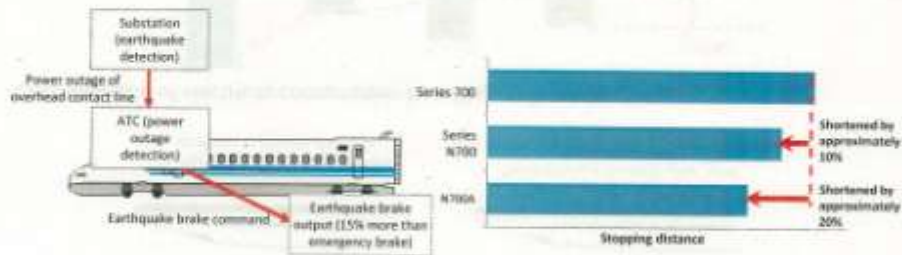
By employing central fastening brake disks, Series N700 has 15% better braking force than Series 700.

Proprietary and Confidential Information (JRC)

Earthquake Brake System

9

- When a electricity power outage of overhead contact line caused by an earthquake is detected by ATC system, stronger-than-normal brake power is applied by the system.
- Braking distance was shortened by leveraging the attributes of Central Fastening Brake Disk (20% improvement over Series 700, 10% improvement over Series N700).



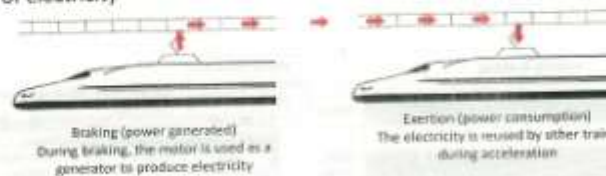
N700A earthquake brake system shorten braking distance by 20 %, compared with Series 700.

Proprietary and Confidential Information (JRC)

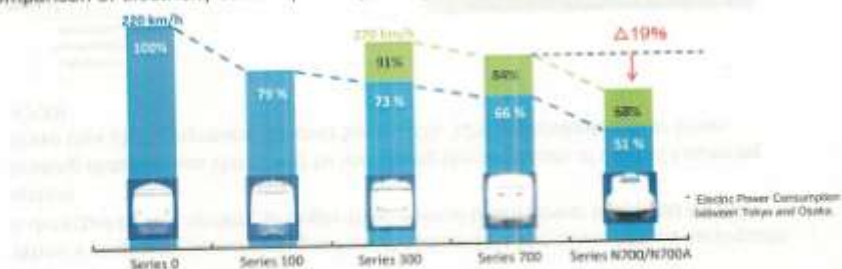
Reduction in Energy Consumption

10

○ Recycling of electricity



○ Comparison of electricity consumption by rolling stock model



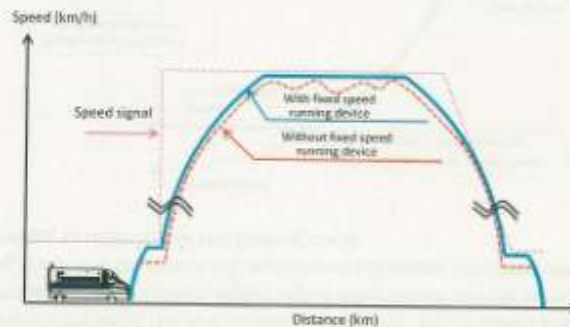
Compared with the Series 700, Series N700 used 19% less energy due to refining and employing the latest technology.

Proprietary and Confidential Information (JRC)

Cruise Control System

11

- Enables precise control in accordance with speed signals
- Objective speed can be followed with high precision by leveraging information from ATC (speed signals, running location, track information).
- Enables quick recovery from timetable disruptions



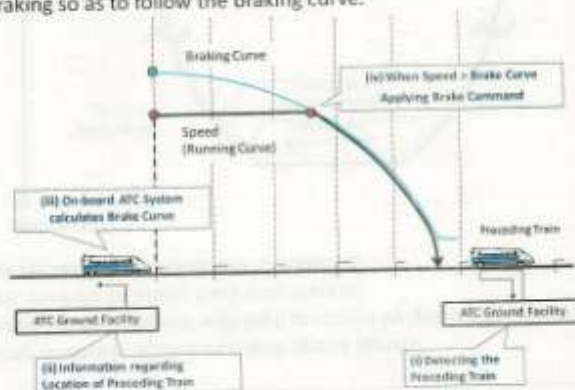
Cruise control system enables quick recovery from timetable disruptions, by utilizing information from ATC system.

Proprietary and Confidential Information (JRC)

Highly Reliable ATC System

12

- ATC is the digital-type signaling system to prevent train-to-train collisions and excessive speed.
- The ATC system consists of the ATC Ground Facility and the On-board ATC equipment. The ATC Ground Facility transmits digital signal information on rails such as the location of preceding train. The On-board ATC equipment calculates a braking curve and activates braking so as to follow the braking curve.

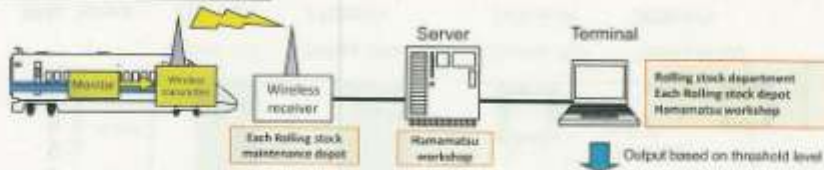


ATC system shows highly reliable performance without failures.

Proprietary and Confidential Information (JRC)

Monitoring ATC Conditions by ATC Chart Data Analysis ¹³

○ ATC chart automatic analyzer



○ Automatic analyzed items

- Characteristic response against signal aspect
- Braking Performance
- Adhesion Performance (Skidding, Slipping)

Etc...

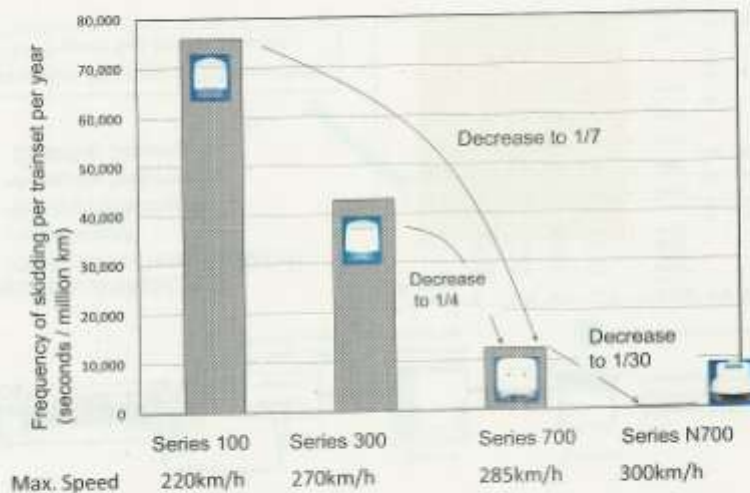
530 million line data of 130 trainsets for 7 years has been analyzed

列車番号	駅	信号	速度	ノッチ	キロメートル	時間	種別	運転状況
1688	0038A	0080	270	212	P15	436.4		
1759	2289	270	230	P15	452.2			
1759	3089	270	229	P13	450.9			
1759	3089	270	229	P13	450.4			
2159	0080	270	288	A7	434.6			
						15	1	滑走
						15	2	滑走
2159	0080	270	287	A7	434.8			
						15	3	滑走
2159	1085	270	284	A7	434.0			
						16	0	滑走
2159	1185	270	284	A7	434.5			
						14	1	滑走
2159	1185	270	283	A7	434.4			
						14	2	滑走
3159	1289	270	281	A7	434.4			
						15	1	滑走
						15	2	滑走
						15	3	滑走
3159	1289	270	287	A7	434.3			
						16	2	滑走

Analyzed data are used for rolling stock design and maintenance work.

Proprietary and Confidential Information (JRC)

Decreasing Skidding Frequency through Analyzed ATC Data ¹⁴



Skidding Frequency of Series N700 was decreased to 1/200 of that of Series 100.

Proprietary and Confidential Information (JRC)

Education and Training for Employees

15

○General Education Center

- JR Central has the General Education Center for employee education and training.
- The Center has the latest training equipment that is almost identical to actual operating facilities.



General Education Center



Driving Simulator



Conductor Simulator

Proprietary and Confidential Information (JR-C)

Education and Training for Employees

16

○Emergency Response Training

- Comprehensive large-scale training exercises in accident recovery are conducted annually, providing opportunities for learning and improving skills to use the facilities for immediate response and accident recovery.
- Rescue operation training is conducted in the emergency response training.



Rescue operation training



Coupled two trainsets

Employees are educated and trained for how to handle facilities accurately in an emergency.

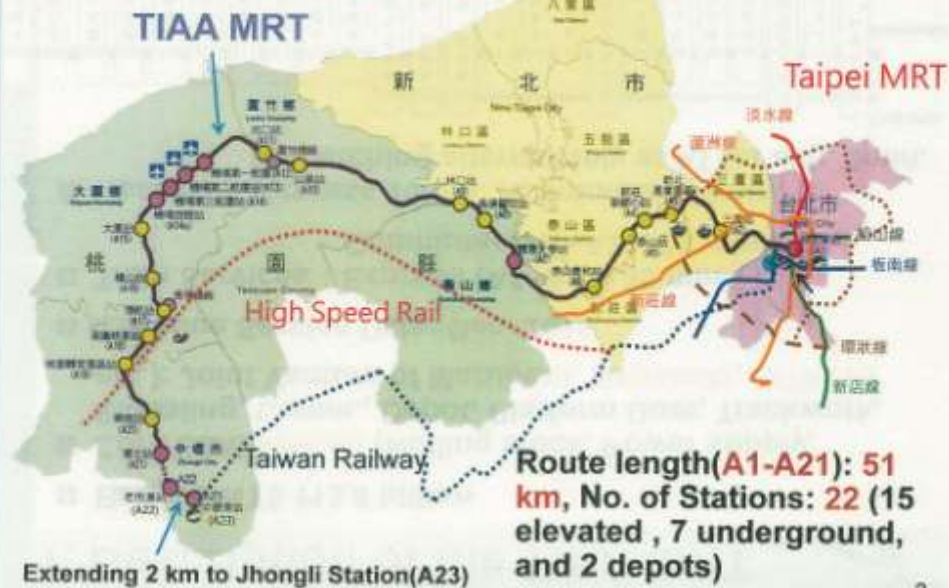
Proprietary and Confidential Information (JR-C)

6. In-Town Check-in, Baggage Handling and Emergency Preparation of TIAA MRT – Bureau of High Speed Rail, MOTC



1. Description of the TIAA MRT

Taoyuan International Airport Access MRT



3

1. Description of the TIAA MRT

- ❑ **Budget: NT\$ 113.8 billion**
- ❑ **Core E&M system** (Rolling stock, Power supply, Signaling, Comm., Depot, Platform Door, Trackwork, etc.): Joint Venture of **Marubeni, Kawasaki, HITACHI**
- ❑ **Revenue Service Date: Dec. 2015**
- ❑ **Train Services :** **Express** (A1~A12, 35 min.) ; **Commuter** (A1~A21, 70 min.)
- ❑ **Headway: Express 10min. ; Commuter 10min.**
Dispatching alternatively at A1 for avg. 5min.



4

Electrical Multiple Unit

Express Train



4 passenger cars + 1 baggage car

Commuter Train



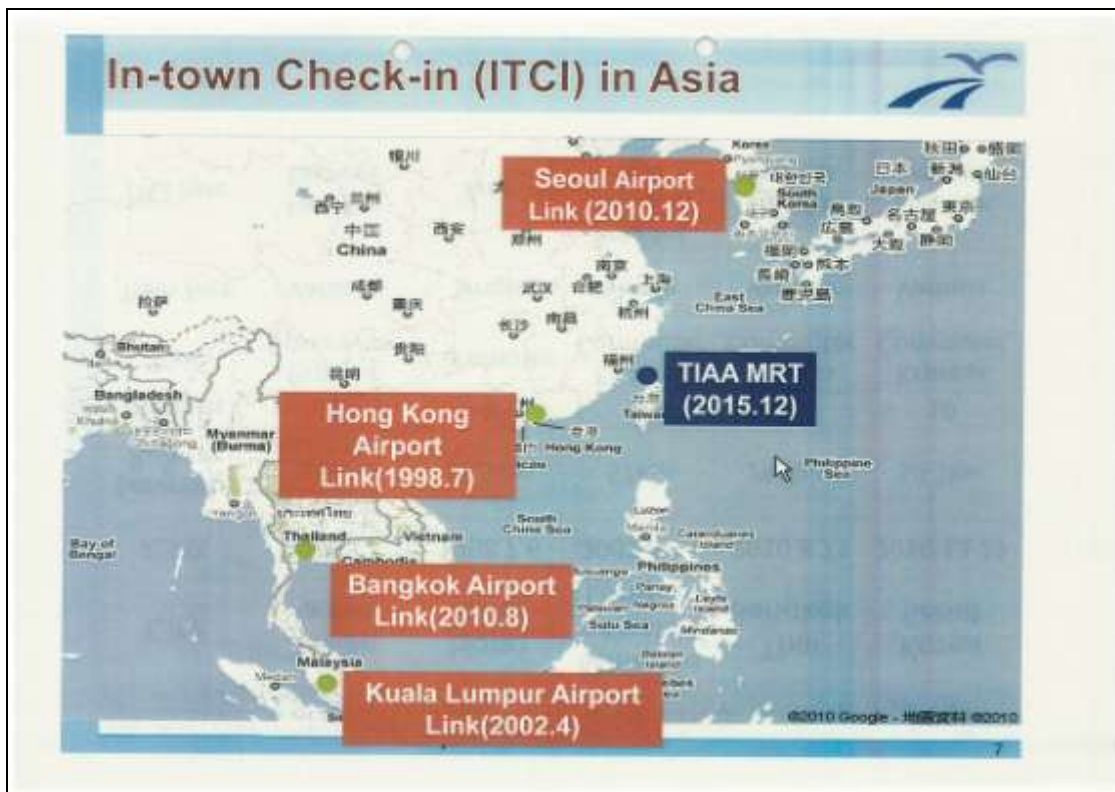
4 passenger cars



2. ITCI and Baggage Handling Service

- The In-town Check-in(ITCI) and Baggage Handling Service will be provided at **Taipei Main Station(A1)**.
- Airline passengers could **check-in and collect their boarding pass** for free 150 minutes ahead of scheduled flight departure time.
- Check-in baggage will be delivered from check-in desks to loading area by conveyers and then loaded into containers. **Containers will be loaded mechanically** to baggage car of Express train.



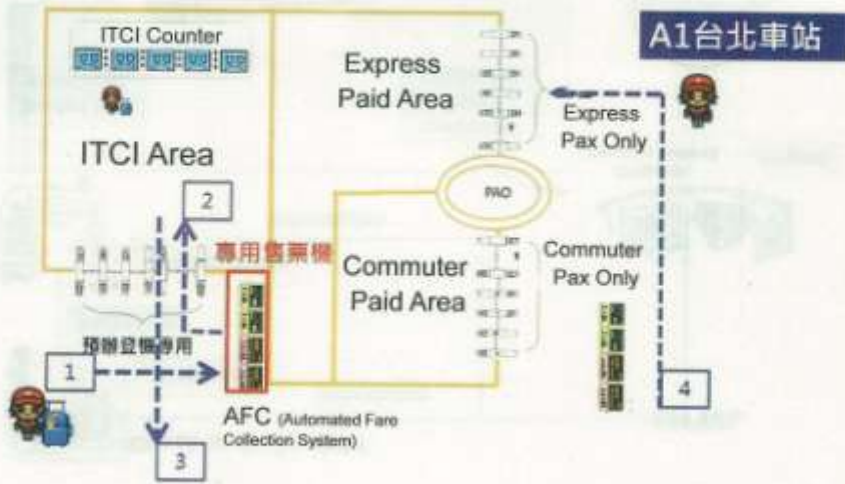


In-town Check-in (ITCI) Service

City	Taiwan Taipei	Hong Kong	Malaysia Kuala Lumpur	Thai Bangkok	Korea Seoul
R.S.D.	2015.12	1998.7.6	2002.4.14	2010.8.23	2010.12.29
Length of Railway	51.03km (Taipei to Airport: 35km)	35.3km	57km	28.6km	58.3km
Stations	22	5	5	8	10
Train	Express Commuter	Commuter	Express Commuter	Express Commuter	Express Commuter
Train Fare	Various	Single	Single	Various	Various
ITCI Fare	Free for Express	Free	Free for Express and Commuter	Free for Express	Free for Express

ITCI Layout and Passenger Moving Route at A1

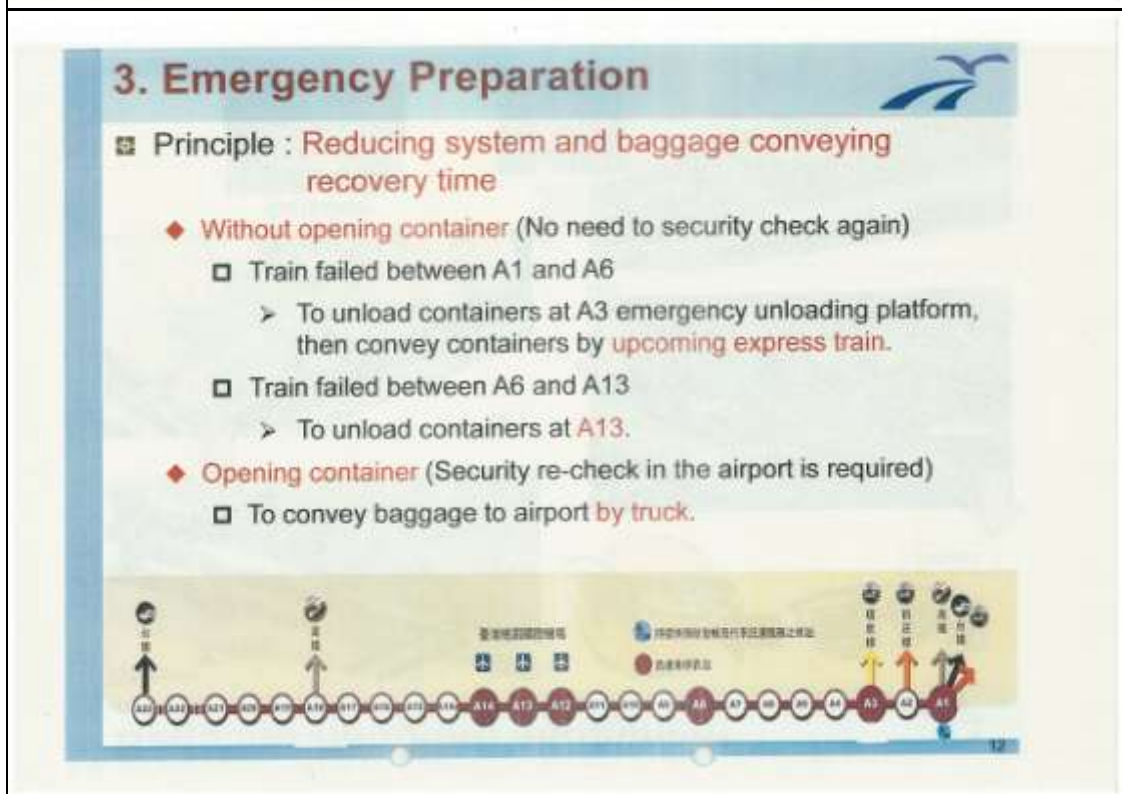
A1 Taipei Main Station



Baggage Handling Process



Note: SITA(Society International De Telecommunication Aeronautiques)



3. Emergency Preparedness



Without opening container



Opening container



13

4. Conclusion

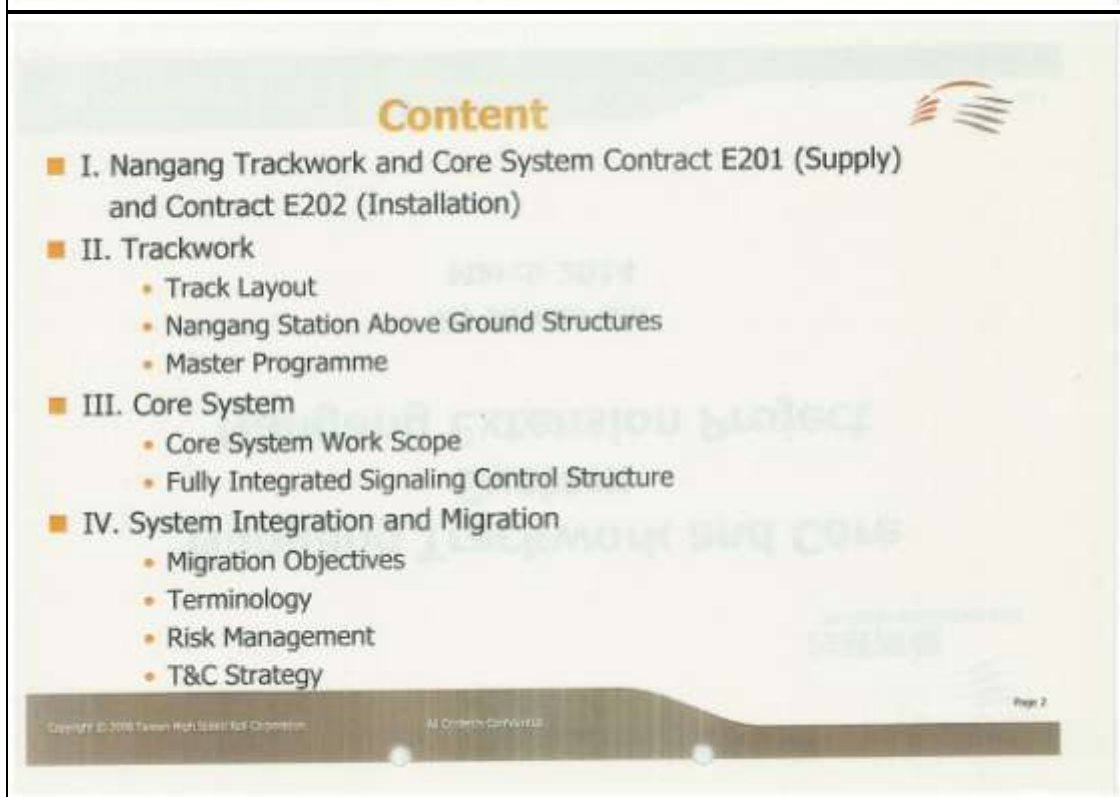
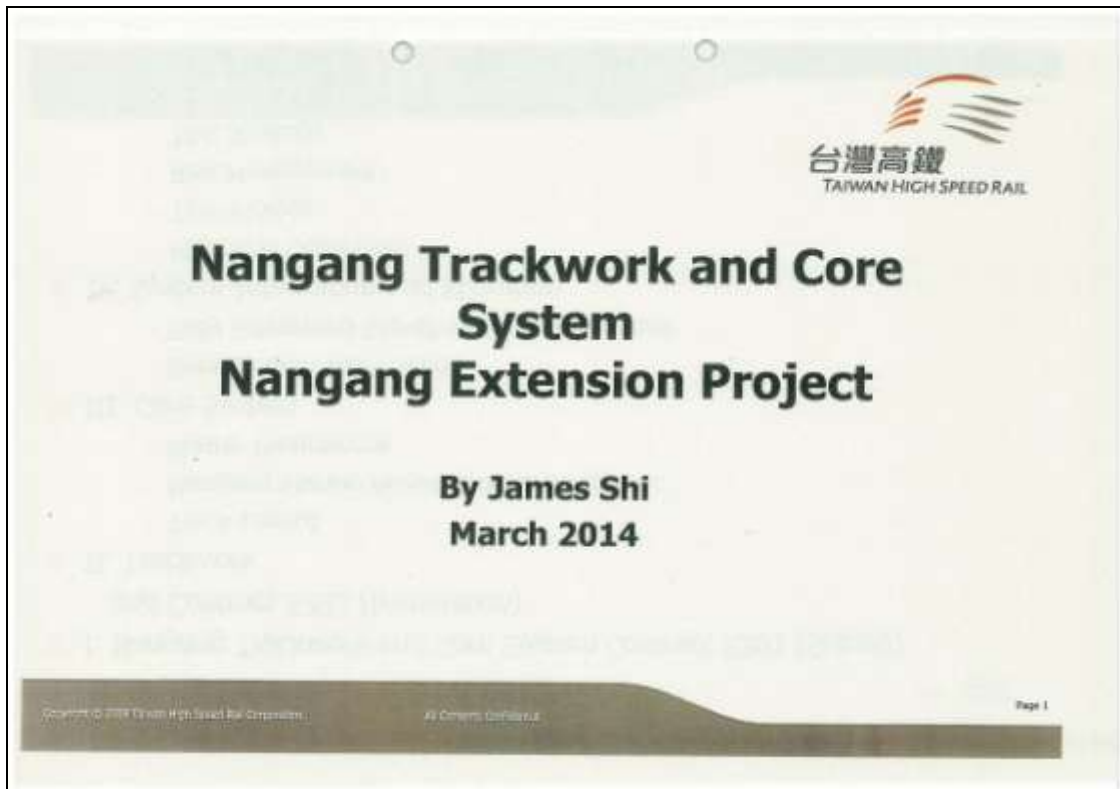


- The In-town Check-in(ITCI) and baggage handling service is convenient for airline passengers to forward baggage early and get boarding pass right at the moment.
- Taiwan Taoyuan International Airport is the main access from Taiwan to the world. With the operation of the TIAA MRT and ITCI service, the airport access and service will be much convenient.
- ITCI and baggage handling service involved railway operator, airlines, aviation police and other related authorities. BOHSR will continue to coordinate with all the involved parties to ensure the ITCI service successful.

14



7. Nangang Track work and Core System Nangang Extension Project – Taiwan High Speed Rail Corporation



I. Nangang Trackwork and Core System Contracts E201 / E202



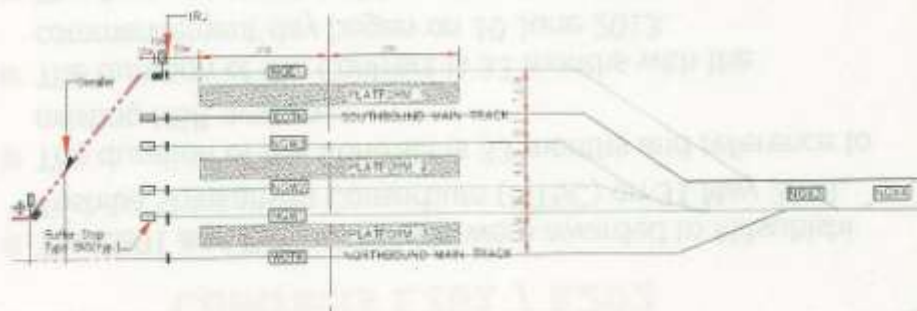
- The E201 and E202 Contracts were awarded to Mitsubishi Toshiba Shinkansen Consortium (MTSC) on 31 May 2013.
- The duration of the Contract is 33 months and reference to existing HSR system.
- The duration of the Contract is 33 months with the commencement day began on 10 June 2013.
- The Project is expected to be completed by Mar 2016 with revenue service commencing July 2016.

II. Trackwork



General Description

- The track layout for Nangang Extension Project with platform tracks NGE1, E0TK, NGW3, NGW2, NGW1 stub-ended at TK-(3+583) and W0TK stub-ended at TK-(3+928). The end portion (345m) of the W0TK platform track will be served as the maintenance vehicle track. Power for the OCS will still be supplied by the new sub-station ATP0.



II. Trackwork

Nangang Station Above Ground Structures



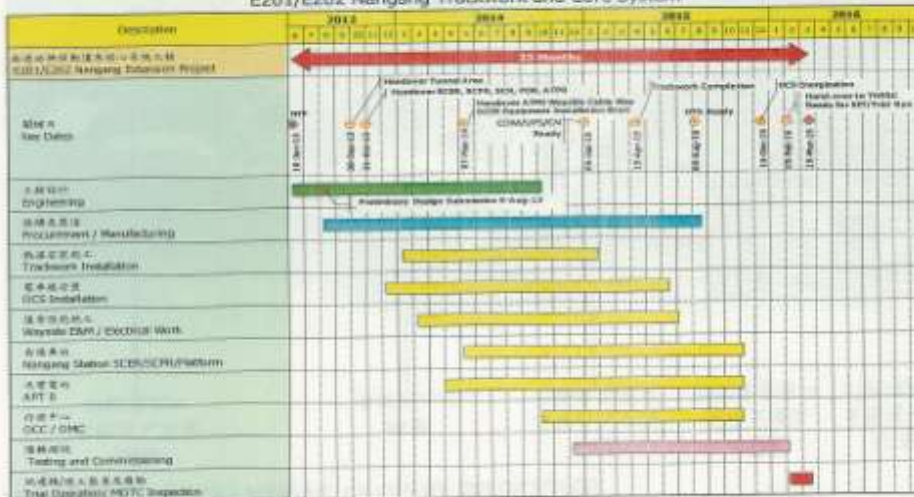
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NEP – Master Programme

E201/E202 新南港軌道及機電核心系統供應安裝新制 E201/E202 Nangang Trackwork and Core System



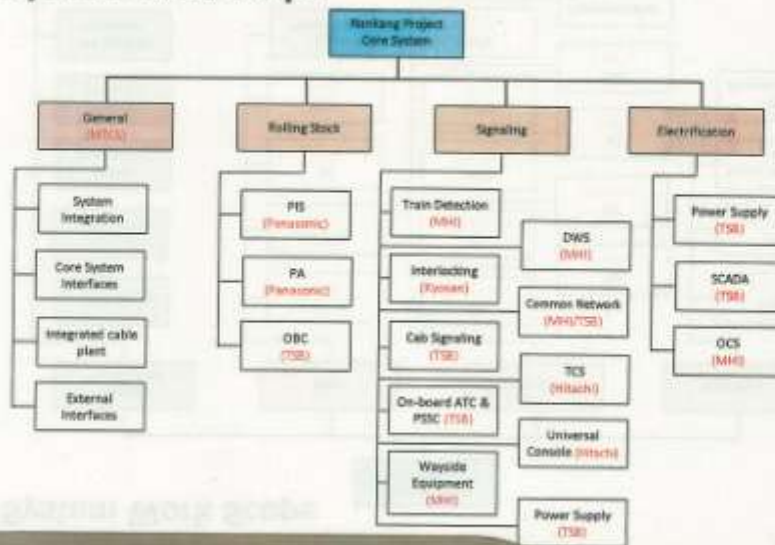
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III. NEP - Core System

Core System Work Scope



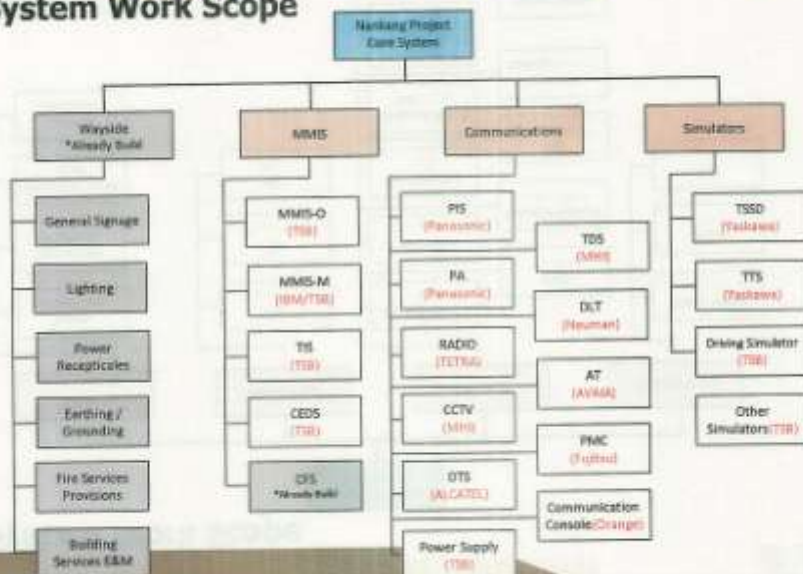
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III. NEP - Core System

Core System Work Scope

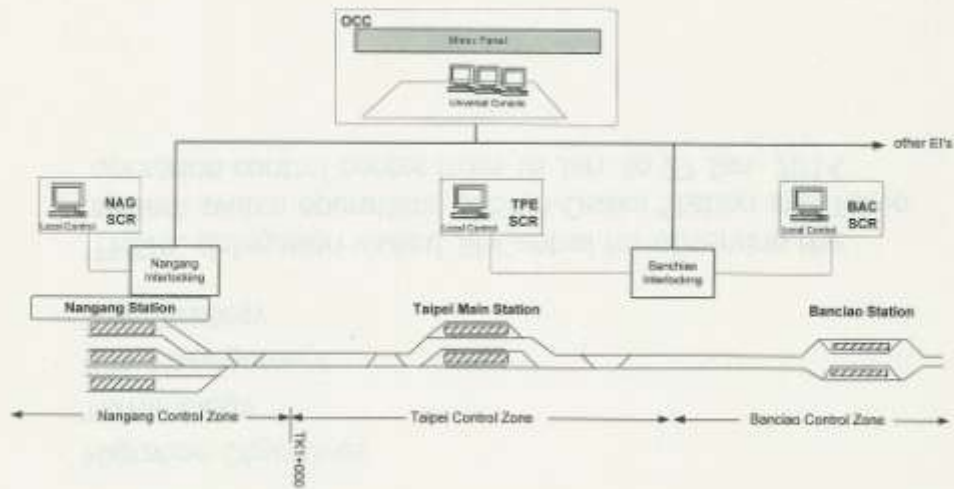


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Page 8

Fully Integrated Signaling Control Structure



IV. System Integration and Migration



- Migration Objectives
- Terminology
- Risk Management
- T&C Strategy

THSRC delegation visited JR-Central for observing the system switch operations of Shin-Osaka Station and Tokyo operation control center from 18 Jan. to 27 Jan. 2014

Construction Photos -1



Rail delivery from outside tunnel
near TK-(4+685)



Rail delivery into tunnel near TK-
(4+685)

Construction Photos -2



LWR production arrangement



LWR production line Station 1

LWR : Long Welded Rails

Construction Photos -3



FBW Flash-butt-welding preparation work for LWR - Station 2



FBW for LWR - Station 2

LWR : Long Welded Rails

Construction Photos -4



Welding joint grinding work



Welding joint grinding work

Construction Photos -5



GI (geometrical inspection) checking at welding joint



UT (ultrasonic test) at welding joint

Construction Photos -6



Rail distribution to work site



Rail distribution to work site near station area

Construction Photos -7



LVT blocks assembling work



Assembled LVT blocks

LVT : Low Vibration Track

Construction Photos -8



Contractor's workbase inside TRA Taipei Workshop near TK1+000.
Note elevated platform built over existing tracks as the Workshop is
to be reserved as a historical area.

Construction Photos -9



Ticket concourse of HSR Nangang Station



Inner concourse of HSR Nangang Station

Construction Photos -10



Nangang station front view 1



Nangang station front view 2

The End