行政院及所屬各機關出國報告

(出國類別：協商)

赴日本氣象協會參加年度協商會議報告書

服務機關：交通部中央氣象局

出 國 人 職　　稱：主　任

姓　　名：申湘雄

出國地點：日本

出國期間：民國九十三年五月十日至五月十四日

報告日期：民國九十三年八月二日

行政院及所屬各機關出國報告提要

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赴日本氣象協會參加年度協商會議報告書

出國計畫主辦機關／聯絡人／電話：

交通部中央氣象局／陳淑珍／2349-1057

出國人員姓名／服務機關／單位／職稱／電話：

申湘雄／交通部中央氣象局／氣象資訊中心／主任／2349-1260

出國類別：☐1 考察☐2 進修☐3 研究☐4 實習☑5 其他：協商

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報告日期：　民國九十三年八月二日

分類號/目：H8/氣象　I8/資訊科學

關鍵詞：氣象, 日本氣象協會, MTSAT, 系集氣候預報, MICOS

內容摘要：（二百至三百字）

本局與日本氣象協會(JWA)於民國七十三年簽訂氣象資料供應合約，由JWA 負責提供世界氣象組織(WMO)之全球氣象觀測資料。為維持資料供應之穩定及不受政治因素干擾，本局與 JWA 在合約中訂定雙方成員每年兩次檢討全球通信系統(Global Telecommunation Systems, GTS)資料供應情形，並適時調整資料傳輸方式、速率與內容。

今年度東京會議，除檢討年度合約履行狀況外，並針對資料提供、資料交換及合作事項進行協商，分別就季節系集預報資料之提供、氣象衛星資料之備援、即時地震資料之交換、預報天氣模式之合作進行詳細分析研討，並達成協議。

摘要

本局與日本氣象協會(JWA)於民國七十三年簽訂氣象資料供應合約，由 JWA 負責提供世界氣象組織(WMO)之全球氣象觀測資料。為維持資料供應之穩定及不受政治因素干擾，本局與 JWA 在合約中訂定雙方成員每年兩次檢討全球通信系統(Global Telecommunation Systems,GTS)資料供應情形，並適時調整資料傳輸方式、速率與內容。

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壹、目的

職此次奉派至日本東京出席本局與日本氣象協會(JWA)全球氣象資料供應年度協商會議，有兩項主要任務：

一、檢討本局與該協會在年度資料提供作業

(一)檢討線路之作業狀況

(二)因應 JWA MICOS 更新、檢討線路傳輸方式

二、資料提供、資料交換及合作事項

(一)日本氣象廳季節系集預報資料之提供

(二)氣象衛星資料備援

(三)地震資料交換

(四)預值天氣預報模式合作

貳、協商行程

職於民國九十三年五月十日(星期一)啟程，五月十四日返國，為期五天。此次赴日與會者尚包括資訊工業策進會氣象專案譚經理允中，民用航空局台北氣象中心黃光遠先生。

一、 年度協商會議

會議於五月十一日起於會見 JWA 理事長渡邊純一郎(Junichiro Watanabe)先生後，假日本氣象協會第五會議室舉行。十二日由 JWA 安排訪問 Japan Air Line(JAL)及明星電氣株式會社(MEISEI Electric Co., LTD)，十三日上午參訪富士通研究所(FUJITSU Laboratories LTD)下午於日本氣象協會第五會議室舉行協商會議議案最後確定。十四日返台。

參與此次協商會議之日方代表有：管理兼企畫本部本部長陳介臣先生、營業推進部部長羽根田勤先生、營業開發課課長櫻井康博先生、課員山本有子小姐、市場企畫課課長田口晶彥先生、MICOS 本部本部長渡邊好弘先生、MICOS 企畫調整部部長淹谷克幸先生、MICOS CENTER 部長橋波伸治先生、課員早坂祐一先生、技術開發部 Hayashi 先生、東北支局支局長野瀨泰一先生、東北支局氣象情部課課長森知夫先生、課員下由晉也先生。

另日本氣象廳亦派火山部管理課課長上垣內修先生參與地震資料交換之協商。

二、日本氣象協會組織近況

日本氣象協會近日改組，以下說明改組後的氣象協會的組織架構與人員職務近況。

日本氣象協會組織

1. Chairman [會長 石月]

(1) Director General [理事長 渡邊 純一郎(Watanabe Junichiro)]

(A)管理本部(Administration Division) [管理本部長陳介臣]

(a) 管理部

(b) 財務部

(B) 企畫本部(Planning Division) [企畫本部長 陳介臣]

(a) 企畫部

(C) 營業本部(Business Head Office) [營業本部長藤本健幸]

(a) 營業部(Business Department) [部長羽根田勤]

(I) 營業開發課(Business Development Section)

[課長 櫻井 康博 (Yasuhiro Sakurai)]

(II) 市場企畫課(Market Planning Section)

[課長 田口 晶彥(Akihiko Taguchi)]

(III) 營業統括課

(b)營業推進部(Business Promotion Department)

(D) Meteorological Information Comprehensive Online Service Division(MICOS) [MICOS 本部長 渡邊 好弘(Yoshihiro Watanabe)]

(a) MICOS 企畫調整部(MICOS Department)

[部長 滝谷 克幸(Katsuyuki Takitani)]

(b) MICOS Center [部長 橋波 伸治(Hashinami)]

(E) 技術開發本部(Research and Development Institute) [技術開發本部長 渡邊 好弘(Yoshihiro Watanabe)]

(a) 技術開發部(R & D Department) [Hayashi]

(b) 技術企畫部(Technical planning Department)

(F) 支社

(a) 首都圏支社

- 營業部(Business Promoting Department)

  [部長 古市 信道(Nobumichi Furuichi)]

- 研究顧問部(Consulting Department)

- 情報部 (Information Department)

- 情報處理部

- 北關東支店
- 新潟支店
- 北陸支店
- 福井事業所
- 常野支店
- 沖繩支店

(b) 北海道支局 [鬼島]

- 旭川支店
- 涵館支店
- 室蘭支店
- 帶宏支店
- 網走支店
- 釧路支店

(c) 東北支局(Tohoku Regional Office)

[支局長 野瀨 壽一(ToshiKazu Nose)]

- 氣象情報課 [課長 森 和夫(Kazuo Mori)]

[課員下田 晉也(Shinya Shimoda)]

- 青森事業所
- 八戶事業所

- 秋田事業所
- 山形事業所
- 福島事業所
- むつ事業所

(d) 東海支局

- 靜剛支店

(e) 關西支局

- 兵庫事業所
- 中國支店
- 四國支店

(f) 九州支局[岩淵]

- 長崎事業所
- 熊本事業所
- 大分事業所
- 宮崎事業所
- 鹿兒島事業所

理事長與常務理事為兩年一任，可連任。目前的三位常務理事為：陳　介臣、藤本　健幸、渡邊　好弘。長期以來與

氣象局主要實際商談單位為 MICOS Department，此部分負責氣象服務業務的規劃，負責人為滝谷 克幸部長，作業負責單位為 MICOS Center。自 92 年度起，營業部門也派人參與會商，並負責雙方連繫、訪問與接待事宜，主要負責人為櫻井康博課長。

MICOS Department 負責氣象資料相關計畫事宜，MICOS Center 負責氣象資料提供作業相關事宜，目前與氣象局作業相關聯絡人為 Hayasaka，該員為新進 MICOS Center 人員。

Business Department 負責氣象業務的開發，營業開發課負責規劃事宜，市場企畫課負責新業務的拓展，營業統括課負責業務的統計總覽。

三、協商內容

(一)年度作業檢討

全球氣象資料成長相當快速，本局自民國七十三年起與日本氣象協會訂約由該協會負責提供本局所需之全球氣象資料，十數年來由於資料量不斷成長，線路傳輸速率分別由 4.8k、9.6k、56k 提升至現今的 128k，而目前也僅能滿足本局作業需求。

雙方就一年來資料傳輸、接收、故障通知、排除、協調和資料重傳作業，詳細的分析與檢討。

今年由於日本氣象協會更新其氣象資料傳輸及作業系統(MICOS)，故日方詳細解說其更新系統之硬體架構、軟體設計及傳輸資料格式等，又因我方要求及日方可提供之資料又增加許多，故特別針對資料量之增加、傳輸速率之提升，傳輸方式之改變，雙方從 1984 年起至目前為止的作業，做了詳細的探討，冀求在新系統架構下能研究出更有效率的資料服務方式。

(二)年度議題協商

氣象局與 JWA 討論議題分述如下：

1. 議題：請提供三個月的 ensemble forecast digital output(1 month interval)。

   討論：JMA 現有兩類 seasonal ensemble forecast data，主要在預報 hot season 和 cold season：

(1) Seasonal forecast member grid point value

Making frequency : Five times a year.
The output period : The correspondence at the forecast announcement month and the output period is as follows.

發佈月份	預報月份	預報目的
2	3-8	hot season
3	4-8	hot season
4	5-8	hot season
9	10-2	cold season
10	11-2	cold season

Statistical processing: average for one month
Ensemble members: 31
Grid: 2.5 degree by 2.5 degree
Area: full globe
Element:
Surface: SLP, daily precipitation, temperature(2M), temperature of seawater
Upper: height, wind, temperature, humidity, specific humidity
Record format: GRIB2
File size: about 1Mbyte to 3Mbyte a file (changes from output periods),40 files about 80Mbytes to 120Mbytes totally

(2) Seasonal forecast ensemble statistical grid point value

Making frequency : Five times a year.

The output period : The correspondence at the forecast announcement month and the output period is as follows.

發佈月份	預報月份	預報目的
2	6-8	hot season
3	6-8	hot season
4	6-8	hot season
9	12-2	cold season
10	12-2	cold season

Statistical processing: ensemble mean value of average for average for one month and three months, and spread

Grid: 2.5 degree by 2.5 degree

Area: full globe

Element:

Surface: SLP, daily precipitation, temperature(2M), temperature of seawater

Upper: height, wind, temperature

Record format: GRIB2

File size: about 30Kbytes to 70Kbytes a file , 29files about 2Mbytes totally

結論：

- 氣象局(預報中心)需要決定那一種 ensemble 資料是需要的，再告訴 JWA。
- 目前 X.25 專線的頻寬不足，不足以提供 ensemble 資料，解決方法有三：一是增加頻寬，此方式請 JWA 評估頻寬的需求量；二是將資料分段傳送，因為 ensemble 資料的

急迫性不高，可以分檔案利用專線空閑時間傳送；三是利用 internet 傳送，此方式也為 JWA 所接受。

2. 議題：日本氣象衛星近況說明。

結論：

- On Nov 29, 2003, the launch of rocket "H-IIA Launch Vehicle No.6 (H-IIA F6)" failed. The Japan Aerospace Exploration Agency (JAXA) is investigating the cause of the accident.
- MTSAT-1R is completed and waiting for launch. The launch is postponed due to the problem of rocket. Current plan for launch is Nov 2005.
- On Feb 2003, MTSAT-2 has been ordered to Mitsubishi Electric Corp. The launch is scheduled in FY 2005.
- MTSAT-2 will be acting as back-up to MTSAT-1R until 2009 and MTSAT-1R will be used as back-up after that.
- 由於 MTSAT-2 的衛星資料格式將不同於過去，JWA 提供 HRIT(High Rate Information Transmission)如附錄一和 HiRID(High Resolution Image Data)如附錄二格式說明。

3. 議題：地震資料交換現況問題處理。

結論：

- 對於氣象局的使用部分，JWA 應解釋如何進行安裝，另外在 Tokyo Univ. 的 WIN 網頁上有原始程式碼可參考。
- 對於 JMA 的部分，氣象局應提供正確的解釋和 sample 資

料。

- WIN 可否改為 file type 資料格式仍有待雙方討論，將請地震中心與日方協商。
- 地震中心提議此部分資料是否需要另外利用專線傳輸，JWA 建議因為資料量小，不需要另外專線。

  * S13 與 RTD 之波形格式如附錄三

4. 議題：CWB 執行 JWA 數值模式仍有問題，無法正常執行初始化(initialization)。

   結論：

   - 日方說明因最近三個月進行改組，所以中斷了此段時間的雙方運作，目前已重新開始雙方的連繫合作，雙方洽談結果初步認為一個月內可讓模式開始於氣象局運作。

5. 議題：將目前專線的 protocol 由 X.25 改為 TCP/IP。

   結論：

   - JWA 準備英文版的介面規格。
   - JWA 準備利用 MMTP(MICOS Message Transfer Protocol)。
   - JWA 會提供 MMTP receive module(Linux OS)。
   - JWA 目前已有 CWB 所使用的 LINUX OS。

- JWA 和 CWB 會對於 interface specification 是否合適再進行討論。
- 目前建議由 CWB 自行安裝 MMTP module 較為適合。
- 未來可透過雙方的安排，利用傳輸的空檔時間進行測試。
- 氣象局南區中心需要有備援能力，因此若台北局本部有困難接收資料時，中華電信會直接將資料傳送南部處理，需要安排時間進行資料轉送的測試，此部分問題會再請JWA配合測試。另行傳送時會使用固定 IP 或更換新的 IP 會再通知 JWA。
- 計畫時程如下

Topic	May	Jun	Jul	Aug	Spt
1. Preparing interface specification in English	→	→			
2. Preparing MMTP receive module on LINUX OS		→	→		
3. Adjusting the interface specification		→	→		
4. Installing the MMTP module to CWB LINUX computer by CWB			→		
5. Test				→	
6. Start to send by new protocol					Δ

6. 議題：月預報資料格式可否轉為.htm, .txt 或.doc 問題。

結論：目前 JMA 提供的資料為 tiff 格式，JWA 無法進行轉換

提供其他格式。

7. 議題：JWA 介紹 new MICOS system。內容請參考附錄四。

(三)訪問 Japan Air Line(JAL)

此次訪問 JAL 的機會來自於民航局對於飛機航管控制的工作與航空公司多所相關，而 JAL 為日本最大的航空公司，其氣象資訊系統又正好為 JWA 所負責建置，因此經由 JWA 的介紹得以訪問 JAL 的飛航控制部門(Flight Operations Center)。

JAL 包含 JAL、JAA、JAS、ANA 等數家航空公司，藉由電腦技術的改進，將原本由全世界各地分支機構控制飛機航管的系統集中在東京的飛航控制部門管理，針對日本國內、美國、歐洲、亞洲等區域分別有控制小組負責，主要工作在於利用氣象和航管的資訊決定飛機的起飛和航線的建議，也會因為氣象和業務需要調度飛機。每位管制員要面對五至六台電腦系統與螢幕，可看到氣象的資訊(包括天氣圖和觀測資料)、飛機航線的氣象預報、和飛行員的通訊等軟體系統。

氣象資料對於航空公司相當重要，JAL 會根據飛機的能力狀況，在惡劣天氣來臨前調度飛機到其他機場。JAL 目前擁有的飛機中 70~80%可以提供 ACARS 資料，對於飛航氣象資訊非常有幫助。在日本該資料由 JMA(Japan Meteorology

Association)負責收集，不同於我國由民航局負責收集。未來有計畫將資料透過 JMA 再送到 WMO，可和各國的 ACARS 資料進行交換。

此次訪問特別說明了飛航控制的訓練，飛航人員有 120 小時的 Operation Officer(OO)和 280 小時的 Operation Dispatcher(OD)兩類課程，其差異在於前者受訓後可以提供飛機起飛的建議，但是仍須 OD 的決定才能放行，後者有權力決定飛機的起飛。其訓練方式注重實際使用，因此是進行一段課程後參與日常工作，再進行下一段課程，整體訓練時間會延遲較久。JAL 並且對於現有員工持續進行每年度的在職訓練。

(四)訪問明星電氣株式會社(MEISEI Electric Co., LTD)

MEISEI 成立於 1938 年，主要銷售各式儀器，涵蓋市場包括氣象觀測儀器、地震觀測儀器、海象觀測儀器、衛星偵測儀器和通訊產品，一般性的產品經由其他廠商購得後負責整合組裝，高技術性產品則自行生產。目前氣象局的氣象高空觀測系統和民航局機場自動氣象觀測系統均採用該公司產品。

除了經由介紹瞭解該公司的 radiosonde、AWOS (Automated Weather Observing System)系統和地震偵測系統，並透過工廠的導覽，實際參觀該公司的地面觀測系統、能見度觀測儀、風向風速儀等。其中地震偵測儀器，可在偵測到地震的 P-wave 後，迅速反映出其強度和位置，並預測接續的 S-wave 發生時間，由於兩者間約有十秒左右的差異，因此可加以利用進行地震的減災反應措施，目前 JMA 已經在試用階段，令人印象深刻。

由於日本氣象協會所使用的氣象觀測儀器全是明星電氣株式會社的產品，雙方關係很好，故日本氣象協會表示如本局在使用明星電氣株式會社的產品上有任何問題該協會將全力協助。

(五)訪問富士通研究所(FJJITSU Laboratories LTD)

富士通研究所成立於 1968 年，資本額 50 億日圓，包含本地員工 1500 人和海外員工 150 人，分為 10 個實驗室、1 個計畫群和 4 個中心，主要研究中心(IT Core Laboratories)位於東京附近的川崎，研究重點在於 software & service、IT systems、Network system、Storage system、Terminal equipments、Display devices、Semiconductors、Materials。

此次拜訪富士通研究所主要是因為日本氣象協會此次作業用資料蒐集、處理及傳輸系統(MICOS)更新案是採用富士通公司的全新設計及設備，故特別安排該公司作詳盡的說明及展示。除此之外該公司另安排了兩個介紹重點，一個是參觀 Technology Hall，其間展示富士通各種研發中的先進產品和各類產品的演進過程，包含家用機器人、通訊產品、大型電腦、儲存設備、訊號加強器、螢幕和家用產品等；另一項重點在聽取 IT system 的介紹，富士通目前的研究朝向 organic computing 發展，概念是各個 component 也都能自

我控制，讓整體機器的擴展彈性增加，當有任何問題發生時能夠迅速的處理，並且以其儲存設備的功能當作示範系統，該設備模仿 RAID 架構再加以改進，任何一部分的儲存設備失效後可以迅速復原，而當新設備加入後也可以立即做 load balance，達到 organic 設計的目的。

參、心得與建議

一、本次年度協商討論多項主題，基本結論如下：

1. 會議中確認可以取得 seasonal forecast 資料，資料內容與傳送方式會進一步確認。未來氣象局可以參考 JMA 對於 seasonal 預報的做法，做出適合本地的長期預報。
2. 瞭解目前日本氣象衛星的現況，並同意衛星資料藉由網際網路傳輸作為本局衛星資料之備援。
3. 對於地震資料的交換，在資料使用與格式處理上需要繼續交換意見。
4. 對於 ANEMOS 模式引進的初始化技術問題雙方認知可於一個月內解決。
5. 本次會議確認解決資料傳送方式由 X.25 依雙方議定時程改為 TCP/IP 的解決方法。
6. 未來民航局有機會可以要求外國航空公司提供 ACARS 資料，有助於氣象資料的收集。

二、日本氣象協會為因應時代變遷及社會需求，目前已重新擬訂組織之調整、營業人員和技術人員的調動原則，授與各本部及支社社長相當的權限和靈活度。

原則上每年由企畫本部訂出營運政策、目標，再由管理本部主導，各本部及支社提出新年度營運計畫及過去年度作業檢討，於作業檢討中找出新年度營運之需求以期符合年度營運政策及達成年度營運目標。基於新的營運需求，作出組織調整及人員調動計畫，調整後次年並該調整作檢討。

今年的組織調整，將原本的作業五大本部縮為三大本部，主要在調整因橫向連繫之缺失而造成的營運目標未達成而訂。另外因東北支局將擴大傳輸系統服務而將 MICOS 本部的兩大技術高手調往東北支局協助建置系統及負責作業。而原為 MICOS CENTER 部長(負責與本局協商、連繫與作業)之古市信道由於二年來與本局合作表現優異及此次 MICOS 更新與所有大東京區服務對象溝通協調相當成功，而調為首都圈支社營業部部長。JWA 組織之靈活調整、人員之適才適用及因應實際需求的人員調度支援，皆足以借鏡。

三、日本氣象協會表示近年來的與日本氣象廳接觸，覺

察到日本氣象廳已逐年改善對本局的觀感與態度。前年日本GMS衛星發生問題，JMA主動向JWA表示對本局如何使用新的GOES衛星之關切，並指示JWA儘力協助本局。去年主動提出交換地震資料的議題(目前正積極進行中)。今年更派遣地震課長至JWA處與本局洽談。JWA表示JMA目前雖無法與本局進行官方正式活動，但實質(透由JWA)的接觸早已展開，且其預期將來會更有進展。

附錄一、HRIT(High Rate Information Transmission)

JMA HRIT

Mission Specific Implementation

Issue 1.2
1 January 2003

Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku, Tokyo, Japan, 100-8122

DOCUMENT CONTROL

Issue	Date	Status and Changes	
Issue 1	6 January 2000	Original Issue	
Issue 1.1	1 December 2000	1) Section 4.4.2.11	Header Type #130 – Explanations
		2) Section 4.4.2.12	Header Type #131 – Explanations
		3) Section 4.4.2.13	Header Type #132 – Explanations
		4) Appendix C	Link parameters
			Delete link budget example
Issue 1.2	1 January 2003		

Amended or supplemented parts are underlined.

CHANGE TRACEABILITY from Issue 1.1 to Issue 1.2		
Location of change in issue 1.1	Change	Ref.
TABEL OF CONTENTS	- removing of 3.1.3 Metorological Data - change of section numering 3.1.4 to 3.1.3 - removing of 4.5.5 - Change of appendix numbering	
Section 1.2	- modification of definition 'data rate'	
Section 1.3	- removing of appendix B - Change of appendix numbering	
Section 1.4.1	- change of [AD.1] rev 2.4 to rev 2.6	
Section 1.6	- Update of MSG LRIT/HRIT Mission Specific Issue 1.0 to Issue 4.1.9	
Section 2.2	- removing of Meteorological Data	
Section 3.1.1	- removing of 'Meteorological Data'	
Section 3.1.3	- removing all text	
Section 3.1.4	- change of Section numbering 3.1.4 to 3.1.3	
Section 4.2.1	- insertion of Number of image segment files might be changed in future due to the timeliness requirement	
Section 4.3	- removing Meteorological data	

	- modification of mission specific file type replaceing of Table 4.1 LRIT File Types	
Section 4.4.2.1	-	
Section 4.4.2.3	-	
Section 4.4.2.5	-	
Section 4.4.2.9	-	
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APPENDIX A	- insertion of Number of image segment files might be changed in future due to the timeliness requirement - mondification of A.1.2 - modification of A.1(removing of TBD and 'Sprit') - removing of A.1.4 - removing of A.1.5 - removing of A.2 - modification of A.3.1(removing of 'Sprit')	
APPENDIX	- removing of 'APPENDIX B' - change of appendix numbering	
APPENDIX C	- change of appendix numbering C to B adding of Pulse shaping 'Root'	
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1.INTRODUCTION

1.1 Purpose of the Document

A Global Specification for Low Rate and High Rate Information Transmission (LRIT/HRIT) [AD.1] has been agreed by the Co-ordination Group for Meteorological Satellites (CGMS). The global specification is based on the ISO standard 7498 (OSI Reference Model) [RD.1] and the CCSDS recommendations of Advanced Orbiting Systems (AOS) [RD.2]. It defines the structure and the formatting of the LRIT/HRIT files and the processing and transport protocols of all OSI layers applicable to all geostationary meteorological spacecraft.

The purpose of the document, JMA HRIT Mission Specific Implementation, is the specification of the more detailed communication structure applied to the high rate transmission service of meteorological mission of the MTSAT (Multi-functional Transport SATellite).

This document defines the formatting manner from the view of the transmitting site, it further implies function from the receiving side (User Stations) point of view.

1.2 HRIT Service

The mission shall be named LRIT (Low Rate Information Transmission) if the communication link provides a data rate below 256k bit/s. If the rate is greater than or equal to 256k bit/s, the mission shall be named HRIT (High Rate Information Transmission).

The MTSAT dissemination service provides the HRIT service. The service is performed via one physical channel of the MTSAT with a data rate of 3.5Mega symbols per second.

1.3 Document Structure

A brief description of the contents of each of the sections is given below:

Section 2	provides an overview of the OSI layer reference model and its particular functionality.
Section 3	presents the data to be disseminated via JMA HRIT.
Section 4	introduces to the HRIT file structure in general and defines the mission specific file types and secondary headers.
Section 5	contains the required details about the compression and encryption algorithms.
Sections 6 to 8	summarize the mechanisms of formatting the data into source packets and transfer frames.
Section 9	defines the JMA HRIT mission specific parameters of the physical layer.
Appendix A	shows the file format of image data to be disseminated via the HRIT dissemination channel

Appendix B	defines the parameters of satellite to ground communication link
Appendix C	contains list of abbreviations used in this document
Appendix D	contains list of TBDs, TBCs

The handling of failure cases and the utilization of dissemination data are not covered by this document.

1.4. Applicable and Reference Documentation

1.4.1 Applicable Documentation

[AD.1]CGMS: 'LRIT/HRIT Global Specification', Rev 2.6,12 August1999

1.4.2 Reference Documentation

[RD.1] ISO: 'Information Processing System - Open System Interconnection - Basic Reference Model', ISO standard 7498-1, 1994
[RD.2] CCSDS: 'Advanced Orbiting Systems, Networks and Data links: Architectural Specification', CCSDS Recommendation 701.0-B2, November 1992
[RD.3] WMO: 'WMO Manual on the Global Telecommunications System', Publication number 386, 1992
[RD.4] CCSDS: 'Time code formats', CCSDS recommendation 301.0-B-2 April 1990
[RD.5] ISO: 'Information Technology - Digital Compression and Coding of Continuous-tone Still Image - Requirements and Guidelines, Compliance Testing and Extensions', ISO standards 10918-1, 10918-2, DIS 10918-3
[RD.6] Data Encryption Standard (DES), Federal Information Processing Standard (FIPS) PUB 46-2, U.S. Dept. of Commerce, National Institute of Standards and Technology, 30/12/93
[RD.7] DES Modes of Operation, FIPS PUB 81, U.S. Dept. of Commerce, National Institute of Standards, 2/12/1980
[RD.8] CCSDS: 'Telemetry channel coding', CCSDS recommendation 101.0-B-3, May 1992

1.5 Conventions

Data types and encoding rules given in this document follow the specifications of [AD.1]

1.6 Acknowledgment

This document is based on :
MSG LRIT/HRIT Mission Specific Implementation, EUMETSAT MSG/SPE/057, Issue 4.1.9 March 2001
and MTSAT LRIT Mission Specific Implementation Issue 6,?/?/?? is prepared for JMA HRIT dissemination service.

JMA would like to express its sincere appreciation for the cooperation and assistance of EUMETSAT in preparing this document.

附錄二、HiRID(High Resolution Image Data)

MTSAT HiRID

Technical Information

Issue 3
1 June 1999

Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku, Tokyo, Japan, 100-8122

DOCUMENT CONTROL

Issue	Date	Status and Change
Issue 1	1 March 1998	Original Issue
Issue 2	1 July 1998	APPENDIX A 1) – 7) 1) Section 2.2.1 Documentation Sector 2) Section 2.2.2 Infrared Image Data Sectors 3) Table A.1 S/C & CDAS documentation block (Word No.1) 4) Table A.1 S/C & CDAS documentation block (Word No. 98) 5) Table A.4 Orbit and attitude data block (Word Nos. 2957-2962) 6) Table A.4 Orbit and attitude data block (Word Nos. 2977-2982) 7) Table A.7 Calibration data block (Word Nos. 5-10) APPENDIX B
Issue 3	1 June 1999	APPENDIX A 1) – 4) 1) Section 1. Main characteristics 2) Table A.1 S/C & CDAS documentation block (Word No.65) 3) Table A.1 S/C & CDAS documentation block (Word No. 68) 4) Table A.6 Contents of orbit prediction data sub-block (Word Nos. 195-200) APPENDIX B (One line of Page 9)

Amended or supplemented parts are underlined.

MTSAT HiRID Announcement of the Technical Information
Issue 3, 1 June 1999

CONTENTS

1. Introduction

2. Outline of HiRID

3. Transmission of HiRID

4. Data format of HiRID

4.1 Change of dissemination timing of data

4.2 Change of image data frame

4.3 Addition of 3.7 μm IR channel data (IR 4)

4.4 Increase of quantization level

4.5 Change of navigation information

4.6 Change of calibration information

APPENDIX A : Characteristics of MTSAT HiRID

APPENDIX B : Sample Program of MTSAT HiRID and GMS-5 S-VISSR image navigation

APPENDIX C : Processing of expanded infrared data with a sample program

1. Introduction

Japan Meteorological Agency (JMA) is now developing the Multi-functional Transport Satellite (MTSAT), which is planned to be operational on the geostational orbit at 140 E in March 2000 following its launch in August 1999 as the successor to GMS-5.

Digital image data for Medium-scale Data Utilization Stations (MDUS) are named the High Resolution Image Data (HiRID) and will be disseminated via MTSAT in place of Stretched Visible Infrared Spin Scan Radiometer data (S-VISSR) of GMS-5. The data transmission method and data format of HiRID will be different from those of S-VISSR. The MTSAT will introduce a new transmission and earth observation systems. The HiRID format is designed to be upper-compatible with S-VISSR format.

This document is prepared to provide MDUS users with the necessary information on data reception and data processing of HiRID for MDUS users. The outline of HiRID and the main alterations from S-VISSR are described in Chapter 2, the transmission method in Chapter 3 and the HiRID data format in Chapter 4.

The specification of HiRID is shown in APPENDIX A. A sample program of image navigation for HiRID and S-VISSR is shown in APPENDIX B. This program is the same as that for S-VISSR which is used currently. The processing of expanded infrared data with a sample program is also shown in APPENDIX C.

2. Outline of HiRID

This chapter describes the differences on the data transmission and processing between HiRID and S-VISSR.

MTSAT is equipped with two transmitters which transmit Imager observation data and HiRID dissemination data separately. The carrier wave to transmit HiRID is not interrupted even when Imager observation data are being transmitted. If a receiving system of MDUS utilizes the carrier interruption to receive S-VISSR, it may need to be modified due to the transition to HiRID. Details of data transmission are explained in Chapter 3.

MTSAT is newly equipped with an infrared sensor of 3.7 μm band (IR 4) in addition to the infrared sensors (IR 1-3) and visible sensors (VIS) of GMS-5. The observation data with all the sensors is disseminated by HiRID . Data in all infrared channels (IR 1-4) of MTSAT has 1024 (10-bit) quantization levels which is increased from 256 (8-bit) levels of GMS-5. Image-processing programs in the current MDUS need to be modified in order to use these new data. The format of the upper 8-bit data of IR 1-3 and visible (VIS) data of MTSAT are same as S-VISSR data. Therefore image-processing programs in the current MDUS can be used without modifications to obtain HiRID data with the same bit depth as S-VISSR.

Navigation data included in HiRID is updated during the course of observation by processing its image data at the ground station of JMA. Fixed conversion tables from brightness levels to physical quantities are used in HiRID, because calibration is made to Imager observation data at the ground station of JMA before it is disseminated as HiRID.

Details of data format and processing are explained in Chapter 4.

3. Transmission of HiRID

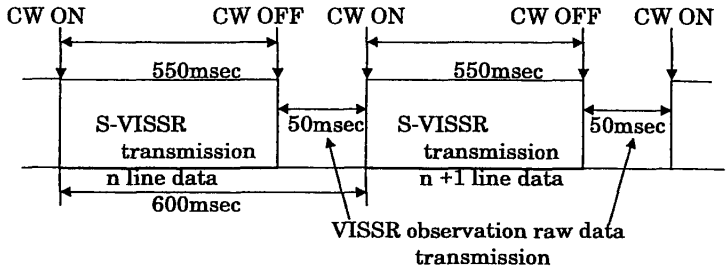
Raw data of earth observation obtained with MTSAT and GMS are called "Imager observation data" and "VISSR observation data", respectively. MTSAT is equipped with two transmitters which transmit Imager observation data and HiRID dissemination data separately, while in the case of GMS VISSR observation data and S-VISSR are transmitted from one transmitter.

As shown in Figure-a, one-line data of VISSR observation and S-VISSR are transmitted alternately within the period of 600 milliseconds, which corresponds to one spin of GMS-5. Therefore, the carrier wave of S-VISSR is interrupted for approximately 50 milliseconds while VISSR observation data are transmitted.

As shown in Figure-b, the transmission of carrier wave of HiRID is not interrupted, because Imager observation data and HiRID are transmitted separately..

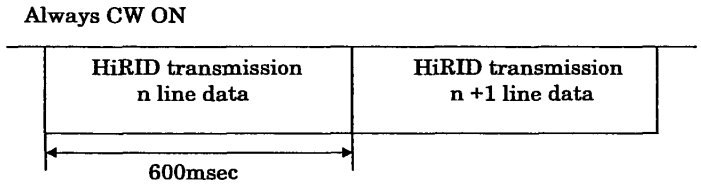
If an MDUS receiving system utilizes the interruption of carrier wave to detect the end of each line data, the MDUS needs to be modified so that it can detect the end of line without using the interruption and can reset PN sequence at this timing.

HiRID data stream is shown in Figure-c.



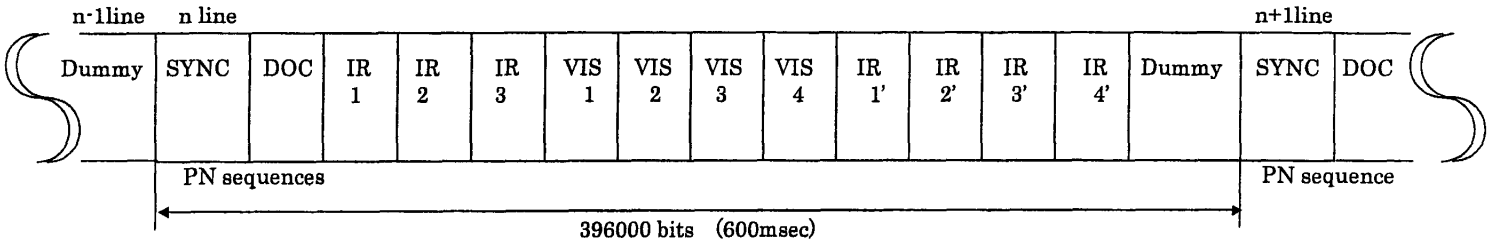
CW : Carrier Wave

Figure-a S-VISSR data transmission on GMS



CW : Carrier Wave

Figure-b HiRID data transmission on MTSAT



SYNC : Sync code (Fixed data of PN sequence)

DOC : Documentation sector

IR1~IR3 : 8 MSBs data of IR data sectors

VIS1~VIS4 : VIS data sectors (6 bits data)

IR1'~IR3' : 2 LSBs data of IR data sectors

IR4 : IR4 data sector (10bits data)

Dummy : All logic zeros

Details of each part are shown in APPENDIX.A.

Figure-c HiRID data stream

4. Data format of HiRID

4.1 Change of dissemination timing of data

HiRID is composed of the dummy data part and the significant image data part as shown in Figure 1. The significant image data part consists of 2201 lines of data. During the transmission of the significant data part, the frame flag in Documentation sector is ON. Dummy data, in which the frame flag is OFF, is sent before and after the significant image data of HiRID.

While dissemination of S-VISSR starts almost simultaneously with VISSR observation, significant image data of HiRID are disseminated with a delay of about 5 minutes from the start of Imager observation as shown in Figure 2.

Dissemination time of significant image data of HiRID is approximately 22 minutes for the full disk observation and is approximately 11 minutes for the hemisphere observation.

4.2 Change of image data frame

Figure 3 shows the image data frame of S-VISSR and HiRID. The number of lines from north to south in the full disk observation is 2201 which is less than that of S-VISSR data. The number of pixels from west to east on IR image is 2291 which is the same as that of S-VISSR data.

4.3 Addition of 3.7 μm IR channel data (IR 4)

The 3.7 μm channel (IR 4) sensor is newly carried on MTSAT. IR 4 data is included in HiRID in addition to the visible (VIS), split window (IR 1, IR 2) and water vapor (IR 3) data. Band width of these sensors are as follows:

VIS	0.55 - 0.80 μm
IR1	10.3 - 11.3 μm
IR2	11.5 - 12.5 μm
IR3	6.5 - 7.0 μm
IR4	3.5 - 4.0 μm

As shown in Figure 4, IR 4 data are stored in the third IR image of HiRID format sectors as 10 bit data. In order to use the IR 4 data, image-processing program of the current MDUS needs to be modified so that the second IR image data sectors are processed.

4.4 Increase of quantization level

The quantization of VIS data of HiRID remains to be 6 bits. In the case of IR data, the quantization is refined to 10bits or 1024 levels from 8 bits or 256 levels in S-VISSR. IR 1-3 data are divided into the upper 8-bit part and the lower 2-bit part. The former is called Most Significant Bits (MSB) and the latter Least Significant Bits (LSB).

As shown in Figure 4, in HiRID the upper 8-bit data of IR 1-3 are placed in the same areas and in the same format as S-VISSR, and the lower 2-bit data is put into the spare area which is filled with dummy data in S-VISSR format. Therefore, users have to combine the upper 8-bit data with the lower 2-bit data to process HiRID as 10 bit image data.

4.5 Change of navigation information

The processing of navigation is necessary for MDUS users so that each pixel/line of image data is assigned correctly to the corresponding latitude/longitude of the earth. The navigation data is stored in the Simplified mapping block and the Orbit and attitude data block (S & O data blocks) in Documentation sector. As shown in Figure 5, 200 lines of S & O data blocks are used to send one set of navigation data and is Sub-commutation ID is used to identify each of the 200 lines.

附錄三、S13 與 RTD 之波形格式

S13 與 RTD 之波形記· · 案格式

案之記· 格式, 可分為三部分:FileHeader、PortHeader 及 Data。FileHeader 儲存· 案頭資訊固定佔 24Bytes, 其格式如下:

```
Type :: RTD_fileheader   !—24 Bytes
    !— 四個字元儲存系統識別碼(RTD, S13)
    character      :: fid*4
    !— 以下欄位儲存· 案記· 時間之年
    integer(2)     :: iyear
    !— 以下欄位儲存· 案記· 時間千分之秒數
    integer(2)     :: imsec   !—milli-seconds /1000 = sec
    !— 以下欄位儲存· 案記· 之長度以秒數計
    integer(2)     :: filelength
    !— 以下欄位儲存· 案記· 時間之月
    integer(1)     :: imonth
    !— 以下欄位儲存· 案記· 時間之日
    integer(1)     :: iday
    !— 以下欄位儲存· 案記· 時間之時
    integer(1)     :: ihour
    !— 以下欄位儲存· 案記· 時間之分
    integer(1)     :: imin
    !— 以下欄位儲存· 案記· 時間之秒
    integer(1)     :: isec
    !— 儲存測站數目
    integer(1)     :: nbr_of_ports
    !— 儲存系統之取樣率
    integer(1)     :: sample_rate
    !—7 個 Bytes 的保留空間
    character      :: blk*7
End Type RTD_fileheader
```

FileHeader 以下的區域儲存 PortHeader，一個測站有一個 PortHeader，一個 PortHeader 佔 32Bytes，因此，PortHeader 的總長度佔(32*測站數目)Bytes，一個 PortHeader 格式如下：

```
Type :: RTD_portheader   !-32 Bytes
    !- 四個字元儲存測站碼
    character      :: station_code*4
    !- 四個字元儲存儀器型態(RTD or S13)
    character      :: instrument_type*4
    !- 三個字元儲存三個分量之順序(VNE or another)
    character      :: complist*3
    !- 以下三個 1Byte 整數儲存 VNE 之極向
    integer(1)     :: polarity_v
    integer(1)     :: polarity_n
    integer(1)     :: polarity_e
    !- 一位元整數儲存硬體輸入之 COM Port 數
    integer(1)     :: ncom
    !-5 個 Bytes 的保留空間
    character      :: blk*5
    !- 以下三個 4Bytes 實數儲存 VNE 之放大倍率
    real           :: gain_v
    real           :: gain_n
    real           :: gain_e
End Type RTD_portheader
```

Portheader 以下的區域儲存訊號資料，其資料的排列方式為複編方式排列，首先為第一個測站第一時間點的資料，然後為第二測站第一點，至最後一各測站，接著第二時間點資料至最後時間點資料。一個測站一點的資料佔 6 個位元組(三個分量*2Bytes 整數)。以二位元整數之矩陣排列如下：

I2Data(Ncom,Nstations,Npoints)

其中 Ncom 為 3，代表 VNE 三個分量。Nstations 為測站數目。 Npoints · 一個測站所記· 之點數，為· 案記· 之長度以秒數乘以取樣率。這樣的方式儲存非常有利於資料讀取，當陣列宣告後即可一次讀取資料，當資料讀入陣列後即為解編後之數據。

附錄四、新 M ICOS 系統簡介

Introduction of the new MICOS system

A communication system and product form are changed in the new MICOS system to be released in June, this year. The outline is explained.

[communication system]

In the new MICOS system, it cha

communicates by HTTP from the system which distributes wording of a telegram by X.25, HDLC, BSC, and MMTP (original protocol). The Internet circuit of a low price can be utilized now and it is expected by this that a user's convenience increases.

The following two communication systems are assumed in the new MICOS system.

1. System referred to from browser in HTTP procedure to Web server.
2. Distribution system which built delivery check procedure into

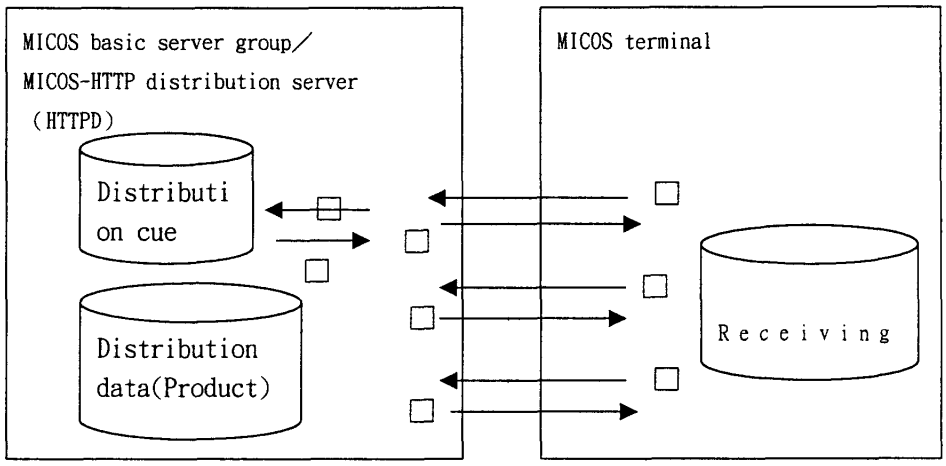
HTTP protocol and which is called MICOS-HTTP.

In MICOS-HTTP, when it requests to a server side periodically from a terminal side and the corresponding weather product exists in cue, it acquires with a HTTP procedure. Instancy information acquisition is enabled by adjusting a request interval. Technical data are carried in an attached sheet.

[product formal]

Although the wording-of-a-telegram product was adopted conventionally, the product of an XML file format is adopted in new MICOS. Now, at the Meteorological Agency, although a part of information was XML-ized, in the new MICOS system, almost all the information except image data was XML-ized. Thereby, the processing system with affinity with the Internet technology became possible. Sample data are carried in an attached sheet. The basic composition of an XML file has specified the layered structure of discernment information, a place, classification and time, and an element.

The whole transmission sequence image of the product acquisition and delivery check in MICOS-HTTP distribution



Ⅰ. Product metadata acquisition

□Product metadata demand

・Product metadata is required of a MICOS-HTTP distribution server from a MICOS terminal.

②、③Distribution cue check

・It checks whether the non-distributed product for distribution exists within a MICOS basic system.

□Product metadata distribution

・A MICOS-HTTP distribution server will return the metadata, if the product for distribution is accumulated. If there is nothing, although it will wait for accumulation of fixed time and data, the purport which is not is returned if not still accumulated.

Ⅱ. Data acquisition (product data)

□Product data demand

・Distribution of product data is required from a MICOS terminal

□Product data distribution

・Applicable product data is distributed from a MICOS-HTTP distribution server.

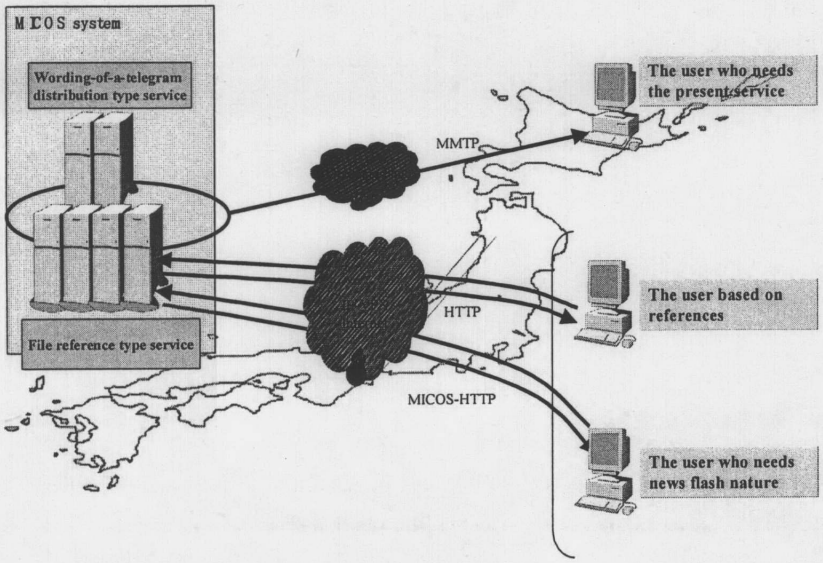
Ⅲ. Delivery check

□The notice of a delivery check

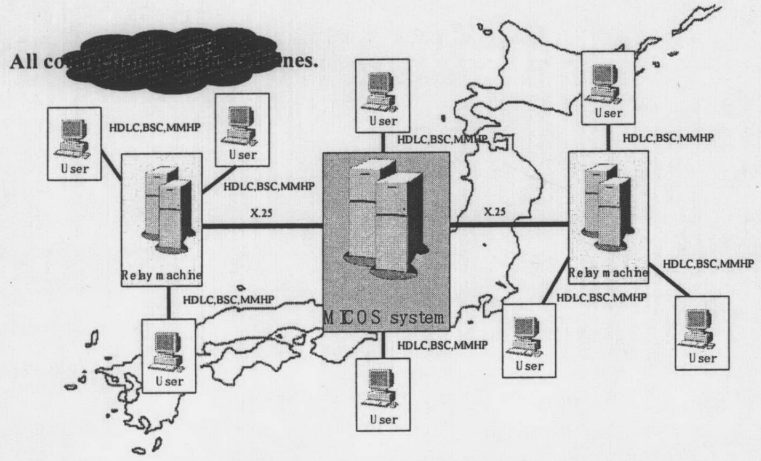
・A MICOS terminal returns the delivery check of data which carried out the completion of reception to a MICOS-HTTP distribution server.

□Delivery check result return

・A MICOS-HTTP distribution server processes the completion of distribution, and returns a result to a MICOS terminal.



Present MICOS service composition



In the present MICOS distribution network, a dedicated line is directly connected to a user and service is offered. The relay machine is arranged in various places.