

COOPERATION BETWEEN SFCG AND CGMS ON RADIO FREQUENCY ISSUES

(Submitted by WMO)

Summary and purpose of document

The CGMS/WMO Forum on Data Transmissions from Meteorological Satellites at its meeting on 30 August 2006 recommended to CGMS to initiate technical discussions by SFCG on the evaluation of the sharing studies.

WMO participated at the SFCG 26 meeting in Bonn (Germany) from 19 – 27 September 2006. Cooperation on technical issues of radio frequency management was discussed and SFCG prepared a liaison statement to CGMS describing proposed cooperation.

ACTION PROPOSED

CGMS is invited to take note of the SFCG liaison statement and endorse proposals.

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The main points of the liaison statement are:

- SFCG recommends that CGMS member agencies make use of the SFCG Resolution RES A12-1R2 to facilitate sharing between existing and planned meteorological satellite systems (Annex 2);
- SFCG recommends to consult the SFCG data base for information on existing systems;
- SFCG can provide a forum for technical discussions and the evaluation of sharing studies after submission of inputs on planned MetSat systems;
- In order to minimize time delays due to an unfortunate sequence of annual meetings of SFCG and CGMS SFCG proposes to nominate a coordinator which is member of both groups. This coordinator shall be nominated on a yearly base. SFCG recommends that for maximum effectiveness and fastest response in urgent situations the coordinator role would be filled by WMO. SFCG will establish a group of contributors for issues related to Meteorological Satellites with the SFCG representative to CGMS as coordinator;
- SFCG would be prepared to create a special Inter-sessional Working Group (IWG) on the topic if required at a later time. It has to be noted that such IWG can only be created at annual SFCG meetings.

It has to be noted that neither PRC nor Korea were represented at SFCG-26.

SFCG-26

LIAISON STATEMENT TO THE COORDINATION GROUP FOR METEOROLOGICAL SATELLITES (CGMS)

SFCG was informed by document SF26-51/I provided by WMO about the outcome of the CGMS/WMO Forum on Data Transmissions from Meteorological Satellites held in Geneva on 30 August 2006.

It is understood that this meeting took place to identify measures to improve the coordination of future systems among Metsat operators in order to avoid conflicting frequency plans and potential interference as in the case of the future planned use of the 7750–7850 MHz band by NPOESS, FY-3 and MetOp.

SFCG notes that the potential interference issues among the above mentioned systems only surfaced at a rather late stage in the process of system development at which necessary system modifications were difficult to implement and that this circumstance triggered CGMS to discuss ways to improve the coordination among MetSat operators.

SFCG supports the recommendations agreed at the CGMS/WMO forum on measures that are intended to improve the coordination among Metsat operators in order to avoid such a situation in future. SFCG proposes that CGMS makes use of the coordination procedure as described in SFCG Res A12-1R2 (http://sfcgonline.org/handbook/res/RES_A12-1R2.pdf).

In this context it should be noted that SFCG already provides a forum for multilateral discussions and coordination of spectrum matters of mutual interest concerning space radiocommunication services which can be utilised by the Metsat operators as most of them are SFCG as well as CGMS members.

In order to facilitate sharing between existing and planned satellite systems, SFCG has established, and improves as necessary, an inter-agency frequency coordination procedure (SFCG RES A12-1R2) which motivates SFCG members, already at the very early stages of a mission design, even before starting the ITU-R notification procedure, to coordinate the planned frequency use with concerned SFCG members.

Furthermore, the SFCG satellite database can be utilised to provide information on existing and planned satellite systems of SFCG member agencies.

With information on planned Metsat systems provided by CGMS on a regular basis, SFCG can provide the right forum for technical discussions and the evaluation of sharing studies.

SFCG also recognised the potential problem of time delays due to an unfortunate sequence of the annual meetings of SFCG and CGMS. In such cases member agencies of both groups should ensure that the information on planned missions and already identified potential frequency spectrum conflicts are directly provided to SFCG in order to avoid delays. In addition, SFCG has the possibility to create at each annual meeting an "Inter-Sessional Working Group" to resolve urgent issues, working (usually by correspondence) between SFCG meetings when considered necessary in order to make use of the time between the yearly meetings of SFCG and CGMS.

SFCG proposes to improve coordination between CGMS and SFCG by nominating a responsible person to represent SFCG at CGMS and vice versa on a yearly basis. This person will be responsible to bring potential problems on either Group to the attention of the other Group. SFCG recommends that for maximum effectiveness and fastest response in urgent situations the coordinator role would be filled by WMO. SFCG will establish a group of contributors for issues related to Meteorological Satellites with the SFCG representative to CGMS as coordinator.

SFCG 26 has nominated Mr. Robert Wolf (WMO) to be the representative to CGMS 34. SFCG contributors shall be nominated by organisations representing MetSat issues in SFCG.

This year SFCG contacts on issues relating to MetSat are:

Coordinator:	WMO	(Robert Wolf)
Contributors:	NOAA	(Dave McGinnis)
	EUMETSAT	(Markus Dreis)
	JAXA	(Korehiro Maeda)
	RFSA	(Michail Vassiliev)

**SPACE FREQUENCY
COORDINATION GROUP**

Resolution A12-1R2

ESTABLISHMENT OF PROCEDURES FOR INTER-AGENCY

FREQUENCY COORDINATION

The SFCG,

CONSIDERING

- a) that the increasing congestion of frequency bands allocated to the space science services calls for an efficient coordination procedure to facilitate individual frequency assignments and to reduce the potential for mutual interference;
- b) that the coordination procedure contained in Article 9 of the ITU Radio Regulations does not always provide the desirable flexibility to facilitate inter-agency coordination of frequency assignments;
- c) that member agencies could make use of the methods contained in the annex to this Resolution to coordinate frequency utilization which may not be readily applicable in Article 9 of the Radio Regulations;
- d) that some member agencies, for many years, have used with great success inter-agency procedures to facilitate coordination of frequency assignments;
- e) that the principles underlying these procedures have found to be effective and may also prove useful in inter-agency coordination of frequency assignments among member agencies in general;
- f) that inter-agency coordination based on a format common to member agencies will ease the application of the procedural methods;
- g) that nevertheless the provisions of Article 9 of the Radio Regulations provides the formal coordination mechanism to be used between administrations when applicable;

RESOLVES

1. that those member agencies wishing to undertake inter-agency frequency coordination with other member agencies give due consideration to the use of the procedures contained in the annexed *SFCG Manual of Procedures for Inter-Agency Frequency Coordination* as a template for development of bilateral and/or multilateral agreements;
2. that member agencies involved in coordination utilize the SFCG database and provide update information, if appropriate.

**SPACE FREQUENCY
COORDINATION GROUP**

(Annex to SFCG RES A12-1R2 of 20 October, 2005)

**SFCG MANUAL OF PROCEDURES FOR
INTER-AGENCY FREQUENCY COORDINATION**

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Annex 1: Flow Diagram of Advance Planning Phase

1. PURPOSE

Member Agencies of the SFCG share certain radio frequency bands allocated to space services of common interest to these Agencies. As a consequence of this, it is essential that advance planning and post-launch operational coordination be carried out by these Agencies with a view to minimize radio spectrum interference between their missions.

This manual defines a method and execution of Inter-Agency frequency coordination that may be considered among consenting SFCG member agencies.

2. SCOPE

This Manual defines coordination activities associated with the use by SFCG Member Agencies of the relevant frequency bands allocated to Earth-to- Space, Space-to-Earth or Space-to-Space radio-communications in the Radio Regulations of the International Telecommunications Union (ITU), supplemented by SFCG Recommendations, where applicable.

These activities will basically consist of advance planning and operational coordination with respect to the use of relevant frequency bands by SFCG member agency missions and earth stations or by programs in which these Agencies participate. Consideration will also be given to other frequency bands when unwanted emissions are likely to occur.

3. PROCEDURAL APPROACH

3.1 Advance Planning Phase

The discovery of radio interference between active space missions or a potential interference condition in a finalized mission design may result in burdensome emergency solutions involving costly engineering changes and/or constraints on mission operations and objectives.

The initiation of advance planning of frequency use at the very early stages of a mission design is motivated by recognition of the following facts:

- The mutual coordination of frequency use is, by its very nature, rather time-consuming.
- The implementation of design modification that may be required in the course of the coordination procedure becomes increasingly more difficult as the project advances through its design and qualification stages.

Consequently, even very preliminary information made available during the early phases of mission design can be most helpful in identifying potential areas where frequency conflicts may occur. This can lead to joint remedial action by the Agencies concerned to affect minimum cost and inconvenience to the Projects concerned.

3.1.1 Description of Responsibilities

In order to carry out advance planning of frequency utilization during the preparation for, and conducting of, multiple simultaneous flight missions, the Agencies will assume the following responsibilities:

- A. Identify, at the earliest possible stage of system design development, space missions susceptible to interference from, or likely to cause interference to the other Agency's space operations.
- B. At the earliest possible stage, provide to the other Agency information about proposed use of frequencies in, or adjacent to, the space service frequency bands.

- C. In the event that a potentially serious conflict is identified, the Agency discovering the conflict will identify areas which can facilitate coordination between the Agencies and notify the other Agency of relevant information

Resolution of interference cases, following the conclusion of advance planning phase specified in paragraph 3.1.3, will, at the same time, meet the technical information requirements of the official frequency coordination procedures (when applicable) set forth in the appropriate sections of Article 9 of the ITU Radio Regulations.

Consequently, the activities carried out between the Agencies during the advance planning phase will greatly facilitate - and thereby shorten - the official coordination in accordance with Article 9, Section II of the ITU Radio Regulations (when applicable). It can, however, not replace the formal (administrative) exchange of information required by said provision between the Radio Regulatory Authorities, responsible for the notification of the respective satellites.

3.1.2 Interfaces

The interfaces in the Agencies, for the activities carried out in the advance planning phase are listed in Table 3.1.

TABLE 3.1

INTERFACES FOR THE ADVANCE PLANNING PHASE

Agency:

Network:

Name of Contact:

Function:

Address:

Phone:

Fax:

Telex:

Advance Planning Procedure

The following procedure defines the framework within which the advance planning of frequency use will be carried out. The procedure for advance planning of frequency use is also outlined in a flow diagram (Annex 1, Figure 3.1). Deadlines for completion of the various tasks are indicated as a guideline. However, personnel with authority to conduct the indicated tasks are invited to make every effort to reduce the overall duration of the procedure.

Step 1: Initial Announcement of Intended Use of Frequency Bands

Objective: Initiation of procedure for advance planning phase

Responsibility: Agency A (announcing Agency)

The preliminary exchange of mission information prior to, or during the mission definition phases should take place at the earliest possible time even though some of the required

information may be tentative or incomplete. Tentative or incomplete information should be clearly identified in the preliminary exchange of information.

Agencies will exchange, as soon as available and if possible, at least three (3) years prior to the scheduled launch date, summary-type information on mission design, mission objectives, trajectory/orbit data, scheduled launch time, mission lifetime¹. Frequency information should include the allocated frequency bands that will be used, the planned centre frequencies, and occupied bandwidths. To expedite the coordination procedure, alternative frequency bands should be included whenever possible.

Step 2: Preliminary Assessment of Potential Interference

Objective: Request for identification of interference potentials

Responsibility: Agency B

Upon receipt of the preliminary coordination data forwarded by the announcing Agency (Agency A), the recipient Agency (Agency B) will promptly (preferably within one week) acknowledge receipt and proceed to examine the material with regard to interference which is likely to be caused to, or by, its missions and/or the services rendered by its networks(s) in operation.

Within approximately one month from the acknowledged date of receipt of the coordination data, the recipient Agency should notify the announcing Agency of its preliminary assessment on interference potentials. If a preliminary assessment is not possible, the recipient Agency should indicate the reasons and suggest remedies that would allow assessment to proceed. The announcing Agency will acknowledge receipt (preferably within one week) of this preliminary assessment of interference potentials and provide a response to the other Agency within a period of 1 month regarding the preliminary assessment.

Within the framework of pre-flight planning and mission analysis, the information exchanged may include, but not be limited to, the following:

- Provision of relevant trajectory/orbit and telecommunication link specifications for those missions which have been identified as susceptible to interference from, or to be sources of interference to, space operations of the other Agency. This information will consist as a minimum of that required in Appendix 4 of the Radio Regulations.
- Analysis and prediction of the extent of Interference to the discovering Agency's space operations.
- Performance of simulations and/or ground tests, if required and feasible, to determine the susceptibility to interference conditions of the mission operations system.
- Definition of critical operational phases for those missions which have been identified as being susceptible to interference.
- Development, jointly with the other Agency, of criteria for temporarily turning off telecommunications links, or other measures for avoiding interference.

Step 3: Detailed Examination of Potential Interference (if required)

Objective: Joint in-depth investigation of potential interference

Responsibility: Agencies A and B

¹ The data set for preliminary examination of potential interference is described in Section 6.1.

The Detailed Examination is to be performed simultaneously by the Agencies concerned for all missions identified as having interference potential. Since this work requires additional resources and support from numerous internal organizations, the following procedure will be followed:

- A. If more than two missions (i.e. one "mission pair") are involved in an interference case, it may be advisable to develop a cross-reference matrix containing the Agency A and B mission pairs which are identified in Step 2 as having interference potentials. It is left to the mutual decision of the agencies involved to develop such a matrix.
- B. The matrix should identify those missions requiring priority analysis together with the completion dates.
- C. After priorities for the Detailed Examination have been mutually established, a detailed analysis of the high priority mission pair will be initiated by the agency that suspects interference will be experienced from the other agencies transmitters. For example, if Agency B suspects potential interference from signals radiated by the proposed transmitters of Agency A, Agency B will perform the Detailed Examination of the interference potential. Agency B will request the baseline information contained in Data Set Specifications for Advance Planning of Frequency Use as outlined in Section 6 of this document. This information will be provided by the suspected interferer Agency.

The Data Set will be furnished by Agency A within approximately one month and Agency B should complete the detailed examination within a period of two months. The result of this examination will be forwarded to Agency A for concurrence of the findings. This concurrence should be provided within one month after the receipt of the Detailed Examination.

The anticipated rate and duration of potential interference occurrences should be estimated for the period between the scheduled launch of the new mission to the end of its normal mission lifetime. However, in order to accommodate possible launch delays and/or extensions of the mission lifetime, the end date of the normal mission lifetime should be appropriately extended for the purpose of interference avoidance planning.

Step 4: Joint Analysis and/or Test/Simulations (if required)

Objective: Joint attempt to identify solution(s) of interference problem

Responsibility: Agencies A and B

In case Agency B, in Step 3, had not succeeded in resolving the interference problem, but regards as beneficial joint analysis and/or tests/simulations with A, it shall inform the latter within two weeks of its intent to initiate Step 4. This announcement shall, if possible, already include a technical outline for the proposed joint analysis and/or test/simulations program.

Step 5: Initiation of Remedial Action (if required)

Objective: Implementation of solutions to interference problems

Responsibility: Agency A and/or B

If the results of Step 4 have established the existence of unacceptable interference, the Agencies will jointly determine whether there are feasible engineering or procedural solutions for solving or reducing the problem. Any mutually acceptable engineering

solution(s) will be implemented immediately. In the absence of engineering solutions, the Agencies concerned will determine whether post launch operational procedures can be adequately coordinated or modified to alleviate the interference problem.

If adequate post-launch operations coordination can alleviate the interference problem the Agencies concerned will apply the general operations coordination procedures, called up in 3.2.3. They will jointly develop mission- specific operations coordination procedures, to be implemented for post-launch operations. The responsibility for the development and implementation of these operations-related activities rests with the offices identified in Table 3.2. The offices identified in Table 3.1 will be kept informed on the progress made in the development of the mission-specific operations procedures.

3.2 Post-Launch Operations Phase

3.2.1 Description of Activities

In all cases in which Step 5 of the advance planning procedure (paragraph 3.1.3) resolves the interference problem through the implementation of mission-specific coordinated operations procedures, the responsible Agency Operations Offices identified in Table 3.2 shall:

- Establish general operations coordination procedures for the satellites networks concerned, as required.
- Establish mission-specific operations procedures with the framework of the general operations coordination procedures as required.
 - Schedule mission operations support so as to minimize disruptive RFI.
 - Coordinate the resolution of immediate operations problems as necessary.
 - Notify its Agency Frequency Manager of major interference cases, the circumstances involved, the action taken, and whether any additional action is required.

3.2.2 Interfaces

The Agency interfaces for the execution of post-launch operations coordination are listed in Table 3.2.

3.2.3 Operations Coordination Procedure

General operations coordination procedures by which Agencies concerned exchange operational information for the resolution of possible and/or actual Radio Frequency Interference (RFI) problems will be developed, as required, by the offices identified in Table 3.2.

The general operations coordination procedures may be complemented by mission-specific operations procedures, if required.

General and mission-specific operations coordination procedures do not form part of this Manual.

TABLE 3.2

INTERFACES FOR POST-LAUNCH OPERATIONS COORDINATION

Agency:

Network:

Name of Contact:

Function:

Address:

Phone:

Fax:

Telex:

4. PRIORITY GUIDELINES

These priority guidelines apply in the case of interference, actual or potential, involving space missions of SFCG Member Agencies. They are meant as a tool for the treatment of interference cases in the framework of the mission specific operations coordination procedure described in 3.2.3.

Priority 1 (Critical) – Interference events that jeopardize humans actively engaged in space mission activity.

Priority 2 (Critical) – Interference events that jeopardize spacecraft safety, especially during time of a declared spacecraft emergency.

Priority 3 (Critical) – Interference events that jeopardize the successful completion of the mission objectives, i.e., objectives that are time-critical and can neither be revoked nor re-scheduled.

Priority 4 (Semi-Critical) – Interference events that could jeopardize scheduled time-critical mission objectives having limited opportunities for re-scheduling.

Priority 5 (Routine) – Interference events that jeopardize mandatory mission objectives with subsequent opportunities for re-scheduling.

5. EXTENSION AND CANCELLATION OF FREQUENCY ASSIGNMENT

The Agencies concerned will inform each other, at the earliest possible date of any:

- Intended extension of the use of a frequency band beyond the previously scheduled termination,
- Predicted or unscheduled cancellation of a frequency assignment.

This information, which is vital to the orderly execution of advance planning phase and the conscientious management of the limited frequency resources, shall be forwarded between the

offices identified in Table 3.1, Paragraph 3.1.2. It will also be duly reflected in the SFCG Satellite Data Base entries for the spacecraft concerned.

6. DATA SET SPECIFICATION FOR ADVANCE PLANNING OF FREQUENCY USE

The specification of the required Earth-to-Space, Space-to-Earth and Space-to-Space radio link data set necessary to establish radio spectrum interference potentials are listed in this section.

6.1 Data Set for Preliminary Examination of Potential Interference (3.1.3 Step 2)

The data set for the preliminary examination of potential interference shall be supplied using the format of the SFCG Satellite Data Base.

6.2 Data Set for Detailed Examination of Potential Interference

This data set shall be an expanded version of the one described in 6.1. Its contents shall be defined by the offices defined in Table 3.1 on a case by case basis.

7. REVISION AND AMENDMENT CONTROL

The SFCG Procedures Manual for Inter-Agency Frequency Coordination shall be subject to additions, deletions and amendments, as the need arises, by agreement among SFCG Members. The authority for revisions will rest with the SFCG.

The execution of the revision will rest with the Executive Secretary of the SFCG.

8. APPLICABLE DOCUMENTS

- ITU/Radio Regulations (current)
- Final Acts of most recent WRC
- Radio Regulations Board: Rules of Procedure
- Preface to Radiocommunication Bureau International Frequency Information Circular (Space Services) (BR IFIC) (<http://www.itu.int/ITU-R/space/preface/index.html>)
- SFCG Resolutions and Recommendations

Annex 1

Flow Diagram of Advance Planning Phase

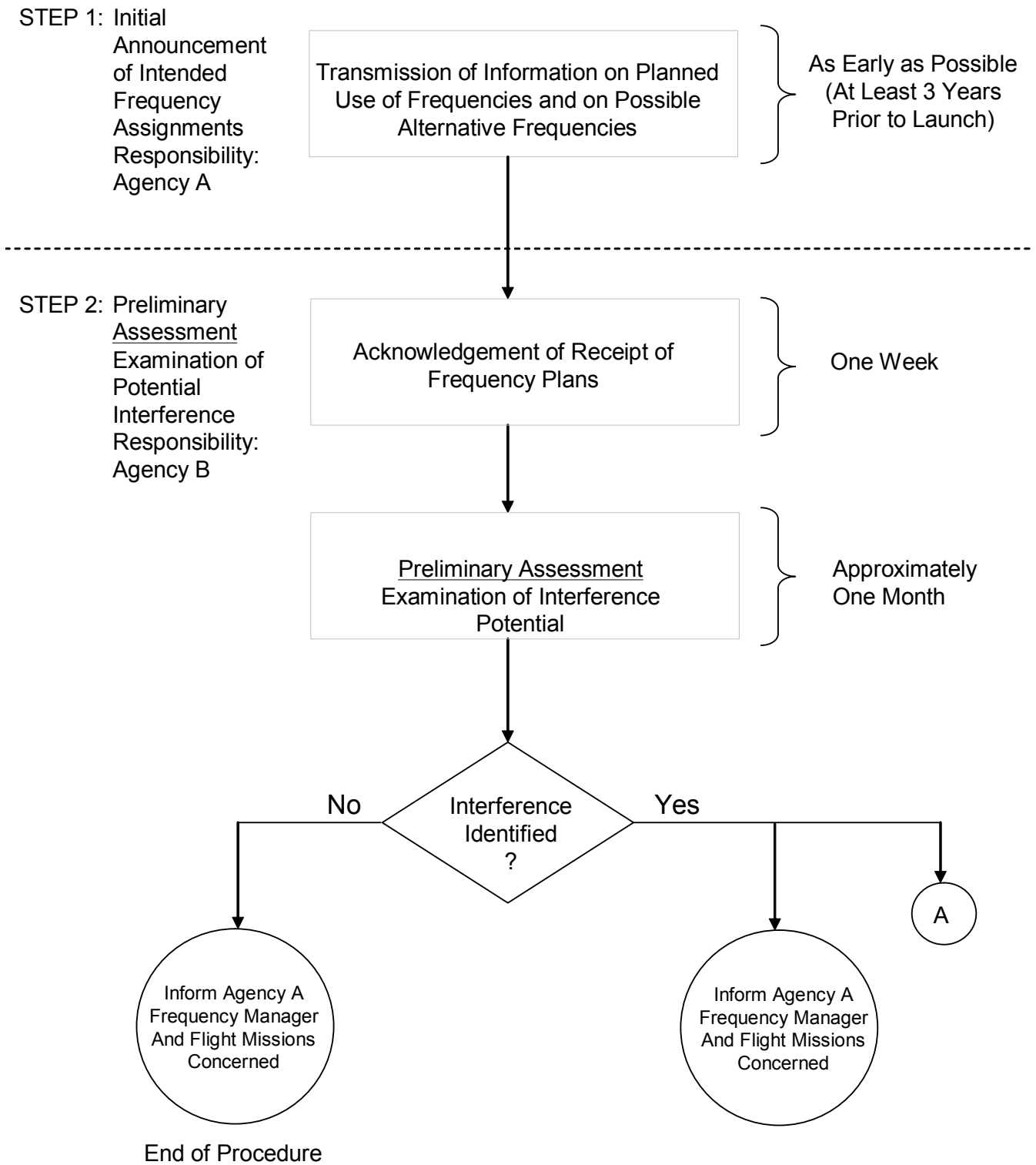


Figure 3.1 Advance Planning Phase

Flow Diagram (Sheet 1 of 4)

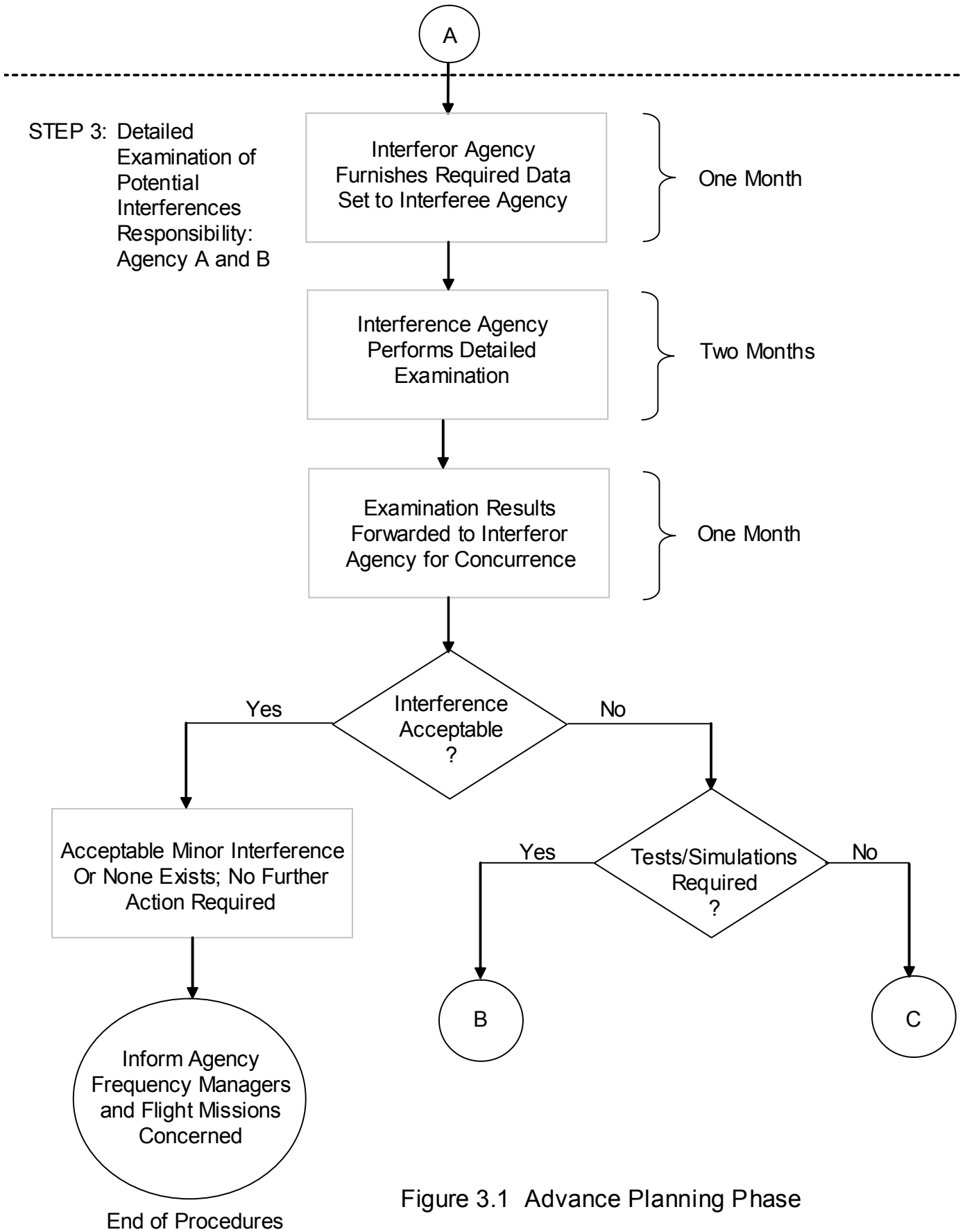


Figure 3.1 Advance Planning Phase
Flow Diagram (Sheet 2 of 4)

Note: Step 4 can be omitted when Interference Tests/Simulations are not necessary

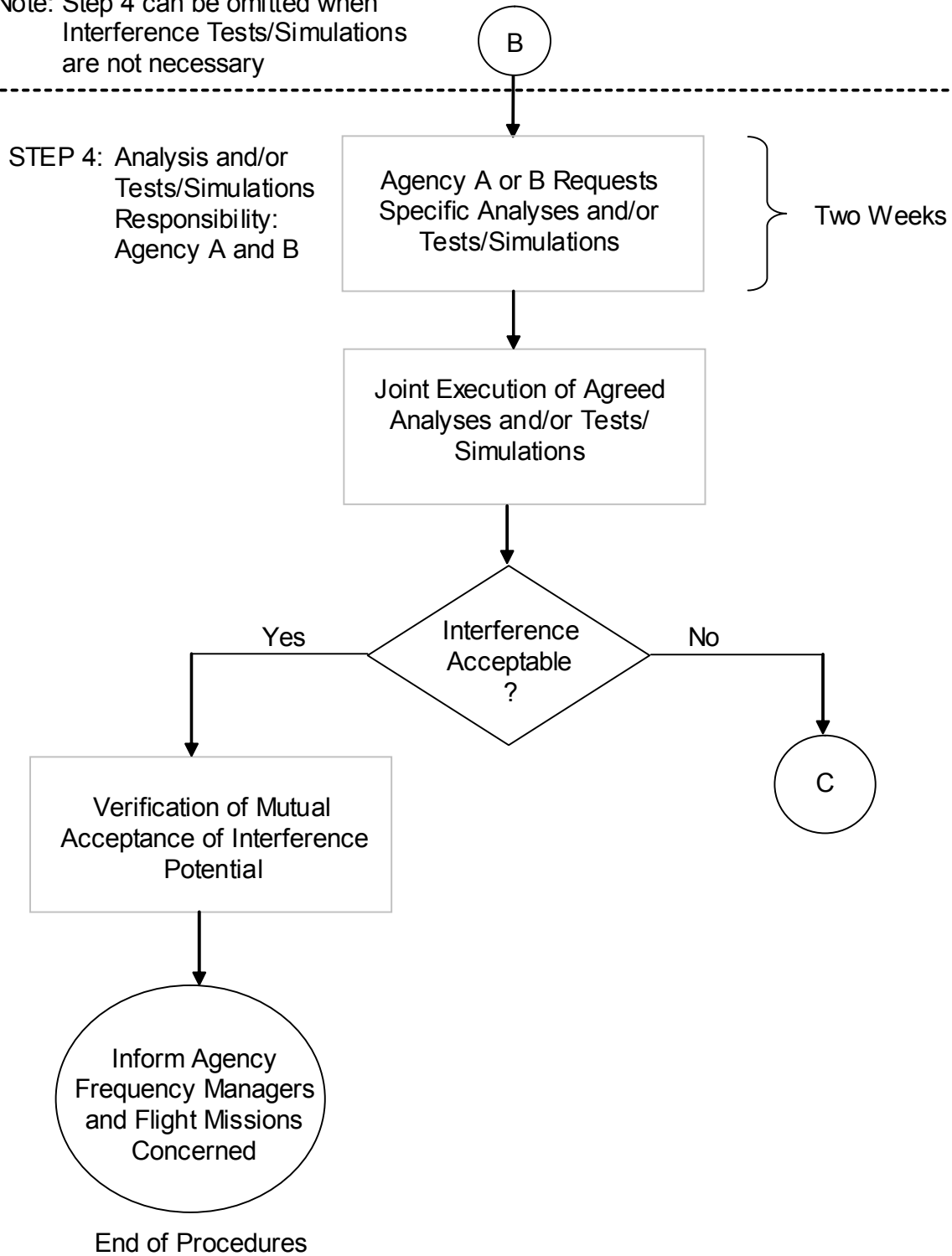


Figure 3.1 Advance Planning Phase

Flow Diagram (Sheet 3 of 4)

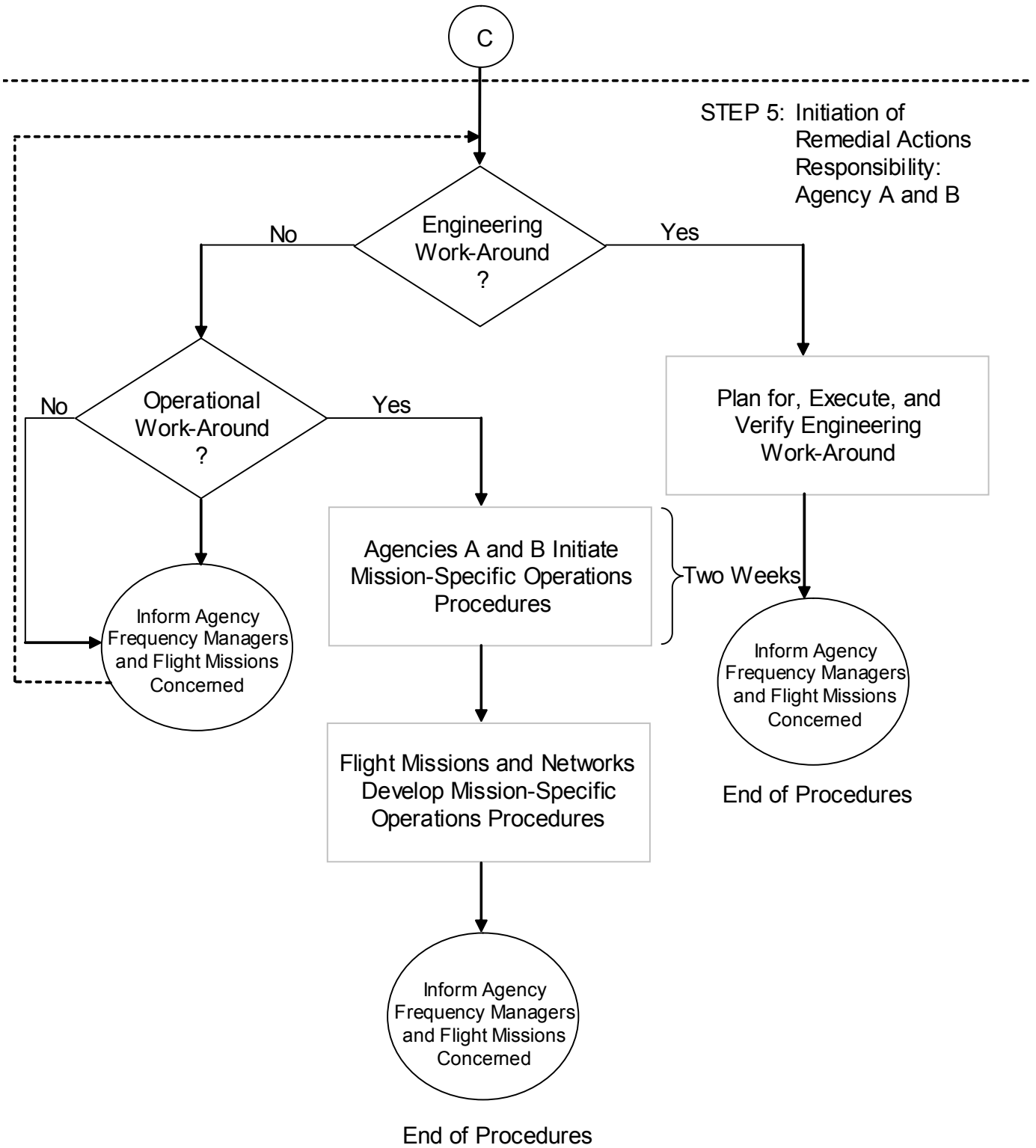


Figure 3.1 Advance Planning Phase

Flow Diagram (Sheet 4 of 4)