

## SPECIFICATIONS FOR AIRCRAFT MAIN DECK LOADER (35 TON)

### 1 MAIN FUNCTIONS

- 1.1 The Joint Container Pallet Loader (the “Loader”) is to be of the standard type and to be used for transferring cargo loads of not less than 35,000 kg into and out of the main and lower deck of all commercial aircraft from a level of not more than 500 mm from the ground. It must be capable of performing the following operations:
  - 1.1.1 Transfer all types of IATA approved AULDs to and from the main and lower decks of all aircraft types
  - 1.1.2 Transfer two half-size or full-size containers jointly or separately
  - 1.1.3 Handle standard aircraft pallets up to 2440mm x 6100mm (96” x 240”)
  - 1.1.4 Receive and discharge loads from pallet dollies at a minimum height of the loader platform at 500mm (20”) with stabilizer fully extended and receive and discharge loads from aircraft at a minimum height of not less than 5550 mm (216”) (\*Maximum height of bridge fully raised should reach above 5560 mm
  - 1.1.5 Be able to rotate containers and pallets of sizes of up to 2440 mm X 3180 mm (96" x 125") on its platform

### 2 STATUTORY REQUIREMENTS

- 2.1 The manufacturer of the unit shall be responsible for:
  - 2.1.1 its design and structural standard by ensuring that it meets or exceeds IATA, OSHA, SAE and other relevant standards where applicable and also has all the latest safety features
  - 2.1.2 meeting Singapore Vehicle Construction and Use Rules and registration with the Singapore Land Transport Authority
  - 2.1.3 meeting the Singapore Aerodrome Act and the Vehicle and Equipment Construction and Use Rules.

### 3 GENERAL REQUIREMENTS

#### 3.1 Environment

- 3.1.1 The loader shall be designed to function outdoors. Specifically, the nature of operations demands rugged, impact-resistant hardware whose functions and controls shall be foolproof and failsafe
- 3.1.2 As the Singapore Changi Airport is located by the sea, stringent rust control measures shall be observed in the design of the loader. All hydraulic lines shall be of stainless steel, and all guides and rails be galvanized. Outdoor conditions are as follows:
  - Shall be designed for use under Singapore weather and operation condition.
  - Temperature: 20°C to 50°C
  - Relative Humidity: 0% - 100%
  - Strong wind from the sea and annual tropical monsoon, can erode paint and body work. Anti-rust/corrosion prevention technique, together with primer and corrosion resistant paint are essential
- 3.1.3 Supplier must certify that the equipment will operate reliably under the requirements stated in Clause 3.1 “Environment”.

### 3.2 System Safety

- 3.2.1 All control methods, circuitry, mechanical equipment and operating procedures shall be designed to provide maximum safety for operating personnel. Designs shall minimize potential damage to equipment or the contents of the cargo handled. Failsafe techniques shall be employed to prevent the occurrence of unsafe condition that could result from an equipment failure or improper implementation of the operating procedures.
- 3.2.2 Service brake must be of the dual system type and able to have smooth braking at slow speed to prevent damage of aircraft structure. Brake system must be in working condition when engine is off

### 3.3 Personnel Safety

- 3.3.1 The loader shall be convenient and safe to use, and control functions to be performed shall be simple to minimize possible errors. Convenient means for emergency system shutdown shall be provided.
- 3.3.2 The loader must provide adequate means for ensuring the safety of maintenance personnel. Devices such as disconnect switches, circuit breakers, overload control relays and lockouts, both electrical and mechanical, must be provided to prevent the accidental activation of those positions of the system under operation maintenance. These devices shall be located in areas where access is restricted to maintenance personnel.

## 4 **CHARACTERISTICS**

### 4.1 General

- 4.1.1 The loader must be designed to allow transfer of loads to be effected at a height measured down the level ground of not more than 500mm at the lowest and minimum raised height of not less than 5550mm to match all aircraft types.
- 4.1.2 The powered system shall be able to transfer loads at a speed of approximately 18m/min. The use of belting should be avoided.
- 4.1.3 The loader (unloaded) must be able to traverse at a cruising speed of 12 to 13 kmph and climb a slope with a gradient of 50 with steady motion even after coming to a halt at the gradient
- 4.1.4 In case of breakdowns, there must be facilities for towing by tractor with a draw bar pull of 2800kg. Recessed towing eyes are to be provided at the front and the rear complete with tow bar to be towed on the loader.
- 4.1.5 The loader must have separate platforms – a forward Bridge and an Elevator on the rear:

### 4.2 Bridge Design

- 4.2.1 The Bridge must also be capable of performing all its functions without being hooked to the aircraft. The side guides and personnel safety railings shall be of light and sturdy material for easy manhandling.
- Safety railing on bridge to be firm type. Lock mechanism to be provided
  - Top and front of safety railing to be installed with a rubber bumper
  - Bridge lifting to be done by single scissor
- 4.2.2 The operator's console shall be fitted with the joy-stick type of operations and ergonomically designed such that related functions are grouped together within easy reach of one another. Functions are to be clearly marked for easy identification. Bridge and platform lift shall be of 2 switch control to prevent unintended operation. Indicator lights shall illuminate when bridge or platform is fully lowered.

To incorporate flashing warning light on the operator panel when:

- High hydraulic oil temperature reaches the preset value of the overheating temperature.
- Preset value of high engine operating temperature.
- When alternator is not charging.
- Fuel level is low

4.2.3 A feature (e.g. step) shall be provided on the operator's platform to facilitate the opening and closing of aircraft cargo door by operator with short stature of 1.5m to 1.7m height.

4.2.4 The Bridge must be so constructed that there is sufficient all-round clearance from aircraft frame and door when properly docked to all cargo holds for servicing of all known commercial aircraft as stated in Clause 1.1.

- The front of the Bridge shall be mounted with a horizontal rubber bumper.
- To have a distance sensor mounted below on both ends of the fixed platform of the bridge, to alert operator at a 2m distance with an intermittence beeping sound and a continues beeping sound as the bridge is in close contact with aircraft.
- To have a dual motion interlock, which will not allow operator to raise and lower bridge while driving
- When bridge raised auto drop to snail speed (slowest speed) for slow docking

4.2.5 The cylindrical rollers shall be of hot-dipped galvanized steel with;

- a suitable length to have clearance on both ends for easy installation and removal
- material thickness of 5mm
- plates inside to strengthen roller
- good traction under dry and wet weather conditions.

### 4.3 Elevator Design

4.3.1 The Elevator has to be capable of handling:

- Standard aircraft pallets measuring up to 2440mm x 6100mm (96" x 240").
- End and side loading.
- Singly or in pair with half size containers and shall allow for individual operations on both halves of the platform
- Capable of side loading for either half separately or full width of the platform.
- Capable of rotating containers and pallets up to 2440mm x 3180mm (96" x 125")
- Able to handle long and low overhang 20 feet pallets (by means of rear stopper bypass toggle switch)

4.3.2 All operations in transferring of AULDs and rotating containers must be powered.

4.3.3 The platform shall be designed to allow transfer to and from pallet dollies which have a height ranging from 480mm (19") to 530mm (21")

4.3.4 The end stopper and guides are to be powered and non-retractable after a maximum height of 1520mm (60")

4.3.5 All rollers shall be made of steel with wall thickness not less than 6mm

4.3.6 Extra slow enable switch system for lowering and lifting of platform for sensitive cargo to be installed at operator's console panel

4.3.7 Provide a safety cage with an emergency switch to transfer personnel from rear platform to bridge

#### 4.4 Conveyor System

4.4.1 Preferences will be given to a cluster roller assembly for the conveyor system in the place of steel or rubber rollers

#### 4.5 Stability

4.5.1 The loader must be certified to be safe for operations and driving in wind velocity of up to 72kmph and for loading operations under a 160kmph gust condition.

4.5.2 The loader and platform must be structurally designed to operate efficiently with no noticeable vibration and noise under uneven load distribution where the centre of gravity of 1.5 times designed load is shifted to 1/3 of the platform.

#### 4.6 Operating Systems

4.6.1 The loader is to be powered by a Deutz diesel engine. Preference will be given to Modular Power Pack for quick change. Engine make and model to have good after sales service support in Singapore.

4.6.2 The engine shall be equipped with a demand throttle for efficiency and fuel economy, low oil pressure and low water level shut-off device, starter interlock, cold starting device and other features to be given by the manufacturer.

#### 4.7 Control System

##### 4.7.1 Consoles

4.7.1.1 All controls shall be grouped in consoles to minimize operating points throughout the system. Grouping shall generally be in accordance with the group, subgroup and component specifications.

4.7.1.2 Consoles shall contain the specified control elements such as joysticks, selector switches, and those indicator lights which will augment operations.

4.7.1.3 Consoles functions shall be identified in English using elementary concise terms and supplemented by graphic symbols.

4.7.1.4 Consoles shall be designed in accordance with sound human engineering principles.

4.7.1.5 Consoles shall conform to the environmental requirements specified in Clause 3.1 and shall employ weatherproof boxes, switches, joysticks and lights.

4.7.1.6 All identification plates shall be mechanically fixed to the console face.

4.7.1.7 Controls arranged to logically reflect the equipment movements required.

4.7.1.8 All electrical control levers and joysticks shall avoid the use of internal mechanical linkages to transmit control action.

4.7.1.9 Controls required in the group, subgroup, and component specifications shall be of the “momentary” or “maintain” types as defined as follows:

- Momentary: Operator activates control to initiate function. Function continues independently.
- Maintain: Operator must hold control for continuous function.

4.7.1.10 Mushroom head emergency stop push buttons to disrupt electrical power shall be employed where an emergency may require immediate shut down. Drawings indicating locations of such buttons shall be submitted to SAS for approval.

4.7.1.11 Indicator lights shall not be affected by extraneous light.

4.7.1.12 Control elements such as switches, push buttons, handles, etc. shall be selected for ease of operations in the specified environment.

4.7.1.13 Control elements such as switches, push buttons, indicator lights, bulbs, etc. shall be easily replaceable.

#### 4.7.2 Interlocks and Limits

4.7.2.1 Failsafe interlocks and limits such as check valve, shall be provided in the system to ensure safe operations as specified in the groups, subgroups, and components specifications. However, the Supplier shall be responsible for the integration of the characteristics of the elements selected for combination into a total system. Interlocks and limits shall be included for the protection of personnel, equipment and cargo in the performance of the operational functions specified for the subgroups and elements comprising the group. A low skill level of operator competence and intelligence, and conditions of personnel in attention shall be assumed in the design of such interlocks and limits.

#### 4.7.3 Emergency Operation

4.7.3.1 Preferably battery powered and manual hand pump, for the basic operation of detaching from the aircraft, lifting of stabilizer, including free wheeling for towing operations; operation of the transfer and transfer system, lowering of elevator including the stoppers and assistance for power steering

4.7.3.2 Emergency activation buttons to operate steering must be fitted at driver's console panel

4.7.3.3 Emergency operations to be a stand-alone system, it must not be affected by the main system if the electrical systems fails

4.7.3.4 An additional manual pump to be located at a convenient location on the right side of the loader to be provided. A selector control for: neutral, stabilizer "up" and platform lower should also be part of the system (in the event of catastrophic failure)

#### 4.7.4 Hydraulic System

4.7.4.1 The operating pressure shall not exceed 250 bar (3,000psi)

4.7.4.2 Components such as pump, motor cylinder and control valve must be of reputable make and have sale and be able to purchase and service in Singapore. Such information must be submitted together with the original tender. All components like orbit motors and stabilizer cylinders shall be easily accessible for replacement when faulty

4.7.4.3 Repair kits (seals) must be available for all components and part numbers of manufactured provided. All Hydraulic components shall use Viton seals.

4.7.4.4 To use steel pipes instead of hydraulic hose on areas of less movement and minimize use of hydraulic hoses

- All hydraulic hoses shall be fitted with sleeve on both ends of ferrule.
- Viscosity of the hydraulic oil to be VG68, i.e. suitable for Singapore weather.

4.7.4.5 Hydraulic system should come with an oil cooler

#### 4.8 Electrical System

4.8.1 It has to be a self-charging direct current system with heavy-duty maintenance-free battery. All wiring shall be of double insulated silver type with colour code and numbering for each wire.

4.8.2 Lightings:

- Flashing (on/off) amber beacon light (approved by SAS before installation)
- Spotlight (front/rear) location as below
- Headlights
- Sidelights (front and rear)
- Rear reflector
- Reversing light with horn
- Rear brake lights
- Operator panel light
- Work lights (flood light for bridge and rear platform) LED
- An amber colour beacon light is to be fitted underneath the rear platform. It should blink when lowering together with the intermittent sound of the horn.
- Electrical control system to be contactors and relays.

All the above lights should come with, preferably, LED lights and protection grill

4.8.3 Electric Components

4.8.3.1 As equipment is used in an outdoor environment, solenoid coils, emergency motor and other electrical switches to have a high degree of water proofing. The warranties for these components alone shall not be less than 2 years.

4.8.3.2 Electrical systems to be 24V DC.

#### 4.9 Additional Features

4.9.1 Ergonomically designed butt rest seat is to be provided for the driver and operator.

4.9.2 Fuel tank cap should be of lockable type, painted green in color

4.9.3 Ignition start switch to be key-controlled type (Each key must be unique for each equipment)

4.9.4 Hour-meter, oil pressure gauge, temperature gauge, ampere meter, fuel gauge, low oil pressure cut-off device, voltmeter and other applicable instruments to be fitted.

- 4.9.5 A 1.7m camera pole to be mounted on the left side of the bridge pointed in the direction of the cargo hold

## 5 OTHERS

### 5.1 Paint Work and Logo

- 5.1.1 Two under coats of primer with marine coating agent and finishing coat provided according to SAS Corporate identity; details of which will be given upon award.
- 5.1.2 All working member surfaces i.e. rollers, belting, and caster (lift and drive chains excepted) must be of non-corrosive material or hot-dipped galvanized to prevent rust and corrosion.
- 5.1.3 All steps must come with anti-skid material
- 5.1.4 For the installation of SATS GPS system, the following connection to be made in the lower ignition electrical junction box:
- Low oil signal
  - High temperature signal
  - Forward signal
  - Reverse signal
  - D+ charging signal
  - Ignition signal
  - Stabilizer fully extended signal
  - Starter relay wire
  - Fuel level wire to provide value in volt when the fuel tank is “Full”, “Half” and “Empty” (level where fuel cannot be sucked out)
  - A 40 core or more wire with numbering, running from driver’s console to the main control box
  - 10 additional 24V power point terminals at the driver’s console and the main control box for future purposes

### 5.2 After-Sales Responsibility

- 5.2.1 The supplier to provide his factory engineer to commission the loader on delivery. The engineer is required to provide practical training to SAS Training and Maintenance staff for two weeks on the following:
- Operations
  - Preventive Maintenance
  - Repair/Overhaul of components
- 5.2.2 The supplier is required to furnish the following:
- 3 sets of Operator’s Handbook
  - 3 sets of Operating Manual
  - 3 sets of Workshop Repair Manual
  - 3 sets of Parts Manual
  - 3 sets of accurate “as built” drawings
  - 3 sets of detailed components manual (Comprising the engine, main hydraulic pump, hydraulic cylinder and motor, starter motor, alternator , etc).
  - Consignment spares

### 5.2.3 Recommended spare stocking list

- 2 set of the above manual and drawing in CD-ROM
- 2 set of the OF training manual in CD-ROM

### 5.2.4 Additional Items To Be Supplied:

- a. 1 unit 5 kg CO<sup>2</sup> fire extinguisher per unit
- b. Complete set of keys (3 sets per unit)

### 5.2.5 Standardization to SATS fleet of equipment

5.2.5.1 One spot light to be mounted on the bridge (at operators console) pointing into the cargo hold

5.2.5.2 One spot light to be mounted on the bridge behind the operator's console pointing towards the rear platform

5.2.5.3 Battery master switches to be positioned on the right side of the loader

5.2.5.4 Jumper start connector (if provided) to be positioned on the right side of the loader.

### 5.2.6 Warranty

5.2.6.1 All breakdowns during the warranty period shall be made serviceable within 3 working days.

- 24 months warranty on all components and warranty jobs to be carried out by OEM.
- 10 years warranty for main chassis.

## 6 ACCEPTANCE TEST

### 6.1 General

6.1.1 The supplier shall perform all necessary inspections and tests to demonstrate that the loader meets all requirements of this specification. Supplier's records of inspections and tests shall be kept complete and available to SAS at all times. Records or reports of inspections and tests shall be signed and approved by the supplier. SAS reserves the right to witness any test to determine if the loader meets all specified requirements. The acceptance tests shall be conducted in accordance with a test plan and procedure provided by the supplier and approved by SAS. The supplier shall provide adequate personnel to assist SAS in inspecting and testing the loader in Singapore.

6.1.2 Reasonable notice shall be given to SAS prior to the performance of final acceptance tests. SAS or its appointed representative shall witness all acceptance tests and indicate acceptance by signing and dating the test data sheet.

6.1.3 The tests and inspections identified in this specification represent the minimum requirement for loader acceptance and do not necessarily represent the complete final test requirements, as variations in equipment types and designs, which will evolve under a competitive bid, may require additional specific tests. The supplier shall develop a test plan and procedure that will ensure performance of the specified tests as well as the additional test which may become necessary.

6.1.4 Testing of each system and their elements shall be performed utilizing airborne unitized load devices of various sizes, loaded to their maximum capacities and lightly loaded containers of each specified type. Specifically, the loader will be tested to 1.5 times the designed load at various heights ranging between 500mm (but preferably 480mm) to at least 5550mm and hold for an unlimited period of time. On site testing, a pressure water hose of 80psi will be used to simulate raining conditions.

6.1.5 The test program shall verify system compliance with the requirements specified herein. In general, load capabilities, speed, stop and guide functions, sensors, controls, alignments, ruggedness, deflection, smoothness of acceleration and deceleration, noise, continuous cycling, unitized load flow and safety features shall be verified.



6.1.6 During the performance of the specified tests, there shall be no damage to the cargo, containers or equipment. All mechanism and stops shall operate as described. None of the components shall overheat and shut down due to overload, malfunction or misapplication.

## 6.2 Test Reports

6.2.1 Fifteen days after completion of the tests, the supplier shall submit a report summarizing the detailed results of the tests. The supplier shall make available to SAS upon request, the results of all tests conducted.

## 6.3 Final Acceptance

6.3.1 Final acceptance of the loader shall be made only after all the following six conditions have been fulfilled:

- a. the loader has been successfully tested as specified
- b. after final inspection if the loader is found to be in compliance with specifications (Pre-delivery inspection to be carried out by SAS or its appointed representative at manufacturer's premises. Any improvements raised by SAS or its appointed representative to be carried out prior to shipping to Singapore)
- c. after the loader has been operated by SAS for a period of one calendar month and has not experienced any failure, irregular operation or abnormal wear
- d. fulfillment of requirements stated in Clause 5.2.
- e. delivery of spare parts as approved by SAS.
- f. the supplier has provided the names, addresses and 24 hours phone numbers of at least 2 staff of the local representative (approved by SAS) of the supplier with authority and experience to make replacements and repairs immediately for the full life of all warranties.
- g. The tender price is to be valid for 3 years from the commissioning of the first unit.

## 6.4 Conditional Acceptance

6.4.1 If the loader is found to be unacceptable at the time of final inspection, SAS will inform the supplier of the particular defects that must be remedied before final acceptance is made. At this time, SAS may at its sole discretion elect to advise the supplier in writing that a conditional acceptance has been made. The conditional acceptance shall, to the extent set forth herein, relieve the supplier of responsibility for the security and insurance of the loader and shall also be used to initiate the time of warranty of the loader. In no case, however, will a conditional acceptance relieve the supplier of the responsibility for performing all the work set forth in the contract documents, including the correction of deficiencies noted at the time that the conditional acceptance is made; and SAS shall be entitled to retain from the supplier's payments an amount commensurate with the work remaining to be accomplished. Further, SAS may elect to put the loader into operation subsequent to the issuance of a conditional acceptance, in which case the supplier must perform all work.

## 6.5 Parts Availability

6.5.1 The supplier shall guarantee the availability of all spares and replacement parts and subassemblies required by any equipment item supplied, for a minimum fifteen years operational period. Such parts shall be either available from components manufacturer when an unmodified commercial component is required or subcontractor when "special" components are required.

- 6.5.2 Should the supplier, subcontractor or such suppliers as the supplier may specify, fail to make such parts available during the fifteen years operation period, or should the supplier's pricing become unreasonably high on a competitive basis, SAS has the right to use the supplier's drawings, at its sole discretion, for fabricating such parts, or having such parts fabricated.
- 6.5.3 The supplier shall provide recommended spare parts list and shall hold stock of value of not less than 10% of unit price (items and numbers as approved by SAS) in Singapore for the duration of the warranty period. They should also ensure the availability of spares support (on site) within 48 hours.

## **7 PREVENTIVE MAINTENANCE PACKAGE**

- 7.1 Preventive maintenance should be provided by the supplier for a period of 5 years after commissioning the units. All servicing costs should be quoted separately in the PRICING / DELIVERY SCHEDULE table.

## **8 OPTION PURCHASE**

- 8.1 If the option is to be exercised, please quote the unit price for the following items:
- 8.1.1 Spare engine module
  - 8.1.2 Main hoist cylinder
  - 8.1.3 Main hydraulic pump