



Public Investment Memorandum

SASOF V LP
Absolute Return Program

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Senior Portfolio Manager, Non-Traditional Investment Strategies

November 18, 2019



Recommendation

PSERS' Investment Office Professionals (Staff), together with Aksia, recommend that PSERS invest \$150 million in SASOF V LP (SASOF V or the Fund). This recommendation is based on our assessment of the investment strategy and our evaluation of Carlyle Aviation Services V LP and its affiliates (Carlyle Aviation or Investment Manager).

Firm Overview

Carlyle Aviation is an industry leader in the aviation finance market specializing in the management of mid-life (approximately 8 to 15 year old) commercial narrowbody and widebody aircraft. Founded in 2002 by Bill Hoffman (Chairman) and Robert Korn (President) as Apollo Aviation Group (Apollo Aviation), Apollo Aviation initially started as a private equity advisor managing commercial aircraft investments. In 2007, Apollo Aviation entered into a 50/50 joint venture with Sciens International Aviation Holdings Ltd., an affiliate of Sciens Capital Management LLC, to invest third party capital in the aviation industry. With this affiliation, Apollo Aviation became one of the first investment managers to invest third party capital in the aviation industry. Over time, Apollo Aviation built out a leading mid-life aviation platform. In 2017, Bill Hoffman and Robert Korn purchased Sciens' 50% stake in Apollo Aviation. In Q4 2018, The Carlyle Group L.P. acquired 100% of Apollo Aviation and rebranded the company as Carlyle Aviation Partners Ltd. (Carlyle Aviation). Bill Hoffman and Robert Korn remain with Carlyle Aviation in the same role. Bill and Robert have more than 50 years of combined aviation and aircraft leasing experience.

Carlyle Aviation employs over 90 professionals worldwide with offices in Miami, Dublin, and Singapore. These professionals provide a wide range of internal capabilities including origination/sourcing, pricing/financial analysis, risk analysis, technical analysis, marketing, asset management, legal/contracting, and accounting/tax. The Investment Manager also contracts with over 35 consultants throughout the world for technical and engineering services (physical aircraft inspections, repurposing aircraft, etc.). Carlyle Aviation has developed a proprietary enterprise management system to integrate all aspects of their aviation business. Our experience with the Investment Manager has found them to be willing to add and develop staff and invest in technology as activity increases and the need arises.

Carlyle Aviation is currently investing SASOF IV LP, which was launched in April 2017 and in which PSERS is an investor. Carlyle Aviation raised \$950 million in capital commitments for SASOF IV LP. SASOF V represents Carlyle Aviation's fifth institutionally focused commingled aircraft leasing fund. PSERS' investment in SASOF V will be our fourth investment with Carlyle Aviation. The investment period for SASOF IV LP ends in April 2020. The investment period for SASOF V LP will begin at that time.

Market Opportunity

While the airline sector has historically been cyclical and impacted by outside events, long-term air traffic and aircraft demand trends have continually increased. Passenger traffic has proven to be resilient to external shocks and has doubled every 15 years.¹ The last five years have seen Revenue Passenger Kilometers (a common measurement of air travel demand) growth rates of between 5% and 8%.² Air passenger traffic growth is forecasted at 4.6% over the next 20 years with higher growth rates forecasted in the Middle East and Asia Pacific.³ People in emerging markets have increasing opportunities to travel due to rising incomes, accompanied by improved service and lowered prices resulting from increased competition in the airline sector.⁴ Twenty years ago, the majority of passengers traveled on airlines based in North America or Europe, but today more than half travel on airlines based outside of those

¹ 2018 Airbus Global Market Forecast, 2019-2038

² International Air Transport Association (IATA) Economic Outlook, June 2, 2019

³ Boeing Commercial Market Outlook, 2019-2038

⁴ Boeing Commercial Market Outlook, 2019-2038



regions.⁵ By 2038, Boeing predicts that 40 percent of passengers will travel on an airline based in the Asia-Pacific area.⁶

Both Boeing and Airbus forecast air traffic growth to continue to outpace world GDP growth and expect the global aircraft fleet to nearly double in size by 2037^{7,8}. In addition, both manufacturers have order backlogs of over eight years.^{9,10} The strain on the available supply of used aircraft should sustain, if not create, demand growth for the Fund's targeted mid-life aircraft. This strain should also translate into strong, stable residual values.

With rising input costs (fuel and labor), leased aircraft offer an attractive economic alternative for airlines looking to control costs. As a percentage of the worldwide narrowbody and widebody aircraft fleet, leased aircraft have grown to almost 50%.¹¹ Recently, lease rates for mid-life aircraft have remained flat or trended slightly downward.

Another way for airlines to control costs is through aircraft maintenance. An engine overhaul is one of the most material intensive maintenance, repair, and overhaul activities. Airlines seeking cost savings will drive the demand for used surplus parts rather than purchase new replacement parts from the original equipment manufacturers. Unlike an aircraft whose value depreciates with age, used parts generally maintain their value. Used parts, though sold at a discount to new parts, are priced in relation to new parts whose value appreciates annually.

Investment Strategy

Carlyle Aviation is targeting an \$850 million capital raise for SASOF V, continuing the investment strategy it has pursued since 2012 focusing on the purchase of mid-life commercial aircraft with two to four years of lease life remaining. SASOF V will seek to generate attractive risk-adjusted returns that exhibit low correlation to the broader financial markets through disciplined acquisition, prudent financing strategies, proactive aircraft fleet management, and efficient disposition utilizing multiple exit strategies.

Acquisition – SASOF V will primarily target mid-life commercial aircraft that exhibit attractive supply/demand characteristics for lessors. In addition, Carlyle Aviation will look to identify special situation acquisitions which introduce transaction complexities which limit competition and offer higher potential returns. Primary sources of acquisitions include airlines and other lessors.

Financing – In past funds, Carlyle Aviation has utilized subscription lines to improve cash management and non-recourse financing with asset-specific collateral.

Aircraft Fleet Management – As of June 30, 2019, Carlyle Aviation had 241 aircraft on lease to 101 lessors in 57 countries. Carlyle Aviation uses an inhouse proprietary system to manage lease, re-lease, marketing, maintenance reserves, and maintenance events. Anticipated monthly lease rate factors (monthly lease payment as a percentage of the aircraft cost) of 1.0% to 1.1% equate to a 12.6% to 14.0% annual yield. Lease extensions or lease transitions can prevent having aircraft on the ground without leases. Experience has shown the remarketing team to be proactive at transitioning aircraft between lessees which limits aircraft downtime. Active maintenance management of upcoming shop visits can offer lessees creative solutions to reduce expenditure and operating downtime and generate incremental income from maintenance reserves (regular payments by lessees toward future maintenance) and end of lease settlements.

⁵ Boeing Commercial Market Outlook, 2019-2038

⁶ Boeing Commercial Market Outlook, 2019-2038

⁷ Boeing Commercial Market Outlook, 2019-2038

⁸ Airbus Global Market Forecast, 2019-2038

⁹ Boeing Commercial Market Outlook, 2019-2038

¹⁰ Airbus Global Market Forecast, 2019-2038

¹¹ The Aviation Industry Leaders Report 2019, KPMG



Operating leases create two main sources of income for Carlyle Aviation (the lessor):

- Lease Income – The contractual nature of the monthly lease payment provides Carlyle Aviation with a base case level of income at the inception of the investment.
- Aircraft Maintenance Reserves – Leases typically dictate that an aircraft be returned to the lessor at the end of the lease in an agreed upon condition in terms of the economic life (flying hours remaining) of its key components. In most cases, the lessee will pay a monthly amount into maintenance reserve escrow accounts managed by Carlyle Aviation. As maintenance work is completed and approved, the lessee may be reimbursed from these accounts for the worked performed. The maintenance reserve accounts provide security for Carlyle Aviation in regard to the aircraft quality and maintenance performance upon the return of the aircraft at the end of the lease. These reserves may also be a source of revenue at the end of the lease. Should an aircraft be returned at the end of a lease in a more depleted condition than was agreed to in the lease, in certain cases Carlyle Aviation will have the right to receive additional monetary end of lease compensation equivalent to the value of the excess economic time used by the lessee on the key components of the aircraft.

In addition, the aircraft investment is protected through other contractual provisions, such as requiring the lessee to insure the aircraft and security deposits which protect Carlyle Aviation in the event of lessee default. Should any default issues arise, leased aircraft assets also have the benefit of a global consensus on moveable assets, ratified through the Cape Town Convention on International Interests in Mobile Equipment. The treaty creates international standards for the registration of contracts of sale, liens, leases, and other legal remedies related to lessee default including the repossession of aircraft equipment.

Disposition of Assets – Carlyle Aviation will employ multiple exit strategies to dispose of aircraft assets. All teams work closely to identify and model various exit strategies including engine exchanges prior to major maintenance events, liquidation of assets through part-out or sale, and selling a portfolio of assets into an asset-backed securitization vehicle.

Portfolio Fit

The investment in the Fund will be part of the Absolute Return Program.

Investment Instruments

The Fund will primarily invest in in-production, mid-life commercial aircraft.

Investment Team

Robert Korn leads the investment team. Robert co-founded Apollo Aviation (now Carlyle Aviation) with Bill Hoffman in 2002 after previously working for Pegasus Aviation and BF Goodrich in various roles. Robert is supported by a team of over 90 individuals that have a wide range of educational and professional experience.



**COMMONWEALTH OF PENNSYLVANIA
PUBLIC SCHOOL EMPLOYEES' RETIREMENT SYSTEM**

| Name | Title | Years' Experience Firm / Total | Prior Experience | Education |
|-------------------------|--|---------------------------------------|---|---|
| Bill Hoffman | Chairman | 17 / 33 | Hoffman & Hoffman / Arthur C. Moller, PA / Plaza Bank of Miami | Juris Doctor / MS, Finance |
| Robert Korn | President | 17 / 26 | Pegasus Aviation / BF Goodrich (formerly Rohr) | MBA, Finance / BA, Economics |
| John Logan | Senior VP, Finance | 8 / 8 | None | MSc, Finance / HDip, Actuarial Science / BSc, Economics and Finance |
| Jordan Sulkin | Managing Director, Investor Relations | 5 / 22 | Trilogy Capital / Bank of America / Meritage Group / Global Asset Management | BS, Business Management |
| Javier Meireles, CPA | Chief Financial Officer | 9 / 16 | PricewaterhouseCoopers LLP | MS, Accountancy / BS, Accounting |
| Ted O'Byrne | Managing Director, Co-Head of Aviation | 1 / 26 | AerCap / Airbus | MBA |
| Clifton Dameron | Chief Legal Officer | 4 / 22 | Sciens Capital Management LLC / Bingham McCutchen LLP / Morgan, Lewis, & Bockius LLP | Juris Doctor / BA, History |
| Jason Avdenko, CPA, CFA | Chief Compliance Officer | 5 / 13 | Aksia LLC, PricewaterhouseCoopers, Millennium Partners | BS, Business Administration, Finance, Accounting |
| Rob Taylor | Chief Technical Officer | 12 / 38 | SEB Corporation / WestJet Airlines / Turbowest Helicopters / Pratt & Whitney Canada / Canadian Airlines International | BTEC, Aerospace (Mechanical) / Aircraft Maintenance Engineer (AME) |
| Pascal Picano | Chief Marketing Officer | 6 / 25 | SAFRAN / Swissair Group / GA Telesis / Sumitomo Corp. / ILFC | MBA, International Business & Administration / BS, Finance |
| Kate Holohan | VP, Pricing & Financial Analysis | 7 / 7 | None | MSc, Finance / BA, Economics and Business |
| Dan Logan | VP, Portfolio Management | 7 / 7 | None | PhD, Manufacturing Design and Control System Engineering |
| Michael Kittle | VP, Aviation Lending | 1 / 16 | DVB Bank / Bombardier / Accenture | BS, Business Administration |



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|------------------|-----------------------|---------|--|--|
| Pat Reiss | VP, Legal | 9 / 40 | Eastern Airlines / AeroThrust Corporation / Ametc / AerCap | BS, Information Management |
| Marcus Miller | VP, Dublin Operations | 11 / 16 | KPMG | MSc, Management / HDip, Business Studies |
| Mark McCaugherty | VP, Credit Management | 8 / 8 | None | MSc, Finance / BSc, Accountancy |
| Peter Blakeney | VP, Aircraft Trading | 9 / 10 | AerCap / MacCormick Civil and Tunneling | MiM, Management / BS, Engineering |
| Simon Leader | VP, Asset Management | 8 / 8 | None | MSc, Finance / BS, Commerce |

Investment Highlights

- Track Record
- Infrastructure
- Experienced Management Team
- Established Sourcing Network
- Established Distribution and Marketing Network
- Technical Expertise
- Active Management
- Multiple Exit Scenarios
- Committed Capital
- Access to Capital Markets

Investment / Risk Considerations

- Reliance on Technology
- Macro Environment
- Potential Fund Term Mismatch
- Releasing Risk
- Counterparty Credit Risk
- Non-U.S. Investment Risk
- Leverage
- Asset Risk
- Concentration Risk
- Macroeconomic Risk
- Change in Ownership



Investment Committee Disclosure

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| Relationship with Aksia | None Disclosed |
| Introduction Source | PSERS has been invested with Carlyle Aviation (formerly Apollo Aviation) since January 2013 via our investment in the Sciens Aviation Special Opportunities Investment Fund II, LP. |
| Placement Agent | Yes. Carlyle Aviation engages placement agents in certain jurisdictions (Japan and Sweden) for certain accounts. The placement agents are compensated based on the aggregate commitments to SASOF V. The placement agent fees paid will not be borne by the SASOF V limited partners but will be paid by the Investment Manager. A placement agent was not used to solicit PSERS' business. |
| PA Political Contributions | None Disclosed |
| Potential Conflicts | We are not aware of Carlyle Aviation having any material conflicts. |
| PSERS History with the Investment Manager | PSERS is an investor in Sciens Aviation Special Opportunities Investment Fund II, LP, SASOF III LP, and SASOF IV LP. |
| PSERS Allocation Implementation Committee Approval | November 18, 2019 |

Oversight Responsibility

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|---------------------|---|
| Investment Office | Charles J. Spiller Deputy CIO, Non-Traditional Investments Robert E. Little Senior Portfolio Manager |
| External Consultant | Aksia LLC |

Manager Recommendation Memo

November 15, 2019

Board of Trustees
Commonwealth of Pennsylvania, Public School Employees' Retirement System
5 North Fifth Street
Harrisburg, PA 17101

Re: SASOF V LP

Dear Trustees:

Aksia LLC, having been duly authorized by the Board of PSERS, has evaluated and hereby recommends a direct allocation to SASOF V LP (the "Fund") in line with PSERS' Investment Policy Statement, Objectives, and Guidelines. It is further recommended that PSERS commit up to \$150 million in the Fund.

Carlyle Aviation Partners ("CAP", or the "GP"), formerly Apollo Aviation Group, is a leading aviation investment organization with approximately \$5.8 billion of assets under management. The firm specializes in the ownership and management of mid-life (~8 to 15 years old) commercial aircraft across a geographically diverse footprint; as of June 30, 2019, CAP manages a fleet of approximately 240 aircraft on lease to 101 airlines across 57 countries. The GP was one of the first groups to invest third party capital in the asset class and used its first mover advantage to build one of the most prominent mid-life aviation leasing platforms. The Firm employs close to 90 professionals focused on the aviation market across offices in Miami, Dublin and Singapore.

The Fund is the fifth vintage in the SASOF series, and the GP is targeting an \$850 million raise. The Fund's first close is expected at year-end 2019 and fundraising is expected to be complete by the end of 2020. The strategy will remain consistent with prior vintages, generally focusing on the purchase of mid-life aircraft with 2 to 4-year remaining leases, with emerging market airlines representing the majority of lessees. The portfolio is expected to consist of 125+ in-production aircraft, primarily narrow body Boeing 737-800s and Airbus 320-200s.

Aksia's recommendation is based upon the following analytical factors and is made within the context of PSERS' investment guidelines:

- Due diligence of the Fund's investment process, including a review of its investment strategy, investment team personnel and structure, and risk management;
 - On-site investment due diligence visit conducted September 18, 2019.
- Due diligence of the Fund's operations, including an operations and infrastructure review, regulatory and compliance review, LPA review, Form ADV review, and Financial Statement Review;
 - On-site operational due diligence visit conducted September 17, 2019.
- Evaluation of the Fund's strategy within the context of the current investment environment; and
- Appropriateness of the Fund as a component of the PSERS portfolio.

This recommendation is given solely for the benefit of PSERS and cannot be relied upon by other investors considering an investment in the Fund, since their needs, objectives, and circumstances may not be identical to those of PSERS. The scope of this recommendation is limited to the investment merits of the Fund. In addition, please consult your tax, legal and/or regulatory advisors before allocating to any private investment fund.

Please feel free to contact us should you have any questions about this recommendation.

Respectfully,



Patrick Adelsbach
Partner, Head of Credit Strategies



Simon Fludgate
Partner, Head of Operational Due Diligence